

The Role of Technology Continuance Theory in Willingness to Continue Online Learning Among Fisheries and Aquaculture Students During The COVID-19 Pandemic

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Abstract: Higher education institutions have been forced to close campuses and shift towards online learning to prevent the spread of the coronavirus disease (COVID-19). Although the curriculum requires laboratory sessions, fisheries and aquaculture students from a public university in Malaysia shifted their training online, a completely different and unexpected scenario. Due to the virus's rapid spread, the online sessions were not properly prepared by the university but still needs to be performed for the students. As the pandemic forces higher institutions to continue with online learning, understanding the factors influencing students' willingness to continue online learning is crucial for both parties. The study adopted the Technology Continuance Theory and used a purposive sampling method, gathering 294 respondents from the online survey. The study also examined the online learning service quality, conformation, perceived usefulness, perceived ease of use, satisfaction, attitude, performance and fisheries and aquaculture students' willingness to continue using online learning during the pandemic. Moreover, the study extended the predictive power by introducing the serial mediation of perceived usefulness, perceived ease of use, attitude, performance and satisfaction. Using SmartPLS, the results revealed that all of the hypotheses were supported. Ultimately, the findings provided essential information to understand further the student's willingness to continue online learning during the pandemic. Furthermore, the results help the top management craft a better strategy and policy on online learning and develop a proper plan to allow students to return to campus life.

Keywords: *Technology Continuance Theory, Willingness to continue online learning, Fisheries, Aquaculture students, Sequential Mediator*

1. Introduction

The emergence of COVID-19 resulted in a pandemic caused by the severe acute respiratory syndrome. Since the virus first inception at the end of 2019, the outbreak has gravely impacted various activities worldwide. Consequently, governments worldwide have responded by cancelling public events and closing offices, restaurants and educational institutions to avoid crowd gatherings. In the

education sector, approximately 1.53 billion students of all ages in more than 184 countries have been affected by the sudden outbreak [1]. Similarly, higher education institutions in Malaysia were forced to close campuses and shift towards online learning to prevent the spread of COVID-19. Thus, suggesting that the online learning method is the most popular alternative solution to prevent the COVID-19 outbreak in higher education institutions.

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Accordingly, UMT complied with the Ministry of Higher Education (MoHE) by offering online learning classes. As a leading university in marine science in Malaysia, students in fisheries sciences had to depend on online sessions, although they require many lab sessions to gain skills and knowledge in applied science and agrotechnology. Besides, UMT graduates in this field are highly recognised for meeting the country's industrial demand.

Although online learning has become routine in many countries, [2] stated that conventional education in institutions offers courses with practical experience essential to train the students. Meanwhile, [3] confirmed the prevalent use of face-to-face education in technical courses such as fishery, aquaculture and fishery resources. Nevertheless, students were only provided with theoretical learning sessions in the online learning classroom such as Google Meet or video conferencing due to campus closure. Since students' expectations and the real scenario are completely different, their willingness to continue online learning is questionable. Besides, limited studies have examined willingness to continue online learning during the COVID-19 outbreak among fisheries and science students. Thus, the study aims to identify the factors influencing fisheries and aquaculture students' willingness to continue using online learning during the pandemic.

Numerous studies were conducted on online learning, either before or during the pandemic. Notably, the online learning experience has influenced students' willingness to continue using online learning systems [4]. Significantly, the success of online learning methods depends on students' willingness [5]. Therefore, the study aims to identify the factors of students' willingness to continue studying online. Because the nature of studies is different based on the study area and skills required, the study specifically focused on students in fisheries and aquaculture as a core area in UMT. Furthermore, the findings could be useful to other studies involving psychomotor skills during lab activities.

The study also adopts and extends the Technology Continuance Theory (TCT) by [6] to determine the factors of students' willingness to continue using online learning systems by examining the online learning service quality, conformation, perceived usefulness, perceived ease of use, satisfaction, attitude, performance and willingness to continue. The study could be a reference for other institutions offering fisheries education and similar studies. The study outcomes are also crucial for higher education institutions to improve the quality of online learning systems and develop a proper plan to allow students to return to campus life.

2. Literature Review

2.1 Technology Continuance Theory (TCT)

[6] proposed the theory to understand user's continuance intention based on characteristics of the Technology

Acceptance Model (TAM), Expectation Confirmation Model (ECM) and Cognitive Model (COGM). Specifically, TCT comprises confirmation, perceived usefulness, perceived ease of use, satisfaction and attitude to determine continuance intention. The contribution of TCT to literature is combining attitude and satisfaction in one technology continuous model. Additionally, TCT has more exploratory power than TAM, ECM and COGM [7].

The robustness of TCT has been confirmed in numerous services such as internet banking [8], healthcare [7] and mobile booking applications [9]. The study extended the original TCT model by incorporating online learning service quality and students' performance. Service quality is predicted to influence perceived usefulness and perceived ease of use, whereas students' performance is predicted to influence willingness to continue using online learning systems.

2.2 Willingness to Continue

Willingness to continue occurs after the initial consumption of a product or service, indicating that customers accept it and are likely to continue using it. [10] mentioned that this idea could be a proxy of behavioural intentions; therefore, adopted in academia. Willingness to use suggests behavioural intention before the actual consumption, whereas willingness to continue is behavioural intention after the initial use. Hence, willingness to continue is similar to continuance intention. Accordingly, the study examines the factors influencing students' willingness to continue using online learning systems by analysing the students' performance.

2.3 Online Learning Service Quality

Service quality measures the gap between user expectation and user experience, such as perceived satisfaction [11]. Service quality in online learning refers to support services provided through the online learning systems, such as assistance with registration, course selection, financial aids by institutions and online technical support services [12]. Students who obtain high-quality services from online learning platforms Will further strengthened their perceived usefulness have stronger perceived usefulness on the platform [13]. The study argued that online learning service quality positively influences students' perceived usefulness and perceived ease of use.

The literature also revealed that online learning service quality positively affects perceived usefulness, confirmed in the electronic learning (e-learning) context [14] and massive open online course (MOOC) [13]. Besides, the relationship between service quality and perceived ease of use indicated a positive effect. According to [15], system quality significantly affects perceived ease of use in mobile website adoption. Hence, the study proposed the following:

H1: Online learning service quality has a positive effect on perceived usefulness.

H2: Online learning service quality has a positive effect on perceived ease of use.

2.4 Confirmation

Confirmation is the realisation of the expected benefit of a system [16]. Similarly, confirmation is the extent to which actual experience confirms an individual initial expectation [17]. When the initial expectation of a product or service is confirmed or exceeded, confirmation occurs, leading to user satisfaction. Specifically, when the students' expectation of online learning is confirmed in the actual usage, they become satisfied with the use of the online learning system. Besides, confirmation develops students' positive attitudes towards an online learning system.

