The effect of external factors in use of technology among Ha'il university academic faculty: evidence from Saudi Arabia

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Abstract

Purpose – The purpose of this paper is to explore external factors: organization technical support, organization administrative support, organization infrastructure and resources, and organization ICT policy's effect on the commitment in use of technology among the faculty staff Hail university, Saudi Arabia.

Design/methodology/approach – A cross-sectional survey approach was used to collect data. A sample of 300 fulltime employees, having administrative and teaching responsibilities participated using a self-completion questionnaire. The data were analyzed using exploratory factor analysis (EFA), correlation and multiple regressions to determine the impact of external factors on the commitment in use of technology.

Findings – Overall, the results provided evidence that organization technical support, organization administrative support, and organization infrastructure and resources have a significant positive impact on the commitment in use of technology. However, organization ICT policy has an insignificant negative impact on the commitment in use of technology. The findings could be generalized on other public sector universities of the Kingdom of Saudi Arabia.

Research limitations/implications – The data were collected from one public sector university of Hail province, the Kingdom of Saudi Arabia. Only four external factors were taken into consideration in investigating its influence on the commitment in use of technology. There could be other external/environmental factors which might be useful to underpin the theory and advance literature.

Practical implications – In-service and trainee faculties should take an advantage of using learning management system. Faculty should create a positive learning environment in their online classes so the learners can take a benefit out of the immense investment on ICT by ministry of higher education. Apart from giving training to teaching staff in use of technology, learners should also be given a platform to increase and improve their digital literacy. Workshops can be conducted frequently for both faculties and learners. Faculty can offer additional and out of the class support to their reluctant and weak students in order to assist them in the use of technology.

Originality/value – Technology integration after COVID-19 outbreak has significantly changed the education sector throughout the world. The use of technology now is unavoidable at primary, secondary and at tertiary level. This study provides an exclusive viewpoint concerning the external/environmental evidence based findings that have not been investigated empirically in the Saudi Arabian context. The current study

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also provides statistically a theoretical five-component model to understand the phenomena in the field of information communication technology.

Keywords Organization technical support, Organization administrative support, Organization infrastructure and resources, Organization ICT policy, Commitment in use of technology, Hail university, Higher education, Saudi Arabian universities

Paper type Research paper

Introduction

Technology not only supports creating new knowledge but also facilitates problem-solving and enhances human capacity to work effectively as well (Arora and Srinivasan, 2020). At higher education level, significant growth in the use of information and communication technology (ICT) has been seen in recent years especially during COVID-19 (Almaiah *et al.*, 2020; Arora and Srinivasan, 2020). In a significant manner, technology has taken over the globe. Innovation has also had an impact on the educational industry. Information technology is a potent tool for making the teaching and learning process more engaging and purposeful (Bidawatka, 2020). High-quality higher education is a necessary feature in offering experience and skill growth. Both emerging and developed countries must assure that schooling is of high quality in order to prepare pupils for a global marketplace. In terms of offering development environments, technological innovation has revolutionized the field of education (Elumalai *et al.*, 2020).

However, the integration of ICT into classroom instruction is not as simple as it seems. The integration process is complicated and challenging for faculties and administrations as implementers. Several studies have established what these hurdles are in various ways and cultures. Such as discrepancy between existing ICT resources and existing ICT policy (Stensaker *et al.*, 2007), poor administrative support (Stensaker *et al.*, 2007), Unavailability of financial resources and outdated ICT infrastructures (King and Boyatt, 2015; Stensaker *et al.*, 2007), lack of opportunities for training and technical support in the field of ICT (Alemu, 2015). Learning providers can use e-learning systems to help them control, organize, administer and monitor their learning and teaching activities. It also intends to assist educators, institutions and universities in promoting learning during university and school closing times. Furthermore, the majority of these systems are free, which will aid in continual learning during the coronavirus outbreak (Almaiah *et al.*, 2020).

Digital technology's influence in academic achievement has evolved from a simple instrument for research and investigation to an approach and comprehensive use. Based on educational goals, technology can promote interactive learning in very well and structured styles (Tuma, 2021). There is no debate that the present situation puts a lot of strain on virtual instruction while also creating a wide range of skills for many academic staff, which accelerates organizational innovation procedures (Zawacki-Richter, 2021). The deployment of technology integration is a difficult process undertaken by myriad variables. The teacher is crucial in any technique of academic reform. Invest in promoting collaboration and blended learning management tools that show how new technologies may be used to intentionally benefit the learning experience (Bruggeman *et al.*, 2021).Based on the above discussed challenges faced in integrating ICT at higher education level, this study aims to predicted from a combination of four variables: "Organization technical support", "organization administrative support", "organization infrastructure and resources, and "organization ICT policy" among the faculty members of one selected public university in the Kingdom of Saudi Arabia.

Review of the related literature

ICT in the Kingdom of Saudi Arabia

Alike many other countries, Middle East countries especially Saudi Arabia has made significant investments intending to enhance public education. Teaching was expanded by

revising the curriculum and adding new electronic devices to the public education system. This initiative has incorporated training and developmental services for educators to apply information and communication technologies (Almarri *et al.*, 2019). According to Alshmrany and Wilkinson (2017), the use of ICT is new in Saudi Arabia. Unlike other developed countries, Saudi lacks effective ICT programs, especially at the tertiary level. However, the Government of Saudi is striving hard to improve the educational practices in order to meet global demands, especially by integrating ICT in education at a high level by giving it utmost priority. In addition, many projects are conducted by the Saudi Ministry of Higher Education to build adequate infrastructures at university level to improve the quality of e-learning in higher education (Alzahrani, 2017). In addition to this, ministry of Saudi also launched "The Plan for the Future of University Education", and it was considered one of the major strategic plans for the introduction of technology at higher education level (Al-Ghabban and Zaman, 2013). Similarly, Alharbi and Lally (2017) pronounce that the education ministry of Saudi Arabia has acknowledged the significance of ICT integration at all levels of education. Therefore, an effort has been made to reform and restructure the education system at the university level as ICT integration in Education is slow despite continuous efforts and investments by the Government of Saudi (Al-Gamdi and Samarji, 2016). Muzafar and Jhanjhi (2020) mention that several e-governments projects in Saudi Arabia have been introduced for ICT integration in education, e.g. "Yesser", "Saudi Portal" and "Amer". They also highlight that mainly Digital Transformation Program is one an important goal in order to achieve 2030 objectives as National Vision 2030 of Saudi is to establish a digital government so the country becomes a global ICT hub. Equally important, educational policies developed so far need to be reformed in order to integrate ICT in education at all levels.

Despite all this advancement in the country, Saudi Arabia is still lagging behind the educational sector leaders, particularly in Information and communications technology (Almarri *et al.*, 2019). In order to achieve the outcomes of all above mentioned projects, faculties must have a positive attitude toward ICT adoption irrespective of the education level, which is the key to success. Commitment by faculties and administrative support together will help bring about a change in the education system of Saudi Arabia (Almarri *et al.*, 2019).

Hypothesis development

According to the researches, there are certain factors which play an important role in integrating technology. These factors may be divided into internal and external factors to perform certain action related to technology integration. The internal factor is defined by the individuals' behavioral attitude, while the subjective norms are determined by the external factors (Ajzen and Madden, 1986; Fishbein and Ajzen, 1975). The degree of the actual activity is assumed to be largely dependent on the intention of the user and the environment in which the user is performing certain actions (Asiri *et al.*, 2012). Therefore, the external factors determine whether or not to engage users in carrying out the action (Liker and Sindi, 1997).

Infrastructure and resources play a vital role in integrating ICT in teaching pedagogy (Atman-Uslu and Usluel, 2019). For is study, infrastructure and resources in term of technology is referred as personal computer, laptops, Wi-Fi-device, smart lab, digital white board. In their study, they found that lack of funding to purchase hardware and software is also one of the reasons that faculties do not use technology in their classrooms. The availability of computers and their usability have a direct connection with each other. They also found that faculties who have access to computers in their institutes integrate technology in their lesson plan effectively.

