Impact of the extended version of Technology Acceptance Model on predicting learners' adoption to synchronous online learning in Sri Lanka

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Abstract

Synchronous online learning has played the prime role in controlling the spread of the COVID-19 throughout the world. Despite the technological advancement, the immediate shift towards the synchronous online learning has challenged availability and accessibility to the quality learning due to the over-reliance on the class-room based teaching and learning. Thus, this study focuses on investigating the impact of factors affecting adoption to synchronous online learning amidst the COVID-19 in Sri Lanka. As the consequence, institutions can pay attention on the essential factors to enhance the adoption to synchronous online learning. In this study, Technology Acceptance Model (TAM) has extended with the external variable of perceived self-efficacy and tested its impact on all other core constructs of TAM. This study used online questionnaire to collect the data from undergraduates of Sri Lankan state universities. Consequently, the study received 382 valid responses. For the data analysis, IBM SPSS statistics 25 and SmartPLS 4 were used and hypotheses were tested using PLS-SEM. The study has identified five variables namely perceived usefulness, perceived ease of use, attitude, perceived self-efficacy and behavioral intention to use. Based on the statistical evidence, all the proposed relationships were supported except attitude and perceived usefulness towards behavioral intention to use. Notably, this study has both theoretical and practical implications. To the best of author's knowledge, this study firstly attempted to investigate the adoption synchronous online learning with the extended version of TAM using PLS-SEM.

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Most of the previous studies explored the online learning in general. Furthermore, the findings can be used to establish policies to make synchronous online learning more effective, specifically if the any pandemic occurs in future.

Keywords: *Synchronous online learning; TAM; Sri Lanka; Adoption to synchronous online learning; Intention to use*

Introduction

Online learning is not a newly emerged paradigm in the education sector. It has emerged since 1990 in order of restructuring the traditional class-room based learning (Kanwal et al., 2020). As a result of that, the learning and teaching is enriched with the smart features of online learning such as online quizzes and assignment submission, student forums, instant chat boxes, video conferencing and virtual class rooms (Chinyamurindi & Shava, 2008). Thus, the learning is not now restricted within the class-room setting like in the early times whereas students can experience unique features which will make the learning experience more interesting (McNeil et al., 2000). The rapid progress of Information and Communication Technology (ICT) has simplified the accessibility and availability of the learning irrespective of the time and locational barriers (Raab et al., 2001; Tarhini et al., 2013).

Moreover, the online learning provides many advantages to the global education system. It eliminates time and location related barriers thus; the learning is available to everyone at their convenient zone (Cross, 2004; Sun & Zhang, 2006). Comparatively, online learning is affordable, interactive and easier for the observation of the learners (Al-Azawei et al., 2016). Furthermore, the technological advancements like video demonstration and collaborative features in online learning has made it even more attractive and interesting (McNeil et al., 2000). Especially in the Sri Lankan context, Synchronous online learning has been tremendously facilitated by the Sri Lankan government through Lanka Education and Research Network (LEARN) and Internet Service Providers to cover the network charges and network traffic in order to ensure the smooth functioning of the online teaching and learning during the COVID-19. Moreover, at each university level free wireless hotspot access and technological equipment support such as laptops, tablets Pcs and headphones with webcam has been provided with the immediate effect to ensure that the routine teaching and learning activities have not been collapsed due to adverse effect of the COVID-19.

Online learning has been defined in several ways by many research scholars. Ngai et al. (2007) stated that learning happens through online with the support of networking capabilities by eliminating time and place related barriers. E-learning is also referred to as online and web-based learning, is defined as the learning that is bridged by internet based platforms (Ramayah et al., 2010; Trombley & Lee, 2002). Based on the time involved, online learning can be broadly divided into two categories namely asynchronous and synchronous learning (Huang et al., 2008). Asynchronous learning provides the accessibility of learning material through the uniformed access medium. Thus, the materials will be available at anytime and anywhere. Even though the learning through the asynchronous learning platforms is convenient and flexible, it does not provide a space for the teacher-student interaction. In contrast, synchronous learning provides rich experience in learning since it allows real-time online communication and interaction between teacher and students. This furthermore permits students to clarify doubtful concepts real-time and teacher can monitor student's progression in learning too (Contreras-Castillo et al., 2006; Hrastinski, 2006). Also, synchronous learning allows the group discussion, mentoring and brainstorming like in the traditional learning (Deshpande & Hwang 2001; Huang et al. 2008).

