


# Testing the Impact of Social Isolation on Students' Acceptance of Learning Management Systems After the COVID-19 Crisis Using a Modified UTAUT Model

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## ABSTRACT

After more than two years of the beginning of Covid-19 crisis, this research work investigates the students' acceptance towards utilizing learning management systems (LMSs) as a useful supporting learning medium while most of higher education institutions over the world have adopted these systems to become an indispensable, promising teaching tool and considering the distance learning as compliance to the conditions of social isolation is case of any crisis. This article analyzes the most significant factors effecting the adoption and led to the acceptance of LMSs through the higher education across 423 undergraduate and postgraduate students from several universities in Jordan. By applying the structural equation modelling, the results reveal that all proposed determinants have an impact on the adoption of distance learning, with noted significant impact for social isolation. The infection anxiety and students' level have moderated these effects on the behavioral intentions and actual use of learning management systems and show significant impact on them.

## KEYWORDS

Covid-19, Distance Learning, Learning Management Systems, Social Influence, Social Isolation, Technology Acceptance, UTAUT

## 1. INTRODUCTION

Since the fourth quarter of year 2019, the world is still suffering from the spread of Covid-19 and its unexpected variants, which recognized as pandemic in the beginning of 2020. No one denies the negative impact of this pandemic on our lives. Its effect influences different sectors over the world; industry, transportation, aviation, service providing, businesses, in addition to the education, are examples of the most effective sectors (Momani et al., 2022). Besides this effect, the huge number of confirmed cases and high mortality rates in some affected countries have made a feeling of fear among people against social gathering. As precaution procedure, governments over the world moved toward lockdown and curfew. They issued different policies to control the social activities. Policies such as social isolation, social distancing, and institutional and self-quarantine were introduced (Momani, 2022). Therefore, social isolation becomes one of most successfully used methods during this crisis

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to limiting mixing and direct contact between people. Masoom (2016) defined social isolation as “the loss of social relations at the personal level, or disengagement from essential social institutions from societal level.”

While millions, even billions, of people enforced to stay at their homes to get rid of infection and activating the social isolation, alternative mediums of communication have become needed. In education, distance learning or electronic learning (e-learning) was the suit alternative to continuing the learning process, especially for higher education level. The existence of Learning Management Systems (LMSs), e.g., Moodle, WebCT, and Blackboard, video conferencing applications, e.g., MS-Teams, Zoom, and WebEx, helps in compensating the shortage in physical contact between students and instructors (Momani, 2021b). LMSs have been defined by Turnbull et al. (2019) as “web-based software platforms that provide an interactive online learning environment and automate the administration, organization, delivery, and reporting of educational content and learner outcomes”. Therefore, LMSs are enabling teachers sharing materials, creating assessments, and communicating with their students in a professional virtual way without hindrance of time and place. Many universities and higher-education institutions over the world activated their contingency plans and moved to distance learning. Obviously, the noble role of technology is compensating, filling the gap, and recovering the negative effect of this crisis.

This study has been conducted to reveal the students’ perspective regarding the adoption of LMSs after the pandemic and continue using them after recovery. Thus, the arisen problem is that this sudden conversion to the distance learning needs to be examined in order to evaluate and explore the students’ acceptance and dependence on LMSs. This study suggests applying one of the technology acceptance theories as a proposed approach to assess the ability of the proposed research population (Jordanian students) to adopt such kind of technology (LMSs) within their usage behavior (online learning). According to Momani and Jamous (2017), this approach is considered as a technique or testing in software engineering which has a strong interconnection with the psychological and sociological sciences. So, this study proposed a modification on the unified theory of acceptance and use of technology (UTAUT), where it is recognized as one of the most intensive and robust technology acceptance theories (Al-adaileh et al., 2022; Momani, 2020).

After almost two years of moving to distance learning, this experience needs to be evaluated. Technology acceptance tests are designed for such kind of studies. Actually, technology acceptance tests were recognized by researchers as a mature step of information systems development. As mentioned by Teo (2011), “technology acceptance is the willingness of an individual to adopt the use of technology for facilitating task performance based on the support it was designed to provide”. Scholars concluded that the acceptance of LMSs among learners varies from country to another (Almuraqab, 2020; Santiago et al., 2020). Accordingly, this study investigates the most significant factors effecting the adoption and led to the acceptance of LMSs through the higher-education process across 423 undergraduate and postgraduate students from several universities in Jordan.

