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Measuring the Success of the Real-Time E-Learning through the Empirical Application of DeLone and McLean's Information Success Model: Post COVID-19 Recovery in Sri Lanka

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Abstract
Purpose - *This study measures the success of the real-time e-learning with the application of IS Success Model in the Sri Lankan context. It formulates recommendations to enhance the adoption to real-time e-learning during the pandemic.*
Design/methodology/approach *–This study used deductive approach with the self-administered questionnaire. Followingly, through the convenience sampling technique, 382 questionnaires from undergraduates enrolled in national universities Sri Lanka were filtered for the analysis using IBM SPSS Statistics 25 and SmartPLS 3.*
Findings - *The findings revealed that both system and information quality have the significant positive relationship with user satisfaction and behavioral intention to use and user satisfaction also has significant positive relationship with behavioral intention to use.*
Originality- *This study assesses the level of success of the real-time e-learning after the COVID-19 pandemic in the Sri Lankan context. The study results emphasis the important aspects to be considered to further enhance the level of success of the real-time e-learning in Sri Lanka.*
Key words *IS Success Model, DeLone and McLean, real-time e-learning, COVID-19, Sri Lanka*

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I. Introduction

The advancementin information and communication technology has removed temporal and locational constraints from learning(Sun *et al.*, 2008;McGill, Klobas and Renzi, 2014;Kurt, 2019). As a result, the learning now become more convenient and accessible to everyone irrespective of the locational barrier.Because of the availability of electronic devices and speedier internet access, online learning systems are nowadays widely used in the education industry.

E-learning, also known as online and web-based learning, is a type of learning that occurs through the internet-based online platforms (Trombley and Lee, 2002;Ramayah, Hazlina and Lo, 2010). Education all over the world is mainly supportedby the internet-based online platformsduring the COVID-19 emergency.

The emergence of Corona virus firstly in 2019 December at Wuhan China, is the sole cause for the closure of education system across the world. The novel corona virus spreads among human beings through respiratory droplets produced by sneezing and coughing(Zia, 2020).Thus, the government authoritieshaveinitiatedways to eliminate close contacts by imposing severe rules and regulations to maintain social distancing thereby, to control the spread of virus. Consequently, the strategy called work from home to minimise the spread of the COVID-19 has been enforced. Thereafter, the academic activities have been facilitated mainly by the real-time online applications and other learning tools to resemble the class-room based learning. Followingly, most of the academic related activities were carried-out through the online-means with the support of technological devices and software.

Despite the Sri Lankan university system is particularly familiar with face-to-face learning methodologies, COVID-19 has mandated the use of real-time e-learning platforms to complete normal academic assignments.Even though the e-learning has been viewed as a convenient approach to acquire the knowledge, learners still face many issues.

Furthermore, researches conducted at COVID-19 emphasizes students' preference for classroom instruction, as they face multiple challenges with online learning process through technology-mediated platforms. As per Adnan and Anwar (2020), students prefer face-to-face learning as the online learning deters motivation. Besser, Flett and Zeigler-Hill (2020) stated that students who abruptly switch to the online mode of instruction experienced the decreased learning and increased attentional difficulties.Furthermore, several studies have revealed a preference for hybrid learning.Because it is more economical, accessible, useful, and easier for

lecture delivery and practical tests(Pirapuraj, Rishan and Ali, 2019;Selvaras, 2020;Rameez, Fowsar and Lumna, 2020). Since the majority of students are primarily involved in e-learning via smartphones, specifically through real-time e-learning platforms(Pal and Vanijja, 2020), it is difficult for them to engage in learning like in the class-room based learning. Thus, previous research findings revealed thatthe real-time e-learning is no longer a close substitute for classroom teaching and learning.At this point, it is critical to investigate the success of the new learning model with the prime support of real-time online platforms to enhance and enrich the quality of teaching and learning.

IS success model introduced by DeLone and McLean (1992) is therefore the ideal model to investigate the success of the real-time e-learning after the COVID-19. Because it has identified popular quality related dimensions to be considered with e-learningand the majority of e-learning-related studies have employed the IS success model.Furthermore, few studies examined tested the suitability of this paradigm with real-time e-learning in international and local setting.

Also, the reviewed studies presented inconsistent findings in relation to the core constructs of the IS success model introduced by DeLone and McLean (1992). As a result, the existing knowledge does not provide the correct direction for predicting the success of the real-time e-learning.

Similarly, the research papers analyzed for this study revealed that studies assessing the quality related factors in the Sri Lankan contextare countable. Thus, the deficiencies discovered have revealed an urgent need to do research with the incorporation of the IS success model to measure the success of the real-time e-learning in the Sri Lankan setting.