Inadequate technical supports also create stress among faculties, which might affect faculties' readiness to integrate technology (Toprakci, 2006). For this study, technical support

is a service provided by a hardware or software company which provides registered users with help and advice about their products. With regard to the importance of the technical coordinator, Smerdon *et al.* (2000) stated that the absence of technical support hindered faculties to integrate technology in the classroom. It was also confirmed from their study that faculties who were provided technical support proven to be better than faculties who were not provided technical support. Faculties must have clear ICT policies before they design their pedagogy to integrate technology, so they can reflect and evaluate their practices in the light of those policies (Barri, 2020).

"Commitment" has been described by scholars as "attachment or alignment psychologically towards the change rather than showing acceptance for any kind of change" (Herold *et al.*, 2008, p. 347). As per Herscovitch and Meyer (2002), Piderit (2000), and Straub (2009), commitment to change is complex, which consists of sentimental as well as the social aspects. According to Kopcha *et al.* (2020), scholars and educators play a vital role in preserving complexities pertaining integral process of integrating technology. Amoako-Gyampah *et al.* (2018) affirm that technology is implemented successfully on certain dependent factors, especially support and encouragement given to staff by top management and administration.

With regard to the importance of the technical coordinator, Smerdon *et al.* (2000) stated that approximately 68% of the faculties who were surveyed claimed that the absence of technical support hindered them to integrate technology in the classroom. Findings also suggest that faculties who were provided technical support proven to be better than faculties who were not provided technical support. Availability of a technology resources are not enough until the technical support of using hardware and software are not provided to faculties. One of the studies conducted by Japhet and Usman (2018) found that those faculties who have the facility of computers and Internet in their institute are still not using them in their lecture on a daily basis as they were not provided technical support to handle those hardware and software.

Leaders are responsible to motivate their staff toward integration technology in their teaching by providing them professional development workshops (Almekhlafi and Almeqdadi, 2010). According to Munir and Khan (2015), the non-supportive administrative staff is one of the main hindrances, which prevents faculties to integrate ICT in their teaching. The active technology programme needs help from the entire organization (Osika *et al.*, 2009). This was also discussed in the study conducted by Harasim (2017) that those institutes where administration includes technical support in their long-term plan, promote technology in their teaching, especially in online teaching in a better way as compared to those where administration support is absent.

Based on the previous studies and empirical findings, this study intends to answer the following research question:

Research question: How well "commitment in the use of technology can be predicted from a combination of four variables: "Organization technical support", "organization administrative support", "organization infrastructure and resources, and "organization ICT policy" among the faculty members of one selected public university in the Kingdom of Saudi Arabia?

Research hypotheses

The following hypotheses are formulated based on the discussed literature and empirical findings.

H1. There is a positive impact of organization technical support on faculty's commitment in the use of technology.

H2. There is a positive impact of organization administrative support on faculty's commitment in the use of technology.

H3. There is a positive impact of organization infrastructure and resources on faculty's commitment in the use of technology.

H4. There is a positive impact of organization ICT policy on faculty's commitment in the use of technology.

The following model to determine the external organization factors that influence the commitment in use of technology is given below:

Methodology

The current study was explanatory in the characteristic wherein effect of predictors on the outcome variable was predicted (Sekaran and Bougie, 2003). In other words, "studies that establish a causal relationship between variables may be termed explanatory research" (Saunders *et al.*, 2016, p. 176). The measurement model comprises five variables, for instance, "organization technical support", "organization administrative support", "organization infrastructure and resources", "organization ICT policy" and "commitment in the use of technology. These five dimensions are used to measure external factors in the academic context of one selected public university. Furthermore, based on the preceding literature, Figure 1 exhibits the relationship between organization external factors and the 'commitment in the use of technology. The basic regression model is written as follows:

$$yn = \alpha + \beta xn + \varepsilon$$

In the above equation, y represents an outcome variable and α denotes the intercept term. x represents predictors, β denotes the regression coefficient while ε is the error term. The basic operational form of the current study model is represented as follows:

"Commitment in use of technology" = ("organization technical support", "organization administrative support", "organization infrastructure and resources" and "organization ICT policy").

Based on the above explication, the following regression model is executed in this study:

$$\mathrm{CUT} = \alpha o + \beta_1(\mathrm{OTS}) + \beta_2(\mathrm{OAS}) + \beta_3(\mathrm{OIR}) + \beta_4(\mathrm{OICTP}) + \varepsilon$$

Sample, instrument, piloting and data collection procedure

The objectives of the current study were to ascertain the association and current trends between research variables, therefore, adopted a quantitative approach. To do so, a cross-

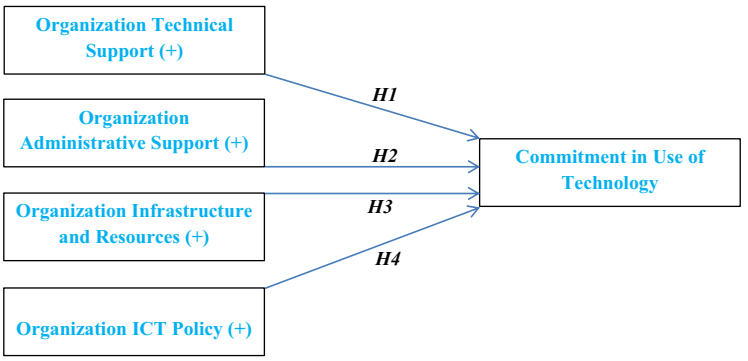

Figure 1.
Hypothesized model of the study

sectional survey technique is chosen to answer the research question. The aim of a cross-sectional study is to observe a population or phenomenon that is completed at one point in time (Babbie, 2008). In addition, the survey technique is used to provide scientifically collected data as a basis for researchers since it counts on empirical evidence (Kothari, 2004). In this design, the data are collected concurrently and answered at the same time in contrast to experimental design wherein data collected in different phases (Bryman, 2012).

Self-completion instrument written in Arabic and English was used. There was a total of 32 items in a questionnaire. The number of items fulfills the minimum requirement in a research instrument (Hair *et al.*, 2006). In order to strengthen the face and content validity of the instrument, it was given to five assistant professors of the College of Business Administration and College of Arts. These experts assure the content validity, face validity and translation of each item. The questionnaire was translated two times by using a Delphi technique wherein they provide their discernment and accurate summary based on their structured communication (Dalkey and Helmer, 1963; Bernice, 1968; Sackman, 1974; Harold and Murray, 1975). Hence, it was translated and back-translated to ensure translation of scale's accuracy. After getting approval from experts, the instrument was finally ready to disseminate to the respondents. In our study, the reliability of the instrument is enhanced by using four steps: clear hypothesize constructs, accurate level of measurement, multiple indicators and pilot-testing (Neuman, 2007). As evident in Table 1 the initial reliability of the research instrument was found out by computing Cronbach's alpha using SPSS version 22 over 40 records in a pilot study which were not included in the main study. The value was found significant, i.e. 0.923 which is considered satisfactory as proposed by (Black, 1999; George and Mallery, 2003; Nunnaly, 1978). Moreover, inter-item correlation of each variable was also computed.

Selected sample has to be represented for the target population since it yields more valid and reliable results (Hair *et al.*, 2010). Besides, it is upon researcher's discretion to decide the sample size based on the target population (Sekaran and Bougie, 2003). All university employees (faculty members) of a selected public university were taken as a target population. Non-teaching and clerical staff were not part of the study. The unit of analysis was the faculty members employed in the selected university of the Kingdom of Saudi Arabia.

