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E-Learning Readiness: A Scale Development in Saudi Higher Education Institutions

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Abstract

This research constructs E-Readiness for e-learning in Saudi Arabian higher education institutions. Seven dimensions forming E-readiness, namely (Policy, Pedagogy, Technology, Interface Design, Management, Administrative Support, Evaluation and Continual Improvement). Research instrument was developed using pool of items generated from literature, then confirmed using EFA, CFA. The scale served as reliable, valid tool to assess E-Readiness. This research considered unique attributes of teacher, student, and administrator to achieve meaningful comparisons across groups, results exhibit adequate cross-group equivalence which achieved at different levels. Finding confirmed the universality of E-Readiness factors to have significant explaining power, stability of the scale and it isn't influenced by differences of groups either conceptually or psychometrically, therefore, ability for testing the measurement model for participants in e-learning with no need for separation. The study provides a theoretical insights and empirical findings. Discussion, implication of finding and recommendation for future research in e-learning in higher education institutions were presented.

Keywords: E-readiness; EFA; CFA; KSA

Introduction

This research investigates the current levels of E-Readiness (ER) of Saudi Arabian Higher Education Institutions (SAHEI) for implementing e-learning initiatives. A Comprehensive model of E-readiness was developed taking into consideration the unique attributes of teachers, students, and administrators. Seven dimensions forming the component factors of E-readiness have been identified, namely (Policy and Institutional Business Strategy, Pedagogy, Technology, Interface Design, Management, Administrative and Resource Support, and Evaluation and Continual Improvement). SAHEI had extended quickly and witnessed a progress because of the increasing demand and working to encourage the use of Information and Communication Technology (ICT) to meet this demand. Many activities have been conducted to carry out researches, development and implementation of e-learning in Higher education. In recent years, Saudi Arabia has undergone considerable reform of their education system and has invested significantly into the development of schools and universities [1]. Many studies explored a variety of intervening variables that might influence the success of e-learning. Pittinsky and Chase [2] provided comprehensive guidelines for e-readiness factors that influence e-learning initiatives. Many researchers studied readiness from different perspectives, most of them focused on organizational, strategic, technological and educational aspects. This study did not differ from previous studies, where the seven dimensions proposed focused on those aspects. Previous studies have empirically investigated these factors and found excellent explaining power of E-Readiness factors; few of them indicated whether these factors are appropriate for multi-groups depending on invariance testing. The researchers have pooled extensive set of factors based on literature to measure and understand the attributes of E-Readiness and developed reliable and valid instruments. A large-scale web survey across SAHEI was performed. The development of measurement scale followed two steps, Firstly, the researcher have initially pooled a set of items for the E-Readiness measurement model based on previous studies such as Pittinsky and Chase [2]; Darab and Montazer [3], Watkins [4]. The instrument was distributed to respondents who are engaged in e-learning process. Exploratory factor Analysis (EFA) were deployed for pilot testing to examine the reliability and validity of the instrument for 103 respondents from SAHEI, the resulted factors of E-Readiness were subjected for extensive survey. Secondly, Confirmatory factor Analysis CFA) was deployed for confirming the results. Empirical analysis on a sample of 1161 was performed using CFA. Results support empirically the validity of E-Readiness measurement scale for evaluating E-Readiness in SAHEI. Results of multi-group CFA analysis indicated that all of the three groups conceptualize the constructs of the measurement scale similarly. To achieve meaningful comparisons across groups, the measurement model developed to measure constructs of the study exhibit adequate cross-group equivalence, invariance and variance at different levels. Finding confirmed the universality of five dimensions of E-Readiness (Pedagogy, Technology, Interface Design, Management, Administrative and Resource Support) to have significant explaining power of E-Readiness. This research was organized into five sections namely Introduction, Background, Method, Finding, Discussion, Conclusion which addresses how the study question been answered as well as contribution, Limitation, Recommendations and recommendation for future research.

Background

According to Peter [5], E-Readiness (Electronic Readiness) is a measure of the degree to which country, nation, or economy is ready, willing or prepared to gain the benefits of ICT. It is used to measure how the country is ready to partake in electronic activities such as e-learning, e-commerce, e-government, etc. The assessment of ER helps communities in evaluating its unique opportunities and challenges.

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Using new technology in teaching will provide students more capability to collect information from variety of sources besides the instructor, and in this way, e-learning will create a competitive learning environment [6]. The assessment of E-readiness is serving as a useful starting point for the developing countries, especially in Kingdom of Saudi Arabia [7]. It provides a fundamental basis for planning and building policies and decisions on e-learning. The current research seeks to develop a theoretical framework that hypothesized the factors of the measurement scale. Finding from previous studies support the importance of these factors in achieving successful e-learning initiatives. A growing body of literature about e-learning readiness that has produced a range of e-learning readiness models. The literature and models are focused on three primary groups of stakeholders: (1) learners like cf. Demir and Yurdugü [8], Horzum et al. [9] (2) Teachers like cf. Al-Furaydi [10]; Guglielmino and Guglielmino [11], and (3) Aadministrator.

