E-Learning Satisfaction During the Covid-19 Pandemic: A Non-Parametric Approach

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ABSTRACT

This paper aims to explore the relationships between e-learning dimensions and students' perceived satisfaction in the context of a public university in a developing country during the time of coronavirus (COVID-19) pandemic. Survey questionnaire forms designed in 7-point Likert scale were completed by a total of 133 business undergraduates who had completed purely on-line courses as their university campuses were closed to prevent from coronavirus spread. A non-parametric approach, i.e., Partial Least Squares – Structural Equation Modelling (PLS-SEM) was used to test the e-learning model. A measurement model and a structural model of the specification was analyzed to test internal reliability, indicator reliability, discriminant validity, convergent validity, coefficient of determination (R-squared), predictive relevance, path coefficients and effect size. Key analysis results have showed that the most critical factor positively affecting student satisfaction with e-learning is learner interaction while computer anxiety is negatively associated with e-learner satisfaction with this learning mode. Content analysis has also indicated that interaction is one of the most common problems as perceived by e-learners. The results emphasized the importance of human interaction in virtual learning environment. E-learning system designers should consider more functions for easier and more dynamic interactions in online class sessions.

Keywords

e-learning, perceived satisfaction, partial least squares

Introduction

During the new coronavirus pandemic (COVID-19) in 2020 students in many nations are obliged to study completely online. E-learning refers to the use of information and internet technology to receive knowledge through virtual learning environment. Despite its role as a mode of modern education, a challenge for its success is to keep e-learners motivated to complete on-line courses and satisfy the users of the e-learning system (DeLone & McLean, 1992). Another issue is that e-learning is unfamiliar for many students in developing countries as their schools have never prepared for online learning systems. Schools in developing countries are less adaptive than those in developed countries in adopting online learning mode (Bana et al., 2020). Reasons for this discrepancy include the shortage of technology infrastructure, the lack of internet reliability, no preparedness, unreliable internet access, teachers' skills of using computers (Eltahir, 2019).

The objective of this paper is to investigate critical factors of e-learning that would affect online students' perceived satisfaction with e-learning. In addition to quantitative analysis, the study is to determine critical difficulties raised by e-learners themselves through qualitative analysis. The study results would contribute to finalizing an e-learning model in higher-education institutions in a developing country, especially in emergency situations when universities have to abruptly shift traditional in-campus classes to e-learning sessions. Furthermore, it provides practical lessons for e-learning system designers to improve the dimensions of learning management systems to better serve e-learners who for the first time switch their traditional face-to-face learning mode to purely online learning mode.

Theoretical Framework

E-Learning

Fundamentally e-learning refers to web-based learning system in a virtual learning environment (Piccoli et al., 2001). Piccolo et al. (2001) indicated six aspects that make e-learning different from classroom-based classes: space, time, place, technology, interaction and control. In terms of space, time and place, e-learning courses are conducted in virtual learning environment, with geographical barriers removed, in flexible time and mobile place. In terms of technology, e-learning provides a wide variety of functions such as audio, video, embedded items, video conferences, online

discussion board. Students are interactive in technology-mediated setting and have high level of controlling time, place and pace of study during class presentation (Piccoli et al., 2001).

A 2017 report showed that from 2012 to 2016, total course participation in massive open online courses (MOOC) was 4.5 million, with a daily average enrollment of 1,554 new students (Chuang & Ho, 2016). MOOCs technology results in economy of scale (Saltzman, 2017). There is also upward trend of using mobile devices (portable devices such as smart phones) and social media for education (Zawacki-Richter et al., 2015). Table 1 indicates key advantages and disadvantages of e-learning.

Table 1 – Advantages and disadvantages of adopting e-learning

Dimensions	Advantages	Disadvantages	Key References
Costs	Cost effectiveness thanks to economy of scale	Fixed cost is high	Cochrane (2014) Saltzman (2017)
Flexibility	Learning anytime, anywhere Lifelong learning	Course contents shortened Intellectual properties stolen	Volles (2016)
Learning devices	Any devices connected to internet (computers, mobile devices such as laptops, smart phones)	Disadvantaged students with difficult access to learning devices	Zawacki-Richter et al. (2015).
Interaction	No limitations on time and space for interaction Asynchronous and synchronous learning	No face-to-face interaction	Katz (2002)
External factors	No need to apply for visa for overseas study[1].	Online degrees not accredited in some nations Censorship policies Technology export control laws	Contreras (2015) Barr & McClellan (2018).