Traditionally, web-based communication depended on asynchronous platforms. Thus, students can access the learning materials irrespective of the time whereas synchronous systems has been accommodated as the secondary tool for teaching and learning due to the high cost and internet bandwidth involved and unavailability of adequate tools with the students (Duemer et al., 2002). Contrastingly, students also reported that the learning through video conferencing is useful and interesting as it facilitates the communication even with the partial video. As stated by Wang (2004) learning through video conferencing allows to notice the body languages of students and create own learning environment to students. Even though students perceive learning via video conferencing tool is useful, institutional support is essential to reap maximum benefits. But, most of the institutions ignore the importance of providing adequate facilities (Wolf, 2006).

Moreover, Covid-19 in 2019 December in Wuhan, China, has created many challenges to the educational institutions due to the fact that, it requires physical distancing to minimize the societal spread of the virus. As a result of that, education institutes have been forced to utilize the synchronous learning in

order to engage in routine teaching and learning activities during the pandemic. Notably, Sri Lanka was not exempted from the pandemic. The novel Corona virus has been identified in Sri Lanka 27th January 2020 from a Chinese tourist and a local person with COVID-19 infection identified on 11th March 2020 (Erandi et al., 2020). With the focus to control the virus spread Sri Lankan government announced the immediate closure of the universities on 20th March 2020 (Erandi et al., 2020). Thereafter, state universities in Sri Lanka has switched to the online learning with the prime support of Zoom video conferencing tool. To a developing country like Sri Lanka, the adoption of the learning model which is fully supported by the computer-aided platforms is very novel (Kanwal et al., 2020) due to the digital disparity exists in developing countries in terms of the ownership of the devices (Guitton, 2020; Kapasia et al., 2020; Pal & Vanijja, 2020) and familiarity to the classroom- based learning (Adnan & Anwar, 2020).

In addition, recently conducted studies in the international context have established that there are numerous challenges that a student needs to encounter in synchronous online learning adoption despite the technological advancement and higher literacy in information technology. Students perceive that handling hard materials is more convenient than uploading and downloading the documents via the Chat feature in synchronous online learning platforms like Zoom (Rahayu, 2020a). Lowenthal et al. (2020) further mentioned that in synchronous online learning students will be distracted by many works at a time and also lack of the Internet connection has questioned the accessibility of the quality learning. In addition, many elderly internet users will loose their confidence in using technology due to the significant reliance on them, is referred to as technophobia which creates a kind of fear in mind when dealing with software and hardware (Galit, 2018). Faculty teachers sometimes become technophobic which disturbs the interactive teaching and learning process. Consequently, this immediate adoption of synchronous online learning will therefore be achieved at the cost of quality education to learners. Thus, student's adoption to synchronous online learning must be investigated with the appropriate theoretical model to effectively regulate the future of Sri Lankan.

TAM is a widely used framework to investigate the adoption to online learning, subjected to many empirical validations mainly in developed countries (Teo et al., 2008). But, TAM has not extensively used in the studies related to Asian countries specifically, very little studies can be seen in the Sri Lankan context (Samsudeen et al., 2015). Importantly, available studies specifically focused on

the acceptance to the asynchronous online learning platforms (Al-Azawei, 2019; Al-Adwan et al., 2013; Chinyamurindi & Shava, 2008; Ibrahim et al., 2017; Jamalova & Bálint, 2022; Kanwal et al., 2020; Khan et al., 2020; Mashroofa et al., 2019; Masrom, 2007; Liu, 2020 Shao, 2020; Samsudeen et al., 2015; Smeda et al., 2017; Tan, 2019; Tarhini et al., 2014; Pal & Patra, 2021). Even though there is an urgent need for studies dealing with the synchronous online learning adoption, the literature has not yet sufficiently supported this scarce. Especially, the adoption to synchronous online learning has been rarely studied with TAM. Only very few studies have been conducted in the international context (Alfadda & Mahdi, 2021; Bhatt & Shiva, 2020; Faisal et al., 2021; Kim, 2021; Purwanto & Tannady, 2020). Due to this dearth, the available measurement cannot be directly applied to the synchronous online learning context. Thus, there is indeed a need for the reliable and valid measurement for the investigation of the effective adoption behaviour (Faisal et al., 2021).