Technically, technology acceptance theories and models were not designed, in their original frameworks, for testing the voluntary use of generic software (or web-based applications as proposed in this study). There were designed originally to understand and explain the usage behavior and to assess the acceptance of adopting information systems in the organizational mandatory usage environment. UTAUT model was not an exception. It was reported by Venkatesh et al. (2003) that the UTAUT was developed to evaluate the acceptance of integrating new technologies in organizations and firms within mandatory usage of western working environment and culture. Additionally, it is important to highlight here that this model has got a revision by its developers in the form of the extended UTAUT (UTAUT2) (Venkatesh et al., 2012). Whereas UTAUT2 looks more applicable to study the generic voluntary usage applications, this study aims to contribute to investigating and examining the original UTAUT model in the context of the voluntary style of usage and its viability after extension and modification. As concluded by Venkatesh et al. (2012), UTAUT2 has the power

to explain from 52% to 74% of the variance in behavioral intention and usage behavior. This study aims to examine the application of the original UTAUT in the same conditions.

Therefore, the purpose of this study is to examine the viability of the UTAUT model to be modified to assess the acceptance of a web-based application within a voluntary usage environment for a non-western culture, such as the Jordanian students. Accordingly, this study would add some new determinants, remove some others to the structure of the UTAUT model, and redefine the relations between these determinants. These modifications are proposed to make it more suitable to examine the adoption of LMSs within the Jordanian universities' students depending on their behavioral intention and usage behavior of distance learning and their ability to adopt this kind of development on the traditional method of learning that they already experienced. It is worth to know that this research work can be circulated over any Middle eastern or developing country, which all share almost the same features in their needs and experienced the same situations in facing the Covid-19 pandemic.

The findings of this study reveals that the students' use of LMSs is affected by their believes that the system is easy to use, and it will enhance their performance in learning, and the available technical infrastructure is suit for operating this kind of systems. Students, also, are influenced by their society and the prevention measures taken such as the social isolation, without ignoring the variance between students in the degree of the acceptance according to their level in study (freshmen, sophomores, juniors, seniors, or postgraduate) and their level of fear of infection which reported as one of the most significant factors affecting the adoption of LMSs and technology in general during the pandemic. Thus, it can be concluded that the extended model has proven to be useful for understanding the acceptance of LMS among students, accordingly, universities in Jordan can focus more on the system's effective implementation and can invest more in distance learning technology in future.

## **2. LITERATURE REVIEW**

### **2.1. The Unified Theory of Acceptance and Use of Technology (UTAUT)**

The evolution of acceptance theories and models have been initiated since the beginning of the 20<sup>th</sup> century and it is still evolving. As a part of the software quality activities in software engineering field, technology adoption, acceptance, and usage behavior have been started to attract attention by researchers since the 1970s as an initial step for technologies' utilization and realization (Momani, 2020). Currently, to understand the cause of users' accepting/rejecting any new technology has become an integral task in any information system's life cycle (Sivathanu & Pillai, 2019).

In this context, the research study of Venkatesh et al. (2003) aimed to define a unified form of technology acceptance theories. They reviewed the most famous and widely used eight technology acceptance theories and combined them in a unified form have called it the Unified Theory of Acceptance and Use of Technology (UTAUT). Their review done over 32 constructs derived from the examined eight theories (Momani, 2017). Their study resulted four determinants recognized as the most significant and direct effect on behavioral intention to use technology (BI) and the actual usage behavior of that technology (AU). These determinants are: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). Therefore, UTAUT model has been reported and one of the most intensive and robust technology acceptance theories by utilizing the most advantage and significant determinants from the older theories (Momani, 2021a).

Moreover, Venkatesh et al. (2003) tested the moderating variables available in the examined eight theories, and studied their influence on the acceptance and the decision to adopt technologies. Their study concluded that four of moderators are having the most significant effect, these moderators are: gender, age, level of experience, and voluntariness of use. By applying longitudinal survey study, they noted that the predictive validity of the examined eight theories was increased after including the influence of the moderating variables. As a result, the UTAUT model suggested three direct

determinants to the behavioral intention (performance expectancy, effort expectancy, and social influence) and two to the of usage behavior (intention of use and facilitating conditions).

## 2.2. Learning Management Systems (LMS)

Distance learning has become a trend in recent years, especially in the last two years with the spread of this pandemic. It is one of the fastest growing areas of high technology development in the academic environments (Khan et al., 2019; Smolka, 2017). Although the instructor is a core factor in the learning process, but the advantages of e-learning systems change the role of the instructor in this process. Obviously, distance learning gives an opportunity to anyone to learn anytime and anywhere in a rapid and customized way. Currently, several LMSs, either open-source or commercial, available in the marketplace offer electronic teaching and learning tools (Hanaysha et al., 2021; Momani, 2021b).