MOOCs technology has advantage of the economy of scale (Saltzman, 2017). Marginal cost per student in the economy of scale is less than $1 per student for a large class of 100,000 (Saltzman, 2017). The marginal cost is cheaper to use MOOCs because fixed costs for course material preparation is only one time and there is automated grading system and peer assessment on behalf of the instructor (Saltzman, 2017).

As a psychological theory, technological acceptance model in education has been commonly used to determine critical factors affecting learners' attitude and behavior toward endorsement of new learning technology (Ajzen & Fishbein, 1977; Salloum et al., 2019). According to the cognitive model, users' intention to use is determined by their satisfaction and attitude (Oliver, 1980). Piccolo et al. (2001) posited that the antecedents of successful virtual learning system should include human factors in addition to course design factors. Human dimension constitutes the measureable attitude of students and teachers (Piccoli et al., 2001).

***Learner* dimension**

To use an online system, learners are able to use internet-connected devices and have mastery of using internet to gain computer-aided knowledge. Previous studies pointed out three measures for learner dimension in e-learning environment: attitude towards computers, computer anxiety and self-efficacy (Arbaugh, 2002; Piccoli et al., 2001). Access to computers may be concerning to a few people, especially those who have received little or no training on computers or those who with physical impairments (Conti-ramsden et al., 2010). Learners' positive attitude toward computers is related to their interest in using computers to learn (Cole & Hannafin, 1983).

Hypothesis 1a: E-learners' attitude towards computers is positively associated with their satisfaction with e-learning.

Due to the COVID-19 pandemic, universities which traditionally offered face-to-face and in-campus class sessions had to abruptly transition classes to online platform. Their students are totally surprised and unprepared for this new way of learning, which requires using computers with internet access. It is not avoidable that some may feel uncomfortable or anxious with using computers.

Hypothesis 1b: E-learners' computer anxiety is negatively associated with their satisfaction with e-learning.

[1] A study found that international students to the US faced difficulties in obtaining visas (over 80%) and change in American social and political environment (60%) (IIE, 2019)

Internet self-efficacy refers to an individual's judgment of his ability to use internet to perform e-learning activities (Piccoli et al., 2001). Learners who are more confident in using technology and internet are more inclined to adopt internet-based learning and use internet for online activities (Joo et al., 2000). Self-efficacy is proven to have significant effect on ease of use of network-based learning. For example, a study in Pakistan, computer self-efficacy is positively associated with perceived ease of use while technological system has positive significant impact on perceived usefulness of e-learning (Eltahir, 2019).

Hypothesis 1c: E-learners' internet self-efficacy is positively associated with their satisfaction with e-learning.

Course dimension

Online courses are characterized by flexibility, allowing e-learners to access course contents with internet connection anytime and anywhere. They are designed in such a flexible manner that e-learners can adopt e-learning during their work and even in commuting time (Arbaugh, 2002).

Hypothesis 2a. E-Learning course flexibility has positive impact on e-Learner satisfaction with e-Learning.

Hypothesis 2b. E-Learning course quality has positive impact on e-Learner satisfaction with e-Learning.

Technology and design

Online learning is mediated by technology. Internet and information technologies enable online courses and degree-granting programs or massive open online courses (MOOCs) (Saltzman, 2017). Computer-added learning in virtual learning environment demands internet accessibility. Intention to use a technology is psychologically determined by perceived usefulness and ease-of-use of such a technology according to the Technology Acceptance Model (Ajzen & Fishbein, 1977; Salloum et al., 2019). Related studies in higher education demonstrated these associations (Al-Rahmi et al., 2019; Eltahir, 2019). For example, a 2019 study on 1,286 Malaysian e-learning students using Structural Model Equation Model found that there was positive strong effect of perceived usefulness and ease-of-use on behavioral intention to use e-learning system (Al-Rahmi et al., 2019). Students' perceptions of e-learning usefulness and ease of use, in addition to other factors including social influence, quality of life, have significant effect on acceptance and intention to use e-learning (Eltahir, 2019). Therefore, we hypothesize the following:

Hypothesis 3a. Technology quality has positive impact on e-Learner satisfaction with e-Learning.

