

To “D” or Not to “D”?

Assessing Instructors’ Intentions to Adopt Digital Learning in Saudi Arabia’s Public Universities in the Wake of COVID-19

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ABSTRACT

Although digital learning has been used by the public universities to teach students for some time, the relatively new established universities still didn’t fully adopt the digital learning practices. Therefore, this research aims to understand the factors that influence instructors’ intentions to adopt digital learning during and post COVID-19 time period. For this, the paper proposed a model based on the unified theory of acceptance and use of technology extended with additional construct such as self-efficacy and moderators such as staff IT-training and institutional support. The workable data were collected from 274 instructors across 10 public universities that have implemented digital learning in their curriculum relatively lately after 2010, and they are still experimenting its implementation using their resources. The data were analysed using PLS SEM. The results supported the influence of antecedents on instructors’ intentions to adopt digital learning, and moderators were also found to support the relationships significantly.

KEYWORDS

Digital Government Systems, Digital Learning, Instructors, Public Universities, Saudi Arabia, UTAUT

1. INTRODUCTION

Information and communication technologies (ICTs) have brought several benefits in the educational setting for both students and instructors (Alharbi and Lally, 2017). Digital learning (d-learning) has witnessed an exceptional growth specifically in the higher education sector in Saudi Arabia in the recent times (Aljaber, 2018). The implementation of d-learning has had an enormous influence on the way various digital tools are being adopted in many public universities across Saudi Arabia. Even though many public universities have adopted the digital learning solutions, only fewer instructors were using these tools (Aldiab et al., 2019). Recent research conducted in one of the largest universities in the country, found that more than 82% of the instructors were not using the digital learning solutions at any point of time in the past (Al Meajel and Sharadgah, 2018). The study conducted in one other public university in Saudi Arabia found that most instructors either hardly used the digital solutions or

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never used it. Even those who used it largely did it for uploading the course syllabus, sharing grades or sending emails to the students (Tawalbeh, 2018). Although with a view to improve the quality of teaching and learning the Ministry of Education (MoE) suspended all distance learning education in 2017, they cancelled all offline teaching in the wake of COVID-19 breakout and ordered all the higher education institutions to continue with the distance learning through digital tools in March 2020 (Alammary et al., 2021; Albjali, 2018). To maintain the quality of education even through the distance learning mode, the MoE offered various supports to the public universities such as getting them subscription for the d-learning tools and training workshops. At the same time, the public universities in Saudi Arabia also offered the wholehearted support to their instructors to ensure the quality of education is not compromised due to the sudden imposed transition to the distance learning mode (King Abdulaziz University Report, 2020; Umm Al-Qura University Report, 2020).

As this transition from the traditional mode of teaching to the distance learning was so sudden many instructors in relatively newly established Saudi public universities who were not exposed to using the digital learning tools understandably found the adoption of d-learning tools very stressful (Alammary et al., 2021). Given the lack of exposure and lack of adequate resources among the instructors in the relatively recently established public universities, this research explores the factors influencing the adoption of d-learning tools by the instructors for teaching students in the distance learning mode. Although various research studies have explored the d-learning adoption in general and in the context of Saudi Arabia in particular, none of the studies have yet explored it for the public universities lacking exposure and experience in implementing such technologies due to their inexperience and lack of interest and motivation for teaching staff to use it for properly disseminating the education dedicatedly through emerging tools to impart quality education to their students. Deriving from the above discussion, this paper answers the following research questions:

RQ1: What factors influence the adoption of d-learning tools in the recently established public universities in Saudi Arabia?

RQ2: What key roles staff information technology (IT)-training and institutional support have played in the adoption of these emerging technologies?

To answer these questions, the paper aims to explore the factors influencing the intentions to adopt d-learning tools among some of the selected public universities' teaching staff. To achieve this aim, this paper has used one of the most popular theories i.e., unified theory of acceptance and use of technology (UTAUT) of IT adoption as an underpinning theory to understand the adoption of d-learning tools. In addition, the paper also includes a pertinent construct called self-efficacy and the moderators such as staff IT-training and institutional support to understand how these most pertinent factors moderate the relationships between the indented relationships for the proposed model. While undertaking this research using the proposed model and data collected from the selected public universities, this study provides a multi-fold contribution to the existing research in the area of technology adoption in general and specifically for d-learning. First, although many studies have examined the adoption of electronic learning in the past, this is the first study to assess the intentions to adopt d-learning tools in the emerging public universities with lack of digital resources and exposure. Second, the paper used a unique combination of antecedent and moderators to make the model novel to understand the adoption of d-learning among instructors across various public universities in the country. Finally, the paper provides methodological contribution by collecting data from the Academics who have used the digital tools in the past but lacked the right motivation and support to implement it to the places where it was even absolutely required.

The structure for the remaining sections of the paper is outlined as follows: Section 2 provides the theoretical background, proposed research model and development of hypotheses for various relationships between selected constructs. Section 3 discusses the methodology applied to collect the data to validate the proposed model. Section 4 analyses the results in the backdrop of the threshold

values for the standard indicators and proposed hypotheses. Section 5 discusses the results in relation to the available literature in this area. This section also provides sections on theoretical contributions, implications for practice and limitations and future research directions. Finally, the paper provides the conclusive remarks in Section 6.