A sample of 348 full-time faculty members having administrative and teaching responsibilities participated using a self-completion questionnaire. After getting ethical approval (Polonsky and Waller, 2010) from the research ethics standing committee, the survey link was forwarded to the university IT department and from there it was shared to the employees of the university using an exponential non-discriminative snowball sampling technique where one participant recruits another participant (Etikan *et al.*, 2015; Bryman, 2012). In order to expedite the data collection, the same link was forwarded to employees' social

Table 1.
Reliability analysis of pilot study ($N = 40$)

Sr	Variables	Indicators	Cronbach's coefficient alpha	Overall reliability (Cronbach's alpha of 32 indicators)
1	Organization technical support (predictor)	6	0.884	0.923
2	Organization ICT policy (predictor)	6	0.708	
3	Organization administrative support (predictor)	7	0.913	
4	Organization infrastructure and resources (predictor)	7	0.852	
5	Commitment in use of technology (outcome)	6	0.732	

groups and requested to forward to their respective social groups and so on. Due to the current pandemic situation, the university allows only administrative, teaching and non-teaching staff members to visit their department and perform their official duties. Teaching is carried out using a learning management system titled Blackboard ever since the outbreak of COVID-19. However, both face-to-face and online data collection methods were kept into consideration. Data was collected using a Google Forms started in the last week of December 2020 and was completed in the first week of March 2021. Approximately, ten weeks were expended in data collection. At the time of data collection was stopped, two hundred and ninety-three i.e. 84% were gathered on Google Forms and fifty-five i.e. 16% were collected face-to-face.

Data analysis procedures

Statistical Package for Social Sciences (SPSS) 22nd version was used for descriptive and inferential statistics. First, descriptive statistics were executed with the intention of knowing respondents' demographics. Their mean, standard deviations, frequency and percentage were observed. Exploratory factor analysis (EFA) was first performed to reduce 32 Likert-type items into the requisite five factors. Then, Pearson correlation (r) and reliability statistics of loaded items were analyzed. Lastly, regression analysis was used to test hypothesis and model fitness (Perry, 2011).

Data analysis and results

Screening and removal of outliers

In initial screening, no missing or out-of-range values found in the data set due to restricted options used in Google Form. Respondents may not proceed to the next item or page if they missed any item to be filled inadvertently. However, 48 univariate and multivariate outliers were identified and removed from the main data set before inferential analysis by using standard Z-score [3.29 in absolute value] and Mahalanobis distance χ^2 value at $p < 0.001$. According to Tabachnick and Fidell (2007) "Cases with a standardized score in excess of 3.29 ($p < 0.001$, two tailed test) are potential outliers" (p. 73). They further elucidate that "A very conservative probability estimate for a case being an outlier, say, $p < 0.001$ for the Chi-square value, is appropriate with Mahalanobis distance" (p. 74).

Descriptive statistics

Descriptive statistics results are shown in Table 2. A total of 300 useable responses were included in the analysis which includes 196 (65.3%) of who were male and 104 (34.7%) were female respondents ($M = 1.350$, SD = 0.477). However, 61 respondents (20.3%) between 30 and 34 years, 76 respondents (25.3%) were between the age of 35 and 39 years, 112 respondents (37.3%) were between 40 and 44 years, 46 respondents (15.3%) were above 45 years and only 5 respondents (1.7%) were between the age of 25 and 29 years. It is apparent from Table 2 that the majority of the participants were aged between 30 and 45 ($M = 3.440$, SD = 1.031). As can be seen from the Table, most of the respondents' 234 (78%) work experience is between 6–15 years. Only few respondents, i.e. 5 (1.7%) has a work experience above 21 years ($M = 2.450$, SD = 0.870). Similarly, the total number of associate and the assistant professor was 171 (57%) ($M = 3.240$, SD = 0.751). The majority of the respondents were Ph.D. holders, i.e. 181 (60.3%) ($M = 1.420$, SD = 0.540).

Multicollinearity

Pearson correlations between independent variables are shown in Table 3. This correlation was performed in order to check the multicollinearity issue in our model. Due to the weak correlation between independent variables, no multicollinearity exists in our hypothesized

	M	SD	Demographics	*F*	%	Cumulative %
Gender	1.350	0.477	Male	196	65.3	65.3
			Female	104	34.7	100.0
Age	3.440	1.031	25–29 years	5	1.7	1.7
			30–34 years	61	20.3	22.0
			35–39 years	76	25.3	47.3
			40–44 years	112	37.3	84.7
			45 years>	46	15.3	100.0
Experience	2.450	0.870	1–5 years	41	13.7	13.7
			6–10 years	112	37.3	51.0
			11–15 years	122	40.7	91.7
			16–20 years	20	6.7	98.3
			21 years >	5	1.7	100.0
Education	1.420	0.540	PhD	181	60.3	60.3
			Masters	112	37.3	97.7
			BA	7	2.3	100
Designation	3.240	0.751	Professor	10	3.3	3.3
			Assistant professor	144	48	60.3
			Associate professor	27	9	12.3
			Lecturer	119	39.7	100.0
College	5.390	4.592	College of arts	115	38.3	38.3
			College of applied medical sciences	14	4.7	43.0
			College of business administration	20	6.7	49.7
			College of community	10	3.7	53.0
			College of computer science and engineering	13	4.3	57.3
			College of dentistry	15	5	62.3
			College of education	14	4.7	67.0
			College of engineering	3	1	68.0
			College of medicine	16	5.3	73.3
			College of nursing	12	4	77.3
			College of pharmacy	13	4.3	81.7
			College of preparatory year	41	13.7	95.3
			College of public health	5	1.7	97.0
			College of sciences	3	1	98.0
			College of shariah law	6	2	100.0
			Total	300	100.0	

Table 2.
Descriptive statistics and respondents' demographics

	M	SD	OTS	OAS	OIR	OICTP
Organization technical support	4.0911	0.74351	1			
Organization administrative support	3.9283	0.96482	0.498**	1		
Organization infrastructure and resources	3.2883	1.16446	0.430**	0.325**	1	
Organization ICT policy	3.8017	1.07487	0.325**	0.248**	0.316**	1

Note(s): **$p < 0.01$(2-tailed); *$p < 0.05$(2-tailed)

Table 3.
Means, standard deviations and inter-correlations between independent variables

model. Multicollinearity exists if correlation among independent variables is equal to or greater than 0.90 (Tabachnick and Fidell, 2007; Pallant, 2011).

Common method bias

In the existing literature, the threats of the consequence of method biases have long been argued (e.g. Johan and Crane, 1975; Campbell and Fiske, 1959; Fiske, 1982; Greenleaf, 1992; McGuire, 1969). A common method bias is not only a substantial issue but also a key cause of

measurement error and has a momentous influence on research findings (Podsakoff *et al.*, 2003). A common method bias is problematic since it may inflate or deflate the correlation among predictors and outcome variables due to the common method employed for data collection (Campbell and Fiske, 1959). Therefore, we test for common method biases using Harmon's single-factor test on predictors and outcome variables. To do so, we executed the test in SPSS opting principal axis factoring without rotation, setting the numbers of factors to be one. We found out that the total number of variance explained is 34.442%. This suggests that our study has no issue of common method biases since the variance explained is less than 50% according to Harmon's single-factor test assumption.

Reliability analysis

Reliability analysis and Cronbach's alpha values before and after factor loadings are displayed in Tables 4 and 5 respectively. For data validation and consistency between two variables, a reliability test is essentially required (Nunnally, 1978). It is evident from Tables 4 and 5 that the Cronbach's alpha values support the minimum benchmarks ranging from 0.60 to 0.84 (Hair *et al.*, 1998).

Kaiser–Meyer–Olkin and Bartlett's tests

Acceptability of data was calculated before conducting an EFA. Therefore, sampling adequacy was checked using Kaiser–Meyer–Olkin (KMO) and Bartlett's tests before EFA. The value of KMO for all indicators of our study is 0.849, which indicates the satisfactory threshold limit, i.e. 0.70 (Foster *et al.*, 2006; Leech *et al.*, 2005). Besides, Bartlett's test was also performed to check whether a correlation matrix is significantly dissimilar from an identity matrix (Bartlett, 1951, 1954; Leech *et al.*, 2005; Tabachnick and Fidell, 2007). Our analysis revealed that, Bartlett's test of sphericity wherein (approximate Chi-square = 3002.548, degree of freedom = 120, $p < 0.000$) confirms that correlation matrix is significantly different from an identity matrix. The results in Table 6 indicate that sample data are adequate and sufficient for factor analysis.