Hypothesis 3b. Internet quality has positive impact on e-Learner satisfaction with e-Learning.

Hypothesis 4a. Perceived usefulness of the e-Learning system has positive impact on e-Learner satisfaction with e-Learning.

Hypothesis 4b. Perceived ease of use of the e-Learning system has positive impact on e-Learner satisfaction with e-Learning.

***E-learning* environment**

Advantages of e-learning environment include diversity in assessment or multiple ways for student assessment as perceived by students. In a virtual learning environment, e-learners can have student-student and student-teacher communication by means of discussion board, chat rooms, audio and videos, embedded objects or texts. However, disadvantages of e-learning environment include the absence of in-person or face-to-face communication. These factors in virtual learning environment would influence the levels of e-Learner satisfaction with e-Learning (Piccoli et al., 2001; Thurmond et al., 2002).

Hypothesis 5a. Diversity in assessment has positive impact on e-Learner satisfaction with e-Learning.

Hypothesis 5b. Learner perceived interaction with others has positive impact on e-Learner satisfaction with e-Learning.

Based on the acceptance model of e-learning and cognitive model, the author proposed the following conceptual model.

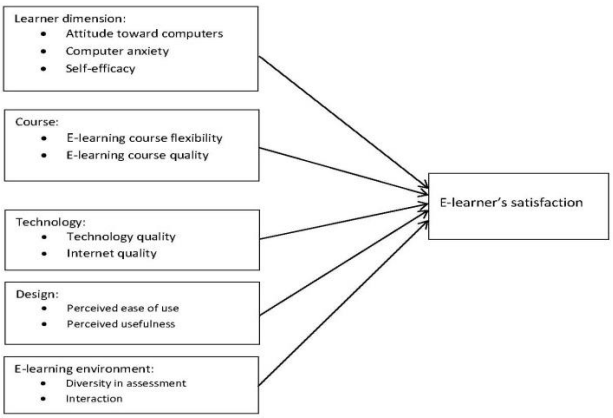

Figure 1 – Conceptual model (Adapted from Sun et al. (2008))

Methodology

Research Design and Data Collection

The experiment was conducted at public university in Ho Chi Minh City, Vietnam. The author realized that the experience of purely online classes was a first-time experiment for students. All students of this experiment had never experienced purely online learning mode until the outbreak of COVID-19 in early 2020, which compelled campuses to be closed and students had to follow this remote study mode. Due to social distancing regulations, all schools in Vietnam had to be closed from March until late May 2020 and lecturers had to deliver online class sessions via Zoom or MS Team software, in combination with learning materials posted in the Blackboard Learning. The author and lecturer collected survey data at the end of May 2020 when the students had experienced purely online classes. Target objects were business students in the School of Business, in management-related courses including the Principles of Management, Quality Management and Project Management. A link to a survey questionnaire designed in google forms was sent to 231 university students enrolled in these courses. A total of 133 (58%) completed the survey form.

A 7-point Likert scale was used to measure variables (1 = strongly disagree; 7 = strongly agree). The survey question items were adopted from the model by Piccoli et al. (2001). The dependent variable perceived e-Learner Satisfaction is composed of 9 items. Independent variables are categorized into 5 constructs: e-Learner (3 dimensions), Course (2 dimensions), Technology (2 dimensions), Design (2 dimensions) and E-learning Environment (2 dimensions). Each dimension is composed of a number of items which would be tested for reliability and validity. Some items are intentionally designed for reversing code for checking response reliability. The questionnaire also included an open question asking the respondents to jot down any difficulties facing them during their e-learning experience.