Past studies discovered that confirmation positively influenced satisfaction. In academic studies, [18] revealed that confirmation positively affects satisfaction in Massive Open Online Courses, and in [19] regarding online library resources and [20] regarding online learning environment. Based on the literature, the following is presented:

H3: Confirmation has a positive effect on satisfaction.

The positive effect between confirmation and attitude was also confirmed in education literature [21] regarding communication in the classroom. Similarly, teacher confirmation positively affects students' affective learning [22]. Hence, the hypothesis is proposed:

H4: Confirmation has a positive effect on attitude

2.5 Perceived Usefulness

Perceived usefulness is the degree of improvement in learning through an online learning system. Hence, the usefulness of a system is determined when students achieved learning accomplishments such as performance improvement. Additionally, [23] highlighted that consumer have a better purchasing attitude if they find a website useful. Hence, the study proposed that students will have a better attitude and be satisfied using online learning systems if they perceived them useful. Therefore, perceived usefulness is the students' level of improvement in learning through the online learning system.

Studies have verified the positive relationship between perceived usefulness and satisfaction. For instance, [24] revealed the positive effect of the relationship in the learning management system context while [25] established the positive relationship in an open online course context. Therefore, the study proposed that:

H5: Perceived usefulness has a positive effect on satisfaction.

The positive relationship between perceived usefulness and attitude was confirmed by [26] regarding multimedia use among school teachers. Besides, [27] revealed the positive effect of usefulness on students' attitudes towards using the online system. Hence, the following is suggested:

H6: Perceived usefulness has a positive effect on attitude.

2.6 Perceived Ease of Use

Perceived ease of use is defined as the degree to which a person believes using a system is free of effort [28].

Moreover, perceived ease of use refers to perceiving whether performing a particular task requires users' effort [29]. Thus, users would adapt easily to the new technology if they perceived it easy [30]. The perceived ease of use in the study is the student's perception of the level of effort required to participate in an online learning session.

Past studies have revealed that perceived ease of use has a positive influence on satisfaction, as confirmed in online learning [31], blended e-learning systems [32] and mobile websites [33]. Hence, the hypothesis is presented:

H7: Perceived ease of use has a positive effect on satisfaction.

The literature also confirms the positive relationship between perceived ease of use and attitude, revealed in augmented reality learning environments [34], English mobile learning [35] and learning management systems [36]. Therefore, the hypothesis is proposed:

H8: Perceived ease of use has a positive effect on attitude.

2.7 Satisfaction

Satisfaction is the students' perception of the learning experience and how its environment aids their academic success [37]. Furthermore, satisfaction is defined as the degree to which the user believes the system meets their initial purpose [38]. Successful interaction with the online learning system leads to high satisfaction, whereas no good interaction leads to dissatisfaction. Therefore, students' satisfaction with prior experience could influence their academic performance. [39] and [40] confirmed the relationship between satisfaction and perceived performance. Therefore, the following is presented:

H9: Satisfaction has a positive effect on performance.

2.8 Attitude

Attitude is the extent to which a person has a favourable or unfavourable appraisal of a particular behaviour [41]. Besides, attitude is a psychological evaluation in attribute dimensions, such as good-bad, likeable-dislikeable and pleasant-unpleasant [42]. Significantly, students' attitude was a predictor for the actual behaviour of using digital learning [43]. The study suggests that students with a high attitude towards online learning will have a higher performance.

Studies have also shown that attitude positively affects performance, confirmed by [44] regarding engineering students' challenging experiences. Hence, the study presented the following:

H10: Attitude has a positive effect on performance

2.9 Students' Performance

Students' performance is the learners' judgement of their ability to complete tasks and their response towards the learning environment [45]. Learning performance is influenced by students' ability, motivation and desire for knowledge [46]. In practice, students' performance is determined by referring to the percentage of learners who

pass assessments or modules [47]. The study suggests that students' perceived performance positively influence their willingness to continue using online learning systems.

The literature also provides that performance positively affects the students' willingness to continue. For example, [48] confirmed that students' perceived performance positively influenced continuance intention. Hence, the study proposed the following:

H11: Students' perceived performance has a positive effect on willingness to continue.

2.10 Serial Mediation

[49] emphasised the crucial role of mediation analysis in model enhancement and theoretical advancement. Hence, the study aimed to enhance the predictive power of the model by adding several serial mediations. Generally, serial mediation theorises a causal chain linking the mediators with a specific direction flow [50]. For example, service quality could influence perceived ease of use, perceived ease of use could influence satisfaction, and satisfaction could influence performance. Additionally, the serial mediation chain should be analysed to understand how online learning service quality affects willingness to continue. Hence, the study suggests mediating the relationship between services quality and willingness to continue through the effect of perceived ease of use, satisfaction and performance.

Studies have also verified the relationship between service quality and perceived usefulness, perceived usefulness and attitude, attitude and performance, and performance and willingness to continue. Based on the model, the mediators (perceived usefulness, attitude and performance) could have a causal relationship with service quality and willingness to continue. Hence, the following is proposed:

H12: Perceived usefulness, attitude and performance sequentially mediate the relationship between service quality and willingness to continue.

Studies have confirmed the relationships between service quality and perceived ease of use, perceived ease of use and satisfaction, satisfaction and performance, and performance and willingness to continue. Hence, perceived ease of use, satisfaction and performance could be serial mediators between service quality and willingness to continue. Therefore, the first following is suggested:

H13: Perceived ease of use, satisfaction and performance sequentially mediate the relationship between service quality and willingness to continue.

Past studies also verified service quality effect on perceived usefulness, perceived usefulness on satisfaction, satisfaction on performance, and performance on willingness to continue. The study suggested a relationship between the mediators and service quality and willingness to continue. Consequently, the following is presented:

H14: Perceived usefulness, satisfaction and performance sequentially mediate the relationship between service

quality and willingness to continue.

The literature verified that service quality influences perceived ease of use. Similar results were also found in the relationship between perceived ease of use and attitude, attitude and performance, and performance and willingness to continue. The mediators of perceived ease of use, attitude and performance could have a sequential linkage between service quality and willingness to continue. Hence, the following is suggested:

H15: Perceived ease of use, attitude and performance sequentially mediate the relationship between service quality and willingness to continue.

Figure 1 illustrates the research framework.

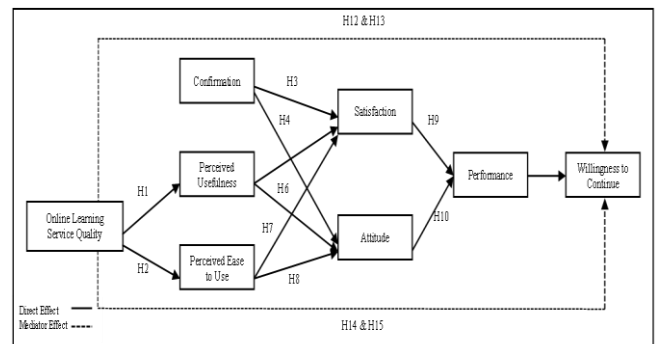


Figure 1: Research Framework

3. Research Methodology

3.1 Instrument Development

The instrument was developed based on seven latent constructs adopted from previous studies. Meanwhile, six online learning service quality items were adopted from [51] while three confirmation items were from [12]. Additionally, three items of each perceived ease to use and perceived usefulness were based on [52]. Satisfaction consists of 3 items adapted from [53], whereas four items measuring attitude were adopted from [54]. Besides, three items of performance were adopted from [55]. Finally, three items of willingness to continue were adopted from [16]. For the scaling of measurement, the independent variables were measured using a five-point Likert scale while the dependent variables were measured using a seven-point Likert scale to reduce the common method variance (CMV) [56].