Darab and Montazer developed a model for e-readiness with three primary components, hard infrastructure comprising technology hardware, software and network connectivity enabling and facilitating e-learning; (2) soft infrastructure comprising organizational policy, management, finance, culture, content, human resources, regulations, resources, security and standards of e-learning; and (3) coordination, supervision and support infrastructure comprising alignment, support and evaluation of e-learning elsewhere. Watkins advocates an approach with seven main components: (1) Organization including commitment to stakeholders, integration of e-learning with organizational strategy; (2) Pedagogy including linking content to desired outputs and outcomes; (3) Technology including the accessibility and interactivity of diverse media technologies such as audio, video and synchronous and asynchronous communication, and maintenance of the e-learning technology infrastructure; (4) Interface design including the e-learning network enabling learners to see their progress and access opportunities to develop their own long-term plans for learning; (5) Management including the competencies of those delivering the e-learning, the extent of training and development available to e-learning educators, the amount of time e-educators have to provide e-learners with one-to-one feedback, the competencies of the e-learners; 6) Resource support including the extent of access learners have from specialist technology support staff (in addition to access to educators); and (7) Evaluation and continual improvement including sufficient time being allowed for the formative evaluation of e-learning courses before they are rolled out, the extent of the contribution and alignment of e-learning to/with organizational strategies and stakeholder interests. Two interesting and relevant features of Watkin's approach to assessing the extent of organizational e-learning readiness are the separation of technology into ICT infrastructure, interface design and learners' technology competencies.

Method

Research instrument

A total of 44 items were generated form literature. Potential paragraphs for each factor of the scale has been set, revised with practitioners from different institutions conducting E-Learning in order to assess the readability and credibility of the scale. This process was repeated three times to ensure conformity with the surrounding environment. The scale was sent to 7 academics at the University of AL-Qassim, King Saud University to review each paragraph of the scale to ensure good formulation. Finally, the scale settled on 31 paragraph (Appendix 1). The answers were ranged as follows: (5=Agree Strongly _ 1=Disagree Strongly). A scale of 31 items have distributed onto 7 component factors, which determined to measure E-Readiness namely (Institutional Policies and Business Strategies=6 items, Pedagogy=4 items, Technology=3 items, Interface Design=4 items, Management=7 items, Administrative and Resource Support=4 items, and, Evaluation and Continual Improvement=3 items).

Sampling, data collection, and screening

Two deferent samples were used to develop and validate the measurement scale. Sample 1 was used for pilot testing and exploratory factor analysis. Sample 2 was used for confirming factors that resulted from EFA. First sample consisted of 2 higher education institutions (Qassim University, King Saud University). The initial sample of 103 responses was used for EFA. Final version of scale were used for surveying higher institutions that use e-learning as a tool for delivering online courses during the period of 2016 and 2017. Data were collected using the developed survey which has been tested by a group of academics and practitioners to verify the readability and clarity, then validated using EFA. A Stratified sample were selected from these institution which experience e-learning as this research focus taking into consideration the unique attributes of teacher, student, and administrator and to take care of the salient features of the population. Data were collected and suitable questionnaires have been subjected for analysis. The validated questionnaire was written in both English and Arabic languages and sent to a sample by e-mail, some of them were interviewed directly. Ten higher education institutions were selected during varying periods from different regions in KSA, including Qassim, Riyadh, Jeddah, Dammam, AlMadinah Almunwarah, and Hayel, 2000 questionnaires were distributed and retrieved (1218), the response rate was (60.9%). The sample was selected from five provinces in KSA to ensure representativeness of the sample namely (Central Region, Western, Eastern, Southern and, Northern province). The online survey was conducted in conjunction with the direct survey, where e-mail messages were used, and WhatsApp messages were used after the questionnaire was uploaded to the Google document and sending the links to the selected sample. The high percentage of respondents were from students which exceeded (564) respondents, Teachers (364) and, the total numbers of administrators were (290). Results revealed that (54%) were engaged in E-learning for more than year, and 27.6 for more than five years. This indicates that the sample obtained has sufficient experience and knowledge regarding online education. It also indicates that the study instrument is suitable for surveying, as the paragraphs of the questionnaire provide a complete visualization of electronic readiness and online learning so that institutional readiness can be identified for the success of e-learning.

Data were checked for missing values, then analysed using AMOS.16. The final data set was composed of 1218, twenty one of the questionnaires were incomplete (more than 20% of the items were empty). These questionnaires were considered useless and been excluded. Other procedures have been followed to manipulate other missing data, where the average value of responses [12] was used in questionnaires with few missing values. Other measures have been taken to enhance the normal distribution of data. Where the extreme values were determined in the sample data (Outlier) by evaluating the distance of mahalanobis using AMOS.16 to calculate the distance to obtain the extreme observations in the dataset from center compared to the majority of other observations. Some observations have been discarded based on observation number. This has improved the multivariate normality. A total of 1197 data were examined to determine the extreme values; 36 observations were deleted from the

dataset due to Mahalanobis distances values greater than ($\chi 2$=102.29; n=37, P <0.001), making the data suitable for analysis is (1161). Since the data (more than 1,000), the data are close to normal distribution and this has led to the reduction of extreme values.

