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An Empirical Analysis of Determinants of eLearning Adoption in Education Sector of Royal Commission Jubail Saudi Arabia

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***Abstract* - Modern information and communication technologies have replaced the customary learning with innovative eLearning solutions, which provide the freedom to trainee to study at their own ease and pace. Positively use of Internet, wireless smart phones, tablets, and computers have enforced this change in modern educational academies. Education Sector Royal Commission for Jubail, Saudi Arabia (ESRCJ) has recently continued to build up the arrangement of eLearning in its institutes and colleges. Therefore, this research study is conducted to analyze teachers' use behavior towards the adoption of eLearning at ESRCJ.This research study adopted an instrument survey questionnaire with explicit changes based on research framework for data collection from faculty members of the Education Sector. The research study systematically determined the factors and tested hypothesis applying Structural Equation Modeling (SEM) statistical investigation methods. As hypothesized, the Perceived Ease of Use (PEU), Perceived Usefulness (PU), Facilitating Conditions (FC), and Training (TR) were the significant factors influencing the teachers' intent to adopt and use eLearning. The findings revealed the strong association of gender with the adoption of eLearning as well.The findings may contribute to the development of strategies and policies for academicians in implementing and enhancing eLearning services in the ESRCJ or similar settings.**

Index Terms - eLearning, Structural Equation Model, distance learning.

INTRODUCTION

Modern Information and Communication Technologies (ICT) have replaced the customary learning with innovative eLearning solutions, which provide the freedom to trainees to study at their own ease and pace. Positively use of Internet, wireless smart phones, tablets, and computers have enforced this change in modern educational academies. ELearning gives the innovative methods for spurring, connecting with students to build up their interests depending on students' useful potential, enabling them organize the substance and information meeting their academic requirements and learning styles, enhancing significance of the learning acquaintance and helping learners by offering distinguished training. Hence, developing economies are promoting eLearning to support and develop-op the knowledge-based economy and redesign the future of the nation with technology-based education system(UNESCO, 2005).

Typical elements of eLearning system are learning management system (LMS), courseware, and the utilization of technology (Z. A. Solangi, Al Shahrani, et al., 2018)(TUENTONG, 2005). To-day, higher education without integrating technology is unworkable. Therefore, in keeping up the needs of the digital young learners those are fetched up with connected and smart way out of life. Globally, educational sector is capitalizing the utilization of innovation positively by keeping students, teachers, and administrators connected (Thaufeega, 2016). After successful implantation of eLearning system in developed countries, many institutes and universities from developing countries like Saudi Arabia adopted their operative systems and models as a benchmark to follow in the teaching-learning activities. However, specific critical factors and regional barriers influenced the successful implementation of those eLearning models. For instance, it has been confirmed that cultural, societal, and socio-economic conditions are major factors affecting the implementation of eLearning (Muhammad et al., 2016), (Alkharang & Ghinea, 2013). Therefore, this research study aimed to investigate

necessary determinants of teachers' decision to accept and use eLearning at Education Sector Royal Commission Jubail. However, primarily, the research evaluated and tested the determinants of eLearning acceptance by teachers that affect the comprehensive advantage of eLearning system in the sector. Another, this research study involved quantitative approach in determining teachers' eLearning use with latent variables, PU, PEU, and intention to use. Facilitating Conditions (FC) to assess the eLearning infrastructure and organization-al factors such as training and workshops accessibility. Elearning is "an innovative approach to education delivery via electronic forms of information that enhance the students' skills, knowledge, or other learning performance" (Xaymoungkhoun et al., 2012)(Suo & Shi, 2008).

Status of eLearning in Saudi Arabia

From this guidance, recommendation, and need, an integrated educational system was established on eLearning and distance learning technologies and systems at the national center to support educational work of higher educational institutes for all levels and categories to surpass limits of time and place. This effort is to realize a mission of Kingdom of Saudi Arabia to spread Science and Knowledge that are based on principles and values of Islam, unite the efforts of universities, and build an eLearning and distance learning thought and mindset in society for the benefit of all society members and for those far ahead of those near. The National Center of eLearning and Distance Learning (NCeDL) has guided the key differences and established the procedures to ensure the de-livery and supervision of eLearning preparation necessities and almost all higher educational institution was integrated with the eLearning system to increase their focus on eLearning. The higher educational institutes i.e. King Khalid University (KKU), Qassim University, Madinah Islamic University, Taiba University, King Saud University (KSU), King Abdul Aziz University (KAU), Al-Baha University, and other institutes have agreed formally with the NCeDL to launch and adopt eLearning programs (Al-Dosari, 2011), (Musbahtiti & Muhammad, 2013) and (Al-Asmari & Rabb Khan, 2014).