3.2 Sampling and Data Collection

The respondents were sampled using purposive sampling as the study focused on fisheries and aquaculture degree students from UMT attending online learning courses during Semester 2, Session 2019/2020. As proposed by [57] [58] stated that researchers use convenience sampling when testing the theoretical effect of variables in the research framework. Using Google Forms, the survey was distributed online via the UMT Official Facebook for one month. As proposed by [59], the sample size should be determined using the power of analysis based on the

number of predictors. [60] suggested with the power of 80%, the medium effect size and $p = 0.05$, the minimum sample size of the study was 76. A total of 294 completed questionnaires were returned; hence, the sample size was not an issue in the study.

Specifically, 69.4% of 294 respondents were female students and the remaining 30.6% were male. Moreover,

most respondents were third-year students (45.2%), 32% were second-year students, and 22.8% were first-year students. In terms of electronic device usage, most respondents have more than one electronic device (80.3%), 12.9% use laptops, 6.5% use smartphones and only 0.3% use desktops. Finally, 78.6% of the respondents have internet access at home while 21.4% do not.

Table 1: Respondent Profile

Variable	Item	Frequency (N = 294)	Percentage (%)
Gender	Male	90	30.6
	Female	204	69.4
Year of Study	First year	67	22.8
	Second year	94	32.0
	Third year	133	45.2
Electronic Device	Laptop	38	12.9
	Desktop/PC	1	.3
	Smartphone	19	6.5
	More than 1 device	236	80.3
Internet Access at Home	Yes	231	78.6
	No	63	21.4

3.3 Data Analysis

The data was analysed using PLS-SEM as the study aims to predict the relationship between variables in the research model [61] [62], using SmartPLS [63] to test the hypotheses. The CMV could be an issue as the study used single-source data whereby the independent and dependent variables were simultaneously derived from the same person. Thus, procedural and statistical methods were used to overcome the CMV issue [64] [65]. For the procedural method, the study employed various anchor scales to measure the independent variables (1-5) and dependent variables (1-7) [64] [65]. As for the statistical method, the marker variable technique was conducted to test the common method bias (CMV) [66]. Besides, the unmeasured marker variables were used as an exogenous variable predicting every endogenous variable in the model- all the significant effects of the model without marker variables remained significant in the model with marker variables. Hence, CMV was not an issue.

The study employed a two-stage approach comprising measurement and structural models [67]. The study also used two types of validities for assessing the measurement model; convergent validity and discriminant validity, which must be confirmed before proceeding to the structural model [68]. Therefore, the bootstrapping method with 5,000 resampling techniques [67] was implemented to assess the structural model. As the online learning service quality was measured as a higher-order construct with type 1 (reflective-reflective), the two-stage approach was applied for the higher-order construct.

3.4 Measurement Model

Convergent validity is established if the loading reaches 0.708 or higher [67], average variance extracted (AVE) of 0.5, and composite reliability (CR) with a minimum of 0.7 [67]. Table 2 illustrates the results of the convergent validity test. As all the loading, AVE and CR were higher than the threshold values, the results indicated that convergent validity was achieved.

Table 2: Convergent Validity

Lower Order	Higher Order	Item	Loading	CR	AVE
Interaction Quality		IQ1	0.959	0.958	0.920
		IQ2	0.959		
Service Environment Quality		EQ1	0.969	0.969	0.939
		EQ2	0.969		
Outcome Quality		OQ1	0.955	0.956	0.915
		OQ2	0.958		
Online Learning Service Quality		IQ	0.884	0.938	0.834
		EQ	0.932		
		OQ	0.923		
Confirmation		CONF1	0.911	0.931	0.817
		CONF2	0.903		
		CONF3	0.898		
Perceived Usefulness		PU1	0.861	0.935	0.827
		PU2	0.928		
		PU3	0.937		
Perceived ease to use		PEU	0.918	0.931	0.817
		PEU2	0.915		
		PEU3	0.879		
Satisfaction		S1	0.942	0.962	0.893
		S2	0.943		
		S3	0.949		
Attitude		ATT1	0.905	0.945	0.811
		ATT2	0.895		
		ATT3	0.893		
		ATT4	0.910		
Performance		PER1	0.951	0.937	0.833
		PER2	0.952		
		PER3	0.829		
Willingness to Continue		WC1	0.956	0.965	0.902
		WC2	0.954		
		WC3	0.939		

Next, discriminant validity is confirmed if the heterotrait-monotrait (HTMT) values are lower than 0.9 [69]. The results depicted in Table 3 satisfied the HTMT

criterion, indicating that all the values were lower than the 0.9 as proposed. Hence, the results indicated an adequate discriminant validity of the constructs and items tested.

Table 3: Discriminant Validity: HTMT Ratio

	1	2	3	4	5	6	7	8	9	10
IQ (1)										
EQ (2)	0.790									
OQ (3)	0.778	0.881								
CONF (4)	0.578	0.697	0.711							
PU (5)	0.523	0.667	0.667	0.824						
PEU (6)	0.575	0.640	0.690	0.747	0.819					
SAT (7)	0.654	0.740	0.743	0.773	0.804	0.832				
ATT (8)	0.613	0.722	0.763	0.737	0.856	0.874	0.876			
PER (9)	0.580	0.673	0.701	0.680	0.790	0.743	0.772	0.786		
WC (10)	0.661	0.721	0.734	0.701	0.729	0.777	0.842	0.828	0.884	

3.5 Structural Model

Before the structural model assessment, the study should confirm that multicollinearity is not a problem, with the variance inflated factor (VIF) values of ≤ 5 [61]. Table 4 shows that all the VIF values were lower than the threshold of 5. Additionally, the bootstrapping technique produced the results for the direct effects, as shown in Table 5 and Figure 3, respectively.