Data analysis

The analysis began by examining demographic characteristics and descriptive statistical analysis of the study variables. The multivariate normality was tested by evaluating the skewness and kurtosis coefficients. Mardia statistic is used for the multivariate distribution on a large scale. The exploratory analysis was then carried out using the principle components method to evaluate the latent dimensions of the measurement scale. The loading factor criterion is considered for retention of items that are related to the latent dimensions. Therefore, items that show a factor loading higher than 0.4 and factors with an eigenvalue value of 1.00 and above were retained. The assessment included Kaiser-Meyer-Olken for sample adequacy (KMO) and Bartlett test of Sphericity. Because the research model is based on logic and theoretical results in previous empirical research, there is a need to use confirmatory analysis to confirm the proposed factors of electronic readiness, to verify the validity of the constructs [13] and to explain the interrelationship between measurement variables [14]. It was also used to identify observable variables that could be reliable indicators of a particular construct. Each measurement scale should include empirical properties such as validity and reliability. When the correlation between elements within the same construct is relatively high, it can be said that the construct validity is achieved. The validity of construct is also achieved when the loading coefficients, the regression weights and the correlation coefficients of the items within the same construct are also high [15]. The convergent validity indicates the degree to which the items measure the construct. Confirmatory Factor Analysis helps to confirm that each item is loaded into one component (one construct) without any cross-loading with another component. Discriminate validity on the other hand is the extent to which the underlying variables (construct) are different [16]. DeVellis [17] indicated each item that measures one latent construct and does not measure another latent construct at the same time considered Discriminate.

Finding

Exploratory factor analysis

First sampling process included respondents from two universities namely (Qassim University, King Saud University), the Response rate differed between the teachers, students and, administrators staff as a stratified sample were selected. The teacher response was 31 (31%), students were 48 (47%) and, administrators were 24 (22%). Results supported the normality for responses as the degrees of skewedness and kurtosis were less than the absolute value of 1.00. Since we confirmed normality of the distribution, we are able to proceed to perform EFA. Measurement scale included seven factors; these factors were used to determine the structural pattern of the preliminary questions. The number of factors was determined based on the number of eigenvalues greater than 1.00 [18]. A factor loading criterion for each factor been adapted from Hair et al. [19] is 0.55, they suggested that for the sample of 100 respondents, factor loading of 0.55 and above are significant. Assessment of suitability of the data for factor analysis was conducted using KMO Measure of Sampling Adequacy and Bartlett's Test of Sphericity for all items in. According to Hair, the KMO index should ranges from 0 to 1, as 0.50 considered suitable for factor analysis. Also Bartlett's Test of Sphericity should be significant ($p<0.05$) for factor analysis to be suitable. Results indicated that the adequacy of sample as the KMO was (0.636) and the test of Sphericity was significant (0.000).

Result of the extraction of component factors indicted that 5 factors were retained based on their eigenvalues. We employed eigenvalue for determining the number of factors to be retained for further analysis and interpretation. Five factors have eigenvalue greater than 1.0 (Appendix 1), we found the eigenvalue for sixth factor less than 1.0 (0.39). The five factors retained explain 64.32 of variance, which means total variance explained is very sufficient. EFA was conducted several times to extract the matrix of items attributable to each factor, and the structure of the variables is subjected to the re-specification. For items with a loading factor of less than 0.55, they are excluded. Cross-loaded items have been discarded. Finally, the rotated factor matrix was obtained for items, which includes the high load items associated with each factor. VARIMAX Rotation was selected to obtain a complete set of loading factors. Table 1 displays the result of rotated component analysis. Eigenvalues (Sum of squared factor loading) are shown in the bottom of table which represents the relative importance of each factor accounting for variance. Sum of squares for 5 factors are (2.521, 2.405, 2.246, 2.213, and 2.193) respectively. The last row in the table is percentage of Trace (eigenvalues divided by number of variables), which indicate total amount of variance explained by all five factors compared to the total variation (64.32). The above analysis reveals that the 31 items measurement scale was reduced into 18 items and loaded on 5 factors. Additionally, 13 items were deleted and 2 items loaded on other factors namely (IPBS2, IPBS5) which been moved to factor (Management). The final structure of variable are listed below, each variable (item) has significant loading above (0.55) and load on only one factor. The results showed that all factors are reliable and have high internal consistency. The highest percentage of factors was pedagogy (0.851) and lowest interface design (0.722). Data were used in this exploratory analysis was considered appropriate for performing EFA based on the descriptive statistical analysis, the sample is also slightly enough for pilot testing as stated by Hair [20]. New measurement scale of E-Readiness was used for extensive and comprehensive surveying of (Teachers, Students, and Administrators) in SAHEI. Institutional Policies and Business Strategies and Evaluation and Continual Improvement factors were not been verified on our scale as there eigenvalue were found less than 1.0. Finally using EFA still insufficient to test the theoretical basis test. An empirical analysis using CFA is necessary to investigate the relationships that exist between the underlying factors and indicators.