Nowadays, it is clearly noted the importance of technologies in growing up any working environment, the learning is not an exception. It is a virtual way of connecting both teachers and learners by ignoring the boundaries of place and time. Online-based technologies have been widely used in education in order to facilitate some of co-learning among learners and lecturers (Goh et al., 2014). LMS employ the multimedia and human-computer interaction tools to get the best form of online communications. The LMS was defined by Adzharuddin and Ling (2013) as “an online portal that connects lecturers and students out of the classroom. It provides an avenue for classroom materials and activities to be shared easily rather than the traditional classrooms that would take too much time spent in delivering these materials”. Alishahedani et al. (2019) mentioned that the successful sharing of knowledge, in general, can help to improve learning habits and be successful in any educational setting, regardless of the type of learner involved. Whereas the interaction and delivery methods used in online classes are dramatically different from traditional classes (Hass & Joseph, 2018; Manoharan, 2008).

## 3. RESEARCH METHODOLOGY

### 3.1 Model Development

In the context of LMSs acceptance, this study proposed an extension of the conceptual model of the UTAUT that suit the unique characteristics of LMSs and its acceptance during the tough time of Covid-19 pandemic. The extended model is proposed to improve the understanding for LMSs adoption and usage within the proposed research population. This extension effects the structure original model of UTAUT by some modifications on its determinants and moderating variables. These modifications are stated as follows:

- Generally, UTAUT model contains the most significant constructs/determinants to test the acceptance and adoption of a technology. While the adoption of LMSs comes in an exceptional situation, the proposed testing model must be enhanced to become more appropriate. The proposed addition was to add a new determinant which it is the social isolation. It is clear that the social isolation is the major reason of LMSs to become the main communication medium within this pandemic.
- As aforementioned, the adoption of LMSs come in an exceptional situation, this study proposed that the default moderating variables of UTAUT will not have significant effect on the adoption of LMSs. This research work studied the impact of the pandemic no the adoption. While students are enforced to compulsory or voluntary staying home, and the general environment led to feel fear of infection, this study proposed the infection fear (or infection anxiety) as a moderator with significant impact on the ability of students to accept and adopt LMSs.

- Students are not same, their level of experience is not the same, too. During the university years, students are growing-up their experience not only in their major specialization, but in some other skills, using technology resources is one of these skills. Accordingly, this study proposed the level of student in the university has a significant effect on their ability to accept and adopt LMSs, as well.

Depending on the aforementioned proposed modifications, the proposed extension of the UTAUT model is illustrated in Figure 1. The modified model assumes that there are four direct determinants of behavioral intention to adopt and continue use LMSs: performance expectancy, effort expectancy, social influence, and social isolation. In addition to two direct determinants of actual use behavior: behavioral intention itself and the facilitating conditions.

### 3.2 Research Hypotheses

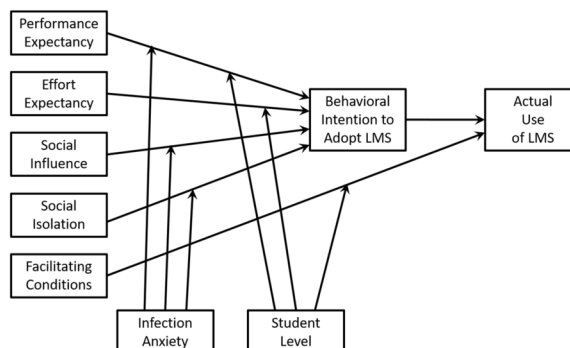
For this research work, two levels of hypotheses have been proposed. The first level of presents the relations between the model's determinants and their influence on the behavioral intention and actual use. While the second level of hypotheses represents the influence of the moderators on the aforementioned relations. The quantitative research method has been applied to statistically test the two levels of the research hypotheses. As discussed previously, the extended UTAUT model of this research consists of five determinants and two moderators as discussed in the following section:

#### 3.2.1 Performance Expectancy (PE)

It represents “the degree to which an individual believes that using the system will help him/her to attain gains in job performance” (Venkatesh et al., 2003) p 447. The related research shows that the performance expectancy has a significant positive effect on the behavioral intention (Davis et al., 1989; Venkatesh and Davis, 2000). It is proposed that this relation moderated by both moderators, infection anxiety and student level. Therefore, the following hypotheses were proposed:

- **H1:** *Performance expectancy* has an effect on *behavioral intention* to adopt LMS.
  - **H1a:** The influence of *performance expectancy* on behavioral intention to adopt LMS will be moderated by *infection anxiety*, such that the effect will be stronger for those who have fear from infection.
  - **H1b:** The influence of *performance expectancy* on behavioral intention to adopt LMS will be moderated by *student level*, such that the effect will be stronger for students in higher level.

Figure 1. The proposed research model



### 3.2.2 Effort Expectancy (EE)

It represents “the degree of ease associated with the use of the system” (Venkatesh et al., 2003) p 450. The related research shows that the effort expectancy has a significant effect on the behavioral intention (Triandis, 1980; Venkatesh and Davis, 2000) and can be moderated by student level. Accordingly, the following hypotheses were proposed:

- **H2:** *Effort expectancy* has an effect on *behavioral intention* to adopt LMS.
  - **H2a:** The influence of *effort expectancy* on behavioral intention to adopt LMS will be moderated by *student level*, such that the effect will be stronger for students in higher level.