The results show that for the direct effect, nine out of ten hypotheses were supported. The $SEQ \rightarrow PU$ ($\beta = 0.617, t = 13.478; LL = 0.532, UL 0.683, p < 0.001$), $SEQ \rightarrow PEU$ ($\beta = 0.630, t = 15.802; LL = 0.570, UL 0.690, p < 0.001$), confirming positive relationships between the variables representing SEQ, PU and PEU. Thus, H1 and H2 are supported. For H3, the values confirmed positive relationships between CONF and SAT ($\beta = 0.244, t = 4.490; LL = 0.153, UL 0.331, p < 0.001$), hence supporting H3. For H5 and H6 on the relationship between PU, SAT and ATT ($\beta = 0.261, t = 3.900; LL = 0.151, UL 0.373, p < 0.001$) and ($\beta = 0.383, t = 5.710; LL = 0.274, UL 0.499, p < 0.001$) respectively, confirming positive relationships between PU, SAT and ATT, hence supporting H5 and H6.

For H7 and H8, the values confirmed positive relationships between PEU, SAT and ATT ($\beta = 0.408, t = 5.863; LL = 0.295, UL 0.523, p < 0.001$) and ($\beta = 0.458, t = 7.251; LL = 0.352, UL 0.560, p < 0.001$), hence supporting H7 and H8. For H9 and H10, the results supported the relationship between SAT and ATT with PER ($\beta = 0.387, t = 4.292; LL = 0.243, UL 0.539, p < 0.001$) and ($\beta = 0.424, t = 4.794; LL = 0.274, UL 0.563, p < 0.001$), confirming positive relationships between SAT, ATT and PER. The results for H10 revealed that PER has a positive relationship with WC ($\beta = 0.842, t = 40.887; LL = 0.806, UL 0.874, p < 0.001$).

Finally, the relationship between CONF and ATT was not proven with ($\beta = 0.083, t = 3.900; LL = -0.036, UL 0.151, p < 0.373$). Consequently, H4 was rejected. Figure 2 and Table 4 illustrates the results for the direct effects of the study.

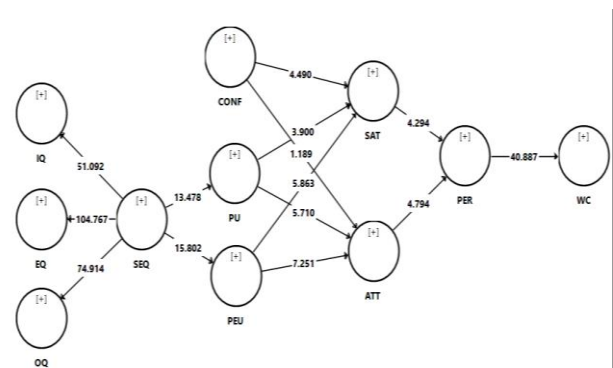


Figure 2: Structural Model

Table 5 demonstrates the values of coefficient of determination (R^2), predictive relevance (Q^2) through the blindfolding technique and effect size (f^2). The study showed the R^2 value of 0.380 for PU, 0.396 for PEU, 0.674 for SAT, 0.716 for ATT, 0.598 for PER and 0.709 for WC, suggesting that SEQ explained 38.0% of the PU variance. Conversely, SEQ explained 39.6% of the PEU variance. As for CONF, PU and PEU explained 67.6% of the variance of SAT. CONF, PU, and PEU explained 71.6% of the ATT variance. Meanwhile, SAT and ATT explained 59.8% of the PER variance. Lastly, PER explained 70.9% of the WC variance. As for predictive relevance, a value of Q^2 higher than 0 indicates that the model has good predictive relevance [61]. The blindfolding technique found that Q^2 is 0.312, 0.319, 0.599, 0.573, 0.568 and 0.636 for the PU, PEU, SAT, ATT, PER and WC, confirming that the model has good predictive power for the subject matters.

Finally, the effect size of f^2 was assessed, whereby an effect size of 0.02 is considered small, 0.15 is moderate, and a value above 0.35 is considered high [70]. The SEQ had a large effect size towards PU and PEU with a value of 0.613 and 0.656. With a value of 0.078 and 0.075, CONF and PU had a small effect size on SAT. Contrarily, PEU had a medium effect on SAT (0.221). For ATT, the study found that PU (0.318) and PEU (0.184) had a medium effect on ATT. As for PER, SAT had a small effect on PER, whereas

ATT (0.149) had a medium effect size on PER. Lastly, with a value of 2.441, PER had a large effect size on WC. Table 5 illustrates all the results for the R², Q² and f².

Table 4: Hypothesis Testing

Hypothesis	Relationship	Beta	SE	T Value	P Value	LL	UL	Decision	VIF
H1	SEQ -> PU	0.617	0.046	13.478	0.001	0.532	0.683	Supported	1.000
H2	SEQ -> PEU	0.630	0.040	15.802	0.001	0.557	0.690	Supported	1.000
H3	CONF -> SAT	0.244	0.054	4.490	0.001	0.153	0.331	Supported	2.338
H4	CONF -> ATT	0.083	0.070	1.189	0.117	-0.037	0.194	Unsupported	2.338
H5	PU -> SAT	0.261	0.067	3.900	0.001	0.151	0.373	Supported	2.810
H6	PU -> ATT	0.383	0.067	5.710	0.001	0.274	0.499	Supported	2.810
H7	PEU -> SAT	0.408	0.070	5.863	0.001	0.295	0.523	Supported	2.325
H8	PEU -> ATT	0.458	0.063	7.251	0.001	0.352	0.560	Supported	2.325
H9	SAT -> PER	0.387	0.090	4.294	0.001	0.243	0.539	Supported	2.997
H10	ATT -> PER	0.424	0.088	4.794	0.001	0.274	0.563	Supported	2.997
H11	PER -> WC	0.842	0.021	40.887	0.001	0.806	0.874	Supported	1.000

Table 5: Effect Size

Relationship	R ²	Q ²	f ²	Decision
SEQ -> PU	0.380	0.312	0.613	Large
SEQ -> PEU	0.396	0.319	0.656	Large
CONF -> SAT			0.078	Small
PU -> SAT	0.676	0.599	0.075	Small
PEU -> SAT			0.221	Medium
PU -> ATT			0.318	Medium
PEU -> ATT	0.716	0.573	0.184	Medium
SAT -> PER			0.124	Small
ATT -> PER	0.598	0.568	0.149	Medium
PER -> WC	0.709	0.636	2.441	Large

[71] and [61] suggested bootstrapping the indirect effect to test the mediation effect for the mediation analysis. [71] also proposed that LL and UL should not straddle a 0 in between and indicated a mediation effect is non-existent between independent and dependent variables. The results indicated that ($\beta = 0.084, t = 3.384; LL = 0.045, UL 0.145, p < 0.001$) for the relationship between SEQ → PU → SAT → PER → WC and ($\beta = 0.020, t = 2.621; LL = 0.022, UL 0.104, p < 0.001$) for the relationship between SEQ → PEU → SAT →

PER → WC confirming that PU, PEU and SAT had a sequential mediation effect for both relationships; thus, supporting H12 and H13. The results for H14 (SEQ → PU → ATT → PER → WC); $\beta = 0.103, t = 3.890; LL = 0.058, UL 0.160, p < 0.001$) and H15 (SEQ → PEU → SAT → PER; $\beta = 0.085, t = 3.524; LL = 0.046, UL 0.140, p < 0.001$) showed that PU, PEU and ATT had a sequential mediation effect for both relationships; hence, supporting H14 and H15. Table 6 depicts the results for the mediation analysis.