2. THEORETICAL FRAMEWORK, PROPOSED RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

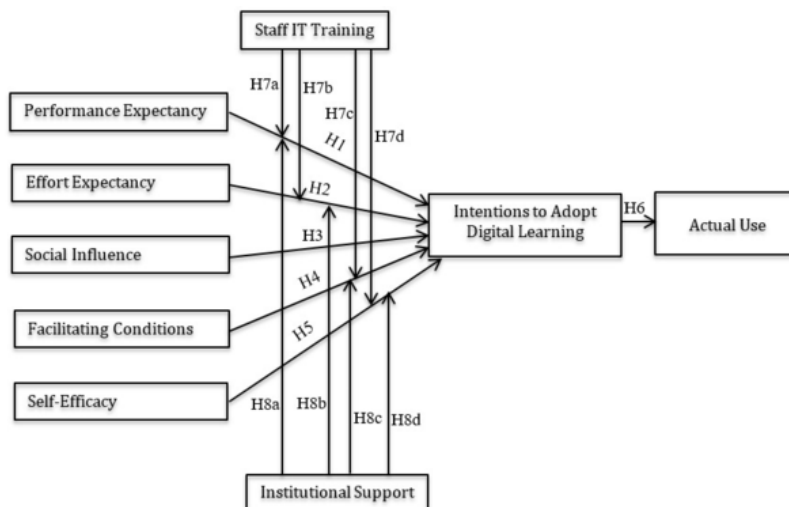
2.1. Theoretical Framework

This research will follow the theoretical background of the UTAUT model. The UTAUT model is selected because it is a unified model constituting of eight other theories on technology adoption including theory of reasoned action, technology acceptance model (TAM), motivation model, theory of planned behaviour (TPB), combined TAM and TPB model, model of PC utilisation, innovation diffusion theory and social cognitive theory (Venkatesh et al., 2003). TAM has been one of the most widely used and popular models in the information systems area however, it has been criticised for not fully covering the features and properties of technologies being used and hence makes a limited contribution to knowledge and practice (Nili et al., 2020). Moreover, both TAM and TPB have also been criticised for being too simplistic and deterministic (Gurer and Akkaya, 2022). The other constituent theories are the subsets of this unified theory, which makes it well placed to be used as an underpinning theory for any research undertaking the acceptance of emerging technology.

2.2. Proposed Research Model

The UTAUT model assumes that the acceptance of IS/IT at the individual level is motivated by the four core constructs of the model including performance expectancy, effort expectancy, social influence and facilitating conditions. It also contains two outcome variables namely behavioural intention and use behaviour along with four moderators such as age, gender, experience and voluntariness to use. Also, it is believed that other constructs such as self-efficacy, staff IT training and institutional support are more suited to the context where the adoption of the d-learning is assessed for the instructors of the newly established universities in Saudi Arabia. Figure 1 illustrates the proposed research model with relevant antecedents, outcome and moderating variables.

Figure 1. Proposed research model (Adapted from Venkatesh et al., 2003)



Performance expectancy is defined as the level to which the individual believes that using the information system will help him or her to achieve better job performance. Effort expectancy is defined as the degree of ease linked with the use of the system or innovation. Social influence is defined as the degree to which the use of certain information systems or innovation is influenced by individual's peers, family and any other acquaintances. Facilitating conditions is defined as the level to which the individual believes that organisation and technical infrastructure exist to support the use of d-learning systems (Venkatesh et al., 2003). In addition, this study also included self-efficacy of the instructors to use the d-learning system as an additional construct. Hence, self-efficacy is defined as an individual's conviction in their ability to use the given system required to produce the performance attainments (Bandura, 1977). In the context of this research, self-efficacy can be considered as instructors' belief that they own the right aptitude and skills to succeed while interacting and engaging with the d-learning systems for teaching students. Moreover, this research also believes that staff IT training and institutional support are vital for them to willingly adopt the d-learning systems as for relatively newly established universities, the staff were not encouraged to use such systems in the past.

2.3. Hypotheses Development

The proposed research model formulates six hypotheses relating to direct relationships between seven constructs and eight hypotheses based on the two moderating variables on four relationships between selected antecedent variables and intentions to adopt d-learning systems.

2.3.1. Performance Expectancy

Performance expectancy is the instructors' belief that using the d-learning systems will improve their performance to implement different tasks that they do to engage students through the online platforms (Venkatesh et al., 2003). This construct has been consistently found as a significant and strong predictor of instructors' intentions to adopt d-learning systems (Abbad, 2021; Al Mansoori et al., 2018; Alshehri et al., 2019). Prior studies have used the impact of performance expectancy for the students (e.g., Abbad, 2021; Alshehri et al., 2019) and instructors (e.g., Alammery et al., 2021) alike. This research also believes that the instructors will try their best to perform to their fullest ability using d-learning systems as their appraisal and promotion will largely depend on their student feedback, which is directly related to their better performance. Therefore, based on the above discussion, the following hypothesis could be formulated:

H1: Performance expectancy will have a positive and significant influence on instructors' intentions to adopt d-learning systems.