### 3.2.3 Social Influence (S.IN)

It was defined by Venkatesh et al. (2003) p 451 as “the degree to which an individual perceives that important others believe he/she should use the new system”. It has an effect on the behavioral intention that moderated by the infection anxiety. According to this, the following hypotheses were proposed:

- **H3:** *Social influence* has an effect on *behavioral intention* to adopt LMS.
  - **H3a:** The influence of *social influence* on behavioral intention to adopt LMS will be moderated by *infection anxiety*, such that the effect will be stronger for those who have fear from infection.

### 3.2.4 Social Isolation (S.IS)

According to Masoom (2016), social isolation was defined as “the loss of social relations in personal level or disengagement from essential social institutions from societal level”. Depending on the proposed model, social isolation has been proposed as a direct determinant of behavioral intention. The effect of social isolation on behavioral intention to adopt LMSs is proposed to be moderated by the infection anxiety, where this feeling of fear proposed to be significantly effective on the decision to adopt LMSs in the time of the pandemic. Accordingly, the following hypotheses were proposed:

- **H4:** *Social isolation* has an effect on *behavioral intention* to adopt LMS.
  - **H4a:** The influence of *social isolation* on behavioral intention to adopt LMS will be moderated by *infection anxiety*, such that the effect will be stronger for those who have fear from infection.

### 3.2.5 Facilitating Conditions (FC)

It is defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al., 2003) p 453. Related researches noted that the facilitating conditions has no effect on the behavioral intention, it has a positive effect on the usage behavior (Ajzen, 1985; Rogers, 2003; Taylor and Todd, 1995a, 1995c; Triandis, 1980). In this study, the effect of facilitating conditions on actual use has been proposed to be moderated by student level. For this, the following hypotheses were proposed:

- **H5:** *Facilitating conditions* has an effect on *actual use behavior* of LMS.
  - **H5a:** The influence of *facilitating conditions* on actual use behavior of LMS will be moderated by *infection anxiety*, such that the effect will be stronger for those who have fear from infection.

### 3.2.6 Behavioral Intention (BI)

It can be defined as “the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior” (Venkatesh et al., 2003). The related research shows that it has a direct effect on usage behavior (Ajzen, 1985; Davis et al., 1989; Taylor & Todd, 1995a; Venkatesh and Davis, 2000). The modified model of this study proposed that this relation is moderated by the student level. According to this, the following hypotheses were proposed:

- **H6:** *Behavioral intention* to adopt LMS has an effect on *actual use behavior* of LMS.
  - **H6a:** The influence of *behavioral intention* on actual use behavior of LMS will be moderated by *student level*, such that the effect will be stronger for students in higher level.

### 3.3. Research Instrument

The survey questionnaire which was conducted through this study has been designed electronically by using the Google Forms tool in order to increase its accessibility, especially within the context of social isolation. In order to get rid of the issue of missing data and giving more reliable findings, the questions were design to be as required without any exceptions, where the participant must answer all questions specified in the questionnaire. The proposed research model was examined by testing each determinant through three statements. Thus, the total of eighteen statements have to be evaluated by the participants presenting their opinion against the LMS adoption and acceptance. Table 1 represents the testing statements of each one of the five determinants, in addition to the behavioral intention factor.

The research population of this study is the actual users of LMSs within the Jordanian university students who are required to perform their study through LMS during this pandemic regardless of their major of study that would enhance the generalizability of the research results. Thus, a total of 423 questionnaires were collected as a primary data for this study, by taking into consideration the model complexity and the guidelines of researchers for applying surveys to study the technology acceptance.

## 4. RESULTS AND DISCUSSION

### 4.1. Reliability test

For any successful statistical analysis, the reliability test is an important step as it represents the degree of accuracy of collected data and the consistency of measurements. This study applies the Cronbach's coefficient alpha ( $\alpha$ ) test as one of the most and widely used techniques to test the reliability (Field, 2009; Kline, 2011; Pallant, 2005). Cronbach's coefficient alpha tests the consistency of respondents' answers to all items of a measure (Cortina, 1993). According to the related research, the Cronbach's  $\alpha$  values should be close to 1.0 for excellent reliability, over 0.8 are good, in the range of 0.7 are acceptable, and below 0.6 considered as poor reliability (Marchewka et al., 2007). The acceptable value can be decreased to 0.6 in exploratory research studies. By using SPSS statistical package, all Cronbach's  $\alpha$  values of each variable in this study are above 0.7, and from the acceptable to the excellent level of reliability (see Table 1). These results indicate that the statements of each measurement item were positively correlated to one another, and they are independent measures for the measurement item.

