E-LEARNING ACCEPTANCE BASED ON TECHNOLOGY ACCEPTANCE MODEL (TAM)

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ABSTRACT

E-learning is regarded as a mandatory teaching and learning approach in higher education worldwide. Despite its importance and popularity, several issues on its use and effectiveness still remain. Universities are facing problems oflow e-learning usage among students and even academic staffs. This study investigate students' acceptance of e-learning in university using modified TAM model consists of six constructs namely instructor characteristics, computer self-efficacy, course design, perceived usefulness, perceived ease of use and intention to use. Data were collected with 95 undergraduate students at Tunku Abdul Rahman University College (TARUC), Johor. Structural Equation Modeling (SEM) was used to analyze the data. Results shown that computer self-efficacyhas significantly effects ease of use, while perceived ease of use significantly affectsintention to use e-learning.

Keywords: e-learning; technology acceptance; TAM.

1. INTRODUCTION

The online learning or better known as e-learning are implemented in almost all higher education institutions all over world from the last 15 to 20 years in general. It has taken over the traditional teaching and learning approaches since then whereby students are able to use an online system that manage courses, materials, discussion and assignments and test through the internet. Universities all over the world have spent millions of dollars to build and maintain their e-learning systems. Among the popular online learning systems are Moodle and Blackboard. Some universities use their self-developed e-learning systems. It is important to have more understanding on why students use (or not use) e-learning to ensure its implementation are fully optimize [1-2, 29].

E-learning or online learning is defined as the usage of the Internet connection to improve the delivery of teaching materials, communication and collaboration between learners and instructors in a virtual environment. The implementation of e-learning is widely accepted due to its tremendous opportunities to connect students and teachers especially with the advancement of internet infrastructure and capability, growing demands of flexible education and preferences of younger generations of learners. Furthermore, e-learning also offers face-to-face interaction with the instructors in the universities. Due to the prospective educational and cost benefits, e-learning has gained its importance from many parties including educational institutions, educational software developers and business organizations [1]. Universities in Malaysia also keeping up with the development by implementing e-learning technology in their education systems [2-3, 30].

E-learning has open opportunities for both educational sectors as well as business sector. E-learning implementation was found to improve students' learning performance [4]. In [1] suggested that in the competitive educational services market, it is necessary to include the e-learning component. In addition, e-learning has become significant in businesses whereby it is used to provide economical online learning for employees [5]. Prominent benefits of e-learning include providing a convenient platform whereby learners can access their learning course materials at any time, learners do not need to meet at the same place and group collaboration tools [36] such as forums and discussions board allows members to work together [6, 31].
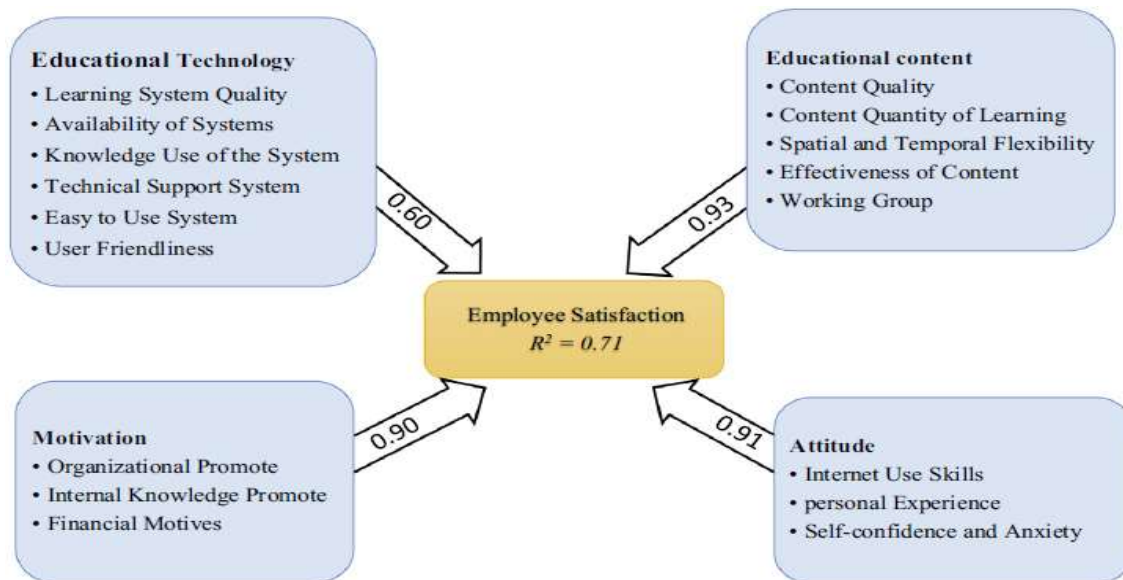
2. REVIEW OF LITERATURES

Researches on e-learning were growing significantly from many years ago due to its importance and implementation at universities all over the world. Despite may research were

done, the issues and challenges of successful e-learning implementation are still remains as suggested in several studies [2-3, 10]. Among the issue of e-learning are high of failure rates for e-learning courses [32], factors that affect student success in using e-learning [10, 33], student satisfaction factors with e-learning such as design clarity, interaction with the instructors and active discussion on the course [34].