Confirmatory factor analysis

The scale resulted in the first phase of the purification was used to conduct a comprehensive survey from different universities from different geographical locations in Saudi Arabia. Online survey was conducted with a direct interview, and the stratified sampling method was used for three groups of respondents who practice online learning at SAHEI to ensure sample representation and generalization of the study results. These groups are: teachers, students, and administrators. Anderson and Gerbing [21]; Hair et al. pointed out in the transition from exploratory analysis to confirmatory analysis, it is necessary to have a sample of at least 150 or more to obtain meaningful estimates [22]. A total of (2000) questionnaire was sent to the sample selected from the universities. The initial response rate was 60.9% (1218) respondents. It can be said that this rate of response will be representative of the total population in the selected universities. Table 1 shows the distribution of the sample size in each university and the type of respondents. Table 2 shows years of participation in online learning.

University	Province	S. Size	Teacher	Student	Admin.
King Saud University	Central	78	26	28	24
Saudi Electronic University	Central	98	32	39	27
Prince Sultan University	Central	74	24	31	19
University of Hail	Central	103	33	36	34
Qassim University	Central	97	32	33	32
King Abdulaziz University	Western	79	20	38	21
Umm Al-Qura University	Western	96	32	42	22
Taif University	Western	66	9	48	9
University of Dammam	Eastern	81	27	38	16
King Faisal University	Eastern	88	29	48	11
King Fahd University for Petroleum and Minerals	Eastern	84	22	44	18
King Khalid University	Southern	96	33	45	18
Jazan University	Southern	76	21	38	17
Tabuk University	Northern	102	24	56	22
Total		**1218**	364	564	290

Table 1: Distribution of sample size and respondent type.

Years of Engagement	Distribution	%
Less than 1 years	224	18.40%
1 to 5 Years	658	54.00%
Greater than Five Years	336	27.60%
Total	1218	

Table 2: Year of Engagement of the sample in online learning.

The confirmation step involves development of a comprehensive measurement model where all individual elements (factors together) are called "Unidimensional" according to Hair. This means that the indicators can be explained by only one construct, and that the individual variable measured is associated with only one construct. Prior to the CFA, problems were identified in the data, ensuring that they were distributed according to normal distribution, and finally the measurement model was prepared. After conducting the CFA, reliability, composed reliability, average variance extracted (AVE), construct and discriminate validity, and finally the specified and revised model of data were finally confirmed.

The specified CFA model for E-Readiness is hypothesized to be explained by 5 factors. Loading item on the factor is non-zero, while in rest of the other factors the loading is zero. The error terms associated with component measurements are not interrelated, and all five factors are correlated. Using the confirmatory analysis to achieve convergence and discrimination of the instrument in order to purify the measurement model, there were some items to be eliminated. For example, weak, cross, multivariate, and error loads were identified, and then the theory was determined to identify the measurement model. In each construct, the estimate of the indicators for each construct and the relationship between them were released. For the latent construct, and because they were not observed and did not have a metric scale (range of values), one loading factor was fixed on each construct at 1.00. According to Hair et al. [22], the loading factor for each item must exceed 0.6. Weak loading has been deleted. We ran the new measurement model repeatedly until we achieve unidimensionality as it requires a positive loading factor. An evaluation of the model fit was carried out after each stage of the CFA model to reflect how the model fits into the data. Many of the fitness indicators used and reported in the literature. According to Hair et al., and Holmes-Smith [23] the researcher should use at least one fitness indices for each category (Absolute Fit, Incremental Fit, and Parsimonious Fit). Based on their discussion, we found frequent indices (RMSEA <0.08, GFI> 0.90, CFI> 0.90, and Chisq/df <3.0) to be used. Acceptable Fitness indices have not achieved in the first run, were (RMSEA=0.087, GFI=0.712, CFI=0.786, and Chisq/df=2.553). Some items with low factor loading less than 0.6 have caused this unacceptable Fitness indices. To improve Fitness indices, each item with a factor loading lower than 0.6 and an R2 (R-Squared for the item) less than 0.4 were eliminated. There are a number of reasons for obtaining a low factor load, for example a biased statement, a double meaning statement, ambiguous terms, a sensitive statement, and so on. Low factor load means that the item is considered useless to measure that particular construct. Retaining these items will affect the fitness indices of the model. Three items were deleted due low factor loading (IPBS5, PED3, ID2). Modified model are shown in Figure 1.

Repeated deletions of low load factors did not result in the Fitness of the model. This led us to study the Modification Indices (MI). The Modification Indices contain duplicate elements in the model, and there is a redundant pair of elements. The higher the MI index (higher than 15), the more likely duplicate elements in the model, duplication between the elements causes the measurement model to be weak. To work around this problem in the measurement model, least loaded deleted. A pair of extra items was also placed as "free parameter estimation" by the pairing/setting error covariance. The item ID1 (e12) was redundant with ID4 (e15) as a value for MI=24.789, and we identified the lowest load factor for deletion (ID1) while loading 0.72. ARS1 and ARS3 (e16, e18, MI=17.186) were combined because they are considered to be very important for theory and the hypothesized model.