Overall, educational institutions are separately established for male and female students in Saudi Arabia. Therefore, the officials of Ministry of Education has also acknowledged the implantation of eLearning in almost all public sector universities and colleges due to shortage of female faculty and staff in learning organizations (Al-Khalifa, 2010) and (Clementking et al., 2013). The National Plan for Information Technology recommended establishing National Center, that had been set up under the guidance, of late Custodian of the Two Holy Mosques King Abdullah Bin Abdul Aziz Al-Saud (May his soul rest in peace) to adopt eLearning and distance learning, and their applications in university-level education and establishing a national center for the provision of technical support, tools and programs required to develop digital educational content. According to Saudi Arabia vision, 2030 Saudi individuals are supposed to be able to participate in the social progress of the country that level is achievable by leveraging Information and Communications Technology skills programs in higher education, skills development institutes, and national policymaking organizations. More, conferring to Saudi Arabia Vision 2030 progress in e-government, the scope of online services has been expanded over the last few years to include eLearning services, online job searches, and other civil affairs. This has improved Saudi Arabia's ranking on several global indicators ranked 36th position in 2014, up from 90th in 2004.

Status of eLearning in Education Sector Royal Commission for Jubail

Education Sector Royal Commission Jubail (ESRCJ) has been effectively implementing and managing eLearning explications in its colleges and institutes using licensed Blackboard learning management system since year 2015. However, this article aimed to examine the significant determinants affecting efficacious implementation of electronic learning. The growth of eLearning in the ESRCJ is quite remarkable that it has established a complete separate department of E-Learning Center full of modern hi-tech solutions to develop online courses and support the eLearning needs of the education sector such as training of the staff, students, development of courses, and mobile eLearning apps as well. The mission and objective of E-learning Center is integrating technology into pedagogical and educational processes and enhance collaborative learning environment in Education Sector of Royal Commission Jubail. In ESRCJ, the E-Learning Center has developed several online courses using different learning management tools and transformed to the Blackboard, which has been effectively used since 2015. Blackboard is similar to other platforms, in the manner of Moodle, Schoology, and eFront, which gives a virtual framework to design and deliver courses electronically on the web. It has altogether support and tools to handling real-time interactive lecture sessions, examinations, upgrade learning measures, allowing the downloading and printing of records, electronic assets such email, schedule, virtual discussion rooms and so forth. It causes the educator to coordinate a wide range of mixed media material, for example, sound/video addresses, slides, pictures, YouTube, and related connections and create different sorts of online test question banks. (*Blackboard*, 2021).

MATERIALS AND METHODS

This study is based on quantitative methodology in analyzing measureable determinants to achieve research objectives and verify the formulated hypotheses. The instrument survey questionnaire was adopted with explicit changes constructed on the TAM theory with external

constraints added in the research framework. That supported to meet the explicit objectives of evaluating important determinants of teachers' successful adoption of eLearning at ESRCJ. The research study conducted the questionnaire based surveys at colleges and institutes of education sector for the teachers and management staff to assess the personal factors such as perceived usefulness, perceived ease of use, and intention towards eLearning adoption, with infrastructure factor i.e. facilitating condition and management factor such as training and workshop accessibility. The responses from the questionnaires assisted the investigation to determine significant and non-significant determinants towards successful adoption and implementation of eLearning at ESRCJ.

Research Framework and Hypotheses

The research framework is proposed based on Technology Acceptance Model (TAM) with additional determinants to analyze use behavior of teachers and management for successful adoption of eLearning at ESRCJ. Having identified several determinants of eLearning from literature, the most appropriate factors i.e. perceived usefulness, perceived ease of use, behavioral intention, facilitating condition and training have been chosen to include in proposed research framework in Figure 1. More, gender factor is added to measure moderating effect of gender dependent variable and independent variables in the framework. TAM has been successful to determine the use behavior of teachers to eLearning system using its latent constructs like perceived ease of use, perceived useful-ness, and intention (D. Kim et al., 2015). Thus, TAM is applied in this study for an empirical analysis of determinants of teachers' adoption for eLearning at ESRCJ, Saudi Arabia.