Analysis Process

Partial Least Squares – Structural Equation Modelling (PLS-SEM) approach is followed. PLS, a non-parametric technique, is used for theory confirmation when sample size is relatively small (Chin & Newsted, 1998). The reason for using PLS-SEM (structural equation modeling) technique is that the sample size of this study is 133, a small size acceptable for PLS-SEM. Differently from covariance-based SEM, PLS-SEM method allows for small sample size and relaxes some restraints on data, e.g. data normality (Chin & Newsted, 1998).

There are a number of steps in the analysis process. First, the latent or unobserved variables are linked to the indicators in a measurement model.

The SEM method is confirmatory factor analysis to estimate regression coefficients and check if the hypotheses of the conceptual model of e-Learning Quality, fit the data collected in the context of the surveyed university.

The measurement model is to exhibit the link between the indicators and the latent or unobserved variable. We evaluated the measurement model results by examining internal reliability, indicator reliability, discriminant validity and convergent validity.

There are two types of measurement models; namely exogenous latent variables (predictors or independent variables) and endogenous variables (dependent variables- being explained by other constructs) (Figure 1). For consistency purposes, the term independent and dependent variable are used in this study.

The relationships between the latent variables and the observed variables are specified in a structural model. The structural model visually represents model hypotheses among constructs. The structural equation model (SEM) is expressed by:

$$\eta = \gamma' x + \varsigma$$

Where x'=(x_1, x_2, x_3, …x_q) is a (1 x q) vector of explanatory variables of the latent variable η and $\gamma' = (\gamma_1, \gamma_2, \ldots \gamma_q)$ is a (1 x q) vector of coefficients of the relationships between the latent variable and the explanatory variables.

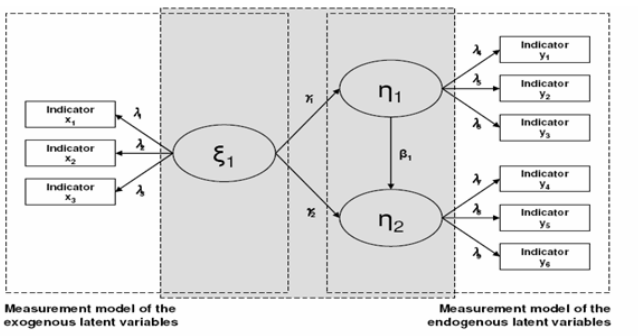

Figure 2 – Design of a structural model

We assessed the structural model by coefficient of determination (R-squared), predictive relevance, effect of path coefficients and effect size (Hair et al., 2017).

Next, as PLS is non-parametric analysis, bootstrapping is needed to avoid inflation of estimated statistics, i.e. t-values (Chin & Newsted, 1998). Path coefficients of variables are determined by bootstrapping for 5,000 trials. Finally, blindfolding process is conducted to determine the predictive relevance of explanatory variables as a block. The blindfolding process would create residual variances from some assumed cases to estimate relevant parameters to calculate predictive relevance. (Sharma & Kim, 2012). The required threshold of the criterion of predictive relevance (Q^2) should be greater than zero to exhibit predictive ability.

Findings

Descriptive Statistics

101 out of 133 responses (76%) are from female students. Up to 70 percent of the respondents have had zero years of experience in taking e-learning before. Only less than 5% of them considered themselves as expert in using computers while 74% had intermediate computer skills.

Table 1 – Respondent demographic

Measure	Value	Frequency	Percent
Gender	Female	101	75.9
	Male	32	24.1
Years of experience in e-learning	0	93	69.9
	1	18	13.5
	2	9	6.8
	3	6	4.5
	4 or more	7	5.3
Levels of computer skills	Expert	6	4.5
	Intermediate	99	74.4
	Novice	28	21.1

Perceived Issues with E-Learning

Table 2 presents the problems faced by the respondents. The first column "Condensation" denotes the meaning units which are condensed from the comments made by the respondents. The second column "Code" concisely describes the condensations.