Table 6: Mediation Analysis

Hypothesis	Relationship	Beta	SE	T Value	P Value	LL	UL	Decision
H12	SEQ -> PU -> SAT -> PER -> WC	0.084	0.025	3.384	0.001	0.045	0.145	Supported
H13	SEQ -> PEU -> SAT -> PER -> WC	0.053	0.020	2.621	0.009	0.022	0.104	Supported
H14	SEQ -> PU -> ATT -> PER -> WC	0.103	0.027	3.890	0.000	0.058	0.160	Supported
H15	SEQ -> PEU -> ATT -> PER -> WC	0.085	0.024	3.524	0.000	0.046	0.140	Supported

4. Discussion

The study aimed to identify the factors influencing UMT students' willingness to continue using the online learning system during the pandemic. The results confirmed that the extended TCT model with online learning service quality and perceived performance explained students' behaviour towards online learning continuance. Furthermore, the findings could be a reference for the administration of FPSM and similar faculties or institutions that require face-to-face education to aid students' success. Considering the ongoing pandemic, extending knowledge on online learning behaviour among students who require psychomotor skills and practical experience is crucial for their academic success.

The analysis showed that online learning service quality positively affects perceived usefulness. The findings align with [13], showing that better online learning service quality strengthens students' perceived usefulness on online learning platforms. Therefore, university management should provide better service quality in online learning platforms. Good support for online learning ensures a smooth learning process using online learning platforms.

The study also revealed that online learning service quality positively influences the perceived ease of use, as in [15] regarding mobile website adoption. Hence, the findings indicate that good service quality influences students' perception of the effort in using online learning platforms. Thus, good service quality for online learning platforms should be maintained and enhanced by the management to ensure the ease of using online learning among students.

Confirmation had a positive effect on satisfaction, parallel with [20] regarding online learning environment. Hence, once the students realised that the online learning platform could aid their academic success, they will be satisfied with online learning. Hence, the learning process using online learning platforms should fulfil students' expectation. Lecturers should ensure they can fully deliver teaching materials during online sessions. If the learning process is confirmed by the students, they will be satisfied with the session.

Attitude was also positively influenced by confirmation, as shown in [21] regarding communication in classroom. The findings showed that students' attitude towards online learning is high if the usage of online learning platform meets their expectation. Thus, the management should inform the lecturers to effectively deliver teaching materials during online learning sessions. Once the students confirm the expected benefit of online learning, they will exhibit positive attitude towards the online learning method.

Perceived usefulness positively affected students' satisfaction, in line with [25]. Thus, students are satisfied with the online learning platform when they found that it can

improve their academic accomplishment such as learning performance. Hence, the usefulness of online learning should be maintained by the university management by providing excellent learning materials to the lecturers to enhance the usefulness of online learning among students. The study also found that perceived usefulness positively affects attitude, confirming [27]. The findings suggested that students who improved their learning accomplishment has positive attitude towards online learning platforms. Hence, the university management should maintain the usefulness of online learning. Most importantly, good learning material is crucial to allow students to improve their academic success.

The analysis revealed that perceived ease of use positively affects students' satisfaction, as shown in [31]. The findings proved that the level of effort required to participate in online learning sessions influences satisfaction level. Thus, a system with free effort will positively influence satisfaction among students. In order to maintain satisfaction, the institution management should design an online learning platform which is convenient to use and accessible using different type of devices. As mobile devices are one of the handiest devices nowadays, the online learning platform should be compatible with mobile devices such as smartphones or tablet computers.

Additionally, perceived ease of use had positively affected students' attitudes, similar to [36]. Students who believed that using the online learning system is free from effort exhibit a positive attitude towards the online learning system. Therefore, the positive attitude among students should be maintained by making the system easy to use and accessible using different types of devices.

The results showed that satisfaction positively influenced students' perceived performance, in line with [39]. The study indicates that students believe their learning performance improved due to being satisfied with the online learning method. The factors influencing satisfaction such as confirmation, perceived usefulness and perceived ease of use is vital for the students. Hence, satisfaction among students should be preserved on online learning system usage during the pandemic. As the students learning performance improves, their academic success improves too.

Attitude also positively influenced students' perceived performance, as shown in [44] regarding engineering students' academic performance. The study proved that the positive attitude of using an online learning system influenced the students' academic performance. Hence, the university management should encourage positive attitude among students who rely on online learning during the pandemic. Therefore, the influencing factor for positive attitude such as confirmation, perceived usefulness and perceived ease of use are vital to ensure academic performance improvement.

The final analysis on direct effect demonstrated that

students' perceived performance positively influenced their willingness to continue using online learning systems, parallel with [48] regarding continuance intention in higher education institutions. Hence, the improvement in academic performance directly affects students' willingness to continue. Therefore, students who believe their academic performance improved while using online learning systems will continue using the system in replacement of the physical classroom during the pandemic. Thus, improving academic performance using online learning methods is critical to ensure the continuance of online learning system usage. Hence, the factors affecting students' perceived performance such as satisfaction and attitude should be closely monitored by the university management to provide an excellent academic experience for the students during the pandemic.

For the indirect effect, a multiple sequential mediation analysis was conducted to enhance the research model predictive power. Firstly, the relationship between online learning service quality and willingness to continue was mediated by perceived usefulness, satisfaction and performance. The result indicated the importance of perceived usefulness, satisfaction and perceived performance in online learning during the pandemic. Hence, the institution management should provide an online learning system with good service quality and beneficial for the students to ensure their satisfaction with online learning and improve their academic performance.

Second, the analysis showed that perceived ease of use, satisfaction and performance mediated the relationship between online learning service quality and willingness to continue. The results proved that these factors are vital in influencing students' willingness. Therefore, providing an easy-to-use online learning system affects the satisfaction level among students and their academic performance. Therefore, students are more willing to continue using the online learning system if their academic performance improves. Besides having good service quality, the online learning system should be easy to use to influence the satisfaction level and academic performance.

Third, the relationship between online learning service quality and willingness to continue was mediated by perceived usefulness, attitude and perceived performance. Thus, these factors are crucial for the relationship between online learning service quality and willingness to continue. Similar to the first mediation analysis, good service quality and the benefit of online learning influences students' attitudes and improves their perceived performance. Hence, the students believe these factors influence their willingness to continue using online learning.

Lastly, perceived ease of use, attitude and perceived performance mediated the relationship between online learning service quality and willingness to continue. The results confirmed the importance of the indirect effect of these factors on the relationship between online learning service quality and willingness to continue. Therefore, the university management should maintain positive attitude among students by providing an easy-to-use online learning

system with excellent online learning service quality to ensure the students' academic performance improve. Thus, the students will be more willing to continue using an online learning system.