II. Literature review

There are many theories considering the technology adoption namely Technology Acceptance Model (Davis,1989), Theory of Reasoned Action (Fishbein and Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1991), Information System Success Model(DeLone and McLean, 1992). DeLone and McLean analysed previous researches published from 1981 to 1987 and they formulated six quality related factors which contribute to the information system success namely information quality, system quality, use, user satisfaction, individual impact and organizational impact.

System quality and information quality affect both user satisfaction and system usage. Also, user satisfaction and system usage influence each other and these two will impact individual performance which lead to have the organizational impact. In 2003, the earlier information system success model has been updated with the new dimension of "Service quality". Thus, the updated model included six dimensions: (1) Information Quality, (2) System Quality, (3) Service Quality, (4) Usage/Intention to Use, (5) User Satisfaction And (6) Net Benefits(DeLone and Mclean, 2003).

In 2007, the study conducted in northern Taiwan used the updated DeLone and McLean information systems success model by drawing 232 undergraduate students. The study found significant relationship on actual use through user satisfaction and intention to use(Lin, 2007). The study conducted in the United States of America in 2010 with 674 students found that both the system and information quality had a significant influence on system use and students' satisfaction and system success has been found with 96% of variation along with the R^2 value of 34% and 83% in system use and user satisfaction (Freeze, Alshare, Lane and Joseph Wen, 2010) .

System quality and information quality reported significant positive results in perceived usefulness. However, in the prediction of user satisfaction, only the system quality was reported significant results. Perceived usefulness and user satisfaction contributed 52.10% R^2 value in use. Followingly overall model has predicted 20.37% of R^2 value in overall job performance (Chen, 2010).Mohammadi (2015b)implemented TAM with IS success model in Iran to investigate with 390 students, and the results revealed that only the educational quality and perceived ease of use were found to be insignificant with the intention to use and the perceived usefulness played a mediating role between perceived ease of use and intention to use. The R^2 value of 73% has been reported in actual usage by its predictor satisfaction and intention to use.

Comparative research has been conducted in two different higher education institutions, Jakarta and Central Java in Indonesia, drawing 215 and 172 students, respectively, using TAM with DeLone& McLean IS' Success Model. It has been reported that the Jakarta information quality did not have a significant relationship with intention to use and user satisfaction. On the other hand, system and information quality with intention to use and service quality with user satisfaction did not exert a significant relationship. Additionally, perceived usefulness and user satisfaction were significant predictors of e-learning benefit, with 53.8% R^2 value in Jakarta and 60.6% R^2 value in Central Java (Sandjojo and Wahyuningrum, 2016).

Aparicio, Bacao and Oliveira (2017)found that user satisfaction has been influenced by grit level, information, system, and service quality, and the intention to use has been influenced by information and service quality. Also, the use and satisfaction did not have a significant relationship, and use and user satisfaction has predicted 52.5% of the R^2 value in individual impact. Cidral *et al.* (2018)implemented IS success model in

Brazil, drawing 301 students. The study demonstrated that only the information quality and system quality with user-perceived satisfaction and information quality and collaboration quality with use had reported the significant relationship.A study in Jakarta using 157 students to investigate the success of the e-learning system implementation using the IS Success Model as the primary theoretical model revealed that both the intention to use and user satisfaction positively impact students' performance. The system quality had been operationalized into dimensions, namely technical system quality and educational system quality, whereas it had been found that the users' perceived satisfaction was only mainly influenced by both the factors rather than the intention to use. Content and information quality had been reported as the influencer on intention to use rather than perceived user satisfaction. Also, service quality did not influence either use or user-perceived satisfaction. The use and perceived satisfaction were influenced by 52.3% and 33.4%, respectively, and the individual performance was influenced by 55% (Seta *et al.*, 2018).

A study in Italy with 144 students revealed that system and information quality influenced students' satisfaction. However, the system usage had only been predicted by system quality. The R^2 value of 61.7% on system success has been proved the high explanatory power of the model. Additionally, the model has revealed the R^2 value of 44% and 53% in system usage and satisfaction, respectively (Kurt, 2019).In 2019 Uddin, Ghosh and Isaac (2019) investigated the impact on user satisfaction by system, information and service quality by drawing 388 students from Dhaka university. The findings have revealed the significant impact on user satisfaction with 44% of variation.

Cidral, Aparicio and Oliveira (2020)studied the e-learning system success using the updated IS success model with confucian dynamism theory revealed that only the collaboration and information quality with use and information quality and system quality with user satisfaction found to be significant. Usage and satisfaction revealed a significant positive relationship in both directions. Moreover, both predict the net benefits with the R^2 value of 59.8%.