Exploratory factor analysis

To validate the constructs and to ensure convergent, construct and discriminant validity, an EFA data reduction technique was executed. This technique was used to draw five variables. In factor analysis, a large set of variables reduce and summarize the data into a smaller set of components (Pallant, 2001). To carry out this objective, we have used "Principal components" factoring option. The initial solution was rotated by means of varimax orthogonal rotation

Items	Variables	No. of items	Cronbach's coefficient alpha
External factors of technology integration (predictors)	Organization technical support	6	0.894
	Organization administrative support	7	0.902
	Organization infrastructure and resources	7	0.865
	Organization ICT policy	6	0.630
Outcome variable	Commitment in use of technology	6	0.871
Total number of Likert-scale items		32	

Note(s): Alpha = 0.922 (of 26 indicators)
Alpha = 0.937 (of all indicators items including predictors and outcome variable)

Table 4.
Reliability analysis before factors loading

Items	Variables	No. of loaded items	Cronbach's coefficient alpha
External factors of technology integration (Predictors)	Organization technical support	3	0.790
	Organization administrative support	4	0.882
	Organization infrastructure and resources	3	0.846
	Organization ICT policy	2	0.860
Outcome variable	Commitment in use of technology	4	0.894
Total number of Likert-scale items		16	

Note(s): Alpha = 0.852 (of 12 indicators)
Alpha = 0.889 (of all 16 indicators including predictors and outcome variable)

Table 5. Reliability analysis after factors loading

Kaiser-Meyer-Olkin measure of sample adequacy			0.849
Bartlett's test of sphericity	Approx. Chi-square		3002.548
	Df		120
	Sig		0.000

Table 6. KMO and Bartlett's test

with the Kaiser normalization method. This step is executed to lessen questionnaire Likert-based items into the requisite five factors. Tabachnick and Fidell (2007) point out that "The goal of varimax rotation is to maximize the variance of factor loadings by making high loadings higher and low ones lower for each factor" (p. 620).

A total of 32 Likert-scale items related to external factors in our measurement model is categorized into five groups. Consequently, only 16 items were loaded onto their own variables: Commitment in use of technology (four items), organization administrative support (four items), organization infrastructure and resources (three items), organization technical support (three items) and organization ICT policy (two items). In our study, all loaded items were greater than |0.50| which indicates a very robust convergent and construct validity (Cooper *et al.*, 2007; Field, 2009; Hair *et al.*, 1998; Tharenou *et al.*, 2007) and is considered significant for further analysis (Kaiser, 1974) as shown in Table 7. The least factor loading was 0.699 (i.e. OAS6) which is exceeding the suggested limit of 0.50. Besides, the average factor loadings are more than 0.70 for each factor as recommended by (Tharenou *et al.*, 2007). In Table 8, factor loadings less than |0.40| were deleted to sustain clarity. It is worth noting that the statistical significance of factor loadings is not computed by SPSS (Field, 2005) it is, however, the sample size which points out the factor's loadings statistical significance (Stevens, 2012). Consequently, it can be concluded that the convergent and construct validity of the factors of our study has been confirmed. Since there are no cross-loadings in our "Component Transformation Matrix" hence the discriminant validity is also proven (Tharenou *et al.*, 2007). The eigenvalue of five variables is greater than 1.0 endorses that they are useful and function as an independent factor. The first factor, "commitment in the use of technology" is strong, with a high eigenvalue of 3.226, and it accounted for 20.162% of the variance. The second factor that is, an "organization administrative support" has an eigenvalue of 2.961 and it accounted for 18.509% of the variance. The third factor to be exact is, an "organization infrastructure and resources" has an eigenvalue of 2.384 and it accounted for 14.900% of the variance. The fourth factor namely "organization technical support" has an eigenvalue of 2.109 and it accounted for 13.183% of the variance. Lastly, the fifth factor

Factors loading Items	Components Commitment in use of technology (CUT)	Organization Administrative support (OAS)	Organization Infrastructure and resources OIAR	Organization Technical support (OTS)	Organization ICT policy (ICTP)
CUT5	0.862				
CUT2	0.860				
CUT1	0.844				
CUT6	0.708				
OAS4		0.868			
OAS3		0.819			
OAS5		0.806			
OAS6		0.699			
OIAR7			0.860		
OIAR4			0.852		
OIAR6			0.802		
OTS2				0.774	
OTS1				0.766	
OTS3				0.742	
OICTP2					0.915
OICTP1					0.886
Eigen values	3.226	2.961	2.384	2.109	1.861
% of variance explained	20.162	18.509	14.900	13.183	11.631
Cumulative % of variance explained	20.162	38.670	53.570	66.754	78.385
Cronbach's α	0.894	0.882	0.846	0.790	0.860

Note(s): Extraction method: Principal component analysis
Rotation method: Varimax with Kaiser normalization
Rotation converged in 6 iterations; factor loadings less than |0.40| were omitted
OTS, organization technical support; CUT, commitment in use of technology
OAS, organization administration support; OIAR, organization infrastructure and resources
OICTP, organization ICT policy

Table 7.
Rotated component matrix

		M	SD	1	2	3	4	5
1	CUT (dependent variable) predictors	4.063	0.976	1				
2	Organization technical support	4.091	0.744	0.523**	1			
3	Organization administrative support	3.928	0.965	0.539**	0.498**	1		
4	Organization infrastructure and resources	3.288	1.164	0.407**	0.430**	0.325**	1	
5	Organization ICT policy	3.802	1.075	0.197**	0.325**	0.248**	0.316**	1

Note(s): $^{**}p < 0.01$(2-tailed); $^{*}p < 0.05$(2-tailed)

Table 8.
Means, standard deviations and inter-correlations ($N = 300$)

"organization ICT policy" has an eigenvalue of 1.861 and it accounted for 11.631% of the variance. To conclude, all factors cumulatively accounted for above 78.385% of the total variance.

Correlation and reliability analysis

Cronbach's alpha of each factor (loaded items) was computed after factor analysis. Cronbach's coefficient alpha of factor "commitment in the use of technology" was 0.894;

"organization administrative support" was 0.882; "organization infrastructure and resources" were 0.846; "organization technical support" was 0.790, and "organization ICT policy" was 0.860. The overall reliability of predictors (12 indicators) was 0.852 and the sum of all indicators, i.e. 16 items after loading was 0.889. Before hypothesis testing, a correlation coefficient was computed to assess the association between variables. Table 8 shows means, standard deviations, inter-correlations for commitment in the use of technology and its predictors, i.e. "external organization factors". It is evident from Table 8 that there is a positive high (Cohen, 1988, pp. 79–81) a correlation existed between organization technical support and commitment in use of technology ($r = 0.523$; $n = 300$; $p = 0.000$), organization administrative support and commitment in the use of technology ($r = 0.539$; $n = 300$; $p = 0.000$), a positive moderate (Cohen, 1988, pp. 79–81) correlation existed between the organization infrastructure and resources and commitment in the use of technology ($r = 0.407$; $n = 300$; $p = 0.000$), a positive weak (Cohen, 1988, pp. 79–81) correlation found between organization ICT policy and commitment in use of technology ($r = 0.197$; $n = 300$; $p = 0.001$), a positive moderate correlation existed between organization administrative support and organization technical support ($r = 0.498$; $n = 300$; $p = 0.000$),), a positive moderate correlation existed between organization infrastructure and resources and organization technical support ($r = 0.430$; $n = 300$; $p = 0.000$), a positive moderate correlation existed between organization ICT policy and organization technical support ($r = 0.325$; $n = 300$; $p = 0.000$), a positive moderate correlation existed between organization infrastructure and resources and organization administrative support ($r = 0.325$; $n = 300$; $p = 0.000$), a positive low correlation existed between organization ICT policy and organization administrative support ($r = 0.248$; $n = 300$; $p = 0.000$), a positive moderate correlation existed between organization ICT policy and organization infrastructure and resources ($r = 0.316$; $n = 300$; $p = 0.000$). In brief, it can be concluded that all five variables are correlated to each other, however, this bivariate correlation cannot predict the outcome variable and therefore more advance statistical techniques required to predict outcome variable. Next, Table 8 shows means, standard deviations and inter-correlations for commitment in use of technology and its predictors.