Issues in most universities whom implement e-learning are reluctant of use among certain staffs and students. Many reasons contribute to the scenario, therefore, it is important investigate deeper into the issues that contribute to the scenario including understanding the user preferences and problems that they might encounter during the use activities. As discussed in many studies [6, 35], understanding the user's preferences and characteristics are the critical issue in improving e-learning usage and effectivenesssuggested the elements need to be considered for an effective e-learning which are environmental characteristics, environmental satisfaction, learning activities and learners' characteristics. Environmental characteristics and satisfaction also contributes to the level of e-learning usage [6]. In addition, understanding of user's attitudes also facilitates the design of e-learning environments. Apart from that, methods for assessment in el-learning are also important in success of use [35] together with learner's self-efficacy, multimedia formats and interaction environments.

Another study [10] suggested that motivation plays an important role in ensuring effective use and success e-learning. Factors of individual attitudes and expectation, clear direction and reward and recognition are noted as the notable factors for e-learning motivation. It was recommended three factors of a success e-learning namely instructor characteristics, student characteristics, technology characteristics and support as the indicators for success of e-learning. Extension of the technology acceptance model by suggesting perceived credibility as one of the important indicators for e-learning use together with perceived usefulness, perceived ease of use and computer self-efficacy [9].

It was also suggested that the dimension of for assessing the impacts of e-learning among employee includes educational technology, motivation, educational content and attitudes [37]. Educational technology consists of learning system quality, availability of systems and knowledge use of the system, technical support system, easy to use system and user friendliness. Educational content includes the dimensions of content quality, content quantity of learning, spatial and temporal flexibility, effectiveness of content and working groups. Motivation variable consist of organizational promotes, internal knowledge, promote andfinancial motives. Attitudes include the factors of internet use skills, personal experience, self-confidence and anxiety. The model presented in Fig. 1.

Educational Technology
• Learning System Quality
• Availability of Systems
• Knowledge Use of the System
• Technical Support System
• Easy to Use System
• User Friendliness

Educational content
• Content Quality
• Content Quantity of Learning
• Spatial and Temporal Flexibility
• Effectiveness of Content
• Working Group

0.60

0.93

Employee Satisfaction
$R^2 = 0.71$

Motivation
• Organizational Promote
• Internal Knowledge Promote
• Financial Motives

0.90

0.91

Attitude
• Internet Use Skills
• personal Experience
• Self-confidence and Anxiety

Fig.1. Dimensions for employee satisfaction in using e-learning[37]

Despite many e-learning initiatives and investment were done in recent years, it success is still the issue of discussion. It is important to measure the critical success factors related to e-learning to ensure its value of investments. Among the success factors discussed were student characteristics, instructor characteristics, learning environment, instructional design and support [10, 32]. It was found that two most important success factors were regarded as those related to student and instructor characteristics [32]. Furthermore, it was suggested that instructor knowledge with learning technologies and student knowledge of computer systems as well as technical infrastructure are the important factors for e-learning success. Thus, the need for more investigation and exploration are always occur due to dynamic features of e-learning and implementation. In addition, the diverse features of e-learning systems itself together with various type of policy and implementation strategies also contribute to the research needs. Deeper and more thorough understanding on e-learning use will help to improve current implementation and effectiveness of e-learning.

Literatures covering on e-learning research are widely available with investigation were done form various perspectives with regards to understand how to effectively implement e-learning systems. This includes investigation on effectiveness [6-7], students' satisfaction [6, 8], acceptance [3, 9] and success factors [10]. Previous researches have discussed several problems on e-learning acceptance including poor user technology acceptance in workplace and the ineffectiveness of e-learning. In [11], the authors reveal that there is an increasing evidence that organizations' productivity has reduced because of the poor technology acceptance by organizations' staff although computers have become common at workplaces.

The problem of the underused of e-learning application remains even through e-learning has been proven to benefit organizations and educational establishments [12].In [11] quoted a research done in Taiwan on 67 women and 89 men at Hsin-Chu Science-based Industrial Park concluded that women's rating of computer self-efficacy, perceived usefulness, perceived ease of use and behavioral intention to use e-learning are lower than men's.

Despite many research on e-learning were done all over the world, it is important to investigate the factors that affect the use of e-learning at a specific learning institutions due to different way of implementation such as the content presentation, different student background, instructors teaching style, learning cultures as well as e-learning support provided by the institutions [3, 24]. In addition, in [12] claimed that e-learning success is depends on the execution of an educational model that meets student's requirement and educational objectives. Therefore, it is a complex task which involves multidisciplinary fields to design good e-learning systems [1, 20].