III. Research Methodology

3.1. Research Model and hypotheses development

3.1.1. Information Quality

DeLone and McLean (1992) refers the extent to which the information with preferred characteristics to meet the user's stated or implied needs is produced by the information system. Information quality means the extent to which the content and information available is usable, complete, timely, accurate and structured (Petter and McLean, 2009; Mohammadi, 2015b).

The relationship between information quality and behavioral intention to use has been established by DeLone and McLean (2003) and the positive relationship has been empirically proven by several researchers(Lin, 2007; Freeze, Alshare, Lane and Wen, 2010; Mohammadi, 2015b; Aparicio, Bacao and Oliveira, 2017;Seta *et al.*, 2018; Cidral, Aparicio and Oliveira, 2020;Cidral *et al.*, 2018). In the same way, the positive relationship between information quality and user satisfaction has also been empirically justified in many researches(Lin, 2007; Freeze, Alshare, Lane and Wen, 2010; Mohammadi, 2015b; Sandjojo and Wahyuningrum, 2016; Aparicio, Bacao and Oliveira, 2017; Cidral *et al.*, 2018; Uddin, Ghosh and Isaac, 2019;Kurt, 2019; Cidral, Aparicio and Oliveira, 2020)

Hence, based on the above premise, the following hypotheses are proposed;

H1: Information quality positively impacts the behavioral intention to use the real-time e-learning.

H2: Information quality positively impacts the user satisfaction of the real-time e-learning.

3.1.2. System Quality

System quality stands for the user's perception about the system concerned. Thus, the quality of the system will be assessed by the extent to which the essential software application and hardware available to support the user needs. quality of the e-learning system will consider as high if the system available, usable, easy to learn and rapidly accessible. Additionally, successful e-learning system will user friendly and provide rapid feedback to users(Halawi, McCarthy and Aronson, 2008;Guimaraes, Armstrong and Jones, 2009;Kurt, 2019). Hassanzadeh, Kanaani and Elahi (2012)added educational quality as a new construct to IS success model and considered qualities which facilitate collaborative learning. In a learning model which is mainly facilitated by real-time learning platforms, the extent which the system allows the collective learning is important. COVID-19 negatively hits the gatherings and cooperative class-room learning effectiveness of the immediate replacements for the class-room learningwith the sole support ofreal-time learning platforms need to be assessed whether the communication, collaboration and active learning are still possible.In this research context it is appropriate to define the system quality as the extent to which the system facilitates the communication, collaborative and active learning with the faster and effective distribution of information (Mohammadi, 2015b; Seta *et al.*, 2018).

The relationship between system quality and behavioral intention to use has been established by DeLone and Mclean (2003) and the positive relationship has been empirically proven by several researchers (Lin, 2007; Freeze, Alshare, Lane and Wen, 2010; Mohammadi, 2015b; Sandjojo and Wahyuningrum, 2016;Kurt, 2019). When the user participation is not voluntary, user perception of the system will becomea measure of success.

According to DeLone and McLean (2003) system quality has a positive effect on user satisfaction. Also, it has been empirically proved by scholars (Lin, 2007; Freeze, Alshare, Lane and Wen, 2010; Chen, 2010; Mohammadi, 2015b; Sandjojo and Wahyuningrum, 2016;Aparicio, Bacao and Oliveira, 2017; Cidral *et al.*, 2018;Seta *et al.*, 2018; Kurt, 2019; Uddin, Ghosh and Isaac, 2019; Cidral, Aparicio and Oliveira, 2020). user satisfaction is an essential factor to be considered when the system use is mandatory and it is regarded as the larger obstacle to be solved for the success of the system. In this research context, COVID-19 mandatorily make students to follow classes through real time e-learning platforms. Thus, the user satisfaction needs to be recognized as the important construct.

Hence, based on the above premise, the following hypotheses are proposed;

H3: System quality positively impacts the behavioral intention to use the real-time e-learning.

H4: System quality positively impacts the user satisfaction of the real-time e-learning.

3.1.3. User Satisfaction

It can be therefore defined as the extent to which users perceives that the system meets their requirements (Ives, Olson and Baroudi, 1983; Kurt, 2019). If the system meets the needs of the users the satisfaction of the users will enhance. Conversely, if the system does not facilitate to meet the requirements of the user it will reduce the satisfaction. According to DeLone and McLean (2003) User Satisfaction positively impacts the Behavioral Intention to use the real-time e-learning. Also, it has been empirically proved by scholars(Lin, 2007; Chen, 2010; Seta *et al.*, 2018; Cidral *et al.*, 2018; Cidral, Aparicio and Oliveira, 2020).

Hence, based on the above premise, the following hypothesis is proposed;

H5: User Satisfaction positively impacts the Behavioral Intention to use the real-time e-learning.

3.1.4. Behavioral Intention to use

System usage in DeLone and McLean information success model has also been considered as "possible to use" and "intention to use" (Kurt, 2019). BehaviouralIntention to Usestands for ones' subjective probability in involving in a certain behaviour(Ajzen and Fishbein, 1980).