Table 2 – Perceived Issues with e-Learning

Condensation	Code
My low tech laptop and internet connection problem	Access to device with internet
Hard to find textbooks without being in school	Access to library
Sometimes the audio doesn't work well	Audio quality
Poor connection leads to bad sound quality, missing some of those important point from the teacher	Bad sound quality
Difficult to understand clearly	Communication clarity
Sitting in front of the computer for a long time prevent me from better focusing on the lecture because my eyes are weakened and sometimes it causes headache.	Computer distress
Unexpected broken devices (microphone, speaker, apps,...), interrupting sound	Devices
Besides, sometimes the technical problem appears, like the microphone of my laptop didn't work well and I can't hear the lecturers. This really makes me stressful and in	Devices
Sometimes I am neglected by other factors such as TV, social media,...	Disturbance
Teacher needs to explain by writing	Lack of diversified communication
I also did not know where to download the e-book.	E-book
Online exams may not be fair to everyone due to a possible appearance of third person or using inappropriate program.	Exam disturbance
I like going to school rather than studying online	Face-to-face preference
Hard to focus	Focus issue
Interaction	Interaction
There is lack of interaction between teachers and students, the Internet connection is sometimes unstable	Interaction
Cannot interact with each other	Interaction
Unstable connection and have not enough time to learn	Internet connection
Internet speed, computer errors	Internet connection
Unstable internet causes misunderstanding and misinformation.	Internet connection
Sometime, the internet connection doesn't well and I can't catch up with the information about my lessons.	Internet connection
Concerned about the connection quality from both sides: teacher and student.	Internet connection
Internet connection sometimes has problems which makes me not understand all the lessons and miss the teacher's requirements	Internet connection

Sometimes the Internet has problem so I cannot hear clearly the teacher	Internet connection
The biggest problem I face with e-learning is the unstable internet connection	Internet connection
Unstable network and distraction	Internet reliability
Sometimes, the Internet doesn't work and it kick me out of Zoom 4-5 times. When we have to submit quiz at the same time on Black Board, it may lag.	Internet reliability
Sometimes the teacher's and students' internet connections are flickering and take time to resolve.	Internet stability
Lazy, I think.	Laziness
Students don't have books	Library access
Sometimes misunderstanding others' opinion.	Miscommunication
Noise when we use the internet	Noise disturbance
Power off	Power supply
I always afraid of the situation that the power outages or wireless (Wi-Fi) is poor in my house during the test or quiz so that I cannot submit on time.	Power supply
Even though we are having difficult time, students have to do quiz and assignment every week. That is tough for us because we have not understood 100%. It is fine to do quiz to revise the lesson. However, if lecturers use them as real test, it is unfair for us.	Quiz frequency
Bad quality of pictures	Screen quality
Someone forgot muting the sound	Student microphone
Sometimes I cannot hear the voice of lecturer. The previous class also had to be stopped due to the terrible internet connections.	Teacher voice
Can you upload the audio of review for the midterm exam on blackboard for us?	Uploading recorded lessons
Weak Wi-Fi caused unheard words or lessons properly	Wireless connection
Got kicked out because of Wi-Fi and so many people use it at the same time	Wireless connection
I feel like the lecturers give us double or triple tasks compared to classroom teaching.	Workload
I feel that the workload is too heavy we learn online. Each of every subjects has weekly homework and quiz.	Workload
Sometimes, I lose Internet connection so I miss the knowledge. I have taken about 20-30 minutes to log in Zoom. I don't know the reason why. I'm afraid this happening when I take the online exams which require the attendance on time.	Zoom distress

Table 2 shows that internet connection or reliability is the most common issue faced by the respondents. Other problems include interaction (between lecturer and students, among students themselves), devices accessible to internet, noise disturbance (student microphone, external noise), workload, power blackout, video/audio quality and lack of access to library.

Those complaints raised by the students may reflect self-serving bias. Self-serving respondents tend to blame the e-learning system for all of the problems they have faced without acknowledging any of their own mistakes. For example, only one comment indicated that e-learner was lazy to study. In addition, students' old devices might slow down their internet connection. Many complaints from students were about unstable and slow internet connection, which would occur because those affected students were using computers or mobile devices which were too old to rapidly download data from internet. Alternatively, it was simply because the affected students lived in a geographical area where internet connection was poor. This justification is consistent with the opinions by experts in the field (Oppenheimer & Hibel, 2020).