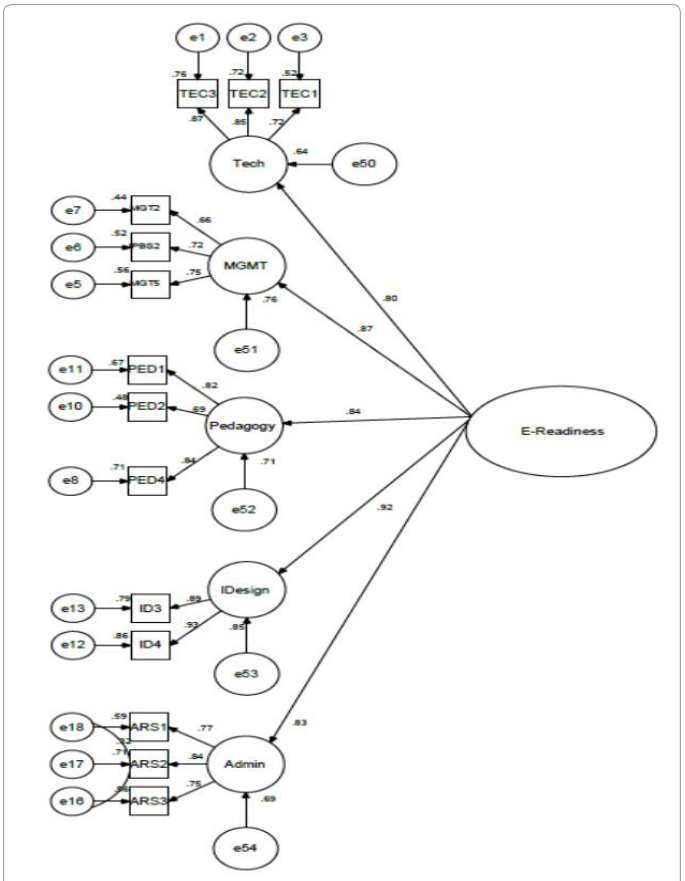

Figure 1: Factor loading for each item, factor loading for each component, and the correlation between the constructs.

This resulted in a good fit with noting that fitness indices had improved (RMSEA=0.062, GFI=0.914, CFI=0.903 and Chisq/df=2.247). The new scale consists of fourteen items and the unidimensionality requirement has been met.

The results also showed that the measure of the electronic readiness of the selected sample contains five components as a Standardized path parameter for the five components is greater than 0.80 and the level of significance ($P \leq 0.05$). The items related to the five constructs of the e-readiness measurement model were fit with the selected data indicating that they can serve as a good measure in SAHEI.

Measurement model validity, reliability and, normality

Hair categorized three types of validity, Convergent, Construct and, Discriminant Validity. Convergent validity can be achieved if all items in the measurement model are statistically significant, and AVE is greater than 0.5. Construct validity can be achieved when fitness indices conform to accepted criteria. Finally, Discriminant Validity reflects the extent to which underlying latent constructs are different. Each item measures one latent construct and does not measure another latent construct at the same time. The Discriminant validity indicates that the measurement model is free of excess items. The correlation between constructs should not exceed 0.85 to ensure discrimination. For the reliability assessment, Cronbach alpha, Composite Reliability, and the AVE were calculated. The value of Cronbach's alpha should exceed 0.7 to ensure measurement reliability. While composite reliability indicates internal consistency of a latent construct in the measurement model and it should exceed 0.70. Average Variance Extracted (AVE) represents the average percentage of variation explained by the items in the latent construct and it should be greater than 0.5. The equation below were used to calculate composite reliability and AVE. AVE=Σ K2/n, CR=(ΣK)2/[(ΣK)2+(Σ1-K2)].

Results (Appendix 2) indicate that composite reliability and AVE values exceeded the acceptable values which mean the measurement is reliable and free of errors and providing consistent results. Appendix 2 also shows the results of descriptive statistics, multivariate normality assessment for constructs and items of a construct in measurement model. Following the fitting of the measurement model, the normality of the data would have to be assessed in order to ensure normal distribution of each measurement model item. The deviation of each item from normal distribution was calculated according to Mardia, Kline [24]. The absolute value of a skewness than 1.0 reveals that the data is normally distributed, all values were below 1.0. The critical ratio (cr) for the kurtosis were also less than 3.0. Tables 3 and 4 show the results of the development of Discrimination Index. The discrimination in the measurement model is achieved when all redundant items are deleted or paired. The square root of AVE and the correlation coefficients must be calculated between construct. Hair points out that the discrimination for all constructs occurs when the square root of the AVE values is higher than the values in its row and column. Thus, we conclude that the discrimination is achieved for all five constructs, and the results indicate that the constructs in the model distinguish each other.

Multi-group analysis

The aim of Multi-Group Analysis is to Investigate and compare the factorial structure of the E-Readiness measurement scales form the three samples separately. The hypothesis is that the construct of E-Readiness (consisting of five factors) is same for Teachers, Students, and Administrators. This means that the 14 items model should show good conceptual, psychometric properties and model invariance for the three groups investigated. The sample survey was conducted with valid responses of (329 of teachers, 551 of students and 281 for Administrator staff). According to Lu and Chiou [25], different demographic variables may cause differences in e-learning, but Lai and Li [26] argued that an perfect theoretical model should consists of identical relationship structures in the construct items among the groups. We employed empirical data set to investigate the invariances among groups, Invariance testing is very important because researchers will not be able to confirm that the instruments used can be generalized to other samples unless it exhibit cross-group invariance.