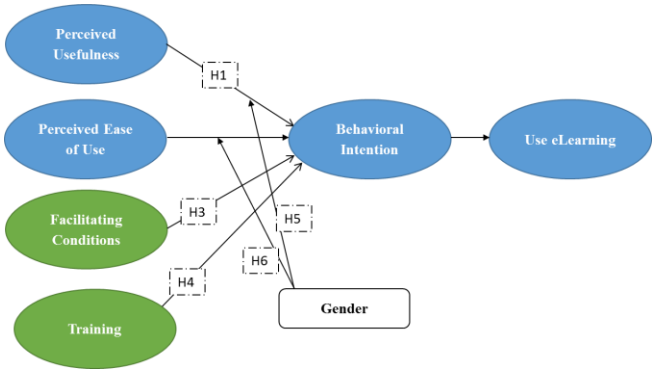

Figure 1 Proposed Research Framework

Behavioural Intention(BI) to Use eLearning: Refers to the situation of end-users' mind to adopt the proposed system with full intention voluntarily or mandatory settings (Z. A. Solangi et al., 2017).

Perceived Ease of Use (PEU): Refers the extent of easiness in utilizing the proposed system. Thus it is hypothesized:

H1: Perceived ease of use influences the intention to eLearning positively.

Perceived Usefulness (PU): Refers to the benefit or value of utilizing the proposed system. Hence it is the strongest predictor of intention. It is hypothesized:

H2: Perceived usefulness influences the intention to eLearning positively.

Facilitating Conditions (FC): This factor supports to include items for measuring the technological, physical infrastructure, and other available facilities overall supporting the adoption of technology in an organization (Z. A. Solangi et al., 2017). "the degree to which an individual believes that an organization and technical infrastructure exists to support the use of the system" (A. Z. Solangi et al., 2010). Hypothesized as:

H3: Facilitating condition influences the intention to eLearning positively.

Training (TR): This factor is chosen to measure the academic, practical, and technical skills of the teachers in using technology-based training at the ESRCJ. For this factor most specific items were added to measure the basic skills of using learning management system, presentation skills, use of smart board and smart projector. "This factor may help to measure access to technology, confidence, and attitudes of teachers" (Doculan, 2016). Hypothesized as:

H4: Training influences the intention to eLearning positively.

Gender: The educational institutes are separately established for male and female students in Saudi Arabia. Similarly, the institutes and colleges of ESRCJ are also separately established for girls and boys. Therefore, it is important to measure the moderating effect of gender between dependent variable BI and independent variables PEU and PU. Gender is hypnotized as:

H5: Gender positively influences moderating role between PEU and BI to eLearning.

H6: Gender positively influences moderating role between PU and BI to eLearning.

DATA ANALYSIS AND RESULTS

Education Sector Population

Table 1 shows details of the respondents from 4 institutes of the ESRCJ located at different areas of Jubail Industrial City with good cross-section of faculty members according to the actual population size of each institute, (25.2%) from Jubail University College (Male), (23.9%) from Jubail University College (Female), (33.7%) from Jubail Industrial College, and (17.2%) Jubail Technical Institute.

Table 1 Education Sector: Workplace

	Frequency	Percent	Valid Percent	Cumulative Percent
Jubail University College (Male)	41	25.2	25.2	25.2
Jubail University College (Female)	39	23.9	23.9	49.1
Jubail Industrial College	55	33.7	33.7	82.8
Jubail Technical Institute	28	17.2	17.2	100.0
Total	163	100.0	100.0	

Demographics

Demographic information collectively shown in Table 2 comprises dept., gender, age, education, teaching, experience etc. The masculinity distribution 76.1% were male, and 23.9% were female. The age group between 36 to 45 and postgraduate PhD, holders' responded with rate of 41.7%, and 47.9% respectively. While 35% masters and 17% were bachelor degree holders. Overall, 70% of respondents were more than 10 years of experienced, which proved the senior faculty members' relevance to academic profession and more tendency to use eLearning.