Aa additional reliability test, another measure can be used to assess the internal consistency for the research questionnaire, which is the inter-item correlation. Inter-item measurement measures the correlation among statements for each item (Hair et al., 2009). The correlation value from 0.10 to 0.29 is considered to be small correlation, from 0.30 to 0.49 is considered as a medium correlation, and from 0.50 to 1.0 is large correlation. All these considerations are for both positive and negative correlations. Hair et al. also determined the values of 0.3 and above are acceptable values for inter-item correlation (see Table 2). It is clearly reveals that all the values are above 0.3. These results supported

**Table 1. Testing statements of the LMSs acceptance test**

Construct	The related questionnaire statements
<b>PE</b>	PE1: Using LMS for studying would enhance my effectiveness of learning and I can do my work more quickly. PE2: Using LMS would help me more in searching for the most appropriate knowledge. PE3: Using LMS would help me in discussing ununderstood points of the material with my teacher freely more effectively. <b>References:</b> (Ernst et al., 2013; Venkatesh et al., 2003)
<b>EE</b>	EE1: Learning to study through LMS would be easy for me. EE2: Using LMS and navigating its tasks is clear and understandable. EE3: It would be easy for me to become skillful in using LMS. <b>References:</b> (Davis, 1989; Venkatesh et al., 2003)
<b>S.IN</b>	S.IN1: Friends in my class positively influenced me to use LMS. S.IN2: I use LMS because other students at the university are using it. S.IN3: My friends in class think that using LMS during this tough time is the best solution for continuing learning process. <b>References:</b> (Venkatesh et al., 2003)
<b>S.IS</b>	S.IS1: Because of social isolation, I feel myself alone and friendless, and isolated from other people. S.IS2: Social isolation makes the physical interaction with teachers and other students impossible, which leads to find some electronic methods to communicate and interact. S.IS3: LMS can be a suitable alternative to fill the gap of less physical interaction with teachers, especially within this tough time. <b>References:</b> (Davis et al., 1992; Ernst et al., 2013; Venkatesh et al., 2012)
<b>FC</b>	FC1: Using LMS in online learning is secured whether to my personal information or to grading, attendance, and sharing materials. FC2: I feel that I have the needed skills, knowledge, and resources to use LMS. FC3: From my experience, I found that the assistance and the technical support from computer department at the university are ready for any assistance or queries. <b>References:</b> (Kripanont, 2007; Venkatesh et al., 2003)
<b>BI</b>	BI1: I intend the university will continue using LMS for teaching and learning in the future. BI2: I would be comfortable in continue using LMS in learning in the future. BI3: I predict that using LMS in my online learning to get the benefits of the flexibility in managing materials conducting assessments. <b>References:</b> (Lim and Ting, 2012; Venkatesh et al., 2003)

**Table 2. Cronbach's alpha and inter-item correlations reliability results**

Measurement Items	No. of statements	Cronbach's $\alpha$	Inter-item Correlation
<b>PE</b>	3	0.784	0.537 – 0.724
<b>EE</b>	3	0.863	0.707 – 0.814
<b>S.IN</b>	3	0.824	0.549 – 0.694
<b>S.IS</b>	3	0.761	0.537 – 0.764
<b>FC</b>	3	0.845	0.582 – 0.687
<b>BI</b>	3	0.912	0.780 – 0.859



the results of Cronbach's Alpha. Therefore, these values suggest that the research questionnaire was reliable research instrument and measurement tool.

#### 4.2. Validity test

For validity testing of the research instrument, two main approaches have been used for factor analysis: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Bacon, 1997; Momani, Jamous, & Yafooz, 2017; Suhr, 2005). EFA is a successful technique to assess the relationships among variables for exploring the construct validity of the instrument's scale. Herein, the AMOS statistical package has been utilized to analyze the factor loading of the six scales of the proposed model. According to Hair et al. (2009), the items with values below 0.4 are considered to be low-loaded. Table 3 presents the loading values of all scales, and all of them are resulting values above the minimum value of factor loading.

For CFA, the Average Variance Extracted (AVE) should be used in order to test the convergent validity. AVE is used to calculate the explanatory power to all variables in the instrument of the average variation. The higher result of AVE means the higher reliability and the higher construct validity. According to Kline (2011), the appropriate value for AVE should be 0.5 and above. Byrne (2010) and Fornell and Larcker (1981) mentioned that the constructs have convergent validity when the composite reliability (CR) exceeds the value 0.7 and AVE is above 0.5. The results of AVE and CR have been stated in Table 4. It is clearly shown that all values of AVE are exceeding the minimum limit of 0.5. Additionally, the CR values exceeding 0.7, which means that there is no overlap among the measures in this study. According to this, these results support the instrument's adequate convergent validity.