Measurement Model

Table 2 indicates the results of indicator loadings, Cronbach's alpha, composite reliability and average variance extracted (AVE). Composite reliability which refers to how well a construct is explained by its own indicators and Cronbach's alpha measures should be greater than 0.7 in order to attain sufficient convergence and internal consistency for the construct (Gefen & Straub, 2005). There is one exemption. Although the two constructs of the e-Learner Dimension, which are "Attitude toward Computers" and "Internet Quality", have low values of Cronbach's alpha (0.22 and 0.432 respectively), compared to the expected threshold of 0.7, the author decided to retain them in the model because their average variance extracted and composite reliability values are satisfactory (> 0.5 and > 0. 7) and kept the e-Learner dimension in the specification model.

The results in Table 3 show adequate composite reliability values (> 0.7). The last column for

average variance extracted (AVE) has value for each construct of greater than 0.5, suggesting that the measurements are reliable. To achieve AVE greater than 0.5 as suggested, the authors removed any indicators with outer loadings with values less than 0.6. Normally, when reflective indicators do not achieve an outer loading greater than 0.4, those indicators should be removed (Hulland, 1999). However, even elimination of indicators with loadings less than 0.5 still did not generate AVE values greater than required 0.5. Therefore, the authors continued to eliminate the indicators with loadings less than 0.6. Only then, the AVE values of greater than 0.5 are achieved (Table 3).

Table 3 - Indicators and reliabilities

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Attitude toward Computer	0.22	0.707	0.556
Computer Anxiety	0.897	0.921	0.745
Course Flexibility	0.837	0.88	0.556
Course Quality	0.713	0.832	0.639
Diversity in Assessment	1	1	1
Ease of Use	0.854	0.901	0.697
Internet Quality	0.432	0.778	0.637
Internet Self-Efficacy	0.938	0.942	0.561
Learner Interaction	0.797	0.856	0.506
Perceived Satisfaction	0.884	0.908	0.593
Perceived Usefulness	0.913	0.938	0.792
Technology Quality	0.844	0.895	0.684

In terms of discriminant validity, a latent variable must share more variance with its own indicators than with any other latent variables, suggesting that the AVE of each latent be bigger than the latent variable's highest squared correlation with any other latent variable (Claes Fornell & Larcker, 1981). Table 4 shows these requirements are met so discriminant validity is acceptable.

Table 4 – Correlations and Fornell-Larcker coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Attitude toward Computer	**0.746**	*1.228*	*0.751*	*0.474*	*0.429*	*0.849*	*0.624*	*0.693*	*0.768*	*0.981*	*0.855*	*0.935*
(2) Computer Anxiety	-0.321	**0.863**	***0.184***	***0.157***	***0.172***	***0.236***	***0.185***	***0.197***	***0.114***	***0.242***	***0.203***	***0.269***
(3) Course Flexibility	0.259	0.046	**0.745**	0.863	***0.514***	***0.496***	***0.74***	***0.307***	***0.779***	***0.693***	***0.583***	***0.484***
(4) Course Quality	0.133	0.057	0.705	**0.799**	***0.406***	***0.376***	***0.638***	***0.147***	***0.778***	***0.73***	***0.485***	***0.34***
(5) Diversity in Assessment	0.214	-0.195	0.474	0.362	**1**	***0.589***	***0.493***	***0.368***	***0.46***	***0.384***	***0.47***	***0.532***
(6) Ease of Use	0.405	-0.23	0.43	0.322	0.545	**0.835**	***0.727***	***0.538***	***0.524***	***0.452***	*0.852*	***0.84***
(7) Internet Quality	0.233	0.022	0.442	0.383	0.332	0.454	**0.798**	***0.622***	***0.847***	***0.653***	***0.657***	***0.841***
(8) Internet Self-Efficacy	0.37	-0.18	0.315	0.145	0.345	0.504	0.426	**0.749**	***0.429***	***0.356***	***0.47***	***0.652***
(9) Learner Interaction	0.323	-0.026	0.649	0.628	0.423	0.433	0.499	0.401	**0.711**	***0.78***	***0.718***	***0.655***
(10) Perceived Satisfaction	0.436	-0.17	0.649	0.651	0.376	0.424	0.449	0.382	0.701	**0.77**	***0.592***	***0.455***
(11) Perceived Usefulness	0.415	-0.185	0.509	0.447	0.449	0.758	0.418	0.48	0.6	0.566	**0.89**	***0.693***
(12) Technology Quality	0.422	-0.255	0.408	0.282	0.487	0.715	0.53	0.585	0.54	0.432	0.608	**0.827**