5. Implications

Overall, assessing the online learning service quality, confirmation, perceived usefulness, perceived ease of use, satisfaction, attitude, performance and willingness to continue in the TCT model provides useful insights regarding higher institution students' behaviour towards online learning during the pandemic. Therefore, the extended model of TCT leads to theoretical and practical implications in online learning usage behaviour.

5.1 Theoretical Implication

Although online learning was extensively researched even before the pandemic, the study presents an extended TCT model to explain the post-usage behaviour of the online learning approach on students in fisheries and aquaculture. The students require practical sessions in the laboratory comprising psychomotor skills and face-to-face education, hence the results might differ from students who focus on theoretical learning. The study confirmed the capacity of the extended TCT to explain the willingness to continue using online learning by incorporating online learning system quality and perceived performance. Besides, using perceived usefulness, perceived ease of use, satisfaction, attitude and performance as mediating variables between online learning service quality and willingness to continue is new in online learning, particularly in the COVID-19 context. Additionally, the study offers a new understanding of the post-usage behaviour of online learning for fisheries and aquaculture students.

5.2 Practical Implications

Practically, a better understanding of students' behaviour on online learning is useful for the university management to provide the students with a better learning experience. The university could enhance its online learning platform and provide better learning material to increase student satisfaction and attitude towards online learning. Therefore, students could enhance their academic performance to aid academic success even without a physical classroom.

The study also identified that most students still rely on mobile data networks with no excellent service such as a home network. As the online learning approach requires a stable connection and large data, an excellent internet connection is required. Most significantly, students in rural and remote areas may find difficulty to participate in online learning sessions actively. Hence, the ministry of education should address the issue to network providers to prevent shortcomings in online education.

6. Limitations and Future Research

The study limitations include: first, the study sample was

limited to fisheries and aquaculture students in UMT; hence, future studies should include other education institutions to elaborate on students' willingness to continue using online learning. Second, students' academic performance during the pandemic and after the pandemic should be compared in future studies. The findings should be useful in identifying factors that disrupt online learning systems. Third, the study identified factors influencing students' willingness to continue using the extended TCT model, thus, future studies should investigate the students' behaviour from a different theoretical perspective to provide different findings and enrich the literature.

7. Conclusion

The study aims to identify the factors influencing students' willingness to continue using online learning systems by adopting and extending the TCT model with online learning service quality and perceived performance. The results indicated that majority of the proposed relationships in the study were supported. Therefore, the present study enhances the knowledge on online learning regarding post-usage behaviour during the pandemic and improves the knowledge on online learning behaviour. Hence, the findings could serve as a reference theoretically and practically. Future research should adopt or extend the extended TCT model in this study into other contexts and the findings should improve the knowledge on the capacity of the TCT. Ultimately, the MoHE and university management should work with network providers to provides an excellent online learning experience for the students during the pandemic.

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9. References

- [1] Nayak, J., Mishra, M., Naik, B., Swapnarekha, H., Cengiz, K., & Shanmuganathan, V. (2021). *An impact study of COVID-19 on six different industries: Automobile, energy and power, agriculture, education, travel and tourism and consumer electronics*. In Expert Systems (Issue November 2020). <https://doi.org/10.1111/exsy>.
- [2] Edwards-groves, C. (2017). Practice Theory Perspectives on Pedagogy and Education. *Practice Theory Perspectives on Pedagogy and Education*, 191–213. <https://doi.org/10.1007/978-981-10-3130-4>
- [3] Silva, F. N. L. da, Silva, O. L. L., Oliveira, L. C. de, & Oliveira, L. A. de A. (2020). Profile and Perceptions of Teachers on Distance Education in Fishing, Aquaculture and Fishing Resources During the Pandemic (COVID-19). *EaD Em Foco*, 10(3). <https://doi.org/10.18264/eadf.v10i3.1027>
- [4] Joo, Y. J., So, H. J., & Kim, N. H. (2018). Examination of relationships among students' self-determination, technology acceptance, satisfaction, and continuance intention to use K-MOOCs. *Computers and Education*, 122, 260–272. <https://doi.org/10.1016/j.compedu.2018.01.003>
- [5] Almaiah, M. A., & Alismaiel, O. A. (2019). Examination of factors influencing the use of mobile learning system: An empirical study. *Education and Information Technologies*, 24(1), 885–909. <https://doi.org/10.1007/s10639-018-9810-7>
- [6] Liao, C., Palvia, P., & Chen, J. L. (2009). Information technology adoption behavior life cycle: Toward a Technology Continuance Theory (TCT). *International Journal of Information Management*, 29(4), 309–320. <https://doi.org/10.1016/j.ijinfomgt.2009.03.004>
- [7] Gilani, M. S., Iranmanesh, M., Nikbin, D., & Zailani, S. (2016). EMR continuance usage intention of healthcare professionals. *Informatics for Health and Social Care*, 42(2), 153–165. <https://doi.org/10.3109/17538157.2016.1160245>
- [8] Rahi, S., Khan, M. M., & Alghizzawi, M. (2020). Extension of technology continuance theory (TCT) with task technology fit (TTF) in the context of Internet banking user continuance intention. *International Journal of Quality and Reliability Management*. <https://doi.org/10.1108/IJORM-03-2020-0074>
- [9] Weng, G. S., Zailani, S., Iranmanesh, M., & Hyun, S. S. (2017). Mobile taxi booking application service's continuance usage intention by users. *Transportation Research Part D: Transport and Environment*, 57(October), 207–216. <https://doi.org/10.1016/j.trd.2017.07.023>
- [10] Shin, Y. H., Moon, H., Jung, S. E., & Severt, K. (2017). The effect of environmental values and attitudes on consumer willingness to pay more for organic menus: A value-attitude-behavior approach. *Journal of Hospitality and Tourism Management*, 33, 113–121. <https://doi.org/10.1016/j.jhtm.2017.10.010>
- [11] Uppal, M. A., Ali, S., & Gulliver, S. R. (2018). Factors determining e-learning service quality. *British Journal of Educational Technology*, 49(3), 412–426. <https://doi.org/10.1111/bjet.12552>
- [12] Lee, J. W. (2010). Online support service quality, online learning acceptance, and student satisfaction. *Internet and Higher Education*, 13(4), 277–283. <https://doi.org/10.1016/j.iheduc.2010.08.002>
- [13] Yang, M., Shao, Z., Liu, Q., & Liu, C. (2017). Understanding the quality factors that influence the continuance intention of students toward participation in MOOCs. *Educational Technology Research and Development*, 65(5), 1195–1214. <https://doi.org/10.1007/s11423-017-9513-6>
- [14] Cheng, Y. M. (2013). Extending the expectation-confirmation model with quality and flow to explore nurses' continued blended e-learning intention. *Information Technology and People*, 27(3), 230–258. <https://doi.org/10.1108/ITP-01-2013-0024>
- [15] Zhou, T. (2011). Examining the critical success factors of mobile website adoption. *Online Information Review*, 35(4), 636–652. <https://doi.org/10.1108/14684521111161972>
- [16] Bhattacharjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly: Management Information Systems*, 25(3), 351–370. <https://doi.org/10.2307/3250921>
- [17] Oghuma, A. P., Libaque-Saenz, C. F., Wong, S. F., & Chang, Y. (2016). An expectation-confirmation model of continuance intention to use mobile instant messaging. *Telematics and Informatics*, 33(1), 34–47. <https://doi.org/10.1016/j.tele.2015.05.006>
- [18] Alraimi, K. M., Zo, H., & Ciganek, A. P. (2015). Understanding the MOOCs continuance: The role of openness and reputation. *Computers and Education*, 80,