2.3.2. Effort Expectancy

Effort expectancy defines the belief associated with using the d-learning systems by the instructors of the newly established public universities in Saudi Arabia from where the data were collected. Although many studies (e.g., Abbad, 2021; Al Mansoori et al., 2018; Decman, 2015) have supported the significant relationships of effort expectancy on behavioral intentions, various other studies (e.g., Alammery et al., 2021) also found them non-significant on the same dependent variable. For example, modelling the acceptance of e-learning in the mandatory environment of the higher education system, Decman (2015) found that effort expectancy was having a non-significant influence on students' intention to adopt this system. Similar results were obtained by some other studies as well. The non-significant influence of effort expectancy on behavioral intentions indicate that the complexity of the system does not really matter to users of e-learning systems. This is largely because most of the time when students are using such systems, they are well versed in handling other similar online systems on their day-to-day basis and hence that doesn't make any difference if they get any other systems to handle for their online learning. However, when we talk about using d-learning systems

by instructors who have hardly used the system except for uploading the course content, emailing students, writing announcement, etc. through interactive learning tools, the ease of handling of d-learning systems for managing their entire teaching through the d-learning tools, it is expected that effort expectancy should exert a significant influence on intentions to use such systems. Therefore, the following hypothesis is formulated:

H2: Effort expectancy will have a positive and significant influence on instructors' intentions to adopt d-learning systems.

2.3.3. Social Influence

Social influence indicates whether the important others to the instructors of the universities such as their friends, members in the family and colleagues influence them to adopt the d-learning systems (Venkatesh et al., 2003). Venkatesh et al. (2003) argued that the impact of social influence could be recognised more when individuals are more sensitive to the opinions of others. Given Saudi Arabia is a slightly collectivist society meaning the individuals give importance to the opinions coming from the family, extended family and extended relationships and manifest their long-term commitment to the member group (Khan, 2017). This indicates that they give high importance to the members of this group and hence they would abide by what is said to them. The UTAUT theory suggests that social influence become non-significant in the case voluntary settings (Venkatesh et al., 2003). However, given that the government made it mandated to implement d-learning system during the time of pandemic, it is believed that social influence will exert a significant influence on the adoption intentions of the instructors. Therefore, the following hypothesis is formulated:

H3: Social influence will have a positive and significant influence on instructors' intentions to adopt d-learning systems.

2.3.4. Facilitating Conditions

Facilitating conditions indicate the support provided by the public universities to their instructors to ensure that the online education takes place without any hindrance when it is required the most in the form of training and development, ICT infrastructure and available resources to support the uninterrupted services to the students and instructors (Venkatesh et al., 2003). Although the original UTAUT model supports the influence of facilitating conditions on use behavior, some comprehensive meta-analyses of the theory have suggested that this construct also has significant influence on behavioral intentions (Dwivedi et al., 2011, 2019). In the context of this research, it is also believed that the instructors would be more interested to adopt the d-learning systems if they get enough support from their institutions to use it for teaching and learning purposes. Considering the above discussion, the following hypothesis can be formulated:

H4: Facilitating conditions will have a positive and significant influence on instructors' intentions to adopt d-learning systems.

2.3.5. Self-Efficacy

Self-efficacy is the individual's self-belief to accomplish behaviours required to attain certain performance level (Bandura, 1977). In the context of this research, self-belief indicates instructors' belief that they possess enough self-confidence, abilities, skills while engaging with the d-learning systems to successfully engage students while teaching the assigned courses to them (Alammery et al., 2021). Many prior studies (e.g., Budu et al., 2018; Li et al., 2012) on e-learning have established

the positive and significant influence of self-efficacy on behavioural intentions to adopt the specific information systems. Hence, this leads to the formulation of the following hypothesis:

H5: Self-efficacy will have a positive and significant influence on instructors' intentions to adopt d-learning systems.

2.3.6. Intentions to Adopt D-Learning

Intentions to adopt a system is an individual's likelihood to take part in a particular behaviour (Venkatesh et al., 2003). Various other models such as theory of reasoned action, technology acceptance model, theory of planned behaviour, etc. of technology adoption have also confirmed a positive and significant influence of behavioural intentions on actual behaviour (Ajzen, 1991; Davis, 1989; Fishbein and Ajzen, 1975). The relationship between behavioural intention and actual use of any technology has been also approved for the research exploring the adoption of digital learning systems (Yakubu and Dasuki, 2019). This research also believes that more the likelihood of the individuals involving in the use of d-learning more would be their tendency to use the system. Deriving from the above discussion, the following hypothesis can be proposed:

H6: Intentions to adopt d-learning system will have a positive and significant influence on instructors' actual use of it.

2.3.7. Moderating Effect of Staff IT-Training

The universities can influence the adoption of d-learning systems among their instructors by providing training to them using Internet and making the Internet points accessible to them and providing technical support (Al-Harbi, 2011). Staff IT training can significantly moderate the relationships between performance expectancy, effort expectancy, facilitating conditions and self-efficacy with intentions to adopt instructors' d-learning systems. This is largely because instructors' performance, ease of use, available infrastructure and their abilities and self-confidence to handle the d-learning systems are intensified with the proper support of staff IT training. Therefore, the following hypotheses can be formulated:

H7a: Staff IT training will positively moderate the relationship between performance expectancy and intentions to adopt d-learning systems.