It is also noteworthy that the TAM has been accounted for many controversial findings related to its core factors. For instance, attitude had the positive impact on intention in some studies (Mashroofa et al., 2019; Samsudeen et al., 2015; Shao, 2020; Smeda et al., 2017) whereas previous studies also demonstrated there is no significant impact on intention (Al-Adwan et al., 2013; Al-Azawei, 2019; Masrom, 2007). Also, perceived ease of use reported contradictory findings with intention to use whereas positive association (Al-Azawei, 2019; Ibrahim et al., 2017; Khan et al., 2020; Shao, 2020; Tan, 2019; Tarhini et al., 2014) and not significant association reported in prior studies (Jamalova & Bálint, 2022). Perceived usefulness had the positive (Al-Adwan et al., 2013; Al-Azawei, 2019; Jamalova & Bálint, 2022; Khan et al., 2020; Liu, 2020; Masrom, 2007; Shao, 2020; Tarhini et al., 2014; Tan, 2019) and non-significant relationship in some studies (Kang and Shin, 2015; Sinaga *et al.*, 2021) with the behavioural intention. Likewise, perceived ease of use associated positively (Al-Azawei, 2019; Al-Adwan et al., 2013; Masrom, 2007; Mashroofa et al., 2019; Pal & Patra, 2021; Samsudeen et al., 2015; Smeda et al., 2017) and not significantly (Nadlifatin et al., 2020; Gao, 2020; He *et al.*, 2020; Kim et al., 2021; Wang et al., 2020) with attitude in previous studies. In the Sri Lankan context, very few studies deal with the online learning (Samsudeen et al., 2015; Pirapuraj et al., 2019). Notably, most of them are not identified with the solid theoretical framework. Thus, predicting Sri Lankan student's adoption behavior towards synchronous online learning using existing knowledge is no longer appropriate. Indeed, specific studies are required to broaden the understanding of the Sri Lankan student's adoption behavior. The deficiency of the exploration

in the above-specified issues inspires the researcher to fulfill the gap with the extended version of TAM to assess factors influencing the adoption to the synchronous online learning in the Sri Lankan context.

- Thus, this study focuses on the research question; what is the impact of extended version of TAM on predicting learners' adoption to synchronous online learning?

Literature Review

Technology Acceptance Model (TAM)
There are many theoretical frameworks deal with the technology adoption namely Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Information System Success Model (IS Success Model), Unified Theory of Acceptance and Use of Technology (UTAUT). TAM is an extended version of TRA, proposed by Davis (1989) for the prediction of the adoption intention and use of technology. As per this model, attitude is being influenced by two personal beliefs namely perceived usefulness and perceived ease of use which are then affected by external factors. Attitude towards the use thereafter influences behavioral intention, which then predicts actual usage. TAM is the widely used model to investigate the adoption of the online technologies. It has the wider range of application on online shopping, online learning, e-government and big data analytics and mobile learning. Also, studies applied TAM for the online learning context concluded that perceived usefulness and perceived ease of use plays a vital role in adoption decision. Most importantly, the literature suggests that TAM is rarely extended with external variable to increase the predictive power.

However, TAM has been a widely used theoretical framework in various researches dealing with the acceptance of information communication technologies (Lee et al., 2003; Rissa, 2014; Shao, 2020). Also, according to Lee et al. (2003), the interviews conducted with experts in the IT field revealed that TAM had been criticized for its extensive use ("Over-use"). Furthermore, it explains only 40% of the behavioral intention variance (Sun & Zhang, 2005; Venkatesh & Davis, 2000). It is mainly due to the differences in the type of sample and the learner's surroundings (Sun & Zhang, 2005). Thus, the explanatory power can be improved using external variables. However, TAM has been used since earlier days; still, contradictory findings are being reported in terms of perceived ease of use and behavioral intention. Some studies reported perceived ease of use as statistically significant (Gefen et al., 2003;