- 28–38. <https://doi.org/10.1016/j.compedu.2014.08.006>
- [19] Joo, S., & Choi, N. (2015). Understanding users' continuance intention to use online library resources based on an extended expectation-confirmation model. *Electronic Library*, 34(4), 554–571. <https://doi.org/10.1108/EL-02-2015-0033>
- [20] Dağhan, G., & Akkoyunlu, B. (2016). Modeling the continuance usage intention of online learning environments. *Computers in Human Behavior*, 60, 198–21. <https://doi.org/10.1016/j.chb.2016.02.066>
- [21] Burns, M. E., Houser, M. L., & Farris, K. L. B. (2018). Theory of planned behavior in the classroom: An examination of the instructor confirmation-interaction model. *Higher Education*, 75(6), 1091–1108. <https://doi.org/10.1007/s10734-017-0187-0>
- [22] Goodboy, A. K., & Myers, S. A. (2008). The effect of teacher confirmation on student communication and learning outcomes. *Communication Education*, 57(2), 153–179. <https://doi.org/10.1080/03634520701787777>
- [23] Moslehpour, M., Pham, V. K., Wong, W. K., & Bilgiçli, I. (2018). e-purchase intention of Taiwanese consumers: Sustainable mediation of perceived usefulness and perceived ease of use. *Sustainability (Switzerland)*, 10(1). <https://doi.org/10.3390/su10010234>
- [24] Ghazal, S., Aldowah, H., Umar, I., & Bervell, B. (2018). Acceptance and satisfaction of learning management system enabled blended learning based on a modified DeLone-McLean information system success model. *International Journal of Information Technology Project Management*, 9(3), 52–71.
- [25] Pozón-López, I., Higuera-Castillo, E., Muñoz-Leiva, F., & Liébana-Cabanillas, F. J. (2021). Perceived user satisfaction and intention to use massive open online courses (MOOCs). *Journal of Computing in Higher Education*, 33(1). <https://doi.org/10.1007/s12528-020-09257-9>
- [26] Weng, F., Yang, R.-J., Ho, H.-J., & Su, H.-M. (2018). A TAM-Based Study of the Attitude towards Use Intention of Multimedia among School Teachers. *Applied System Innovation*, 1(3), 36. <https://doi.org/10.3390/asi1030036>
- [27] Liu, N., & Pu, Q. (2020). Factors influencing learners' continuance intention toward one-to-one online learning. *Interactive Learning Environments*, 0(0), 1–22. <https://doi.org/10.1080/10494820.2020.1857785>
- [28] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, 13(3), 319–339. <https://doi.org/10.2307/249008>
- [29] Rouibah, K., Abbas, H., & Rouibah, S. (2011). Factors affecting camera mobile phone adoption before e-shopping in the Arab world. *Technology in Society*, 33(3–4), 271–283. <https://doi.org/10.1016/j.techsoc.2011.10.001>
- [30] Morosan, C. (2012). Theoretical and empirical considerations of guests' perceptions of biometric systems in hotels: Extending the technology acceptance model. *Journal of Hospitality and Tourism Research*, 36(1), 52–84. <https://doi.org/10.1177/1096348010380601>
- [31] Al-Rahmi, W. M., Alias, N., Othman, M. S., Marin, V. I., & Tur, G. (2018). A model of factors affecting learning performance through the use of social media in Malaysian higher education. *Computers and Education*, 121(February), 59–72. <https://doi.org/10.1016/j.compedu.2018.02.010>
- [32] Al-Azawei, A., Parslow, P., & Lundqvist, K. (2017). Investigating the effect of learning styles in a blended e-learning system: An extension of the technology acceptance model (TAM). *Australasian Journal of Educational Technology*, 33(2), 1–23. <https://doi.org/10.14742/ajet.2741>
- [33] Amin, M., Rezaei, S., & Abolghasemi, M. (2014). User satisfaction with mobile websites: the impact of perceived usefulness (PU), perceived ease of use (PEOU) and trust. *Nankai Business Review International*, 5(3), 258–274. <https://doi.org/10.1108/NBRI-01-2014-0005>
- [34] Wojciechowski, R., & Cellary, W. (2013). Evaluation of learners' attitude toward learning in ARIES augmented reality environments. *Computers and Education*, 68, 570–585. <https://doi.org/10.1016/j.compedu.2013.02.014>
- [35] Chang, C. C., Yan, C. F., & Tseng, J. S. (2012). Perceived convenience in an extended technology acceptance model. *Mobile Technology and English Learning for College Students*, 28(5), 809–826.
- [36] Fathema, N., Shannon, D., & Ross, M. (2015). Expanding The Technology Acceptance Model (TAM) to Examine Faculty Use of Learning Management Systems (LMSs) In Higher Education Institutions. *Journal of Online Learning and Teaching*, 11(2). <https://doi.org/10.12720/joams.4.2.92-97>
- [37] Lo, C. (2010). How Student Satisfaction Factors Affect Perceived Learning. *Journal of the Scholarship of Teaching and Learning*, 10(1), 47–54.
- [38] Kurt, Ö. E. (2019). Examining an e-learning system through the lens of the information systems success model: Empirical evidence from Italy. *Education and Information Technologies*, 24(2), 1173–1184. <https://doi.org/10.1007/s10639-018-9821-4>
- [39] Otto, A. S., Szymanski, D. M., & Varadarajan, R. (2020). Customer satisfaction and firm performance: insights from over a quarter century of empirical research. *Journal of the Academy of Marketing Science*, 48(3), 543–564. <https://doi.org/10.1007/s11747-019-00657-7>
- [40] Philip, G. C., & Moon, S.-Y. (2013). An investigation of student expectation, perceived performance and satisfaction of e-textbooks. *Journal of Information Technology Education: Innovations in Practice*, 12, 287–298.
- [41] Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- [42] Ajzen, I. (2001). Nature and operation of attitudes. *Annual Review of Psychology*, 27–58.
- [43] He, T., Huang, Q., Yu, X., & Li, S. (2020). Exploring students' digital informal learning: the roles of digital competence and DTPB factors. *Behaviour and Information Technology*, 0(0), 1–11. <https://doi.org/10.1080/0144929X.2020.1752800>
- [44] Laguador, J. M., & Dotong, C. I. (2020). Engineering students' challenging learning experiences and their changing attitude towards academic performance. *European Journal of Educational Research*, 9(3), 1127–1140. <https://doi.org/10.12973/EU-JER.9.3.1127>
- [45] Chang, C. S., Liu, E. Z. F., Sung, H. Y., Lin, C. H., Chen, N. S., & Cheng, S. S. (2014). Effects of online college student's Internet self-efficacy on learning motivation and performance. *Innovations in Education and Teaching International*, 51(4), 366–377. <https://doi.org/10.1080/14703297.2013.771429>
- [46] Bandura, A. (1997). *Self-Efficacy in Changing Societies*. Cambridge University Press.
- [47] Li, N., Marsh, V., & Rienties, B. (2016). Modelling and Managing Learner Satisfaction: Use of Learner Feedback to Enhance Blended and Online Learning Experience. *Decision Sciences Journal of Innovative Education*, 14(2), 216–242. <https://doi.org/10.1111/dsji.12096>
- [48] Shahijan, M. K., Rezaei, S., & Guptan, V. P. (2018). Marketing public and private higher education institutions: A total experiential model of international student's satisfaction, performance and continues intention. *International Review on Public and Nonprofit Marketing*, 15(2), 205–234.