H7b: Staff IT training will positively moderate the relationship between effort expectancy and intentions to adopt d-learning systems.

H7c: Staff IT training will positively moderate the relationship between facilitating conditions and intentions to adopt d-learning systems.

H7d: Staff IT training will positively moderate the relationship between self-efficacy and intentions to adopt d-learning systems.

2.3.8. Moderating Effect of Institutional Support

Institutional support plays a critical role in ensuring the adoption of digital learning systems in an organisation (Masrom et al., 2008). For institutional support, the availability of ongoing technical support and help desk were found to be the most critical success factors (Selim, 2007). From the above discussion, it can be easily argued that institutional support could contribute significantly improve the influence of instructors' performance, handling the d-learning systems with ease, improve the existing infrastructure, and boosting up instructors' self-confidence and skills toward intending to adopt d-learning systems. Hence, the following hypotheses could be formulated:

- H8a:** Institutional support will positively moderate the relationship between performance expectancy and intentions to adopt d-learning systems.
- H8b:** Institutional support will positively moderate the relationship between effort expectancy and intentions to adopt d-learning systems.
- H8c:** Institutional support will positively moderate the relationship between facilitating conditions and intentions to adopt d-learning systems.
- H8d:** Institutional support will positively moderate the relationship between self-efficacy and intentions to adopt d-learning systems.

3. RESEARCH METHODOLOGY

As this paper is about developing and validating the proposed hypotheses, the survey method was deemed appropriate for collecting data. A total of 32 questions were used from nine constructs for the proposed model including performance expectancy, effort expectancy, social influence, facilitating conditions, self-efficacy, intentions to adopt d-learning systems, actual use, staff IT training, and institutional support. The items for selected constructs of this questionnaire were used from their originating scholarly sources as far as possible. A seven-point Likert scale were used to record responses for all the scale-based questions. In addition, the questionnaire also consisted of some demographic questions asking about some key characteristics of the respondents such as their age, gender, education level, instructor positions, computer skills and their digital learning experience.

As most of the respondents would teach their courses in Arabic and they also felt comfortable in answering the questions in local language, the questionnaire was designed both in English as well as Arabic language. The original version of the questions was developed in English. However, that was translated back in the Arabic language first using a professional language translator. Furthermore, the translated Arabic version of the questionnaire was given to another professional translator, and it was translated back to English. The questionnaire in its original version in English and the one which is translated back to English were matched to see the accuracy of translation and was finally adopted to be disseminated for the pilot and final data collection exercise (Bhattacharjee, 2012).

As the purpose of this research is to understand the adoption of digital learning systems in relatively newly established government universities, I contacted all those universities in Saudi Arabia that were established post 2010 to understand what level of awareness they have in terms of teaching the courses using digital teaching tools particularly in the compulsory setup in the situation like COVID-19. The key idea to select these universities for understanding the adoption of d-learning systems is largely because they are the ones, which have largely depended on the face-to-face component of teaching and hardly used the digital mode anytime.

The paper-based questionnaires were distributed to the instructors of these universities based on the contacts with some of the instructors through the author's network in each of them. A total of 700 questionnaires were distributed to them during the November and December 2021 and 312 responses were obtained by the end of January 2022. After a manual screening, it was found that 16 questionnaires were partially completed and hence removed from the further scrutiny. While copying the responses on SPSS, it was further realised that 22 of them responded to all the scaled questions using the same response option and hence was discarded as the responses were considered biased and would influence the overall results using these data points. So, the remaining 274 completed responses were used for further data analysis, which made a response rate of 39.14%.

4. RESULTS

4.1. Respondents' Demographic Characteristics

The respondents belonged to all different age groups with the largest 183 represented the age range of 25-40 years followed by remaining 91 belonged to 41 years and older. As far as their gender was

concerned 194 were females and the rest 80 were females. In terms of their education, 171 of them were found to hold the bachelors and master's degree whereas the rest 103 possessed their PhD degree. So far as their instructor ranks were concerned the largest among them were found to be working as Assistant Professors 96 followed by 85 as Lecturers. Among other respondents, 42 were Full Professors, 30 Teaching Assistants and 21 Associate Professors. The data were also collected regarding their computer skills, and it was found that 184 of them possessed excellent computer skills followed by 58 who claimed themselves as good, 23 average and nine with limited skills. The data collected for their digital learning experience, it was found that 64 of them always tried to use the digital learning components in their teaching and learning exercise whereas many other members of instructor staff either never used (i.e., $n=126$) it or used it occasionally (i.e., $n=56$) whereas only 28 of them used it on weekly basis.

4.2. Descriptive Statistics

Mean and standard deviations (SDs) for the measures of all constructs used in the proposed research model is presented in Table 1. The data were collected on the scale of [1-7] for all the items for scaled constructs with '1' measuring 'strongly disagree' to '7' measuring 'strongly agree'. The mean and SD statistics clearly indicate that all the questions were answered favourably with not too much of deviations from their mean values. The higher and positive overall values of constructs indicate that respondents remained convergent while responding to most of the questions and their responses were not too much diverging.