Heijden, 2004; Venkatesh & Davis, 2000) and some are not (Chau & Hu, 2001; Park, 2009). The core relationships of the TAM have been emphasized in Figure 1.
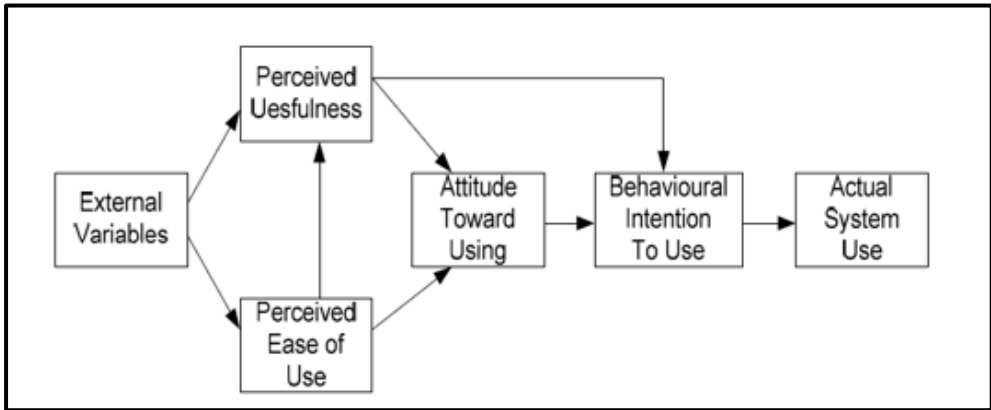

Figure 1: Technology Acceptance Model (Davis, 1989)

Synchronous learning

Worldwide higher education system has primarily been supported by the synchronous online learning platforms in the period of COVID-19 (Ajmal et al., 2020). There are many synchronous online learning platforms available namely Zoom, Skype, Google Meet, Microsoft Teams and so on (Al Faruq et al., 2022). Zoom conference system is a well-known application for synchronous interaction between teacher and learners (Alfadda & Mahdi, 2021) with facilitation of communication enabled lectures, group discussion with breakout rooms, screen sharing option with learners and academicians, whiteboard, polling question and recording facilities (Rahayu, 2020b) annotation tools to draw lines and diagrams (Dharma et al., 2017; Ferns *et al.*, 2020). It is also evidenced that Zoom eliminates the feel of societal isolation (Lowenthal et al., 2020). In spite of the aforementioned advantages, challenges pertaining with the Zoom based learning are also needed to be noted. For instance, it causes accessibility difficulties, lesser instinctual (Dharma et al., 2017) distraction due to the multitasking and prolonged lecture hours than usual (Ferns *et al.*, 2020; Lowenthal *et al.*, 2020), unstable internet and noisy environment and unavailability of the speakers or microphones (Ferns *et al.*, 2020; Lowenthal *et al.*, 2020).

Google Meet which was previously known as Google Hangouts, is also a well-famous synchronous online learning platform (Al Faruq et al., 2022). It allows

to make face-to-face video conference with the limitation of 300 hours (Al Faruq et al., 2022). It is very user friendly and charges low price for the consumption (Ironsi, 2021). Besides, it is an integrated platform with Gmail, allows to view all meeting scheduled, share screen with participants, permits the host to control the user entry, allows 250 people for a meeting (Al Faruq et al., 2022).

Microsoft Teams is an interactive platform with the features of video conference enabled with chat box and content sharing, permits student-teacher collaboration to do quizzes, assignments, group work (McVey et al., 2019; Nemec et al., 2020). Furthermore, Alfadda & Mahdi (2021) studied the acceptance of Zoom using TAM with 75 students in Saudi. Findings indicated that usefulness and ease of use has positively influenced attitude. Further, attitude predicted intention positively. Purwanto & Tannady (2020) used the TAM to evaluate intention to use Google Meet with 145 Indonesian students. Similarly, usefulness and ease of use has the positive effect on attitude. TAM has been used by Bhatt & Shiva (2020) to investigate 125 Indian student's adoption to Zoom. Moreover, use of TRA in Vietnam has shown that attitude and subjective norm has been identified as the main influencer of behavioural intention (Long & Khoi, 2020). Study of acceptance of Zoom using TAM by (Faisal et al., 2021) in Margonda revealed that usefulness, ease of use, intention to use impacts the actual usage.