Table 2 Experience of Blackboard Usage

	Group	Freq.	Percent	Cum Percent
Dept.	Information Technology /Computer Science	22	13.5	13.5
	Engineering	46	28.2	41.7
	Business & Accounting	21	12.9	54.6
	Management Information System (MIS)	1	.6	55.2
	General Studies (GS)	43	26.4	81.6
	Interior Design	5	3.1	84.7
	English Language Institute	25	15.3	100.0
Gndr	Male	124	76.1	76.1
	Female	39	23.9	100
Age	20-35 Years	30	18.4	18.4
	36-45 Years	68	41.7	60.1
	45-55 Years	57	35.0	95.1
	More than 55 Years	8	4.9	100.0
Teach Expc	1-5 Years	23	14.1	14.1
	6-10 Years	28	17.2	31.3
	11-15 Years	42	25.8	57.1
	16-20 Years	37	22.7	79.8
	More than 20 Years	33	20.2	100.0
Edu	Bachelor degree	28	17.2	17.2
	Master degree	57	35.0	52.1
	Ph.D degree	78	47.9	100.0
College/ Institute	Jubail University College (Male)	41	25.2	25.2
	Jubail University College (Female)	39	23.9	49.1
	Jubail Industrial College	55	33.7	82.8
	Jubail Technical Institute	28	17.2	100.0

Learning Management System Experience

This section confirms detailed information about experience of the staff using learning management system (Blackboard), and its mobile app usage in Table 3. An abundant number of faculty members (98.2%) were familiar with the Blackboard and (89%) have been using Blackboard for more than a year while (1.8%) respondents were not acquainted with Blackboard.

Table 3 Experience of Blackboard Usage

	Usage	No.of Responses	Pct%	Cumulative Percent
Blackboard usage	Yes	160	98.15	98.15
	No	3	1.8	100
Blackboard Experience	< 1 year	19	11.7	11.7
	1-3 years	112	68.7	80.4
	4-6 years	15	9.2	89.6
	More than 6 years	11	6.7	96.3
	Sometimes	3	1.8	98.2
	Never used	3	1.8	100.0
Blackboard App Usage	Yes	64	39.3	39.3
	No	99	60.7	100.0

Measurement Model Analysis

The study utilized Confirmatory Factor Analysis (CFA) approach to weigh the reliability, uni-dimensionality, and validity of the research framework variables. Composite reliability and goodness-of-fit indices were assessed to ensure the research framework reliability as recommended (Behl & Pal, 2016)(Hair et al., 2010). More, Cronbach's α coefficient of each factor was assessed to confirm the internal consistency(Z. A. Solangi, Solangi, et al., 2018). Table 4 shows the reliability statistics.

Table 4 Reliability Statistics

Constructs	CR (0.6 to 0.7)	Cronbach's α (>0.7)	AVE (> 0.5)
BI	.882	.844	.723
PU	.809	.846	.711
PEU	.741	.811	.690
FC	.814	.850	.731
TR	.613	.849	.512

AVE=Average Variance Extracted; CR=Composite Reliability

All the constructs values were substantial to the recommended criteria of Composite Reliability (CR), Cronbach's α, and Average Variance Extract (AVE) values as stated in the Table 4. More, discriminant validity of each construct was also calculated using average variance extracted values. Hence, the results proved the sufficient convergent and discriminant validity with strong correlation among items of the same construct in the research framework.

Table 5 Model Goodness-of-Fit (GFI) for initial CFA

Measure	Absolute fit				Incremental fit			Parsimony fit
Fit indices	X^2	Df	X^2 / Df	RMSEA	NFI	TLI	CFI	AGFI
Results	1600.86	743	2.15	0.064	0.805	0.872	0.884	0.775
Recommended Offset Value	$1<X^2/Df<5$			<=.08	>=0.90	>=0.9	>=0.90	>=.80
Reference	(Hair et al., 2010)(Zhang et al., 2013)			(Hair et al., 2010)(Browne, M. W., & Cudeck, 1993)(Todd, Chin & A, 2010)		(Browne, M. W., & Cudeck, 1993)(Tucker & Lewis, 1973)		(Hair et al., 2010)

$\chi 2$=Chi-square, Df=degree of freedom, CFI=Comparative Fit Index, GFI=Goodness-of-Fit index, RMSEA=Root Mean Square Error of Approx, NFI=Normated Fit Index, , AGFI=Adjusted Goodness of Fit Index, TLI=Tucker-Lewis Coefficient

After refining the measurement model in initial CFA, covariation was performed on some indicators taking extraordinary point of residual variance. The final CFA was assessed with five constructs and thirty-two items associated with constructs Behavioral Intention (BI), Perceived Ease of Use (PEU), Perceived Usefulness (PU), Facilitating Conditions (FC), and Training (TR) of the pro-posed hypothetical research framework in Figure 2. Absolute fit, incremental fit, and parsimony fit guides were assessed according to the recommended literature (Raza et al., 2018). The findings con-firmed the model fit by meeting the common recommended threshold except for AGFI (0.775), which is acceptable and improved in the final structural model (S. Kim et al., 2016). Details cited in Table 5.