E-learning self-efficacy, subjective norm and system accessibility are three organizational factors considered as the external variables which influence perceived usefulness, perceived ease of use, e-learning attitude and intention to use e-learning [12]. The researcher further concluded that both e-learning self–efficacy and subjective norm have positive effects on e-learning attitude and the intention to use e-learning. In addition, the researcher also claimed that TAM is a useful model which can assist in understanding behavioral intention to use e-learning. Study conducted using survey on students to assess the application of TAM to the e-learning [3] concluded that a positive view of technology's usefulness is important to encourage individual intention to the use technology and perceived ease of use has a significant influence on the perceived usefulness.In[14], the studyapplied six dimensions (student dimension, instructor dimension, course dimension, technology dimension, design dimension and environment dimension) to investigate the important factors that influence learners' satisfaction in e-learning. The finding of the study concluded that design dimension has a positive effect on the leaners' satisfaction in e-learning.

3. METHODOLOGY

3.1. Research Model and Hypothesis

The purpose of this study is to investigate students' acceptance of e-learning in higher education. The proposed model of students' e-learning acceptance was mainly based on Technology Acceptance Model (TAM). The proposed model of this study consists of six constructs: instructor characteristics, computer self-efficacy, course design, perceived

usefulness, perceived ease of use and intention to use e-learning. Fig.2 shows the proposed model.
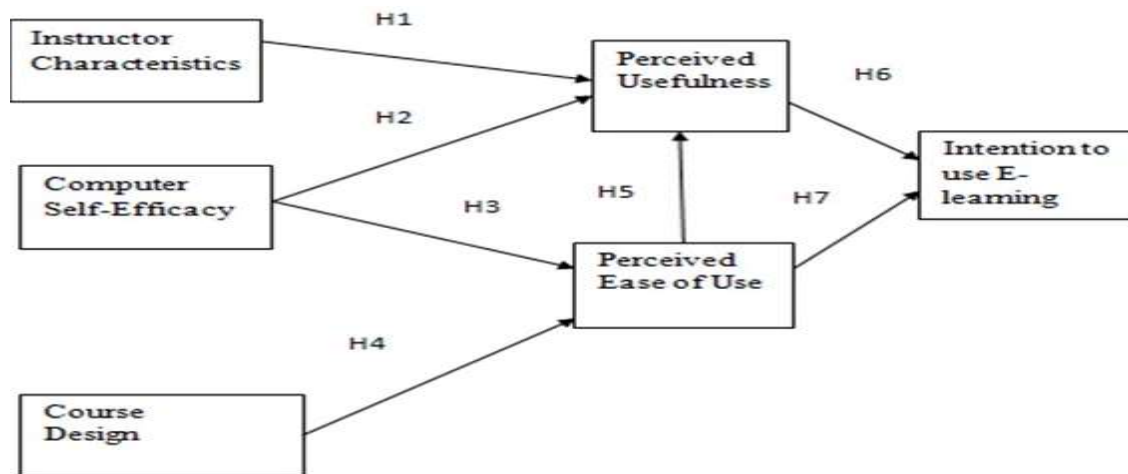
Fig.2. Research model

Instructor characteristics refer to the extent to which trainers will care, help and accommodate their students [1].In [10] found that instructor's attitude towards e-learning technology is an important factor. Additionally, previous literature indicated that positive relationships existed between instructor characteristics and perceived usefulness [1]. Thus, all these lead to the following hypotheses:

H1: Instructor characteristics have a significant effect on the perceived usefulness.

In the context of e-learning, computer self-efficacy is defined individual perceived his or her ability of using computers to complete tasks given [12].Previous research has shown that users who have more positive usefulness and ease of use beliefs, have higher computer self-efficacy[11].A significant body of research also found the importance of computer self-efficacy on the user's behavioural intention to use of technology through the factor of perceived ease of use [12]. Therefore, this study proposes the following hypotheses:

H2: Computer self-efficacy has a significant effect on the perceived usefulness.

H3: Computer self-efficacy has a significant effect on the perceived ease of use.

Three critical success factors of e-learning (instructor characteristics, student characteristics and university support) has been used in [10] to investigate the e-learning acceptance level among university students. The results revealed that course management system is one of the critical factors for e-learning acceptance. Previous researchers indicated that the design of learning contents affected the perceived ease of use [1]. Therefore, this study proposes the following hypotheses:

H4: Course design has a significant effect on the perceived ease of use.

Evidences indicated that perceived usefulness and perceived ease of use have effects on the intention to use e-learning[11, 15]. A significant body of research found that perceived usefulness has effect on the intention to use e-learning[1, 3]. In [15], the authors indicated that perceived ease of use has effect on the perceived usefulness.In [16]claimed that a person's intentions are a function of certain relevant beliefs. Therefore, this study proposes the following hypotheses:

H5: Perceived ease of use has a significant effect on the perceived usefulness.