Hypothesis testing

After assuring basic parametric assumptions, simultaneous multiple regression was performed to ascertain (1) what is the magnitude of the overall relationship among the determinants of organization's external factors (predictors) and commitment in use of technology (outcome variable); (2) and how much each of the predictor variables (i.e. organization technical support, organization administrative support, organization infrastructure and resources, and organization ICT policy) exclusively contributed to predict commitment in use of technology.

Simultaneous multiple regression

Next, Table 9 shows the results of hypothesis testing through simultaneous regression analysis for predicting "commitment in use of technology" (outcome variable). The grouping

Table 9. Hypothesis testing through simultaneous regression analysis using enter method

Hyp	Predictors (constant)	β 0.791	SE 0.265	t-stat 2.980	Sig 0.003	VIF	Relationship observed	Remarks
H1	OTS	0.371	0.073	5.068	0.000	1.530	Positive	Supported
H2	OAS	0.352	0.053	6.621	0.000	1.365	Positive	Supported
H3	OIR	0.155	0.043	3.609	0.000	1.301	Positive	Supported
H4	OICTP	−0.036	0.044	−0.811	0.418	1.175	Negative	Not supported

Note(s): $F(4, 295) = 49.748$, ($p < 0.001$); $Adj\ R^2 = 0.395$ *$p < 0.05$

of variables significantly predicted over 39.5% of the total variance in predicting "commitment in the use of technology". The hypothesized regression model for this research study was significant ($F(4, 295 = 49.748, p < 0.001$), with only three variables that significantly predicted "commitment in the use of technology" except "organization ICT policy". The value of β depicts the relationship between the outcome variable and predictors. In Table 9, it is evident that the sign of the β values of the three predictors are positive while one predictor is negative. This shows that "organization technical support", "organization administrative support", and "organization infrastructure and resources" have a positive significant impact on "commitment in the use of technology". On the other hand, "organization ICT policy" has a negative insignificant impact on "commitment in the use of technology". The issue of multicollinearity does not exist among the predictors variables since the variance inflation factor (VIF) is less than 10. Multicollinearity existed if the VIF is greater than 10 (Woodrow, 2014).

The coefficients of parameter estimates suggest that "organization technical support" (0.371; $t = 5.068, p < 0.05$), "organization administrative support" (0.352; $t = 6.621, p < 0.05$), and "organization infrastructure and resources" (0.155; $t = 3.609, p < 0.05$), reflect a statistically significant impact on "commitment in use of technology". Thus, three respective hypotheses (H1, H2 and H3) were supported respectively. On the other hand, "organization ICT policy" (-0.036; $t = -0.811, p < 0.05$) has shown a statistically insignificant impact in predicting "commitment in use of technology", thus (H4) was not supported. The following equation shows the regression equation to predict "commitment in use of technology":

$$\text{CUT} = 0.791 + 0.371(\text{OTS}) + 0.352(\text{OAS}) + 0.155(\text{OIR}) - 0.036(\text{OICTP})$$

Discussion

Overall, the results provided evidence that organization technical support, organization administrative support, and organization infrastructure and resources have a significant positive impact on the commitment in the use of technology. However, organization ICT policy has an insignificant negative impact on the commitment in use of technology. The findings could be generalized to other public sector universities of the Kingdom of Saudi Arabia.

The study not only confirms the findings of the previous researches but extends the literature in the area of the impact of internal and external factors on the use of technology in higher education. The study confirms that the influence of organization technical support, organization administrative support and organization infrastructure and resources have a significant positive impact on the commitment in the use of technology. Thus, the current study provides both replication and generalization. Similarly, the same is confirmed by Al-Mulhem (2020) who reported that in order to encourage faculties to use and adopt e-learning programmes, infrastructure and technology resources are very important. The findings are also support with the study of Alzahrani (2017) who stated that the supply of ICT equipment appears to be adequate in Saudi universities which might be due to the recognition of its importance. Alkinani (2021) and Hamutoglu and Basarmak (2020) also found the same result in their study that faculties of university are facing Internet connectivity issues, then it turns into obstacles to utilize ICT in their teaching-learning process.

Moreover, inadequate technical supports also create stress among faculties, which might affect faculties' readiness to integrate technology (Toprakci, 2006). With regard to the importance of the technical coordinator, Smerdon *et al.* (2000) stated that the absence of technical support hindered faculties to integrate technology in the classroom. It was also confirmed from their study that faculties who were provided technical support proven to be better than faculties who were not provided technical support. Alzahrani (2017) confirmed

that if the faculty members are not train enough to use equipment, then availability of ICT equipment are also useless. Past studies also support that inadequate ICT-related preparation programs built barrier in university faculty skills to integrate ICT in their teaching (Alkinani, 2021; Muslem *et al.*, 2018; Naveed *et al.*, 2017).

Leaders are responsible to motivate their staff toward integration technology in their teaching by providing them professional development workshops (Almekhlafi and Almeqdadi, 2010). According to Munir and Khan (2015), the non-supportive administrative staff is one of the main hindrances which prevents faculties to integrate ICT in their teaching. The active technology programme needs help from the entire organization (Osika *et al.*, 2009). This was also discussed in the study conducted by Harasim (2017) that those institutes where administration includes technical support in their long-term plan, promote technology in their teaching, especially in online teaching in a better way as compared to those where administration support is absent. Tayyib *et al.* (2020) findings are also support the present study's findings that the university faculty members' readiness to implement the e-learning strategies in the teaching are associated with the institutional support.

However, the current study has challenged the findings of previous researches that organization ICT policy has a significant negative impact on the commitment in the use of technology. Findings of the study suggest that administrative support and availability of infrastructure play a more important role in the commitment of use of technology as compared to policy guidelines of organizations. Policy guidelines do not matter if infrastructure and support from management are not available. Regarding external factors, in 2015, Albugami and Ahmed (2015) found that Saudi's educational policies are not clear, the contradiction was also found in between the instructions and the responsibilities. It was also found in the study that even though the Ministry of Education emphasizes the use of technology in education from beginning to school but it is not providing sufficient support in terms of ICT resources, infrastructure and ICT training to all staff. If the faculties and headmasters do not understand the policies, they will not apply them in their teaching, resulting in the absence of ICT integration in their teaching (Albugami and Ahmed, 2015).

Practical implications

The findings of the study suggest that infrastructure, technical support and administrative support are significantly related to the faculties' commitment in the use of technology. Previous researches also support these external factors that need to be considered when investigating the faculties' commitment in the use of technology. The theoretical framework proposed in this study can be applied for other studies aimed at implementing ICT in higher education not only in Saudi Arabia, but also in other countries.

Currently, ministry of education generously spends funds in higher education to meet vision 2030. For the past two years, traditional and blended learning shifted to an online mode of education throughout the world. This, in fact, is a challenge for both university academic staff and students. In the aftermath of the Coronavirus illness (COVID-19) pandemic, UNESCO's assistant director-general Giannini (2021) for education praised Saudi Arabia for quickly transitioning to online learning methods during a discussion with Saudi education minister Dr. Hamad bin Mohammed Al-Asheikh on the sidelines of the G20 Education Ministers' Meeting in Catania, Italy. She applauded the Saudi authorities' foresight in transitioning to online schooling without sacrificing educational quality.