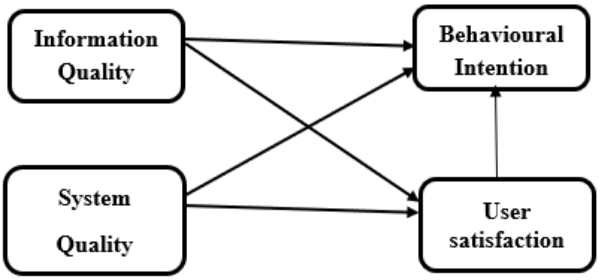

Figure 1. Research model

3.2. Operationalization

The Five-point Likert scale has been utilized to assign scales to measure the model variables ranging from "5" for strongly agree, "4" for agree, "3" for neither agree nor disagree, "2" for disagree, and "1" for strongly disagree(Allen and Seaman, 2007). Because, Likert scale has been frequently used with rating questions(Saunders, Lewis and Thornhill, 2007). The instrument has been developed by referring the existing literature and reworded to make it appropriate to the study. Thus, 5 items for system quality(Mohammadi, 2015b;Cidral *et al.*, 2018), 6 items for information quality(Au, Ngai and Cheng, 2008;Ozkan and Koseler, 2009;Wang and Wang, 2009;Ho and Dzeng, 2010), 6 items for user satisfaction (DeLone and Mclean, 2003;Wu and Chen, 2005;Lee, Yoon and Lee, 2009), 3 items for behavioral intention(Cheng, Lam and Yeung, 2006) has been adapted from past literature.

3.3. Population and Sample of the study

The study aimed to the undergraduates enrolled in national universities in Sri Lanka. Amidst fifteen universities across nine provinces in Sri Lanka the study focused to take at least a university from each province. Sampling

refers to selecting an adequate population for the study to increase the generalizability to the whole population (Sekaran, 2003). This study followed convenience sampling has used to draw the adequate representation of the population. Four-hundred students were requested to participate in the study. Of that population, 382 were properly responded. The hypothesis was tested primarily using SmartPLS 3, and the demographic data were analyzed using IBM SPSS Statistics 25.

IV. Data Analysis And Results

4.1. Descriptive analysis

As per Table 1, 71.50 percent of the 382 study participants were female, and 28.50 percent were male. More than half of the participants fell in 22-25, which was 69.90 percent and 23.82 percent of the remaining participants were between 18-21, and 6.28 percent were between 26 and above.

Table 1. Demographic statistics

Variable		Frequency	Percentage
Gender	Male	109	28.5
	Female	272	71.5
Age	18-21	91	23.8
	22-25	267	69.9
	26 and above	24	6.3
Year of Study	1st Year	184	48.2
	2nd Year	24	6.3
	3rd Year	174	45.5

4.2. Assessment of the measurement model

To measure the internal consistency Cronbach's Alpha, Composite Reliability and Item loading has been used. According to Sekaran (2003), the Cronbach's Alpha value less than 0.60 is considered low, 0.70 is considered acceptable, and greater than 0.80 is considered excellent. The threshold value of composite reliability is 0.70 and above(Bagozzi and Yi, 1988;Dakduk, González and Portalanza, 2019). Item loading needs to be more than 0.70 (Chin, 1998;Henseler, Ringle and Sinkovics, 2009). As mentioned in the Table 2, values for Cronbach's Alpha, Composite Reliability and Item loading has been exceeded the threshold value of 0.70. Thus, the internal consistency has been confirmed.

The convergent validity criteria have been assessed using Average Variance Extracted (AVE). The AVE should be more than 0.50 (AVE >0.50) (Hair *et al.*, 2010). AVE values of all constructs have been exceeded 0.5. This forms the concrete evidence to confirm the convergent validity.

Discriminant validity has been assessed using Fornell and Larcker criterion and cross loadings.
AVE will be used to determine whether the variance of a construct's items is greater than the variance of the other constructs in the model. Typically, the squared root of a variable's AVE must be greater than the correlations between the variable and any other variable in the model, and it must be greater than 0.50(Fornell and Larcker, 1981). Also, cross-loadings indicate the in-depth analysis of the indicators with constructs and needs to be significantly loaded with the latent constructs than the other constructs of the model(Cheng and Chen, 2015). Discriminant validity of the items has been established and this has been portrayed in the Table 3 and Table 4.