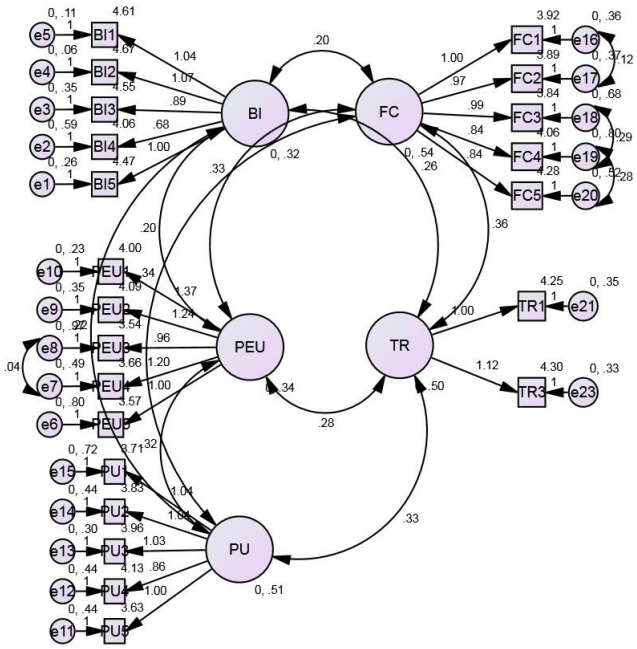

Figure 2 Final CFA Model

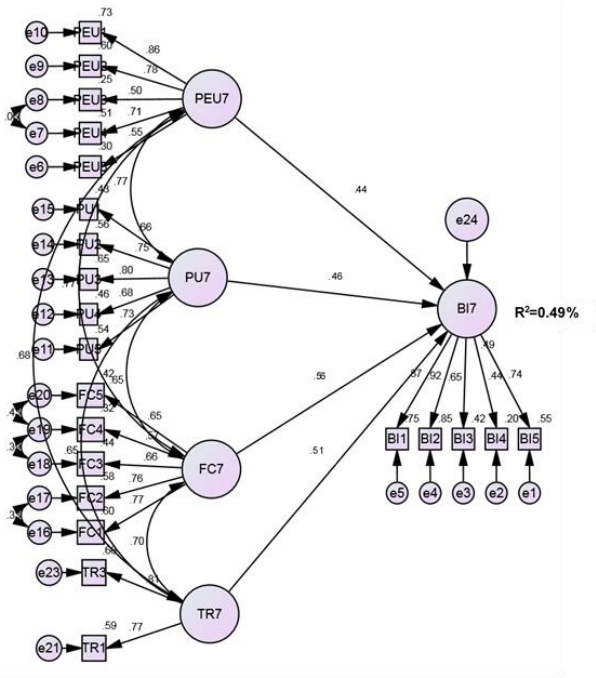

Figure 3 Structural Equation Model

Structural Equation Model and Hypotheses Testing

Finally, structural model was evaluated to predict the effect of exogenous constructs i.e. (Perceived Ease of Use, Perceived Usefulness, Facilitating Conditions, and Training) on endogenous construct Behavioral Intention to Use Behavior with prediction 49.4 percent R2 squared variance of the hypothetical model. Which shows the moderate acceptance of the proposed research framework for the adoption of eLearning system at ESRCJ in Figure 3. Further, regression weight was assessed to verify the four hypothetical casual paths at the p-value (<0.05) significance as detailed in Table 7.

The findings showed that four hypotheses i.e. H1, H2, H3, and H4, were statistically significant towards adoption of eLearning. The findings proved the strong prediction between exogenous and endogenous variables. Hence, the hypothetical research framework showed 49.4 percent prediction of the faculty members' intention towards the use of eLearning system at Education Sector of Royal Commission Jubail, Saudi Arabia. Table 7 describes list of significant hypotheses.