Furthermore, in-service and trainee faculties should take an advantage of using a learning management system. Faculty should create a positive learning environment in their online classes so the learners can take a benefit out of the immense investment in ICT by the ministry of higher education. Apart from giving training to teaching staff in the use of

technology, learners should also be given a platform to increase and improve their digital literacy. Workshops can be conducted frequently for both faculties and learners. Faculty can offer additional and out of the class support to their reluctant and weak students in order to assist them in the use of technology.

Conclusion

The current study examines the impact of external/environmental factors on commitment in the use of technology. The objectives of the current study were to ascertain the association and current trends between research variables. A cross-sectional survey technique was preferred to answer the research question. The instrument was adopted and modified meticulously. A self-completion English and Arabic translated instrument was used to collect data. Initially, there was a total of 32 items in a questionnaire that fulfill the minimum requirement in a research instrument. Moreover, the content and face validity of the research instrument was also determined with the assistance of field experts. The research instrument was translated and back-translated to ensure translation of scale's accuracy. Next, after conducting a pilot study and ensure the initial reliability coefficient of the instrument, the main study was carried out. The instrument was disseminated using a Google Forms link to Ha'il university's teaching staff. A sample of 348 full-time employees having administrative and teaching responsibilities participated in our study.

After data collection, data screening, removal of outliers, multicollinearity was assessed. This statistical protocol was employed to check the correlation between independent variables. After satisfying this assumption, a total of 32 Likert-scale items related to external factors in our measurement model are categorized into five groups. EFA was performed to ensure construct, convergent and discriminant validity. In our study, all loaded items were greater than |0.50| which indicates a very robust convergent and construct validity. Furthermore, since there were no cross-loadings in our "Component Transformation Matrix", therefore, the discriminant validity was also proven. Besides, all of the four organization's external factors demonstrated a significant correlation.

Cronbach's coefficient alpha of external factor one ("organization technical support" $\alpha = 0.894$) which has been found statistically significant to predict the "commitment in use of technology" (0.371; $t = 5.068$, $p < 0.05$). Reliability of second external factor ("organization administrative support" $\alpha = 0.882$) has been found statistically significant to predict the "commitment in the use of technology" (0.352; $t = 6.621$, $p < 0.05$). The third external factor's reliability coefficient ("organization infrastructure and resources" $\alpha = 0.846$) has also been found statistically significant to predict the "commitment in the use of technology" (0.155; $t = 3.609$, $p < 0.05$). The fourth external factor (organization ICT policy' $\alpha = 0.860$) has shown a statistically insignificant impact (-0.036; $t = -0.811$, $p < 0.05$) in predicting 'commitment in the use of technology'. In sum, the hypothesized model supports the theory which holds that the external factors of Ha'il University: Organization technical support, organization administrative support, organization infrastructure and resources except organization ICT policy have a significant positive impact on commitment in the use of technology.

Limitations and directions for future research

The data were collected from one public sector university of Hail province, Kingdom of Saudi Arabia. Only four external factors were taken into consideration in investigating its influence on the commitment in the use of technology. There could be other external/environmental factors that might be useful to underpin the theory and advance literature. Professional development and training are also considered as some of the external factors, which can also be studied to explore their effects on faculties' commitment to integrating ICT. Quantitative

research design was implemented in this study, mixed-method research can be suggested for future research to get in-depth information about the external barriers. Moderating effects of demographic variables such as gender, age, years of teaching experiences, etc. can also be measured to find the effects on the commitment of faculties to use of technology with the external barrier. The present study may not reflect the commitment of private university faculties to implement ICT in teaching. So, in the future, it is also recommended to conduct the same study with the same external barriers in private universities. This study was limited to only external factors, for future in relation with external factors; internal factors such as user personal belief, attitude and behavior can also be studied which hindered or supports faculties to integrate ICT in their teaching.

References

Ajzen, I. and Madden, T.J. (1986), "Prediction of goal-directed behavior: attitudes, intentions, and perceived behavioral control", *Journal of Experimental Social Psychology*, Vol. 22 No. 5, pp. 453-474.

Albugami, S. and Ahmed, V. (2015), "Success factors for ICT implementation in Saudi secondary schools: from the perspective of ICT directors, head teachers, teachers and students", *International Journal of Education and Development using ICT*, Vol. 11 No. 1, pp. 36-34, available at: https://www.learntechlib.org/p/151051/.

Al Gamdi, M.A. and Samarji, A. (2016), "Perceived barriers towards e-learning by faculty members at a recently established university in Saudi Arabia", *International Journal of Information and Education Technology*, Vol. 6 No. 1, pp. 23-28, doi: 10.7763/IJIET.2016.V6.652.

Al-Ghabban, M.A. and Zaman, H.A. (2013), "Mission differentiation in higher education between teaching and research", *The Saudi Journal of Higher Education*, Vol. 10, pp. 11-38.

Alemu, B.M. (2015), "Integrating ICT into teaching-learning practices: promise, challenges and future directions of higher educational institutes", *Universal Journal of Educational Research*, Vol. 3 No. 3, pp. 170-189.

Alharbi, O. and Lally, V. (2017), "Adoption of e-learning in Saudi Arabian University education: three factors affecting educators", *European Journal of Open Education and E-Learning Studies*, Vol. 2 No. 2, pp. 63-85, doi: 10.5281/zenodo.1039316.

Alkinani, E.A. (2021), "Factors affecting the use of information communication technology in teaching and learning in Saudi Arabia universities", *Psychology and Education Journal*, Vol. 58 No. 1, pp. 1012-1022.

Almarri, J., Rashid, R.A.A. and Aljohani, S. (2019), "Teachers' belief towards the implementation of ICT in intermediate schools in Saudi Arabia", *International Transaction Journal of Engineering, Management, and Applied Sciences and Technologies*, Vol. 11 No. 4, pp. 1-10, doi: 10.14456/ITJEMAST.2020.73.

Almaiah, M.A., Al-Khasawneh, A. and Althunibat, A. (2020), "Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic", *Education and Information Technologies*, Vol. 25, pp. 5261-5280, doi: 10.1007/s10639-020-10219-y.

Almekhlafi, A.G. and Almeqdadi, F.A. (2010), "Teachers' perceptions of technology integration in the United Arab Emirates school classrooms", *Journal of Educational Technology and Society*, Vol. 13 No. 1, pp. 165-175.

Al-Mulhem, A. (2020), "Exploring the key factors in the use of an e-learning system among students at King Faisal University, Saudi Arabia", *International Journal of Interactive Mobile Technologies*, Vol. 14 No. 3, pp. 1-19, doi: 10.3991/ijim.v14i03.11576.

Alshmrany, S. and Wilkinson, B. (2017), "Factors influencing the adoption of ICT by teachers in primary schools in Saudi Arabia", *International Journal of Advanced Computer Science and Applications*, Vol. 8 No. 12, pp. 143-156, doi: 10.14569/IJACSA.2017.081218.

Alzahrani, M.G. (2017), "The developments of ICT and the need for blended learning in Saudi Arabia", *Journal of Education and Practice*, Vol. 8 No. 9, pp. 79-87.

Amoako-Gyampah, K., Meredith, J. and Loyd, K.W. (2018), "Using a social capital lens to identify the mechanisms of top management commitment: a case study of a technology project", *Project Management Journal*, Vol. 49 No. 1, pp. 79-95, doi: 10.1177/875697281804900106.

Arora, A.K. and Srinivasan, R. (2020), "Impact of pandemic COVID-19 on the teaching–learning process: a study of higher education teachers", *Indian Journal of Management*, Vol. 13 No. 4, pp. 43-56, doi: 10.17010/pijom/2020/v13i4/151825.

Asiri, M.J.S., Mahmud, R.B., Bakar, K.A. and Ayub, A.F.B.M. (2012), "Factors influencing the use of learning management system in Saudi Arabian higher education: a theoretical framework", *Higher Education Studies*, Vol. 2 No. 2, pp. 125-137, doi: 10.5539/hes.v2n2p125.