According to Henseler, Ringle & Sarstedt (2015), Heterotrait-Monotrait Ratio (HTMT) values should not exceed 0.9 for the constructs to be conceptually more distinct. Based on HTMT ratio as shown in Table 4, conclusion can be made that discriminant validity is achieved for all the constructs in research model, except "Attitude toward Computer" (HTMT > 0.9).

Structural Model

For bootstrapping, we ran 5000 trials, setting the confidence level of 10%. This configuration would

return complete values for two-sided confidence intervals of HTMT ratio, coefficients of determination (R-squared), path coefficients, effect size (f-squared) and predictive relevance (Q-squared). Figure 3 and Table 5 showed the bootstrapping results after the construct "Attitude toward Computers" was removed due to the lack of construct validity as indicated in the previous step of assessing the measurement model.

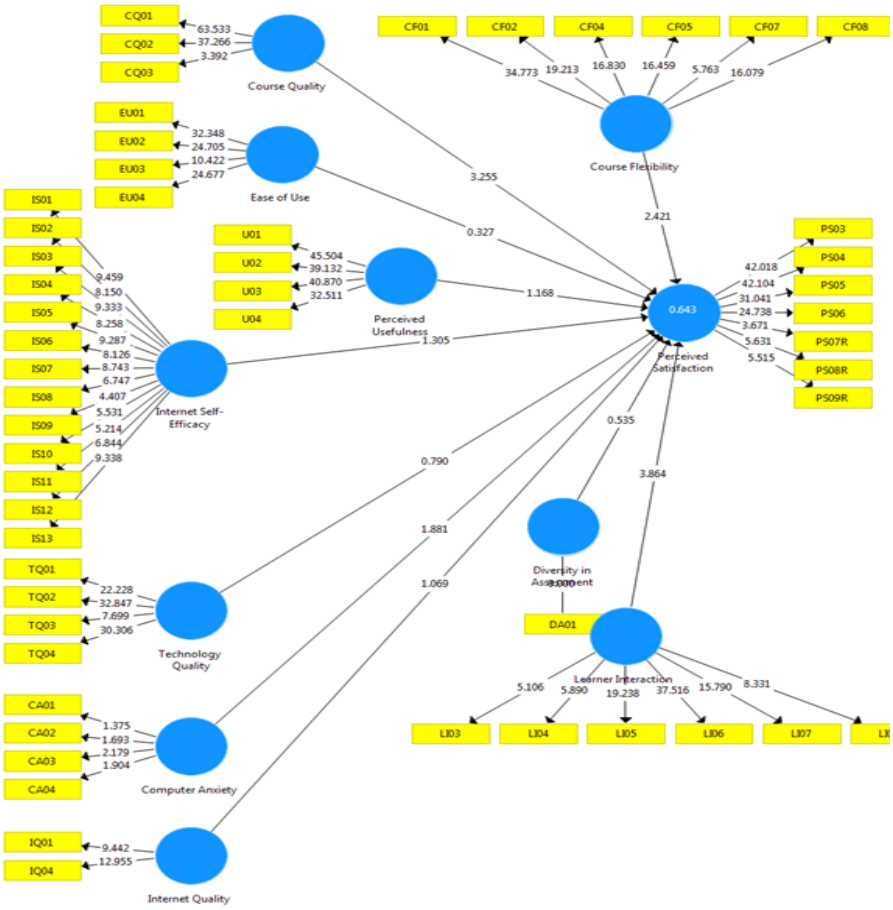

Figure 3 – Structural model with path coefficients

Table 5 – Statistic test results

Independent variables	Path coefficients	T-Statistics	Effect size (f^2)
Computer Anxiety	-0.155	1.881*	0.074
Course Flexibility	0.190	2.421**	0.041
Course Quality	0.271	3.255***	0.086
Diversity in Assessment	-0.052	0.535	0.004
Ease of Use	-0.027	0.327	0.001
Internet Quality	0.069	1.069	0.01
Internet Self-Efficacy	0.127	1.305	0.019
Learner Interaction	0.313	3.864***	0.104
Perceived Usefulness	0.132	1.168	0.017
Technology Quality	-0.066	0.790	0.006
Dependent variable	Coefficient of determination (R^2)	Stone-Geisser test (Q^2)	
Perceived Satisfaction	0.693	0.341	