Discriminant validity is a part of construct validity. It is found when two different concepts are not correlated to each other. According to Fornell and Larcker (1981) and Hair et al. (2009), discriminant validity can be tested through the inter-factor correlations by comparing the square root of the AVE of each factor with the square values of inter-factor correlations of other factors. The square root AVE values should be greater than the square values of the correlations in order to satisfy discriminant validity requirements, and as a result, to be supported (Pallant, 2005; Sekaran, 2003). For this study, the discriminant validity results are presented in Table 4. These results showed that all square values of inter-factor correlations are less than the square root values of AVE (the diagonal cells). It means that the constructs confirm the adequacy of the discriminant validity.

Table 3. Factor loading of the model's measurement scales

Constructs	Factor Loading		
	PE1	PE2	PE3
PE	0.813	0.851	0.733
EE	EE1	EE2	EE3
	0.902	0.841	0.853
S.IN	S.IN1	S.IN2	S.IN3
	0.833	0.741	0.824
S.IS	S.IS1	S.IS2	S.IS3
	0.782	0.733	0.874
FC	FC1	FC2	FC3
	0.794	0.829	0.763
BI	BI1	BI2	BI3
	0.908	0.927	0.883

Table 4. The results of AVE, CR, and the discriminant validity tests

Constructs	AVE	$\sqrt[2]{\text{AVE}}$	CR	PE	EE	S.IN	S.IS	FC	BI
PE	0.641	0.801	0.933	<b>0.801</b>					
EE	0.749	0.865	0.945	0.524	<b>0.865</b>				
S.IN	0.641	0.801	0.934	0.553	0.385	<b>0.801</b>			
S.IS	0.638	0.799	0.941	0.262	0.196	0.258	<b>0.799</b>		
FC	0.633	0.796	0.928	0.258	0.269	0.393	0.294	<b>0.796</b>	
BI	0.821	0.906	0.972	0.543	0.482	0.562	0.460	0.234	<b>0.906</b>

### 4.3. Structural Equation Modelling (SEM)

The SEM is a general structural modelling technique which is widely used in behavioral sciences, especially in information technology researches. It describes the structural relationships among the constructs in the model (Hox and Bechger, 1998). Skrandal and Rabe-hesketh (2005) mentioned that SEM contains two types of models, the measurement model and structural model. Measurement model relates the observed responses to the latent variables. Structural model then specifies the relations between the latent variables and regressions of the latent variables on the observed variables in order to describe how the constructs are related to other constructs in the model (Awang, 2012).

The SEM analysis which is used in this study contained the following two major phases: (1) Investigating only the constructs and their influence on the behavior without considering the effect of the moderators. Two steps of analysis have been followed through this phase. The whole measurement model is used to assess the validity and unidimensionality of the model, and then the structural model is to test the relations among constructs. These two steps were applied herein by using AMOS statistical package. As a result of this phase, the research hypotheses are partly tested. (2) Investigating the effect of the moderators on the influence of the constructs on the behavior. This operation has been done by using multiple-group analysis by using AMOS too. The result obtained from this phase is the completely tested hypotheses, and consequently, the completely tested model.

#### 4.3.1 Measurement model assessment

Hair et al. (2009) recommended using the goodness-of-fit (GOF) measures in order to evaluate the measurement model. Several tests were applied, and the results showed that the model is from acceptable to good level of fit with values as follows: Chi-square ( $\chi^2$ ) = 421.167, degree of freedom ( $df$ ) = 242, the relative Chi-square ( $\chi^2/df$ ) = 1.740, Comparative Fit Index (CFI) = 0.956, Tucker-Lewis Index (TLI) = 0.948, Incremental Fit Index (IFI) = 0.955, and Root Mean Square Error of Approximation (RMSEA) = 0.053. These tests are also recommended to be in use for evaluating the structural model, as well.

#### 4.3.2 Structural model assessment

Within this step, the hypothesized model and its entire relations among constructs were evaluated. GOF tests were examined by using AMOS and the results were as follows:  $\chi^2 = 523.276$ ,  $df = 287$ ,  $\chi^2/df = 1.823$ , CFI = 0.949, TFI = 0.942, IFI = 0.949, RMSEA = 0.055. All results were in good level of fit, Chi-square ( $\chi^2$ ) was greater than the degree for freedom ( $df$ ), CFI, TFI, and IFI indices were above 0.90, finally, RMSEA was less than 0.80. Furthermore, the standardized coefficients were presented on the structural model in Figure 2 and Table 5, as well. It is clear that the whole factor loading values were in the acceptable range (above 0.30). Accordingly, these results showed a good level of fit to the model.