The equivalence or invariance of measurement can be tested by placing equality constraints on parameters in the groups. Equality constraints require parts of the model to be equivalent across groups. Brown [27] also indicated running the multiple-group CFA several times with different marker indicators each time. We used the same multiple fit indices applied for measurement fitting. We firstly tested the structural model separately in each group and conducted the simultaneous test of equal form, then we tested the equality of factor loadings and the equality of indicator intercepts. The equality of indicator residual variances also been tested and the equality of factor variances and finally, the equality of latent means.

We assumed that all the three groups have no different perceptions about the survey tool. Internal consistency was calculated using Cronbach's α for each group. Multi-group CFA was used for the 14-item model invariance testing with AMOS. Results in Table 5 indicated that all dimensions are reliable and have acceptable internal consistency as the value (α) exceeded 0.70 for each group.

Construct	TEC	MGT	PED	ID	ARS	AVE
Technology (TEC)	0.82					0.666
Management (MGT)	0.59	0.71				0.506
Pedagogy (PED)	0.65	0.45	0.79			0.618
Interface Design (ID)	0.66	0.43	0.45	0.91		0.829
Administrative and Resource Support (ARS)	0.49	0.24	0.58	0.49	0.79	0.62

Table 3: Discriminant validity test outcomes.

Value	Res. Type	Technology (TEC)	Management (MGT)	Pedagogy (PED)	Interface Design (ID)	Administrative and Resource Support (ARS)
Cronbach's α	Teachers	0.77	0.75	0.89	0.72	0.85
	Students	0.87	0.79	0.86	0.78	0.76
	Administrators	0.93	0.95	0.84	0.87	0.91

Table 4: Cronbach's α for the five dimensions, three groups.

The model invariance reporting fit criteria mentioned before namely: Chisq/df, CFI, GFI and, RMSEA for each group. Model invariance and measurement equivalence investigation followed procedures based on Byrne [28] who used five models with increasing constraints on the model parameters namely (factor loadings/ regression slopes, intercepts, error variances, covariance between latent variables). Firstly estimated unconstrained model, so all model parameters are estimated without any requirement that these parameters are equal for the different groups. Then, weights model is estimated to assess whether factor loadings are same across the groups. If invariance satisfied, the latent variables will be measured in the same way across groups. This will lead us to test the intercepts model which assumes that intercepts in addition to regression slopes are the same for all groups. When invariance does not hold, then group comparisons regarding indicator variables may be limited in their validity. Finally, the residual model which tests the invariance of the error variances (residuals) is also assumed among groups. It represents complete invariance of factor loadings, intercepts and error variances among groups. The measurement model was estimated and resulted a good fit regarding (Chisq/df=2.49, CFI=0.891, GFI=0.905 and, RMSEA=0.062). This model was used as the configurable model and used to comparison the three groups. The modified three models and their factor loadings are shown in Figures 2a-c.

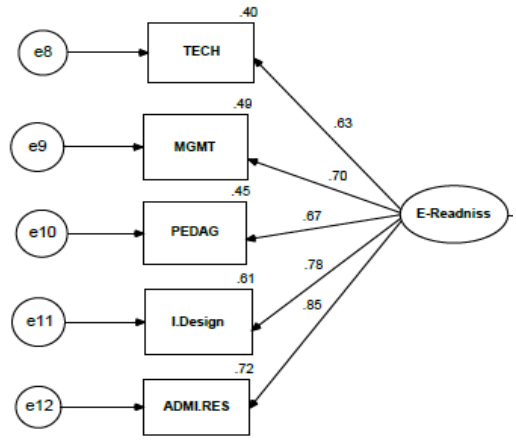

Figure 2a: Model for teacher group after modification.

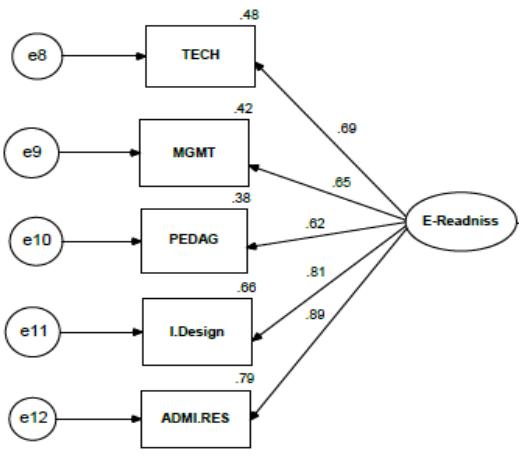

Figure 2b: Model for students group after modification.

The results of Multi-Groups analysis including model fit criteria are shown in Table 5. Additional to good model fit for all three groups, results also highlight the fact that the instrument had generally good to excellent Cronbach's α coefficients (≥ 0.7) for all dimensions (Table 5). So results reveal a reliable measurement model and a good invariance between the groups, and the ability of the model to show differences between groups since that there are no significant differences regarding the assessment parameters. This means also individuals from different groups of the study may interpret the E-Readiness in the same manner.