H6: Perceived usefulness has a significant effect on the intention to use e-learning.

H7: Perceived ease of use has a significant effect on the intention to use e-learning.

3.2. Survey Instrument Development

Based on the relevant literature, a survey questionnaire is developed to meet the research objectives of this study. Questionnaires are divided into Part I which consists of demographic questions and Part II which consists of items for each construct. Several questions item were adapted from previous studies including[10-13, 15]. Thereafter, a few questions from each set of questionnaires were selected and organized to the constructs accordingly as presented in Appendix A. Survey items use Likert Scale from 1 as strongly disagree until 5 as strongly agree.

Appendix A. Survey items used in the study

Instructor Characteristics (CH)	
CH1	I feel the instructor is keen that we use the e-learning based units.
CH2	We were invited to ask questions/receive answers.
CH3	The instructor encourages and motivates me to use e-learning.
CH4	The instructor is active in teaching me the course subjects via e-learning
Computer Self-Efficacy (CSE)	
CSE1	Even though I only have the system manuals for reference, I am confident of using e-learning system.
CSE2	Even if I have never used the e-learning system, I am confident of using it.
CSE3	As long as I have seen someone using the e-learning system before trying it myself, I am confident of using it.
CSE4	As long as I have a lot of time to complete the job for which the software is provided, I am confident of using the e-learning system.
CSE5	As long as someone shows me how to use the e-learning system, I am confident of using it.

Course Design (CD)

CD1   It was easy to understand the structure of the e-learning components.

CD2   It was easy to navigate through the Blackboard/course web.

CD3   The e-learning components were available all the time.

CD4   The course materials were placed on-line in a timely manner.

CD5   I perceive the design of the e-learning components to be good.

Perceived Usefulness (USE)

USE1   Advancing studies through using web-based e-learning systems can help my learning be more efficient.

USE2   Advancing studies through using web-based e-learning systems can help me acquire the information I want to acquire.

USE3   Advancing studies through using web-based e-learning systems can be helpful to my work or learning.

USE4   E-learning would improve my learning performance.

USE5   E-learning would increase academic productivity.

Perceived Ease of Use (PEU)

PEU1   Interacting with the e-learning system does not require a lot of my mental effort.

PEU2   I find the e-learning system to be easy to use.

PEU3   It is easy to become skilful at using an e-learning system.

PEU4   It would be easy for me to find information at e-learning.

Intention to Use E-Learning (IU)

IU1   I prefer e-learning to traditional learning.

IU2   I think e-learning should be implemented in other classes.

IU3   I will recommend e-learning classes to other students.