- <https://doi.org/10.1007/s12208-018-0198-2>
- [49] Ngah, A. H., Gabarre, S., Eneizan, B., & Asri, N. (2020). Mediated and moderated model of the willingness to pay for halal transportation. *Journal of Islamic Marketing*. <https://doi.org/10.1108/JIMA-10-2019-0199>
- [50] Charalambous, A., Giannakopoulou, M., Bozas, E., & Paikousis, L. (2019). Parallel and serial mediation analysis between pain, anxiety, depression, fatigue and nausea, vomiting and retching within a randomised controlled trial in patients with breast and prostate cancer. *BMJ Open*, 9(1), 1–10. <https://doi.org/10.1136/bmjopen-2018-026809>
- [51] Wu, P. C. S., Yeh, G. Y. Y., & Hsiao, C. R. (2011). The effect of store image and service quality on brand image and purchase intention for private label brands. *Australasian Marketing Journal (AMJ)*, 19(1), 30–39.
- [52] Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. *Computers in Human Behavior*, 63, 75–90.
- [53] Isaac, O., Aldholay, A., Abdullah, Z., & Ramayah, T. (2019). Online learning usage within Yemeni higher education: The role of compatibility and task-technology fit as mediating variables in the IS success model. *Computers & Education*, 136(2019) 113–129.
- [54] Salloum, S. A., Alhamad, A. Q. M., Al-Emran, M., Monem, A. A., & Shaalan, K. (2019). Exploring Students' Acceptance of E-Learning Through the Development of a Comprehensive Technology Acceptance Model. *IEEE Access*, 7, 128445–128462
- [55] Damjanovic, V., Jednak, S., & Mijatovic, I. (2013). Factors affecting the effectiveness and use of Moodle: students' perception. *Interactive Learning Environments*, 23(4), 496–514.
- [56] Ngah, A. H., Gabarre, S., Han, H., Rahi, S., Al-Gasawneh, J. A., & Park, S. H. (2021). Intention to purchase halal cosmetics: Do males and females differ? a multigroup analysis. *Cosmetics*, 8(1), 1–14. <https://doi.org/10.3390/cosmetics8010019>
- [57] Hulland, J., Baumgartner, H., & Smith, K. M. (2017). Marketing survey research best practices: evidence and recommendations from a review of JAMS articles. *Journal of the Academy of Marketing Science*, 46(1), 92–108. <https://doi.org/10.1007/s11747-017-0532-y>
- [58] Ngah, A. H., Thurasamy, R., Mohd Salleh, N. H., Jeevan, J., Md Hanafiah, R., Eneizan, B., Md. A. Hanapiah, R., & Eneizan, B. (2021). Halal Transportation Adoption Among Food Manufacturers in Malaysia: The Moderated Model of Technology, Organization and Environment (TOE) Framework. *Journal of Islamic Marketing*, Preprint V(ahead-of-print). [https://doi.org/DOI\(10.1108/JIMA-03-2020-0079\)](https://doi.org/DOI(10.1108/JIMA-03-2020-0079))
- [59] Halimi, F. F., Gabarre, S., Rahi, S., Al-Gasawneh, J. A., & Ngah, A. H. (2021). Modelling Muslims' revisit intention of non-halal certified restaurants in Malaysia. *Journal of Islamic Marketing*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JIMA-01-2021-0014>
- [60] Gefen, Rigdon, Straub, Gefen, D., Rigdon, E. E., & Straub, D. (2011). An Update and Extension to SEM Guidelines for Administrative and Social Science Research. *MIS Quarterly*, 35(2), iii–A7. <https://doi.org/10.1016/j.lrp.2013.01.001>
- [61] Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management and Data Systems*, 117(3), 442–458. <https://doi.org/10.1108/IMDS-04-2016-0130>
- [62] Tan, L. L., Abd Aziz, N., & Ngah, A. H. (2020). Mediating effect of reasons on the relationship between altruism and green hotel patronage intention. *Journal of Marketing Analytics*, 8(1), 18–30. <https://doi.org/10.1057/s41270-020-00067-7>
- [63] Ringle, C. M., Wende, S., & Becker, J. M. (2015). “Smart PLS 3.” Boenningstedt: SmartPLS GmbH.
- [64] MacKenzie, S. B., & Podsakoff, P. M. (2012). Common Method Bias in Marketing: Causes, Mechanisms, and Procedural Remedies. *Journal of Retailing*, 88(4), 542–555. <https://doi.org/10.1016/j.jretai.2012.08.001>
- [65] Ngah, A. H., Ramayah, T., Ali, M. H., & Khan, M. I. (2019). Halal transportation adoption among pharmaceuticals and cosmetics manufacturers. *Journal of Islamic Marketing*, 11(6), 1619–1639. <https://doi.org/10.1108/JIMA-10-2018-0193>
- [66] Rönkkö, M., & Ylitalo, J. (2011). PLS marker variable approach to diagnosing and controlling for method variance.
- [67] Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
- [68] Ngah, A. H., Zainuddin, Y., & Thurasamy, R. (2014). Contributing factors of Halal warehouse adoption. *Management and Technology in Knowledge, Service, Tourism & Hospitality*, 89–94.
- [69] Franke, G., & Sarstedt, M. (2019). Heuristics Versus Statistics in Discriminant Validity Testing: A Comparison of Four Procedures. *Internet Research*, 431–447. <https://doi.org/10.1108/IntR-12-2017-0515>
- [70] Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Laurence Erlbaum and Associates. <https://doi.org/https://doi.org/10.4324/9780203771587>
- [71] Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891.