Table2. Factor Loadings, Cronbach's Alpha, Composite Reliability and Average Variance Extracted

Construct	Items	FL (>0.7)	α (>0.7)	CR (>0.7)	AVE (>0.5)
IQ	IQ_01	0.904	0.95	0.96	0.8
	IQ_02	0.879			
	IQ_03	0.869			
	IQ_04	0.908			
	IQ_05	0.896			

	IQ_06	0.911			
	SQ_01	0.875			
	SQ_02	0.797			
SQ	SQ_03	0.837	0.91	0.933	0.736
	SQ_04	0.885			
	SQ_05	0.891			
	US_01	0.845			
	US_02	0.882			
US	US_03	0.838	0.945	0.956	0.785
	US_04	0.928			
	US_05	0.906			
	US_06	0.913			
	BITU_01	0.929			
BITU	BITU_02	0.911	0.916	0.947	0.855
	BITU_03	0.935			

Note - Factor Loadings – FL, Cronbach's Alpha – α, Composite Reliability- CR, Average Variance Extracted – AVE, Information Quality – IQ, System Quality- SQ, User Satisfaction-US, Behavioral Intention - BITU

Table3. Discriminant validity using Fornell and Larcker criterion

Construct	BITU	IQ	SQ	US
BITU	0.925			
IQ	0.679	0.895		
SQ	0.650	0.729	0.858	
US	0.659	0.716	0.620	0.886

Information Quality – IQ, System Quality- SQ, User Satisfaction-US, Behavioral Intention to Use - BITU

Table4. Discriminant validity using Cross loadings

Construct	BITU	IQ	SQ	US
IQ_01	0.615	**0.904**	0.676	0.649
IQ_02	0.603	**0.879**	0.632	0.665
IQ_03	0.578	**0.869**	0.662	0.589
IQ_04	0.624	**0.908**	0.647	0.651
IQ_05	0.606	**0.896**	0.63	0.624
IQ_06	0.616	**0.911**	0.668	0.663
BITU_01	**0.929**	0.653	0.634	0.657
BITU_02	**0.911**	0.574	0.562	0.56
BITU_03	**0.935**	0.652	0.604	0.605
SQ_01	0.528	0.581	**0.875**	0.565
SQ_02	0.531	0.631	**0.797**	0.425
SQ_03	0.597	0.68	**0.837**	0.544
SQ_04	0.565	0.631	**0.885**	0.549
SQ_05	0.565	0.607	**0.891**	0.565
US_01	0.56	0.612	0.505	**0.845**
US_02	0.594	0.637	0.565	**0.882**
US_03	0.538	0.584	0.506	**0.838**
US_04	0.64	0.665	0.575	**0.928**
US_05	0.586	0.648	0.556	**0.906**
US_06	0.579	0.657	0.584	**0.913**

Information Quality – IQ, System Quality- SQ, User Satisfaction-US, Behavioral Intention to Use - BITU

4.3. Assessment of structural model

If an exogenous variable is highly correlated with another exogenous variable, multicollinearity is assumed(Hair *et al.*, 2010). It has been assessed using VIF (Variation Inflation Factor). It is generally accepted that the VIF values below 5 indicate the absence of collinearity(Hair, Ringle and Sarstedt, 2011;Ringle, Wende and Becker, 2015). Table 5 confirmed the absence of the collinearity as the VIF values portrayed were below 5.

As per Dreheeb, Basir and Fabil (2016), most widely used mechanism to analysis structural model is coefficient determination. According toChin (1998), if the R^2 value is less than 0.19, it is considered very weak; between 0.19 and 0.33, it is considered weak; between 0.33 and 0.67, it is considered moderate; and greater than 0.67 is considered substantial. Both Behavioural Intention to Use and User Satisfaction have identified with the moderate R^2 values of 55.4 % and 53.3% respectively. This has been shown in Table 6.

According toHair *et al.*, (2014), the PLS-SEM algorithm must be run to obtain the coefficient for evaluating proposed relationships between constructs in the structural model. Thus, in the PLS-SEM, path-coefficient is used.If the path-coefficient is close to +1 or -1, it is assumed to denote the strong positive or negative relationship, respectively, and if the path-coefficient is closer to 0, it is assumed to denote the weaker relationship(Hair *et al.*, 2014). If the t-value is greater than the critical value of 1.96 indicates that the structural path is significant at the assumed probability of error or significance level of 5%(Hair *et al.*, 2014). The postulated relationships are needed to be statistically significant (p-value < 0.05) that indicating that the estimates are different from zero in the population (Hair *et al.*, 2014).

Table 7 and Figure 2 shows the result of hypothesis testing. All the independent variables have positively influenced the respective dependent variable. Thus, H1, H2, H3, H4, H5 has been accepted with (β= 0.267, t-value >1.96, p-value<0.05), (β=0.564, t-value >1.96, p-value<0.05), (β= 0.269, t-value >1.96, p-value<0.05), (β= 0.209, t-value >1.96, p-value<0.05), (β= 0.301, t-value >1.96, p-value<0.05).