IU4   I intent to visit e-learning frequently for my course work.
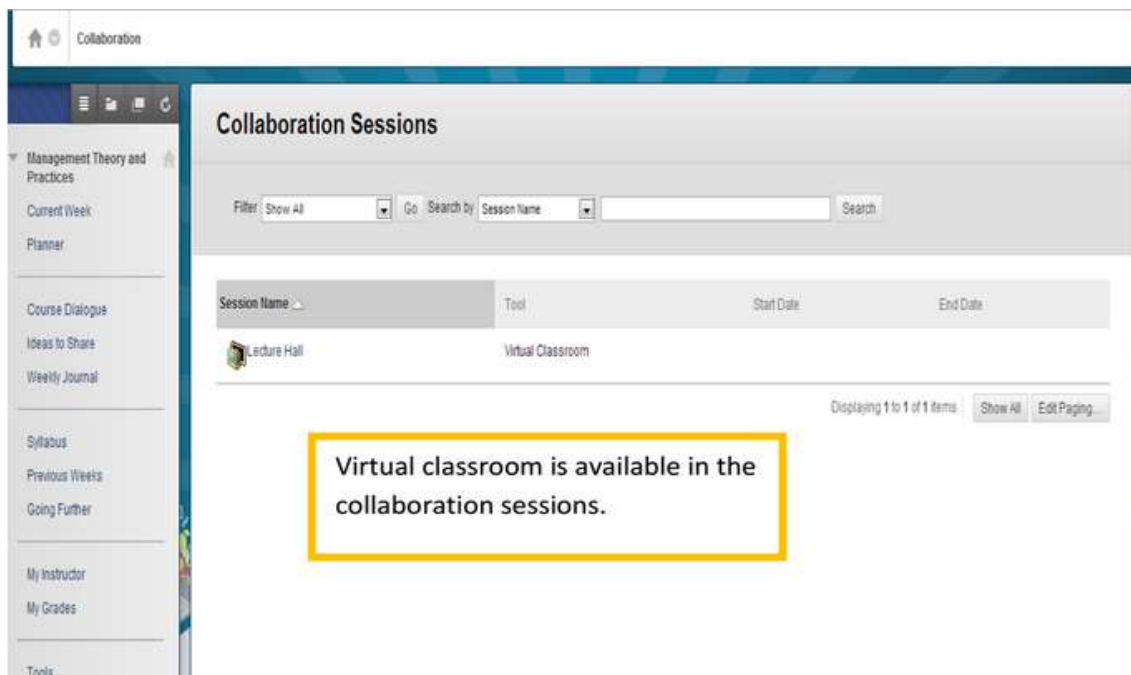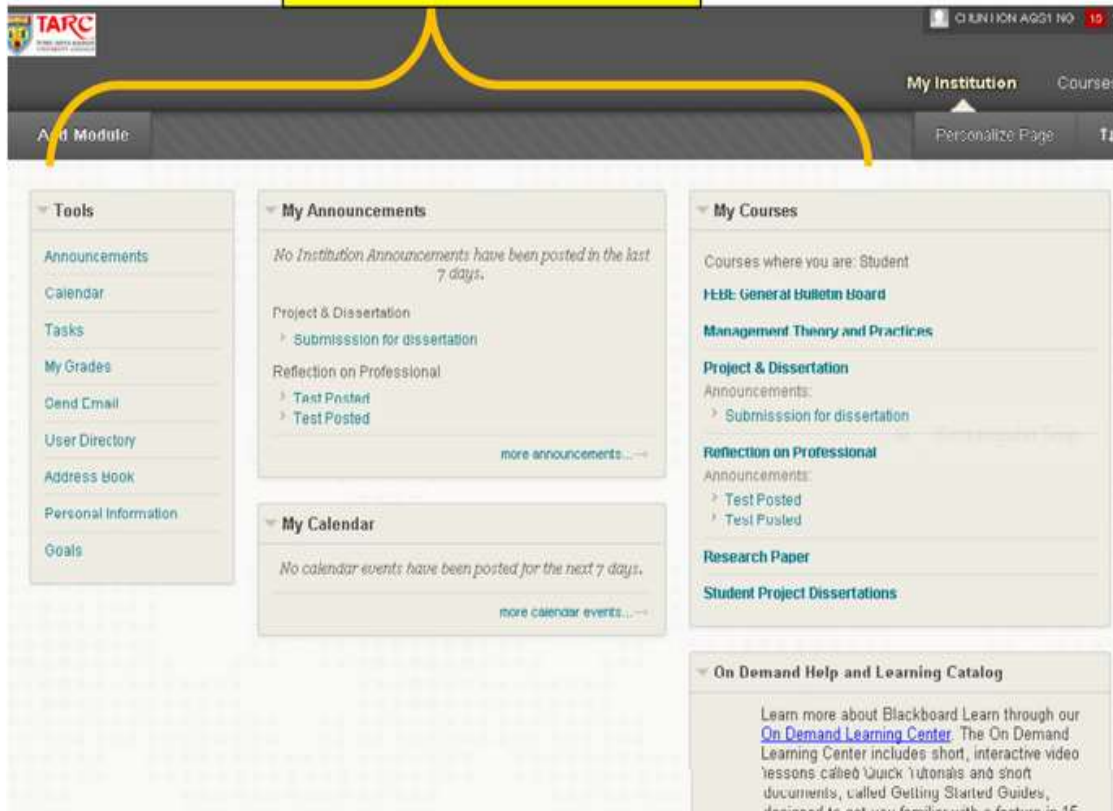
IU5   I intend to use e-learning during the semester.

TARUC use Blackboard e-learning systems [17]. It is mandatory for all students and lecturers to use the systems in their teaching and learning. Screenshots of the system can be found in Appendix B.

Appendix B. TARUC e-learning systems Blackboard screenshots

3.3. Data Collection

Data collection was done among undergraduate students at Tunku Abdul Razak University College. The questionnaire was distributed to 200 undergraduates students who are currently enroll in various study programs with 110 questionnaire were returned. All of them are having experiences with the use of e-learning systems from previous semester. Data cleaning were performed and 15 questionnaires were discarded due to incompleteness or having only one type of answer selection. Total of 95 questionnaires were used for further data analysis. Technique for determining sample size was done by following recommendation [28].

4. RESULTS AND DISCUSSION

4.1. Demographic Information

The demographic components covered gender, the faculties of the participants, program[39] that participants pursue and the year of study as presented in Table 1. The majority of participants are male (63.2%) while the female participants consist only 36.8%. 51.6% of the participants came from Faculty of Accountancy, Finance and Business, 26.3% of the participants came from Faculty of Social Science, Arts and Humanities and 22.1% of the participants came from Faculty of Applied Sciences and Computing.