Discussion

Linking findings to the existing empirical literature

The E-Readiness measurement scale can provide student profiles for Educator, Administrators or institutions looking for the success of distance learning taking in their consideration critical factors (Technology, Management, Pedagogy, Interface Design and, Administrative and Resource Support). These factors were aligned with [29,30]. Two factors were not been verified in the scale. Further attention should be devoted to Evaluation and Continual Improvement in e- learning process. Finding from previous studies support the importance of Policy and Institutional Business Strategy and Evaluation and Continual Improvement. The findings regarding Evaluation and Continual Improvement are aligned with Hussein [31] who observed considerable barriers towards the successful implementation of e-learning at Saudi universities; he stated that there is difficulty in finding consensus on how to best evaluate e-learning success. The results empirically support the validity of research instrument for evaluating E-Readiness for E-Learning Success. Findings suggest that Teachers, Students, and Administrators conceptualize the constructs in similarly.

Implications for theory and practice

The implication of the results from EFA, CFA for multiple groups

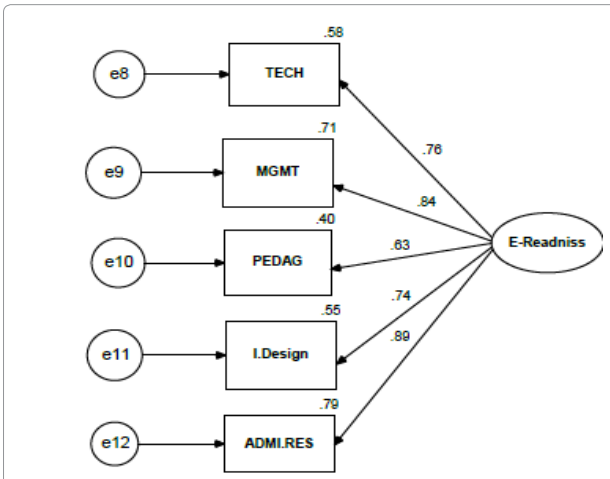

Figure 2c: Model for administrators group after modification.

Invariance Model	Chisq/df	p-value	CFA	GFI	RMSEA
Unconstrained model	2.553	0	0.91	0.942	0.061
Weights model	2.49	0.001	0.892	0.961	0.0603
Intercepts model	2.413	0	0.902	0.912	0.071
Residuals model	2.332	0	0.904	0.934	0.081

Table 5: Results of invariance model (Multi- group analysis) and model fit for each group.

enables us to understand E-Readiness for E-Learning Success validity in online learning research. Colleges and universities facing problems including ill designed online learning that cannot meet demands of the students. A lot of pressure on colleges or universities to provide an effective education, Therefore, academic educational institutions in KSA is looking for alternative and integrated ways to provide an education that attracts students in a highly changing and competitive world. Universities in KSA are more interested in integrating Internet based technologies in the classroom as part of learning which has the potential to change the nature of learning environments and the ways they learn. In addition to focus on E-Readiness factors, our study measured the invariance of different groups in understanding these factors in in influencing on E-Learning Success. Most of previous studies in E-Readiness have empirically investigated these factors and found excellent explaining power of E-Readiness factors, studies such as Moftakhari [32], Mercado [33] Kaur and Abas [34] pointed out that the significance of E-Readiness dimensions might be affected by different demographic variables. Also Lu and Chiou indicated that different demographic variables caused differences in e-learning success. None of the studies in this field have examined the differences between the three groups (Teachers, Students, and Administrators) in the Arab region or even in Saudi Arabia. The stability of the relationships among the variables in measurement model was not influenced by differences of the groups either conceptually or psychometrically, these results verify the appropriateness of applying the measurement model and indicate that testing participants do not need to be separated. The implication of this study can serve as crucial tool for measuring the factors that affecting the E-Learning Readiness. The study asserted the necessary for Teachers and/or administrators to instill sense of belonging for their distance students and try to support their students to enhance belonging in online courses. The model included in this research revealed the importance of Administrative and Resource Support to enhance student's experience in online learning.

Attention should be directed to Institutional Policies and Business Strategies and Evaluation and Continual Improvement. Those two factors were not been verified on our scale, which mean that the sample of Teachers, Students, and Administrators need to be aware of the role of Institutional Policies in online learning. This result can be elaborated as no effect of these constructs on the measurement model, it might be happened due to less correlation with other construct in the measurement model, or elaborated to respondent at the selected population that deem these factor is indiscernible. Many researchers have indicated that there is no comprehensive institutional or national strategic plan for E-learning in higher education institutions in Saudi Arabia. Although there are some individual initiatives to build strategic plan for information systems and E-Learning implementation, but these initiatives do not satisfy the requirements in this important field. Also, standards, clear regulations, procedures on how to evaluate e-learning are still absent.