Table 5.Multicollinearity using VIF values

Constructs	BITU	US
IQ	2.817	2.135
SQ	2.229	2.135
US	2.143	

Table 6.R^2 of the dependent variable

Constructs	R^2	Adjusted R^2	Result
BITU	0.554	0.551	Moderate
US	0.533	0.531	Moderate

Table 7.Table Structural path result

Relationship	Path	T Statistics	P Values	Result
IQ -> BITU	0.267	2.779	0.006	Supported
IQ -> US	0.564	8.537	0.000	Supported
SQ -> BITU	0.269	2.836	0.005	Supported
SQ -> US	0.209	2.888	0.004	Supported
US -> BITU	0.301	3.652	0.000	Supported

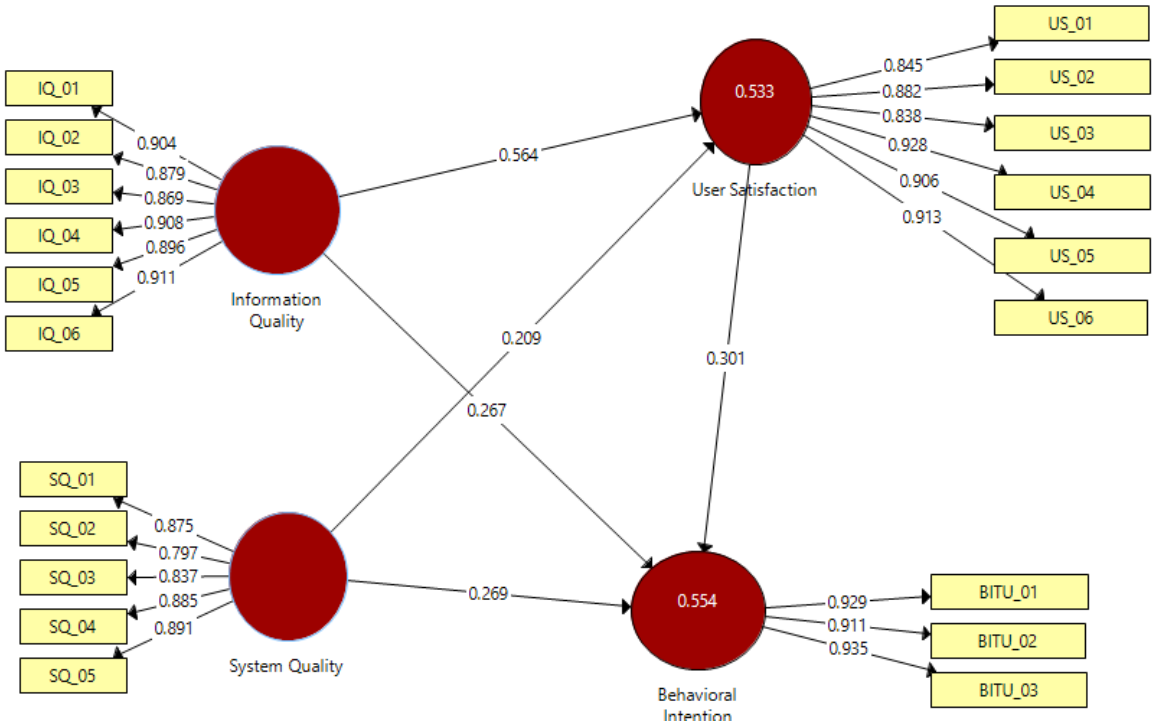

Figure 2. PLS-SEM path diagram

4.4. The effect size - f^2

Sarstedt, Ringle and Hair (2017) f^2 assesses the variation in R^2 values by excluding a variable from the model and measures the level of impact that the excluded construct has on the dependent variable. f^2 values represent 0.02, 0.15, and 0.35 indicate small, medium, and large effects (Cohen, 1988; Hair *et al.*, 2014). Table 8 shows the effect size of the associations identified in Figure 1.

Table8. Effect Size of the constructs

Relationship	R^2 Included	R^2 Excluded	Effect Size(f^2)	Result
SQ -> BITU	0.554	0.522	0.07	Small
SQ -> US	0.533	0.513	0.04	Small
IQ -> BITU	0.554	0.529	0.06	Small
IQ -> US	0.533	0.385	0.32	Medium
US -> BITU	0.554	0.512	0.09	Small

4.5. Predictive relevance – Q^2

Wong (2013) mentioned that predictive relevance of 0.02, 0.15, and 0.35 demonstrates that predictor has a small, medium, and large predictive relevance on the dependent variable, respectively. Table 9 portrays the predictive relevance of the associations demonstrated in Figure 1.