The largest group of the participants reads Diploma in Business Studies (Accounting) (24.2%). The second highest group of the participants reads Diploma in Business Studies (Business Administration) (23.2%). The third highest group of the participants reads Diploma in Hospitality Management (Hotel Management) (18.9%). The fourth highest group of the participants reads Diploma in Science (Information Systems Engineering) (17.9%). The two minority groups read Diploma in Science (Internet Technology) (4.2%) and Diploma in Business Studies (Marketing) (3.2%). Finally, only 1.1 % of the participants read Diploma in Entrepreneurship. Furthermore, about 67.4% of the participants were year 1 students while only 32.6% of the participants were year 2 students.

Table 1. Demographic of respondents

Item	f	%
Gender		
Male	60	63
Female	35	37
Faculty		
Faculty of Applied Sciences and Computing	21	22
Faculty of Accountancy, Finance and Business	49	52
Faculty of Social Science, Arts and Humanities	25	26
Study Program		
Diploma in Science (Information Systems Engineering)	17	18
Diploma in Science (Internet Technology)	4	4
Diploma in Business (Studies (Accounting)	23	24
Diploma in Business Studies (Business Administration)	22	23
Diploma in Business Studies (Marketing)	3	3
Diploma in Entrepreneurship	1	1.1
Diploma in Mass Communication (Public Relations)	7	7.4
Diploma in Hospitality Management (Hotel Management)	18	18.9
Study Year		
Year 1	64	67.4
Year 2	31	32.6

4.2. Data Analysis and Results

Twenty-eight items were used in confirmatory factor analysis. IBM SPSS Amos 21 and the maximum likelihood technique used for data analysis included evaluating the measurement model and structure model, checking the path coefficient of variable and validating the hypothesis. Fig.3 shows the measurement model for E-learning acceptance. This study uses several references as a guide for undertaking research process and data analysis steps [25-26]. The following three indexes were used to assess the fit of model: chi-square with degrees of freedom (X^2/df), the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). For a good fit of model, the chi-square with degrees of freedom should be less than or equal to 3, the CFI should be greater than 0.9 and the root mean square error of approximation should be less than 0.08 [15]. This study obtained the CMIN value for default model is 624.452, the CFI value for the default model is 0.785 and the RMSEA value for the default model is 0.096 [21-23].
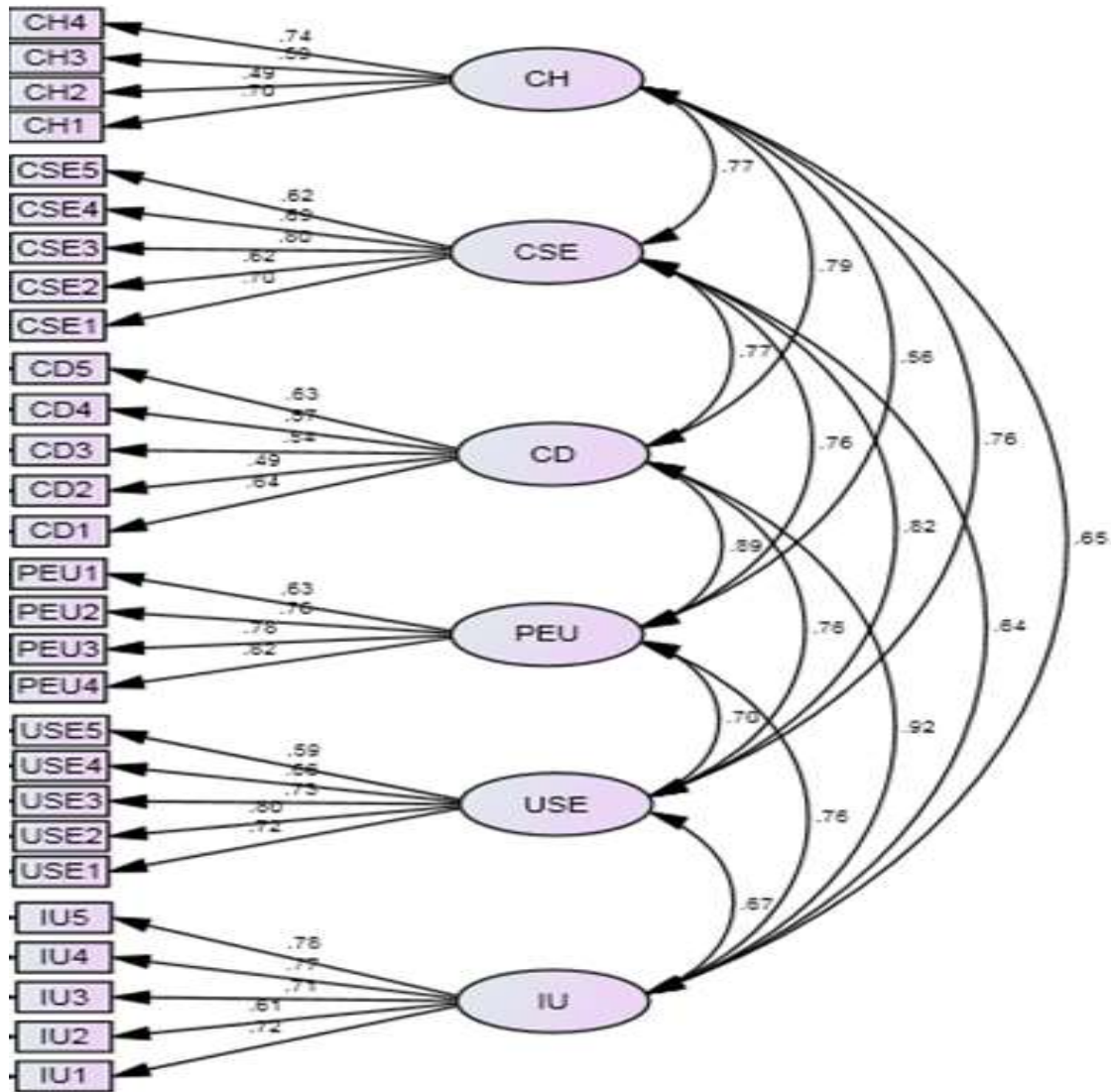
Fig.3. Measurement model