Atman-Uslu, N. and Usluel, Y.K. (2019), "Predicting technology integration based on a conceptual framework for ICT use in education", *Technology, Pedagogy and Education*, Vol. 28 No. 5, pp. 517-531, doi: 10.1080/1475939X.2019.1668293.

Babbie, E.R. (2008), *The Basics of Social Research*, Wadsworth Thomson Learning, Belmont, CA.

Barri, M.A. (2020), "What makes web-enhanced learning successful: four key elements", *International Journal of Technology Enhanced Learning*, Vol. 12 No. 4, pp. 426-446, doi: 10.1504/IJTEL.2020.110051.

Bartlett, M.S. (1951), "The effect of standardization on a Chi-square approximation in factor analysis", *Biometrika*, Vol. 38 Nos 3/4, pp. 337-344.

Bartlett, M.S. (1954), "A note on the multiplying factors for various x2 approximations", *Journal of the Royal Statistical Society Series B (Methodological)*, Vol. 16 No. 2, pp. 296-298.

Bernice, B.B. (1968), *Delphi Process: A Methodology Used for the Elicitation of Opinions of Experts*, An earlier Paper Published by RAND (Document No: P-3925, 1968, 15 pages), available at: https://www.rand.org/pubs/papers/P3925.html.

Bidawatka, N. (2020), "Factors influencing use of technology by higher education teachers and impact of covid-19", *Journal of Emerging Technologies and Innovative Research*, Vol. 7 No. 6, pp. 243-256, available at: http://www.jetir.org/papers/JETIR2006374.pdf.

Black, T.R. (1999), *Doing Quantitative Research in the Social Sciences: An Integrated Approach to Research Design, Measurement and Statistics*, Sage Publication, London.

Bruggeman, B., Tondeur, J., Struyven, K., Pynoo, B., Garone, A. and Vanslambrouck, S. (2021), "Experts speaking: crucial teacher attributes for implementing blended learning in higher education", *The Internet and Higher Education*, Vol. 48, pp. 1-38, doi: 10.1016/j.iheduc.2020.100772.

Bryman, A. (2012), *Social Research Methods*, Oxford University Press, New York.

Campbell, D.T. and Fiske, D.W. (1959), "Convergent and discriminant validation by the multitrait-multimethod matrix", *Psychological Bulletin*, Vol. 56 No. 2, pp. 81-105, doi: 10.1037/h0046016.

Cohen, J.W. (1988), *Statistical Power Analysis for the Behavioural Sciences*, 2nd ed., Lawrence Erlbaum Associates, Hillside, New Jersey, NJ.

Cooper, A., Reimann, R. and Cronin, D. (2007), *About Face 3: The Essentials of Interaction Design*, John Wiley and Sons, Indianapolis, IN.

Dalkey, N. and Helmer, O. (1963), "An experimental application of the Delphi method to the use of experts", *Management Science*, Vol. 9 No. 3, pp. 458-467, doi: 10.1287/mnsc.9.3.458.hdl:2027/inu.30000029301680.

Elumalai, K.V., Sankar, J.P., Kalaichelvi, R., John, J.A., Menon, N., Alqahtani, M.S.M. and Abumelha, M.A. (2020), "Factors affecting the quality of e-learning during the Covid-19 pandemic from the perspective of higher education students", *Journal of Information Technology Education: Research*, Vol. 19, pp. 731-753, doi: 10.28945/4628.

Etikan, I., Alkassim, R. and Abubakar, S. (2015), "Comparison of snowball sampling and sequential sampling technique", *Biometrics and Biostatistics International Journal*, Vol. 3 No. 1, pp. 1-2, doi: 10.15406/bbij.2015.03.00055.

Field, A. (2005), *Discovering Statistics Using SPSS*, Sage Publications, London.

Field, A. (2009), *Discovering Statistics Using SPSS: Introducing Statistical Method*, 3rd ed., Sage Publications, Thousand Oaks, CA.

Fishbein, M. and Ajzen, I. (1975), *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Addison-Wesley, Reading, MA.

Fiske, D.W. (1982), "Convergent-discriminant validation in measurements and research strategies", in Brinberg, D. and Kidder Louise, H. (Eds), *Forms of Validity in Research*, Jossey-Bass, San Francisco, CA, pp. 77-92.

Foster, J.J., Barkus, E. and Yavorsky, C. (2006), *Understanding and Using Advanced Statistics*, Sage Publications, London.

George, D. and Mallery, P. (2003), *SPSS for Windows Step by Step: A Simple Guide and Reference*, Allyn and Bacon, Boston.

Giannini, S. (2021), "Saudi education portal among global top 4, says UNESCO official", *Arab News* 23 June, p. 1, available at: https://www.arabnews.com/node/1881511/saudi-arabia.

Greenleaf, E.A. (1992), Improving rating scale measures by detecting and correcting bias components in some response styles, *Journal of Marketing Research*, Vol. 29 No. 2, pp. 176-88, doi: 10.1177/002224379202900203.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis*, 5th ed., Prentice-Hall, Englewood Cliffs, New Jersey, NJ.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006), *Multivariate Data Analysis*, 6th ed., Prentice-Hall, Englewood Cliffs, New Jersey, NJ.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010), *Multivariate Data Analysis*, The Prentice Hall, New York, NY.

Hamutoglu, N.B. and Basarmak, U. (2020), "External and internal barriers in technology integration: a structural regression analysis", *Journal of Information Technology Education: Research*, Vol. 19, pp. 17-40, doi: 10.28945/4497.

Harasim, L. (2017), *Learning Theory and Online Technologies*, Taylor and Francis, New York, NY. doi: 10.4324/9781315716831.

Harold, A.L. and Murray, T. (1975), *The Delphi Method: Techniques and Applications, Reading, Mass*, Addison-Wesley, Newark, NJ, available at: https://web.njit.edu/~turoff/pubs/delphibook/index.html.

Herold, D.M., Fedor, D.B., Caldwell, S. and Liu, Y. (2008), The effects of transformational and change leadership on employees' commitment to a change: a multilevel study, *Journal of Applied Psychology*, Vol. 93 No. 2, pp. 346-357, doi: 10.1037/0021-9010.93.2.346.

Herscovitch, L. and Meyer, J.P. (2002), "Commitment to organizational change: extension of a three-component model", *Journal of Applied Psychology*, Vol. 87 No. 3, pp. 474-487, doi: 10.1037/0021-9010.87.3.474.

Japhet, E.L. and Usman, A.T. (2018), "Factors that influence teachers' adoption and integration of ICT in teaching/learning process", *Educational Media International*, Vol. 55 No. 1, pp. 79-105, doi: 10.1080/09523987.2018.1439712.

Johan, C. and Crane, E. (1975), "Response bias, yea-saying, and the double negative", *Journal of Marketing Research*, Vol. 12 No. 2, pp. 218-220, doi: 10.1177/002224377501200212.

Kaiser, H.F. (1974), "An index of factorial simplicity", *Psychometrika*, Vol. 39, pp. 31-36, doi: 10.1007/BF02291575.

King, E. and Boyatt, R. (2015), "Exploring factors that influence adoption of e-learning within higher education", *British Journal of Educational Technology*, Vol. 46 No. 6, pp. 1272-1280.

Kopcha, T.J., Neumann, K.L., Ottenbreit-Leftwich, A. and Pitman, E. (2020), "Process over product: the next evolution of our quest for technology integration", *Educational Technology Research and Development*, Vol. 68, pp. 729-749, doi: 10.1007/s11423-020-09735-y.

Kothari, C.R. (2004), *Research Methodology: Methods and Techniques*, 2nd ed., New Age International, New Delhi.

Leech, N.L., Barrett, K.C. and Morgan, G.A. (2005), *SPSS for Intermediate Statistics: Use and Interpretation*, Lawrence Erlbaum Associates, Mahwah, New Jersey, NJ.

Liker, J.K. and Sindi, A.A. (1997), "User acceptance of expert systems: a test of the theory of reasoned action", *Journal of Engineering and Technology Management*, Vol. 14 No. 2, pp. 147-173, doi: 10.1016/S0923-4748(97)00008-8.