Factors affecting the intention to adopt online learning

Masrom (2007) conducted the study with 198 students from University Technology of Malaysia by employing TAM to assess the acceptance of e-learning system. Statistical Analysis System (SAS) was used to analyze the data. Except the relationship of attitude with intention to use, all the other core relationships of TAM were supported with sufficient statistical evidences. Al-Adwan et al. (2013) explored the acceptance to e-learning system using TAM. The study gathered the data from 107 students in Foreign Languages Department at the Applied Science University in Jordan. The results revealed that there is a positive impact of perceived usefulness on intention to use, perceived ease of use had the positive impact on usefulness and attitude. Most importantly, hypothesis proposed between usefulness with attitude and attitude with intention to use were not supported. Tarhini et al. (2014) assessed the moderating effect of gender and age in e-learning acceptance in England. The model used the extended version of TAM with social norm and self-efficacy in

addition to perceived usefulness and ease of use. The results revealed that ease of use, usefulness, social norms and self-efficacy were the essential factors in determining intention to use e-learning. Further, age identified as the significant moderator between the ease of use, usefulness, self-efficacy on intention. Gender moderated the relationship between ease of use and subjective norm on intention. Samsudeen et al. (2015) analyzed the acceptance of e-learning systems among Sri Lankan teachers using modified TAM. The research model identified attitude as the directly linked variable with intention to use of which, external variables are usefulness, ease of use, social influence and facilitating condition. All the association identified has been accepted with the sufficient evidences excepting social influence and attitude.

Smeda et al. (2017) measured the moderating effect of gender with the e-book acceptance in Libya. The conceptual model has extended TAM with the external variables such as self-efficacy and social influence. The analysis revealed the significant positive impact of all the relationships. Additionally, only ease of use had the gender-based moderation. Ibrahim et al. (2017) conducted the study in Johor by drawing 95 undergraduates as the sample of the study. The model employed instructor characteristics, self-efficacy and course design with the core variables of TAM. All proposed relationships found to be significant. Al-Azawei (2019) has extended TAM using perceived satisfaction and self-efficacy to investigate acceptance to LMS. The study analyzed 302 questionnaires from undergraduate from Iraq. All the relationships have accepted except self-efficacy and attitude with intention. Mashroofa et al. (2019) investigated the Sri Lankan academics' attitudinal belief in the acceptance to e-learning. Sample size of the study was 357 academics from state universities in Sri Lanka. The conceptual model identified three external variables of attitude namely compatibility, ease of use and usefulness and attitude has the direct relationship with intention to use. Based on the data analysis using SEM all the proposed relationships were supported except the association of compatibility with attitude. Tan (2019) investigated college student's attitude of using e-tutoring websites for English language by employing TAM3 with the new variable of Virtual Learning Community (VLC). In addition to the relationship of TAM3, the relationship of VLC with attitude and intention to use were supported.

Liu (2020) conducted a research with 98 Chinese students to investigate adoption e-learning with cloud meetings and Massive Open Online Courses (MOOC). The study proposed two connection namely connection between ease of use and usefulness and usefulness and intention. Shao (2020) conducted a study in China with 340 valid questionnaires. The results revealed that there is a

significant positive effect of perceived usefulness, perceived ease of use, attitude and behavioral intention on satisfaction. Also, intention has the partial mediation between attitude, Usefulness, ease of use attitude and satisfaction. Khan et al. (2020) assessed the impact of intention to use the online learning during COVID-19 using TAM. The model employed subjective norm and technological competency as the external variables of ease of use and subjective norm has considered as the external variable of usefulness in addition to the core variables of the TAM. The results has shown that all the proposed hypotheses were supported. Pal and Patra (2021) analyzed students' perception in video-based learning in during the COVID-19 with the sample of 232 students from Indian universities. The model integrated TAM and Task Technology Fit model. Most notably, all the core relationships of TAM have accepted. Jamalova & Bálint (2022) modelled e-learning adoption behavior in Hungary using the extended TAM. In addition to the core variables of the TAM, the model added good teaching scale as the new variable. For the data collection, the study used questionnaire from 451 students. Apart from the ease of use and intention, other relationships have supported.