Figure 2. The standardized path coefficients of the structural model

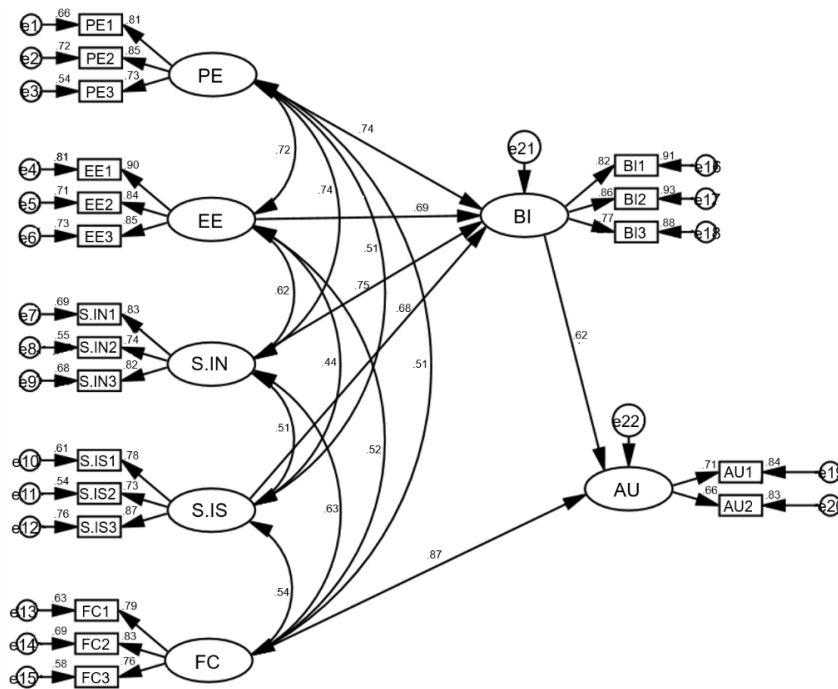


Table 5. The structural model assessment findings

Hypothesis	Path	Standardized path coefficient	Hypothesis testing result
H1	PE → BI	0.74 ***	Supported
H2	EE → BI	0.69 ***	Supported
H3	S.IN → BI	0.75 ***	Supported
H4	S.IS → BI	0.68 ***	Supported
H5	FC → AU	0.87 ***	Supported
H6	BI → AU	0.62 ***	Supported

Note: \*\*\*  $p < 0.001$

#### 4.4. The Effect of the Moderators

As mentioned before, the second phase of SEM was to investigate the effect of the moderators on the influence of the constructs on the behavior intentions and usage behavior. The simultaneous multiple-group analysis was applied in order to test the moderators' effects. In multiple-group analysis, the model is evaluated in two or more groups simultaneously (Arbuckle, 2013; Gorondutse & Hilman, 2014; Momani et al., 2018). AMOS was used to apply the multiple-group analysis here. This test was used to evaluate the invariance of the model depending on the data set. The next two steps were applied through this test:

1. Before applying the simultaneous group analysis, it is important to assess the fit of the model by checking the CFI and RMSEA values within each subgroup.

2. The simultaneous group analysis has to be applied in order to bring results stating that the moderators really affect and moderate the relations among the latent variables in the model. The Chi-square test was applied here. The change in the Chi-square value between the baseline and subsequent models was evaluated at 95% level of confidence. This step aims to test whether there are any statistically significant differences among the groups.

Table 6 presents the GOF tests of each moderator variable in both the baseline and constrained models depending on the influence of each moderator on the specific relations. Table 7 presents the results got from the hypotheses testing operation.

## 5. CONCLUSION

The major implication of this research work is to examine the ability of UTAUT model to be applied to study web-based educational applications within the voluntary style of usage. This paper aimed through its statistical study to test the model's viability to explain the acceptance and usage behavior of LMSs in voluntary style of usage. The findings of applying SEM on this study revealed that the key predictors of the behavioral intentions and usage behavior to accept and adopt LMSs within the Jordanian students according to their usage behavior are: performance expectancy, effort

**Table 6. Simultaneous analysis results**

Moderator	Model	$\chi^2$	<i>df</i>	CFI	RMSEA	$\Delta \chi^2$	$\Delta df$
<b>Infection Anxiety (IA)</b>	Baseline model	1491.131	852	.908	.049		
	Fully constrained	1522.442	900	.912	.050	129.986***	48
	PE to BI constrained	1416.282	854	.914	.047	8.762**	2
	S.IN to BI constrained	1396.956	854	.912	.049	11.432***	2
	S.IS to BI constrained	1402.533	854	.915	.048	13.761***	2
<b>Student Level (SL)</b>	Baseline model	621.132	396	.905	.045		
	Fully constrained	699.120	417	.901	.049	91.205***	21
	PE to BI constrained	621.302	397	.905	.046	9.102**	1
	EE to BI constrained	610.984	397	.907	.045	1.805 <i>n.s.</i>	1
	FC to AU constrained	624.122	397	.908	.044	1.790 <i>n.s.</i>	1

Note: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , *n.s.* not significant