McGuire, R.J. (1969), "The nature of attitudes and attitude change", in Gardner, L. and Eliot, A. (Eds), *The Handbook of Social Psychology*, Addison-Wesley, Reading, MA, pp. 136-314.

Munir, S.S. and Khan, I. (2015), "Practices and integration of ICT at private higher secondary level in Pakistan", *International Journal on New Trends in Education and Their Implications*, Vol. 6 No. 2, pp. 93-104.

Muslem, A., Yusuf, Y.Q. and Juliana, R. (2018), "Perceptions and barriers to ICT use among English teachers in Indonesia", *Teaching English with Technology*, Vol. 18 No. 1, pp. 3-23.

Muzafar, S. and Jhanjhi, N.Z. (2020), "Success stories of ICT implementation in Saudi Arabia", *Employing Recent Technologies for Improved Digital Governance*, IGI Global, Hershey, PA, pp. 151-163, doi: 10.4018/978-1-7998-1851-9.ch008.

Naveed, Q.N., Qureshi, M.R.N., Alsayed, A.O., Muhammad, A., Sanober, S. and Shah, A. (2017), "Prioritizing barriers of E-Learning for effective teaching-learning using fuzzy analytic hierarchy process (FAHP)", *2017 4th IEEE International Conference on Engineering Technologies and Applied Sciences (ICETAS)*, IEEE, pp. 1-8.

Neuman, W.L. (2007), *Basics of Social Research: Qualitative and Quantitative Approaches*, Pearson Education, Boston.

Nunnaly, J. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.

Osika, E., Johnson, R. and Butea, R. (2009), "Factors influencing faculty use of technology in online instruction: a case study", *Online Journal of Distance Learning Administration*, Vol. 12 No. 1, available at: https://www.westga.edu/~distance/ojdla/spring121/osika121.html.

Pallant, J. (2001), *SPSS Survival Manual*, 1st ed., Open University Press, Maidenhead, PA.

Pallant, J. (2011), *SPSS Survival Manual*, 4th ed, Open University Press, Maidenhead, PA.

Perry, F.L. (2011), *Research in Applied Linguistics: Becoming a Discerning Consumer*, Routledge, New York.

Piderit, S.K. (2000), "Rethinking resistance and recognizing ambivalence: a multidimensional view of attitudes toward an organizational change", *Academy of Management Review*, Vol. 25 No. 4, pp. 783-794, doi: 10.5465/amr.2000.3707722.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903, doi: 10.1037/0021-9010.88.5.879.

Polonsky, M.J. and Waller, D.S. (2010), *Designing and Managing a Research Project: A Business Student's Guide*, Sage Publications, Thousand Oaks, CA.

Sackman, H. (1974), *Delphi Assessment: Expert Opinion, Forecasting and Group Process*, R-1283-PR, April 1974. Brown, Thomas, "An Experiment in Probabilistic Forecasting", RAND Paper, R-944-ARPA, 1972.

Saunders, M., Lewis, P. and Thornhill, A. (2016), *Research Methods for Business Students*, 7th ed., Pearson Education.

Sekaran, U. and Bougie, R. (2003), *Research Methods for Business for a Skill Building Approach*, John Willey and Sons, New York, NY.

Smerdon, B., Cronen, S., Lanahan, L., Anderson, J., Iannotti, N. and Angeles, J. (2000), *Teachers' Tools for the 21st Century: A Report on Teachers' Use of Technology*, Statistical Analysis Report, Washington.

Stensaker, B., Maassen, P., Borgan, M., Oftebro, M. and Karseth, B. (2007), "Use, updating and integration of ICT in higher education: linking purpose, people and pedagogy", *Higher Education*, Vol. 54 No. 3, pp. 417-433.

Stevens, J.P. (2012), *Applied Multivariate Statistics for the Social Sciences*, Routledge, New York, NY.

Straub, E.T. (2009), "Understanding technology adoption: theory and future directions for informal learning", *Review of Educational Research*, Vol. 79 No. 2, pp. 625-649, doi: 10.2307/259206.

Tabachnick, B.G. and Fidell, L.S. (2007), *Using Multivariate Statistics*, Pearson Education, Boston.

Tayyib, N.A., Ramaiah, P., Alshmemri, M.S., Alsolami, F.J., Lind-say, G.M., Alsulami, S.A. and Asfour, H.I. (2020), "Faculty members' readiness implementing e-learning in higher education Saudi Universities: a cross-sectional study", *Indian Journal of Science and Technology*, Vol. 13 No. 25, pp. 2558-2564.

Tharenou, P., Donohue, R. and Cooper, B. (2007), *Management Research Methods*, Cambridge University Press, Cambridge, MA.

Toprakci, E. (2006), "Obstacles at integration of schools into information and communication technologies by taking into consideration the opinions of the teachers and principals of primary and secondary schools in Turkey", *Journal of Instructional Science and Technology*, Vol. 9 No. 1, pp. 1-16.

Tuma, F. (2021), "The use of educational technology for interactive teaching in lectures", *Annals of Medicine and Surgery*, Vol. 62, pp. 231-235, doi: 10.1016/j.amsu.2021.01.051.

Woodrow, L. (2014), *Writing about Quantitative Research in Applied Linguistics*, Palgrave Macmillan, Macmillan Publisher, doi: 10.1057/9780230369955.

Zawacki-Richter, O. (2021), "The current state and impact of Covid-19 on digital higher education in Germany", *Human Behavior and Emerging Technologies*, Vol. 3 No. 1, pp. 218-226.

Further reading

Ahmad, T.B.T. (2014), "Between school factors and teacher factors: what inhibits Malaysian science teachers from using ICT?", *Malaysian Online Journal of Educational Technology*, Vol. 2 No. 1, pp. 1-10.

Akubulut, Y., Kesim, M. and Odabasi, F. (2007), "Construct validation of ICT indicators measurement scale (ICTIMS)", *International Journal of Education and Development Using Information and Communication Technology*, Vol. 3 No. 3, pp. 60-77.

Bulut, C. and Culha, O. (2010), "The effects of organizational training on organizational commitment", *International Journal of Training and Development*, Vol. 14 No. 4, pp. 309-322, doi: 10.1111/j.1468-2419.2010.00360.x.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology", *Journal of Management Science*, Vol. 35 No. 8, pp. 982-1003, available at: https://www.jstor.org/stable/2632151.

Gülbahar, Y. (2005), "Technology planning: a roadmap to successful technology integration in schools", *Computers and Education*, Vol. 49 No. 4, pp. 943-956, doi: 10.1016/j.compedu.2005.12.002.

Hur, J.W., Shannon, D. and Wolf, S. (2016), "An investigation of relationships between internal and external factors affecting technology integration in classrooms", *Journal of Digital Learning in Teacher Education*, Vol. 32 No. 3, pp. 105-114, doi: 10.1080/21532974.2016.1169959.

Ramayah, T., Rouibah, K., Gopi, M. and Rangel, G.J. (2009), "A decomposed theory of reasoned action to explain intention to use Internet stock trading among Malaysian investors", *Computers in Human Behavior*, Vol. 25 No. 6, pp. 1222-1230, doi: 10.1016/j.chb.2009.06.007.

Seifu, K. (2020), "Determinants of information and communication technology integration in teaching-learning process at Aksum University", *Cogent Education*, Vol. 7 No. 1, pp. 1-23, doi: 10.1080/2331186X.2020.1824577.

Spiteri, M. and Rundgren, S.C. (2020), "Literature review on the factors affecting primary teachers' use of digital technology", *Technology, Knowledge and Learning*, Vol. 25 No. 1, pp. 115-128, doi: 10.1007/s10758-018-9376-x.

Veen, W. (1993), "The role of beliefs in the use of information technology: implications for teacher education, or teaching the right thing at the right time", *Journal of Information Technology for Teacher Education*, Vol. 2 No. 2, pp. 139-153, doi: 10.1080/0962029930020203.

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