Table9.Predictive relevance of the constructs

Relationship	Q^2Included	Q^2 Excluded	Q^2	Result
SQ -> BITU	0.464	0.44	0.04	Small
SQ -> US	0.414	0.398	0.03	Small
IQ -> BITU	0.464	0.445	0.04	Small
IQ -> US	0.414	0.298	0.20	Small
US -> BITU	0.464	0.428	0.07	Small

V. Discussion and implications

5.1. What is the effect on Behavioral Intention to use among undergraduates in Sri Lanka?

Behavioral Intention to use is moderately predicted by Information Quality, System Quality and User Satisfaction with the R^2 value of 55.4% as portrayed in Table 5.

Information Quality has the positive influence on Behavioral Intention to use (β= 0.267, t-value (2.779)>1.96, p-value (0.006) <0.05), supporting the H1. This finding is in-line with the previous studies too(Lin, 2007;Freeze, Alshare, Lane and Wen, 2010; Mohammadi, 2015b;Cidral, Aparicio and Oliveira, 2020; Aparicio, Bacao and Oliveira, 2017;Seta et al., 2018; Cidral et al., 2018).Thus, Content and information available through such real-time online learning platforms need to be understandable, timely, accurate, and structured to enhance the behavioral intention to engage in online learning.

System Quality has the positive impact on Behavioral Intention to use (β= 0.269, t-value (2.836)>1.96, p-value (0.005) <0.05). Thus, it supports H3. Also, the finding of the study matches previous studies too(Lin, 2007; Freeze, Alshare, Lane and Wen, 2010; Mohammadi, 2015b; Sandjojo and Wahyuningrum, 2016;Kurt, 2019). Therefore, the Real-time online learning platforms must allow students to communicate and collaborate like the traditional classroom environment with instructors and friends. Then, the intention to engage the online learning will be improved.

User Satisfaction positively influences Behavioral Intention to use (β= 0.301, t-value (3.652)>1.96, p-value (0.000) <0.05), leads to support H5. Also, the finding of the study has confirmed in previous studies too (Lin, 2007; Chen, 2010; Seta et al., 2018; Cidral et al., 2018; Cidral, Aparicio and Oliveira, 2020). It indicates that students must be satisfied to shape the intention to use. More precisely, studies published during COVID-19 revealed that students' preference for blended learning indicates high dissatisfaction with online education (Pirapuraj, Rishan and Ali, 2019;Rameez, Fowsar and Lumna, 2020;Selvaras, 2020;Besser, Flett and Zeigler-Hill, 2020). It may be due to attentional difficulties(Besser, Flett and Zeigler-Hill, 2020), lack of motivation (Adnan and Anwar, 2020), and technological difficulties (Pal and Vanijja, 2020). Student satisfaction must be ensured by addressing the shortcomings, as it positively affects intention.

5.2. What is the effect on User Satisfaction among undergraduates in Sri Lanka?

As indicated in Table 5, user satisfaction is predicted as 53.3% by Information Quality and System Quality.

Also, Information Quality had the positive impact on the User Satisfaction β= 0.564, t-value (8.537)>1.96, p-value (0.000) <0.05) and therefore supports H2. The result of the study is consistent with the previous studies(Lin, 2007;Freeze, Alshare, Lane and Wen, 2010; Mohammadi, 2015b; Sandjojo and Wahyuningrum, 2016; Aparicio, Bacao and Oliveira, 2017; Cidral *et al.*, 2018; Uddin, Ghosh and Isaac, 2019; Kurt, 2019;Cidral, Aparicio and Oliveira, 2020). Thus, the extent to which students can get comprehensive, organized, and up-to-date content via real-time online learning will impact satisfaction. Thus, it must be ensured by the academicians and relevant administrators of the university system that required content and information are available on time to students though they are distanced from the university.

System Quality positively influences User Satisfaction (β= 0.209, t-value (2.888)>1.96, p-value (0.004) <0.05) and supports H4. Similar results reported in previously published articles(Lin, 2007;Freeze, Alshare, Lane and Wen, 2010;Chen, 2010;Mohammadi, 2015b;Sandjojo and Wahyuningrum, 2016;Aparicio, Bacao and Oliveira, 2017;Cidral *et al.*, 2018;Seta *et al.*, 2018;Kurt, 2019;Uddin, Ghosh and Isaac, 2019;Cidral, Aparicio and Oliveira, 2020).The outcome indicates that the real-time online learning platforms with the qualities to enhance communication and the collaborative learning environment will increase student satisfaction. If such platforms enable options for interaction and socialization like in classroom-based teaching, students will be more satisfied with their learning during COVID-19, resolving the issue raised by Adnan and Anwar (2020). They assert that online learning does not produce satisfactory results, particularly in underdeveloped countries, due to persistent problems with a lack of interaction and socialization.