4.3. Reliability Analysis

To establish reliability, this research provides internal reliability of constructs (see Table 2). The findings confirmed the indicator reliability through both Cronbach's alpha as well as composite reliability of all the constructs in the proposed model and found all of them greater than the expected threshold values of 0.70 (Hair Jr et al., 2021). To confirm the reliability further, this research also checked the rho_A values to be well greater than the accepted value of 0.60 (Henseler et al., 2016). We also explored the convergent as well as discriminant validity to establish the validity of the constructs. For example, average variance extracted (AVE) values were computed and found to be greater than the accepted minimal value of 0.50. Moreover, the discriminant validity of constructs was established using Fornell-Larcker criterion. In this criterion, the correlation coefficients between each pair of constructs should be always less than their square root of AVE.

4.4. Factor Structure

Exploratory factor analysis (EFA) yielded 10 factors. Five of these factors are antecedents of d-learning systems whereas one each is the mediating and outcome variable and two of them as moderating variables. Item loadings for these constructs indicate that they are distinct items representing independent constructs and none of these overlaps with each other (Thoma and Gruber, 2020). Variance Inflation Factor (VIF) assesses the rigorousness of multicollinearity in the regression analysis. Multicollinearity indicates the occurrence of two or more independent variables with high correlation in some regard (Alin, 2010). The VIF value greater than 10 is often used as an indication for the potential multicollinearity problem (Ahmad et al., 2006). The VIF values (see Table 3) for the measures of each construct are well with that threshold value indicating that there is no problem of multicollinearity in the given data.

4.5. Discriminant Validity

Table 5 presents the discriminant validity of the constructs used in the proposed research model. This table provides the correlation between every pair of constructs and square roots of AVE across the diagonals in the bold fonts. These correlation coefficients also help us to understand that the collinearity doesn't exist between constructs. To avoid collinearity between constructs, none of the

Table 1. Means and SDs

Construct	Item	Mean	SD
Performance Expectancy		5.64	0.870
	PE1	5.56	1.013
	PE2	5.41	1.212
	PE3	5.59	1.201
	PE4	5.46	0.897
Effort Expectancy (EE)		5.76	1.120
	EE1	6.08	1.320
	EE2	5.91	1.001
	EE3	5.84	0.987
	EE4	5.62	0.945
Social Influence (SI)	SI1	5.52	1.040
	SI2	5.56	1.110
	SI3	5.18	1.021
Facilitating Conditions (FC)		5.20	1.081
	FC1	5.21	1.049
	FC2	5.15	1.032
	FC3	5.08	1.107
	FC4	5.14	1.040
Self-Efficacy (SE)		5.46	1.034
	SE1	5.43	1.045
	SE2	5.58	1.067
	SE3	5.31	1.039
	SE4	5.35	1.042
Staff IT Training (SIT)		5.38	0.965
	SIT1	5.29	1.102
	SIT2	5.43	1.033
	SIT3	5.51	1.036
	SIT4	5.34	0.925
Intention to Adopt D-Learning (BI)		5.69	0.957
	BI1	5.57	1.123
	BI2	5.62	1.078
	BI3	5.73	0.938
Institutional Support (IS)		5.73	0.988
	IS1	5.62	1.068
	IS2	5.83	1.018
	IS3	5.53	0.971
Actual Use (AU)		5.45	1.213
	AU1	4.89	1.543
	AU2	5.76	1.134
	AU3	5.87	1.007

Table 2. Constructs' reliability and validity

Construct	# of items	Cronbach's alpha	rho_A	Composite reliability	Average variance extracted
Performance Expectancy (PE)	4	0.740	0.743	0.838	0.564
Effort Expectancy (EE)	4	0.808	0.809	0.875	0.636
Social Influence (SI)	3	0.759	0.771	0.861	0.674
Facilitating Conditions (FC)	4	0.627	0.626	0.782	0.472
Self-Efficacy (SE)	3	0.830	0.831	0.887	0.662
Intentions to Adopt D-Learning (BI)	3	0.784	0.786	0.874	0.698
Staff IT Training (SIT)	4	0.750	0.753	0.843	0.573
Institutional Support (IS)	3	0.672	0.685	0.821	0.606
Actual Use (AU)	3	0.749	0.780	0.852	0.657

correlations should be greater than the threshold value of 0.85 (Kline, 2015). To ensure that all the constructs are distinct and not overlapping with each other, this table ensures that there is no violation of discriminant validity as the correlations between constructs are well within the given threshold as well as the correlation between each pair of variables are less than the square roots of AVE for those variables.