**Table 7. The summary of the hypotheses testing operation**

Affecting Construct	Moderators	Affected Construct	Hypothesis		Hypothesis testing result
<b>PE</b>	IA	Behavioral Intention (BI)	H1	H1a	Supported
	SL			H1b	Supported
<b>EE</b>	SL		H2	H2a	Not supported
<b>S.IN</b>	IA		H3	H3a	Supported
<b>S.IS</b>	IA		H4	H4a	Supported
<b>FC</b>	SL	Actual Use (AU)	H5	H5a	Not supported

expectancy, social influence, and social isolation, all of them have significant influence on the behavioral intentions, while the facilitating conditions and the behavioral intention are significantly influencing the actual use behavior of LMSs. The significant effects of these predictors have supported the level-1 of the proposed hypotheses (H1, H2, H3, H4, and H5) without the proposed effect of the moderators. Therefore, it can be reported that the individuals believe the adopting of LMSs in their distance learning will help them to attain gains and improve the performance of the operation, which reflects the significant effect of the performance expectancy factor on adopting LMSs. This is also due to the degree of ease of use and the familiarity of web-based applications, then effort expectancy factor showed significant effect on adopting LMSs. The results also revealed that the social influence is another significant factor on the adoption, with the effect of friends/professors on students' decision to use LMS in their distance learning. Besides, no one denies the situation of social distancing and social isolation which is resulted from the wide spread of the virus during the Covid-19 crises over the world. Accordingly, social isolation factor shows a significant effect on the behavioral intention to adopt LMSs among the research population studied through this research. On the other hand, facilitating conditions which reflect the individuals believes that the organizational and technical infrastructure of e-learning applications exists to support their usage and adoption of LMSs has a significant effect on the decision of its adoption and continue usage. That's done with the support of their behavioral intentions to adopt the technology which is supported already by the other aforementioned four factors.

The results of level-2 hypotheses testing operation according to SEM with the effect of the moderators showed strong statistical evidence on the validity of the modified UTAUT model of all constructs. Four of moderation effects were supported, while two effects were not. The results showed that the effect of performance expectancy on behavioral intentions is moderated by infection anxiety and students' level. The students' level has no effect of effort expectancy that is not supports the proposed model. Infection anxiety moderates the relation between social influence and behavioral intentions. The relation between social isolation and behavioral intentions is moderated by infection anxiety. Whereas, the actual use is affected by the facilitating conditions and not moderated by students' level as it was hypothesized. Therefore, the movement toward distance learning can be evaluated as smooth, without ignoring some obstacles related to the readiness of the technical and procedural infrastructures.

It is important to mention that the squared multiple correlations (SMCs) of the model have been estimated in order to investigate how much the independent variables explain the variance of the dependent variables (Hox and Bechger, 1998; Nokelainen, 2009). As a result, the model has a power to explain 72% of the variance in behavioral intentions, which is exceed the original UTAUT model that was 69% (Venkatesh et al., 2003). Additionally, the modified UTAUT proves its adaptability and viability to be modified by comparing it with its extension, the UTAUT2 model, which shows an ability to explain from 56% to 74% of the variance in behavioral intention (Venkatesh et al., 2012).

Nevertheless, this study will not stop here. Many suggestions can be reported for the future research work that may be done by the researcher himself or by other researchers who are interesting in this field of technology acceptance and the role of emerging technologies in recovering after disasters. Therefore, this study will, significantly, has an implication to the best use of technology as a part of any disaster recovery plan and it will help the researchers in future. In fact, this study suggested that this modified version of the UTAUT model can be widely applied for many web-based applications such as mobile applications' usage, or any other e-learning or distance learning application. This study, additionally, suggested that the modified model can be applied over any population similar to the Jordanian culture, such as any Arab, middle eastern or developing country. The current determinants and moderators can be examined for accepting and adopting any technology under test. Therefore, the extension of this model through the incorporation of social factors and the Corona Fear will help understand the user's behavioral intention of technology acceptance in light of the recent pandemic and its subsequent behavioral use. The actual use of any information system implicitly relies on the

existence of intention towards using it. However, the continuation of using the information system depends on two beliefs: In the first stage, the information system has to be accepted by the users. Then, continuing usage which comes after acceptance depends on users' satisfaction with the system (Hong et al., 2006). In the educational environment, it means continuing in increasing the investment in information technology and e-learning tools.

Moreover, further determinants or moderators can be added to its structure such as self-efficacy, technology anxiety, technology quality, trustworthiness, cultural factors, and more, in order to improve its explanatory power for any other kind of technologies in both types of usage, (voluntary and mandatory). The ideas will not stop here, because this study can be developed by adopting the longitudinal survey technique in order to assess the differences in the behavioral intentions and the actual use behavior in several time points, in addition to examining the impact of increasing the experience level through the time.

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