In [15] claimed that factor loading value that is greater than 0.50 indicates significant. In this study, CH2 was deleted since CH2 shows the factor loading, 0.49 below the threshold value as suggested in [15]. By removing item CH2 from the analysis, Table 2 shows the overall X^2 value has decreased from 624.452 to 561.222. In other words, comparing the X^2 values between Model MM1 ($X^2_{(334)}$= 561.222) and Model MM ($X^2_{(335)}$= 624.452), the difference X^2 is 63.23. Furthermore, the CFI value has increased from 0.785 to 0.805 and the RMSEA value has decreased from 0.094 to 0.093. However, the values of X^2, CFI and RMSEA are still below the threshold [27]. Therefore, further improvement is required.

From the comparisons of the 10 models, it can be concluded that the measurement model 10 (MM10) is the final model to represent the final best-fitting model. Thus, the confirmatory factor analysis supports the hypothesized five factors except course design factors.

Measurement model 10 (MM10) was the final measurement model with the X^2 value is 161.954 and p = 0.001, the CFI value is 0.929 and the RMSEA value is 0.072. Summary of goodness of fit indices are presented in Table 2.

Table 2. Summary of goodness of fit

Test	Item Removed	Chi-Square/CMIN With Degree of Freedom(Less Than 3)	CFI (Greater Than 0.90)	RMSEA (Less Than 0.08)
MM	-	624.452	0.785	0.096
MM1	CH2	561.222	0.805	0.093
MM2	CD2	514.131	0.816	0.093
MM3	CD3	465.864	0.829	0.092
MM4	CD4	425.246	0.837	0.092
MM5	USE5	331.677	0.889	0.076
MM6	CSE2	304.132	0.891	0.078
MM7	PEU1	270.908	0.899	0.077
MM8	IU2	246.972	0.900	0.079
MM9	CD1,CD5	193.184	0.915	0.076
MM10	CSE4	161.954 and p = 0.001	0.929	0.072

4.3. Construct Reliability

Construct reliability for measurement model is evaluated by three criteria suggested by[15]namely i) the factor loading should be greater than 0.5; ii) the composite reliability (CR) from each construct should be greater than 0.7; and iii) the average variance extracted (AVE) from each construct should be greater than 0.5. Cronbach's alpha value that is greater than 0.70 and this indicates high reliability [18]. According to Table 3, all the values of factor loading are above 0.50. The composite reliabilities of constructs ranged from 0.736-0.840 are greater than 0.70 while the average variance extracted of constructs ranged from 0.484-0.621 is less than 0.50. Lastly, the Cronbach's alpha for instructor characteristics is 0.737, computer self-efficacy is 0.730, perceived usefulness is 0.823, perceived ease of use is 0.832 and intention to use e-learning is 0.834. Thus, all the constructs are considered reliable constructs.

Table 3. Construct reliability

Factor	Item	Factor Loading (>0.50)	CR > 0.70	AVE >0.50	Cronbach's Alpha(> 0.70)
CH	CH1	0.72	0.736	0.484	0.737
	CH3	0.61			
	CH4	0.75			
CSE	CSE1	0.70	0.751	0.502	0.730
	CSE3	0.78			
	CSE5	0.64			
USE	USE1	0.74	0.827	0.545	0.823
	USE2	0.80			
	USE3	0.75			
	USE4	0.67			
PEU	PEU2	0.73	0.831	0.621	0.832
	PEU3	0.79			
	PEU4	0.84			
IU	IU1	0.69	0.840	0.570	0.834
	IU3	0.68			
	IU4	0.80			
	IU5	0.84			

4.4. Correlation between Constructs

According to researchers in [19], 0.80 and above is classified as a strong positive correlation as presented in Table 4. In this study, the correlations between the five constructs of this study ranged from 0.501 to 0.770. Table 5 shows the correlation between constructs.