Note: significance level: *p<=0.10; **p<=0.05; ***p<=0.01

The column of path coefficients indicates the negative causal relationship between Computer Anxiety and the dependent variable with 10% significance level, and the positive impact of Course Flexibility (5% significance level) and Learner Interaction (1% significance level) on the dependent variable. The effect size has moderate effect if its f-squared value is more than 0.15 and large effect if it is more than 0.35 (Cohen, 2008). Because the f-squared values in our model are all less than 0.15, their effect on the dependent variable is considered to be small.

Table 6 shows the value of Q^2 is greater than the proposed threshold of zero, suggesting the model has relevant impact of prediction (C. Fornell & Cha, 1994). In other words, the whole block of the variables of the model are relevant in predicting the dependent variable, i.e., Perceived Satisfaction.

Table 6 – Blindfolding results: predictive relevance

	SSO	SSE	Q^2 (=1-SSE/SSO)
Computer Anxiety	532.000	532.000	
Course Flexibility	798.000	798.000	
Course Quality	399.000	399.000	
Diversity in Assessment	133.000	133.000	
Ease of Use	532.000	532.000	
Internet Quality	266.000	266.000	
Internet Self-Efficacy	1729.000	1729.000	
Learner Interaction	798.000	798.000	
Perceived Satisfaction	931.000	613.156	0.341
Perceived Usefulness	532.000	532.000	
Technology Quality	532.000	532.000	

Conclusions

The analysis results of the measurement model and the structural model using PLS-SEM approach disclose that Course Flexibility, Course Quality and e-Learner Interaction have significant positive impact on e-Learner satisfaction with e-Learning. In contrast, Anxiety toward Computers has negative impact on this dependent variable. The blindfolding results also showed the predictive relevance of the explanatory variables as a block. Compared with the original e-Learning Quality Model, the processed model excluded a small number of indicators which have proven unreliable. The study findings conclude that if a school offering completely an online course wants to satisfy e-Learners with e-learning, it is critical to improve the flexibility and the quality of the course. The school can make it flexible by allowing the learners to access the course anytime, anywhere, with any devices connected to internet and enabling each individual learner to schedule their study according to their resources and time availability. For example, e-Learners can finish their course as quickly as possible unless they have time and resources to do so, hence complete their university program faster. In terms of course quality, as indicated in the original E-Learning Quality Model, to improve it requires the e-learning system to generate e-learners' perception that its quality is greater than any other in-person courses, that taking the course via internet would not affect the learning quality (Piccoli et al., 2001). The most critical factor affecting e-learner satisfaction with e-learning is interaction, which requires easier and more dynamic class discussion, among students and between students and the lecturer, throughout the whole course (Piccoli et al., 2001). Compared to traditional in-person class sessions, online sessions through learning management systems have more channels for communication, such as discussion boards, chat rooms, video conferences, embedded objects. What the online sessions miss is person-to-person communication. However, it is unclear that students want face-to-face meetings with their classmates to discuss lesson topics, or simply that they want social interaction. In fact, in the chat rooms in Zoom class sessions, a number of messages are unrelated to teaching topics. Some students tend to take advantage of classes to chat with their classmates. Course designers should include those tools that not only enable "human"

interactions but also prevent students from chatting topics unrelated to lessons. In business programs, communication skills are essential for students. Therefore, it is necessary for e-learning system which diversifies many communication channels including person-to-person interaction.

Future studies should be conducted for students of multiple disciplines including sciences, social sciences and businesses in many universities or colleges. Additional factors such as individual characteristics and living conditions should be considered as students with difficult access to computers, unreliable internet connection, may find e-learning less effective. In addition, future studies should investigate the relationship of e-learner satisfaction with e-Learning and academic performance.

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