The aforementioned literature analysis suggested that TAM has been chosen to be used in this study due to the wider applicability in several contexts (Lee et al., 2003). Also, the contradictory findings reported in previous studies has emphasized the need for the future empirical validation. The extensive review of the previous studies revealed that only few studies have dealt with the synchronous online learning with TAM in several countries. Notably, as per the researcher's knowledge, studies concerning the Sri Lankan context are void. Thus, to overcome this gap, this study specifically focuses on the synchronous online learning rather considering online learning in general.

Furthermore, The student with the self-confidence and lacking previous experience in online learning will persistently adopt the online learning in a positive manner (Taipjutorus et al., 2012). Conversely, as they mentioned the learner with less self-efficacy will definitely has frustration and demotivation in accepting online learning. This will lead to a low-grade point average and in the extreme case, the student will drop the university (Taipjutorus et al., 2012). Taipjutorus et al. (2012) further emphasized that if the learner is very new to online learning he/she will feel less confident even though the learner is more literate in using technology. It is also important to be noted that only very little studies incorporated perceived self-efficacy as the external variable of the TAM (Tarhini et al., 2014; Smeda et al., 2017; Ibrahim et al.,2017; Al-Azawei, 2019).

Among them, none of them have focused the adoption of the synchronous online learning. Still, the vital role of the perceived self-efficacy in the online learning context has not yet been explored thoroughly using TAM even the COVID-19 has entirely transformed the traditional class-room based learning with the sole support of synchronous online learning platforms. Thus, the role of self-efficacy in fostering adoption of the synchronous online learning is needed to be explored.

Particularly, the study has selected the core variables of TAM namely Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude (ATT), Behavioral Intention to Use (BITU). Additionally, TAM has been extended with Perceived Self-Efficacy (PSE). Because, the role of the self-efficacy has not been captured comprehensively in the synchronous online learning context even though self-efficacy is regarded as the important factor in increasing the adoption of the online learning (Taipjutorus et al., 2012).

Methodology

Theoretical Framework and Hypotheses
The theoretical framework focuses to extend the TAM using perceived self-efficacy in order to explore its vital role in the synchronous online learning context thereby, attempt to fulfill the gap of scarcity of studies in this context. Primarily, the study aims to consider perceived self-efficacy as an external variable and attempt to establish relationships with perceived usefulness, perceived ease of use, attitude and behavioral intention to use.

Perceived Usefulness (PU):
According to Davis (1989), PU means peoples' perception about the extent to which the particular technology will enhance job performance. PU has positively influenced the Attitude in many studies. (Al-Azawei, 2019; Al-Adwan et al., 2013; Pal & Patra, 2021; Masrom, 2007; Mashroofa et al., 2019; Samsudeen et al., 2015; Smeda et al., 2017). As well as, PU has positively influenced the BITU (Al-Adwan et al., 2013; Al-Azawei, 2019; Jamalova & Bálint, 2022; Khan et al., 2020; Liu, 2020; Masrom, 2007; Shao, 2020;Tarhini et al., 2014; Tan, 2019).

Hence, based on the above premise, the following hypotheses are proposed;
H1a: PU will positively influence the ATT of synchronous online learning.
H1b: PU will positively influence the BITU of synchronous online learning.

Perceived Ease of Use (PEOU):
According to Davis (1989), PEOU means the peoples' belief about the degree to which they require to exert additional effort to use the system. PEOU has the significant positive impact on PU in previously published articles (Al-Adwan et al., 2013; Al-Azawei, 2019; Jamalova & Bálint, 2022; Liu, 2020; Masrom, 2007; Pal & Patra, 2021; Shao, 2020; Smeda et al., 2017; Tan, 2019). Also, ATT has been positively influenced by PEOU (Al-Azawei, 2019; Al-Adwan et al., 2013; Masrom, 2007; Mashroofa et al., 2019; Pal & Patra, 2021; Samsudeen et al., 2015; Smeda et al., 2017).

According to the previous studies, PEOU has the positive influence on BITU (Al-Azawei, 2019; Ibrahim et al., 2017; Khan et al., 2020; Shao, 2020; Tan, 2019; Tarhini et al., 2014). Hence, based on the above premise, the following hypotheses are proposed;
H2a: PEOU will positively influence the PU of synchronous online learning.
H2b: PEOU will positively influence the ATT of synchronous online learning.
H2c: PEOU will positively influence the BITU of synchronous online learning.