5.3. Theoretical Implication

Sri Lankan researches have rarely focused on the application of IS Success model to measure the success and quality of the e-learning model. COVID-19 has risen the focus towards the quality of the new learning model with the prime support of the real-time online platforms. But, studies focusing the Sri Lankan context are void and only few studies identified in international context. Thus, this study has been conducted by integrating IS Success Model to measure the success of the real-time e-learning in Sri Lankan context. The researcher has also experienced some difficulties in adapting items directly from previously published studies due to the inadequacies in the measures available. As per the researcher's knowledge, the study has first attempted to investigate adoption to real-time online learning with IS success model, the researcher has been required to adapt items from several studies in different contexts and make them suitable for real-time e-learning context. Thus, the study has contributed to the existing knowledge by identifying and modifying items for the

factors recognized and validating the measures using various statistical tests. Also, the validated questionnaire can be adopted in future online learning-related research.

Furthermore, it has been noted that the studies available in the local context lack the application of PLS-SEM approaches, although it is being extensively applied to study online learning adoption. Thus, this research has applied PLS-SEM using SmartPLS as the primary tool for rigorous statistical analysis and provides a ground for future researchers to practice PLS-SEM. Additionally, the study attempted to understand the adoption of real-time online learning by employing more diagnostics such as effect size and predictive relevance, which were not mostly used in international studies.

There have been no comprehensive studies on the adoption of online learning in the local context using the appropriate theoretical framework. Most available studies were descriptive, lacking a sound theoretical foundation and focusing exclusively on a single context. Thus, the scarcity of empirical studies has resulted in a limited understanding of success of the e-learning in the local context. This study therefore employed sound theoretical frame and performed descriptive and statistical tests.

5.4. Practical Implication

The study found that there is a significant impact of System Quality on User Satisfaction. Thus, application developers can incorporate new features to increase system quality, especially enhancing the communicative and collaborative nature of real-time online learning. When the system allows more opportunities for the collaboration, communication, and sharing of information among students, that will result in enhancing user satisfaction towards real-time online learning. Additionally, academicians are responsible for ensuring sufficient space in lectures for communication and collaborative learning for students, just as there is in traditional learning. It can be accomplished through two-way communication, group discussions using break-out rooms, and permitting communication via private chat. As a result, active learning will occur in real-time online learning with ample opportunities for interaction and socialization. It will contribute to increased user satisfaction with real-time online learning and increase adoption.

Further, Information Quality significantly impacts User Satisfaction as per the result of the study. Thus, universities, specifically academicians and instructors, must ensure that the content and information available through real-time online learning platforms are usable, comprehensive, timely, accurate, and structured in such a way that it increases User Satisfaction in online learning. Also, the quality assurance body of the universities can further ensure the quality of the information in real-time online learning by establishing periodic feedback systems. Thus, the availability of high-quality information and content can be statistically assessed, and recommendations for further improvement can be made. If the quality of information is ensured, the adoption of real-time online learning will increase.

It is also noteworthy that the study found a positive impact of System Quality on Behavioural Intention to Use. Thus, universities need to educate academicians on ensuring active learning by allowing communication and collaboration among students in real-time online learning. It can be facilitated further by convening regular discussion forums with other faculty members to brainstorm new methods and strategies for improving communication and collaboration in real-time online learning. As real-time online learning becomes more collaborative and communicative, students will automatically be tempted to adopt real-time online learning.

Followingly, the study found a significant effect of Information Quality on Behavioural Intention to Use. Thus, the university must ensure information quality by assuring usability, timeliness, accuracy, and structured content delivery by implementing a periodic feedback system. The information quality of real-time online learning must be adjusted in response to the feedback analysis's statistical findings. As the information and content available through real-time online learning become more quality, Behavioural intention to use real-time online learning will improve.

The study also found a significant effect of User Satisfaction on Behavioural Intention to Use. Thus, universities, particularly the Career Guidance Unit, may wish to improve the quality of learning by conducting knowledge-sharing sessions and workshops with students to help them understand how real-time online learning can be more enjoyable. As they enjoy real-time online learning, their behavioral intention to adopt it will also increase.

VI. Limitation and Future Research

This study intended to provide the comprehensive view of the students' perspective of the real-time e-learning. But, it has few limitations to be addressed by future researches. Though this study focused towards the student's instructors' perception on the e-learning must be incorporated built an effective e-learning system. D&M IS success model need to be extended with the new variables such as transformational leadership and organizational and industry related factors to incorporate new knowledge to the existing body of knowledge. other theoretical models may be incorporated with the D&M IS success model to enhance the understanding of

the e-learning.Also, future studies can include graduate students to deepen the understanding and can be cross referenced in different time interval to investigate whether there are any changes in the adoption level.

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