4.5. Structural Model Analysis

The relationships between various constructs were examined to understand the causal link between antecedents and outcome variables. This research examined six direct and eight moderated relationships in the proposed model. All the hypotheses were supported in the validated model for the collected data sample. The findings indicated that three core constructs such as performance expectancy ($\beta=0.432$; $t=4.320$; $p=0.003$), effort expectancy ($\beta=0.234$; $t=3.039$; $p=0.003$), social influence ($\beta=0.314$; $t=4.618$; $p=0.004$), facilitating conditions ($\beta=0.203$; $t=2.942$; $p<0.001$) of the UTAUT model were found to have significant influence on instructors' intentions to adopt d-learning systems whereas intentions to adopt d-learning systems ($\beta=0.669$; $t=19.114$; $p<0.001$) was found to significantly influence their actual use of the d-learning systems. Moreover, self-efficacy ($\beta=0.412$; $t=5.086$; $p<0.001$) was also found to significantly influence intentions to adopt d-learning systems. As far as the moderating effect of staff IT training on the relationships between performance expectancy ($\beta=0.168$; $t=1.750$; $p=0.039$), effort expectancy ($\beta=0.211$; $t=2.671$; $p=0.032$), facilitating conditions ($\beta=0.456$; $t=4.262$; $p=0.003$), and self-efficacy ($\beta=0.267$; $t=2.840$; $p=0.005$) with intentions to adopt d-learning systems, it was found significant for all of them. The effect of institutional support as a moderating effect was also found significant between the relationships of performance expectancy ($\beta=0.354$; $t=3.052$; $p=0.021$), effort expectancy ($\beta=0.177$; $t=2.049$; $p=0.028$), facilitating conditions ($\beta=0.198$; $t=2.000$; $p<0.001$), and self-efficacy ($\beta=0.336$; $t=3.537$; $p=0.018$) with intentions to adopt d-learning systems.

5. DISCUSSION

Out of the 14 hypotheses, five (i.e., $PE \rightarrow BI$, $FC \rightarrow BI$, $SE \rightarrow BI$, $BI \rightarrow AU$ and IS as a moderator between $FC \rightarrow BI$) of them were found significant at $p<0.001$, three (i.e., $SI \rightarrow BI$, SIT as a moderator between $FC \rightarrow BI$ and $SE \rightarrow BI$) were found to be significant at the levels of $p < 0.01$ whereas other six relationships (i.e., $EE \rightarrow BI$, SIT as a moderator between $PE \rightarrow BI$, $EE \rightarrow BI$, IS as a moderator

Table 3. Factor loading and variance inflation factor

	AU	BI	EE	FC	IS	PE	SE	SI	SIT	VIF
AU1	0.825									1.283
AU2	0.787									1.806
AU3	0.818									1.795
BI1		0.841								1.712
BI2		0.850								1.664
BI3		0.816								1.553
EE1			0.828							2.034
EE2			0.733							1.397
EE3			0.815							1.808
EE4			0.811							1.913
FC1				0.701						1.266
FC2				0.684						1.222
FC3				0.711						1.252
FC4				0.652						1.133
IS1					0.825					1.537
IS2					0.822					1.437
IS3					0.680					1.183
PE1						0.770				1.476
PE2						0.810				1.674
PE3						0.737				1.418
PE4						0.680				1.240
SE1							0.818			1.839
SE2							0.813			1.811
SE3							0.815			1.715
SE4							0.807			1.755
SI1								0.843		1.651
SI2								0.846		1.557
SI3								0.772		1.445
SIT1									0.808	1.655
SIT2									0.757	1.518
SIT3									0.681	1.252
SIT4									0.777	1.525

Note: PE: Performance Expectancy, EE: Effort Expectancy, SI: Social Influence, FC: Facilitating Conditions, SE: Self Efficacy, SIT: Staff IT Training, IS: Institutional Support, BI: Behavioral Intentions to Adopt Digital Learning, AU: Actual Use Behavior

PE→BI, EE→BI and SE→BI) were found significant at the level of $p < 0.05$ (see Figure 2). The significant and strong impact of PE on BI (i.e., Hypothesis H1) indicates that possibility of rank promotion, improved productivity and usefulness of using such systems for teaching and learning lead to their improved intentions to adopt such technologies. Various prior studies (e.g., Abdou et al.,

Table 4. Fornell-Larcker Criterion for discriminant validity

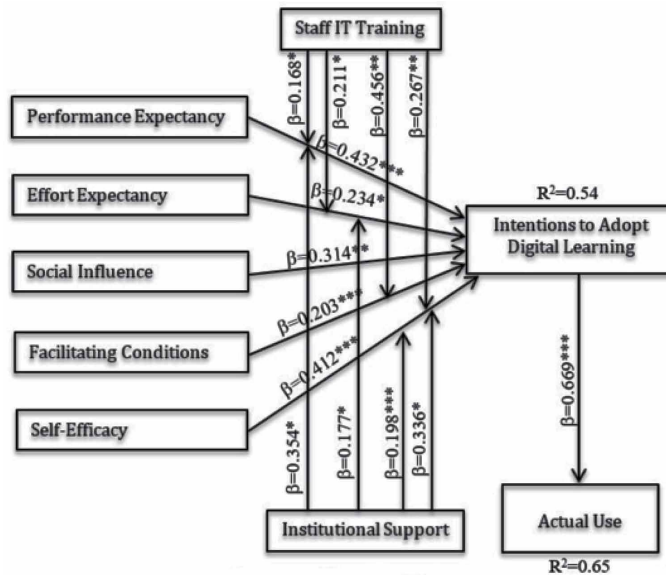
	AU	BI	EE	FC	IS	PE	SE	SI	SIT
AU	0.810								
BI	0.669	0.836							
EE	0.415	0.648	0.798						
FC	0.573	0.672	0.651	0.687					
IS	0.493	0.649	0.695	0.681	0.778				
PE	0.600	0.722	0.693	0.712	0.628	0.751			
SE	0.657	0.717	0.638	0.695	0.679	0.735	0.813		
SI	0.612	0.548	0.485	0.623	0.576	0.606	0.645	0.821	
SIT	0.689	0.751	0.671	0.736	0.682	0.727	0.761	0.662	0.757