Table 6 Structural Model (Regression Weights of Constructs)

Hypotheses			Regression Weight	SE	CR(t-value)	P value	Result
BI	←	PEU	.232	.071	3.246	.001	Accepted
BI	←	PU	.144	.057	2.519	.012	Accepted
BI	←	FC	.516	.069	7.430	***	Accepted
BI	←	TR	.117	.057	2.062	.039	Accepted

CR=Critical Ratio, SE=Standard Error, P=significance value
*** Significance at 0.001 level

Table 7 Model Fit Indices of Final Structural Model

Measure	Absolute Fit				Incremental Fit			Parsimony Fit
Fit indices	X^2	Df	X^2/ DF	RMSEA	NFI	TLI	CFI	AGFI
Findings	1198.02	665	1.802	0.054	0.841	0.912	0.921	0.808
Recommended Offset Value	$1<X^2/Df<5$			<=0.08	>=0.9	>=0.9	>=0.9	>=.80
Reference	(Hair et al., 2010)(Zhang et al., 2013)				(Hair et al., 2010)(Browne, M. W., & Cudeck, 1993)(Todd, Chin & A, 2010)			(Browne, M. W., & Cudeck, 1993) (Tucker & Lewis, 1973)

Moderating Effect of Gender

Perceived ease of use (PEU) and perceived usefulness (PU) latent factors were verified to identify the gender effect between male and female faculty members, working at separate physical locations ESRCJ. Male gender confirmed the greater level of PEU towards use of eLearning (β =0.523, t=11.460, p < 0.001) compared to female level of PEU (β =0.311, t=71.43, p < 0.001). Equally, Female gender confirmed the greater level of PU towards use of eLearning (β =0.517, t=12.060 p < 0.02) than male gender PU (β=0.514, t=11.510, p<0.001). Hence, both hypotheses confirmed statistically significant effect gender on use of eLearning in Table 8.

Table 8 Moderating Effect of Gender

Gender	Hypotheses			Estimate β	S.E.	C.R.(t-value)	P
Male	PEU	←	GM	.523	.071	11.460	***
	PU	←	GM	.514	.057	12.510	***
Female	PEU	←	GF	.311	.069	7.430	***
	PU	←	GF	.517	.057	12.060	.002

GM: Gender Male, GF: Gender Female,

DISCUSSION

Today, higher education without integrating technology is unworkable. Therefore, in keeping up the needs of the digital youth who are geared up with connected world hence, education sector is also capitalizing the innovation where students, teachers and administration are digitally connected worldwide(Thaufeega, 2016). After successful implantation of eLearning system in developed countries, many institutes and universities from developing countries like Saudi Arabia adopted their operative systems and models as a benchmark to follow in the teaching-learning activities. Thus, ESRCJ started to integrate technology in learning and training at its all institutes and colleges by Blackboard and Moodle learning management system. The research study analyzed 163 sample of teachers including Professors, Associate, Assistant professors, Lecturers, Instructors, Lab technicians, and Heads of departments. The empirical analysis confirmed that Perceived Ease of Use (PEU), Perceived Usefulness (PU), Facilitating Conditions (FC), Training (TR), were statistically significant predictors with a strong association of gender effect on PEU, and PU in the adoption of eLearning system by teachers at ESRCJ successfully. Based on proposed hypothetical model six causal relationships were significant and accepted with 49% variance of the model explained by exogenous variables.

CONCLUSION

In Saudi Arabia, due to the exercise of cultural and religious values, the eLearning remains a promising challenge. In Saudi Arabia, several researchers have contributed to literature that shows learners' and teachers' intention towards the adoption and use of eLearning effectively. However, it depends on both teachers and students as the key characters successfully adopt the eLearning in an institute or academic organization. This study is conducted as a part of a research project funded by Research and Applied Studies Center, particularly in the context of Education Sector, Royal Commission Jubail. The aim of the study was to identify and investigate the important determinants of teachers' acceptance for eLearning at ESRCJ, test and validate the proposed research framework in the precision of information system theory i.e. technology acceptance model. Additional three factors were added in the TAM theory i.e. facilitating conditions, training, and gender to measure the management support and personal skills of the teachers with the provision of technological infra-structure and Blackboard training workshops at ESRCJ. The R-Squared (R2=0.49) of the hypothetical model showed 49% prediction to adopt the eLearning. The value of (R2) ranges from (1.0), which is a perfect prediction and (0.0) is no prediction. However, more than (0.10) is acceptable in the literature (Subramani et al., 2016). These investigation findings validated all the factors with four casual relationships, which were statistically significant for the adoption of eLearning at ESRCJ Saudi Arabia. In developed countries, infrastructure support (Facilitating conditions) and management support (Training) are key determinants for an individual to pursue the innovation (eLearning) system. The findings of this study contribute to the development of strategies and policies to enhance eLearning services in ESRCJ. In addition, the developed research framework can easily be adapted for investigating the adoption of eLearning in perspective of students' acceptance of other social settings.

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