Table 4. Strength of linear relationship [19]

Correlation Coefficient Value	Strength of Linear Relationship
At least 0.8	Very strong
0.6 up to 0.8	Moderately strong
0.3 to 0.5	Fair
Less than 0.3	Poor

Table 5. Correlation value between constructs

Construct	1	2	3	4	5
1. PEU	**(0.788)**				
2. CH	0.501	**(0.695)**			
3. CSE	0.769	0.770	**(0.709)**		
4. USE	0.663	0.746	0.764	**(0.738)**	
5. IU	0.725	0.520	0.670	0.610	**(0.755)**

Note. Diagonal elements (in bold) are the square root of the average variance extracted (AVE). Off diagonal elements are the correlations between constructs.

4.5. Structural Model and Hypothesis Testing

Structural model is estimated after the relationship between observed variables and unobserved or latent variables of the measurement model are identified. According to the analysis presented in Fig.4, H3 and H7 are supported. H1, H2, H5 and H6 are not supported. According to the result, instructor characteristics have no effect on students' use of e-learning. This finding is inconsistent with those reported by [1], which indicates that instructor characteristics had a positive influence on the perceived usefulness of e-learning. In addition, perceived usefulness is found to have no effect on students' use of e-learning.

Computer self-efficacy has significant positive effects on perceived ease of use and the standardized path coefficients is 0.75 (p<0.001). In other words, these study shows that when the computer self-efficacy of diploma students to use e-learning is strong, the perceived ease of use e-learning is also high. Thus, it is important for university management to identify student levels of self-efficacy towards using the internet and the online learning systems. If there are lack of those levels among students, a short training or a regular training can be conducted to make sure they are well versed with internet and online applications use.

Perceived ease of use has significant positive effects on the intention to use e-learning and the standardized path coefficients is 0.57 (p<0.001). In other words, these data show that when the perceived ease of use is high, the intention to use is strong.
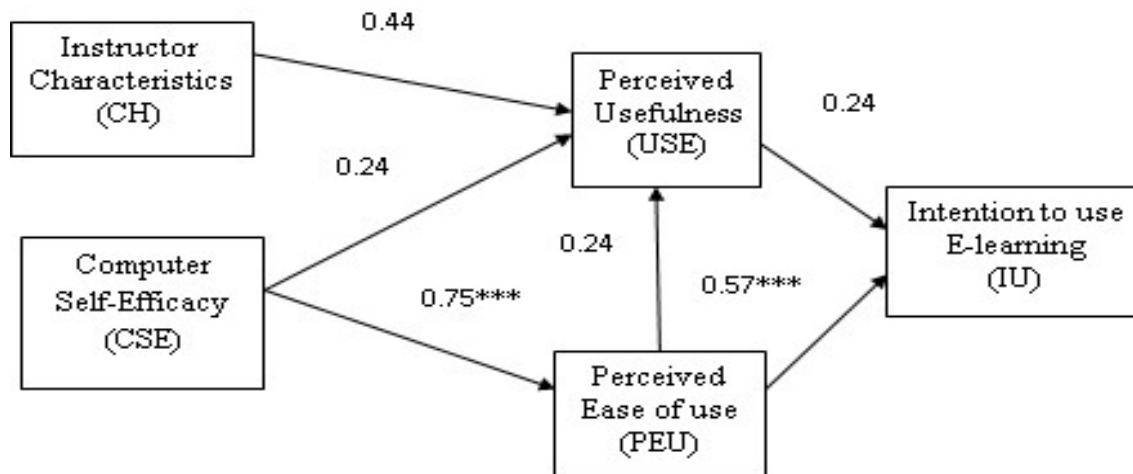
Fig.4. Standardized path co-efficient

5. CONCLUSION

The results of this study shown that computer self-efficacy has significant positive effects on perceived ease of use and the standardized path coefficients is 0.75 (p<0.001). The finding of this study is consistent with the study reported in [12], which indicates the importance of the computer self-efficacy on the user's behavioural intention to use of technology through the perceived ease of use. This study finds that perceived ease of use also has significant positive effects on the intention to use e-learning and the standardized path coefficients is 0.57 (p<0.001), which is consistent with the research results in[12]. In conclusion, the results of this study finds that computer self-efficacy, perceived ease of use and intention to use e-learning are the significant factors that affect students' use of e-learning in higher education. Thus, instructor characteristics and perceived usefulness are removed from the proposed model.

There are several limitations of this study. First, time is the main limitation whereby this study was conducted in a short period of time. The limited time spent resulted in the insufficient time used for literature review. In addition, the findings and implications of this study are obtained only from a single institution, students who currently studying at Tunku Abdul Rahman University College, Johor Branch. Thus, this limitation needs to be considered when generalizing the findings of this study to other user groups or organizations. Despite its limitations, the findings of this study provide several implications for the educational [38] institutions and educational software developers for their future improvement.

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