Table 5. Findings of hypotheses testing

Relationship	β coefficient	Standard deviation	<i>t</i> -statistic	<i>p</i> -value	Hypotheses Supported?
H1. PE → BI	0.432	0.100	4.320	0.000	Yes
H2. EE → BI	0.235	0.077	3.052	0.038	Yes
H3. SI → BI	0.314	0.068	4.618	0.004	Yes
H4. FC → BI	0.203	0.069	2.942	0.000	Yes
H5. SE → BI	0.412	0.081	5.086	0.000	Yes
H6. BI → AU	0.669	0.035	19.114	0.000	Yes
H7a. SIT on PE → BI	0.168	0.096	1.750	0.039	Yes
H7b. SIT on EE → BI	0.211	0.079	2.671	0.032	Yes
H7c. SIT on FC → BI	0.456	0.107	4.262	0.003	Yes
H7d. SIT on SE → BI	0.267	0.094	2.840	0.005	Yes
H8a. IS on PE → BI	0.354	0.116	3.052	0.021	Yes
H8b. IS on EE → BI	0.177	0.082	2.159	0.028	Yes
H8c. IS on FC → BI	0.198	0.099	2.000	0.000	Yes
H8d. IS on SE → BI	0.336	0.095	3.537	0.018	Yes
R ² (BI)	0.54				
R ² (AU)	0.65				

2020; Twum et al., 2021) on electronic learning have supported this relationship. The relatively low but significant influence of EE on BI (i.e., Hypothesis H2) indicates that the instructors found such d-learning systems relatively easier to operate and use which influenced them to adopt such systems in their day-to-day use in teaching and learning. Some of the prior studies (e.g., Abdou et al., 2020; Kocaleva et al., 2015) on electronic learning systems have also supported this hypothesis. Also, the significant and moderately strong relationship between social influence and BI pointed out that the influence of those instructors who found such systems useful had a positive effect on their peers

Figure 2. Validated research model



to make them understand to use it. Like other relationships, this linkage was also supported by the previous literature (e.g., Maldonado et al., 2009; Nguyen et al., 2014) on digital learning.

Further, the significant influence of facilitating conditions on BI (i.e., Hypothesis H4) indicate that the assurance of required resources, compatibility of the university systems with the software being installed and used and their background knowledge will always motivate them to adopt the d-learning systems (Al Mansoori et al., 2017; Abdou et al., 2020). In addition, the significant influence of an additional construct self-efficacy on BI (i.e., Hypothesis H5) indicates that instructors' intrinsic motivation, self-belief, self-confidence with adequate computer and Internet facilities provided by their institutions helped them to adopt the d-learning system (Budu et al., 2018; Li et al., 2012). The hypotheses relating to moderating variable SIT on the linkages of PE, EE, FC and SE with BI (i.e., Hypotheses H7a, H7b, H7c, and H7d) indicate that staff IT training plays a very important role for the instructors' intentions to adopt the d-learning systems through PE, EE, FC and SE. That means the role of staff training expedites the relationships between suggested constructs as it improves their further performance using the d-learning systems, make them feel the d-learning being much easier, learning to properly utilise the available resources and make them feel more confident while using the d-learning systems, which eventually get them motivated to adopt it for the teaching and learning practices.

The significant influence of another moderating variable i.e., institutional support between PE, EE, FC and SE with BI implies that positive and constructive support by the universities can significantly impact all these relationships. For example, the usefulness to the e-learning systems and productivity and performance of instructors led by positive institutional support led to positive intentions to adopt d-learning systems. Similarly, such institutional support also provides instructors' positive intentions to adopt the d-learning systems when it helps instructors to know the details of handling the systems in remote learning situation. It also acts as a catalyst when the influence between SI and BI becomes significant as the senior management wants to disseminate teaching and learning in the critical and unavoidable situations such as COVID-19. As FC and institutional support go together, their combination of course makes instructors to adopt d-learning systems. The positive influence of BI on AU indicates that higher the instructors' intentions to adopt the d-learning systems better were their actual usage of such systems (Nguyen et al., 2014). The relatively stronger variance of

the model explained on both BI (i.e., 54%) and AU (i.e., 65%) indicates that the selected constructs constituting the proposed model were found to be the significant set of variables determining the intentions to adopt the d-learning intentions by the instructors across the relatively new established institutions in Saudi Arabia.