The study provides an idea to consider what are the psychometric properties that should be measured to better understand E-Readiness. Even though, the technological issues such as comprehensive technology plan, Internet connection, interactive Communication Media and Networks etc., have significant impact on e-learning, technology will not guarantee this success and the other factors of E-Readiness are still necessary for online learning success. For example, E-Learning environment is different from traditional learning or classroom learning environment, teachers and students playing a main role in the process of learning in online courses, therefore, teachers and administrators in higher education should pay more attention to distance learners' readiness. The study recommends focusing on raising awareness among concerned parties about the importance of planning for e-learning and setting clear and specific goals, in addition to focusing on integrating e-learning in institutional policies and Strategies. In addition, deepen understanding about continuous assessment which in turn leads to continuous improvement.

Limitations and future research

Though the objectives of this study have been achieved, and despite the careful design of this study, some limitations have appeared. Although the researcher used EFA for examination of the measurement model and confirmed the results using CFA, also testing invariance for the measurement model, which indicated that the common bias is unlikely to happen in the analyzed data, the common bias issue may still exist. Which means that we still need more detailed evidence about none common bias. Secondly, the theoretical focus of this research didn't consider another constructs for E-Readiness. Third, this study did not consider the gender differences (male, female). According to Gonzalez-Gomez [35], they indicated that male and female have different perspectives in understanding the e-learning subjects. Fourth, this study is limited to Saudi Arabia; its findings may not be generalized to other countries. Fifth, Although this study have built a comprehensive theoretical model that included dimensions mentioned in many previous studies, and despite the efforts exerted by the researcher to confirm these dimensions in proportion to the data collected from the Saudi environment. There is a need to study each of these dimensions separately. Sixth, the sample size may be considered as small compared to the number of people involved in e-learning [36]. Last limitation in this study related to university setting because participants (especially students and educators) in this study were not completely enrolled in online programs but rather individual online course(s). Although the survey asked them to answer the questions as a current or potential student and educator in an online course, it is possible participants answered the questions based on experiences. For this reason, different results might have been found if this study were conducted with students and educators in a fully online program.

Due to limitations appeared in this study, the researchers proposed some recommendation for future research. First, Future studies should try to improve the theoretical imperfection of E-Readiness especially in the Arab region by incorporating other relevant variables for conducting further empirical examinations. Second, many studies in in e-learning revealed different conclusions which indicating the relationships among variables might be affected by gender differences. Future research should focus on gender differences in E-Learning subjects especially in the Arab region. Third, the findings of this study may not be generalized to any other countries, unless that there is a possibility to extend some of these results to other societies such as countries in the Arab Gulf because of their similar circumstances. There is a need to conduct such a study in other Arab countries as they share some of the ideas, traditions and IT infrastructure. Fourth, There is a need to study each of E-Readiness dimensions separately, each dimension of this study can be considered as an independent variable which impact the success of e-learning and should be measured, measuring each dimension in this manner increases efficiency and effectiveness in managing this dimension. Fifth, the researcher used the stratified method to represent the study population appropriately, taking into account the homogeneity of each class. However, the size of the selected sample is small for such studies. Among the recommendations for further researches made by the researcher is to

include a larger sample in future studies to be representative of the community and give more accurate results. One of the reasons for the small sample size was the lack of response from the sample. Saudi Arabia is a large country, and it is difficult to reach distant universities. The researcher used the electronic survey method because of the inability to conduct a direct survey, so the responses were few. Sixth, although the empirical study did not demonstrate the importance of Institutional Policies and Business Strategies, as well as Evaluation and Continual Improvement. Future research should address the impact of continuous assessment as well as policies and strategies in measuring E- Learning Readiness. Seventh, it is useful for future research to undertake many studies in surrounding countries in order to formulate a refined model of the theoretical model proposed in this study. Finally, this study investigated a sample consisting of three categories. One of these classifications was students. The sample of students was chosen regardless of specialization, and the specialization was not considered when collecting the sample. The researcher recommends that future researches should take specialty as a control variable in assessing the model, as that different disciplines may give different results because e-learning in colleges have different characteristics from other colleges.

Conclusion

The study revealed that Technology, Management, Pedagogy, Interface Design and, Administrative and Resource Support are five dimensions forming E- Learning Readiness factors in higher education institutions in Saudi Arabia, these factor are confirmed and serve as appropriate tool to measure E- Learning Readiness. Results indicated a good fit for five factor of E-Readiness to sample data, and support empirically the validity of the measurement model for evaluating readiness for E-Learning initiatives in higher education institutions in Saudi Arabia**.** A comprehensive model of E-readiness considered the unique attributes of teacher, student, and administrator indicating the applicability of theoretical framework to different groups which is very crucial to judge generalizability as the three groups are conceptualizing the constructs of the measurement scale in similar. The use of the E-Readiness theoretical framework has enhanced finding of dimensions, with significant support from the grounded theory. Matching between the basic theory and the analytical approach allowed some strength in the process of dimension selection, and provided a mechanism for combining practical and theoretical threads to develop of practical approach of dimensions. The study also opened the door to the Saudi government and higher education institutions to recognize the dimensions that characterize e-learning readiness to convert the opportunity offered by e-learning into educational achievement.

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