5.1. Theoretical Contributions

This research has various theoretical contributions to the existing knowledge in general on technology adoption and particularly to the d-learning adoption research. First, although numerous studies have explored factors analysing the adoption of electronic learning systems in general and in the context of developing countries none of them have undertaken it for the instructors of relatively newly established institutions in developing countries' context. This is the first research of its type that has analysed the adoption of d-learning systems for the instructors of relatively newly established institutions in Saudi Arabia. Moreover, during the time of Covid-19, it became almost evident that without such technologies it wasn't possible for the institutions to impart education to their students. Hence, this has been timely research that has examined the key factors influencing instructors' intentions to adopt d-learning and its actual usage when it was absolutely required by them. Second, this research, like many other studies on electronic learning, has used UTAUT as the underpinning model to propose a research model using additional constructs such as self-efficacy as antecedents and staff IT training and institutional support as the moderating variables between all the antecedents except social influence and intentions to adopt d-learning systems. A combination of these constructs and moderating variables is relevant to understand this context where the higher education institutions are still in the process of implementing and understanding the effectiveness of this technology. The current research provides a perfect platform to the researchers to benchmark this as an underpinning baseline model to extend it further to apply them in the similar contexts. Third, the variances explained by this model on intentions to use d-learning systems and actual behavior to use them were found to be 54% and 65%. This clearly indicates the overall role of the selected key constructs on the dependent variables and relevance of core as well as additional variables in d-learning adoption studies.

5.2. Implications for Practice

This study has various implications for instructors, higher education institutions and government at large. For example, a relatively strong influence of performance expectancy on intentions to adopt d-learning indicates that the senior management team in the higher education institutions should make the d-learning based education more prominently implemented across various programs so that the usefulness of such systems could be understood by the instructors and students alike. The positive influence of effort expectancy on intentions to adopt d-learning indicates that the designers and developers of such systems should make it much easier to access it by the instructors so that they do not find the use of the system stressful.

A significant and moderate impact of social influence on intentions to adopt d-learning systems indicates that the support and training wing of the government higher education institutions, the senior management and experienced colleagues using such systems should convince the junior staff and discuss with them the benefits of using the d-learning systems in contingency situations so that they are always ready to work on it in cases like COVID-19 or even in situations where multiple events are organised on the campus and to minimise the crowd the online ad-hoc teaching arrangements can be made through digital platforms and all such events like student graduation, open days, university wide annual festivals or fair can be organised in parallel as well.

The positive influence of facilitating conditions on intentions to adopt d-learning indicate that the newly established universities should provide more support mechanism (such as trainers, IT support staff, etc.), resources (such as providing individual laptops to the instructors, on call resolution of the IT related issues, etc.) to motivate instructors to use d-learning systems as and when required without any hesitation. Moreover, the positive influence of self-efficacy on intentions to adopt d-learning indicates

that the senior management of the government institutions should provide more frequent opportunities to their instructors to teach online. This will ensure keep their self-confidence intact using d-learning systems to teach students. The moderating influence of staff IT training between PE, EE, FC and SE on BI indicates that the higher education institutions should promote staff IT training to improve instructors' intentions to adopt d-learning. This could be done by recruiting individuals who have right expertise in this area and even they should be provided with the advanced level of training so that they are always updated with what they need to train instructors with. The moderating effect of institutional support between the same relationships also indicates that higher management of the institutions in Saudi Arabia should always provide constructive support to their instructors and encourage them to use such technology so that they are fully equipped with the required knowledge to implement it whenever required.

5.3. Limitations and Future Research Directions

This paper has several limitations. First, the data for this research was collected only from 10 public universities established by the government of Saudi Arabia after 2010 where the digital learning is not the sought-after mechanism to teach students. The future research can also collect data where digital learning was already implemented and compare how it looks different comparing it to the relatively newer institutions. Second, the sample size of this study is only 254. The future research can collect data from larger sample size probably by reaching out to a greater number of instructors who were teaching their courses using the digital learning tools. Third, the data were collected from instructors only using cross-sectional design approach. The future researchers could collect data from some other government as well as private higher education institutions using longitudinal approach. While doing so, the researchers could target such institutions where digital learning was implemented recently and could collect data from the researchers when they are just about to implement the d-learning and when they have used it for some time. Fourth, the data were collected using non-probability based convenient sampling technique considering the limited number of institutions in Saudi Arabia. Such data collection approach might hamper the generalisability of the findings of this research. Therefore, the findings of this research should be implemented to the other countries in the Arab region or other developing countries with proper caution. To expand the generalisability of the findings, the future research could collect data using probability sampling as well as implement a model that could be validated for both developing as well as other under-developed countries, which have still not been able to implement digital learning due to various reasons including the lack of financial and human resources, their government support, etc. Finally, the proposed model could be expanded further with some additional constructs such as service quality, satisfaction, motivation to use the d-learning, etc. in the various other contexts to see how the model performs.

6. CONCLUSION

The paper aims to examine the factors influencing adoption of d-learning systems in the newly established government universities in Saudi Arabia in the wake of COVID-19. The proposed research model is based on the UTAUT as the underlying theory followed by self-efficacy as the additional construct and staff IT training and institutional support as the two moderating variables. All the proposed hypotheses were supported including the ones with moderating variables. The variances explained by the model on BI and AU were found to be 54% and 65%, which indicate that the antecedents considered for the model are the relevant collection of constructs assessing instructors' intentions to adopt d-learning in the government institutions in Saudi Arabia. By undertaking this empirical research, this study offers various theoretical contributions and implications for practice including testing a unique model and set of moderating variables, selecting a relevant context of newly established government institutions given use of d-learning was not encouraged in the teaching and learning across the academic institutions and the key findings, which could help the senior management and government to know better about the effective implementations of such systems in relatively newly established government universities across the country.

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