Attitude (ATT):
ATT means individual evaluation of the consequences of performing particular behavior (Ajzen, 1991; Athiyaman, 2002). Attitude can be demonstrated as a behavioral belief. If the outcome of the behavior is favorable, then the attitude tends to be more positive (Ajzen, 1991). Thus, the attitude can either be positive or negative feelings about a particular behavior. The positive influence between attitude and BITU has proven in many previous studies (Ibrahim et al., 2017; Mashroofa et al., 2019; Samsudeen et al., 2015; Smeda et al., 2017)

Hence, based on the above premise, the following hypothesis is proposed;
H3a: ATT will positively influence the BITU of synchronous online learning.

Perceived Self-Efficacy (PSE):
PSE is the learners' evaluation about the extent to which they can perform computer-related tasks. Thus, PSE refers to the extent to which the learners have confident about his/her capability to use real-time online learning (Bandura,2005). Many experimental researches conducted suggested the significant positive association between PSE and PU (Shao, 2020), PEOU (Smeda et al., 2017; Shao, 2020), ATT (Smeda et al., 2017) and BITU (Shao, 2020). Hence, based on the above premise, the following hypotheses are proposed;

H4a: PSE will positively influence the PU of synchronous online learning.
H4b: PSE will positively influence the PEOU of synchronous online learning.
H4c: PSE will positively influence the ATT of synchronous online learning.
H4d: PSE will positively influence the BITU of synchronous online learning.

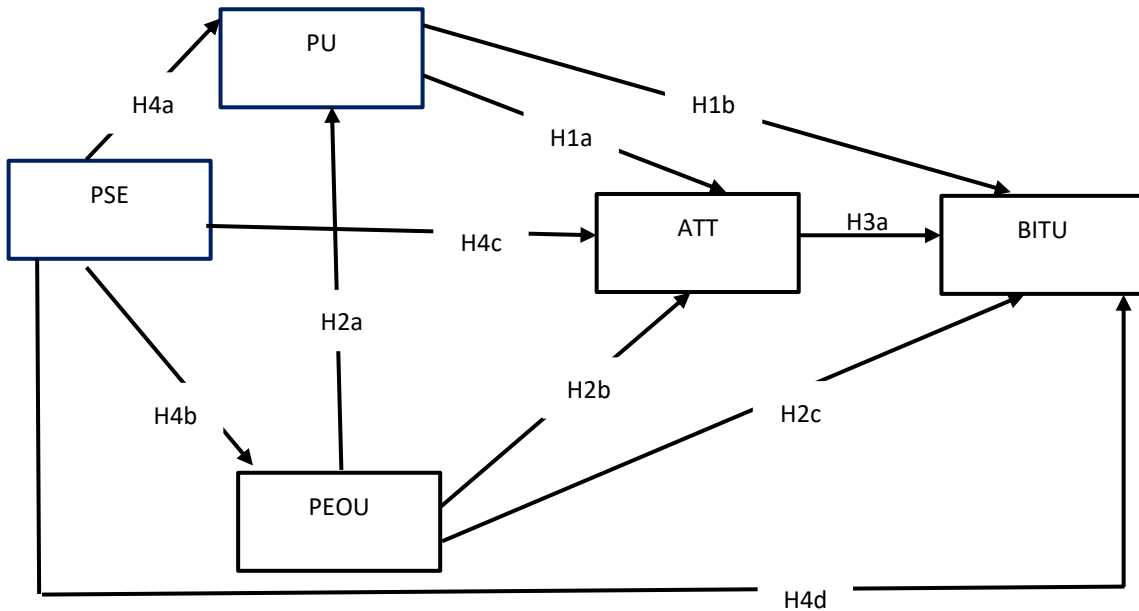Proposed constructs with the relationships have depicted in the Figure 2.

Figure 2: Conceptual diagram with hypothetical constructs and relationships

Participants and procedure

The study data were gathered using online questionnaire shared among the undergraduates enrolled in business management faculties of state universities Sri Lanka. Due to the difficulty in collecting data from all the academic institutions in Sri Lanka, the researcher has limited the scope of the study by focusing only on undergraduates enrolled in business management faculties of state universities. Further, the students' perception of the synchronous online learning will differ based on the nature of the course/degree students enrolled in. Focusing on students enrolled in different Degree programme will not obviously ensure the consistent findings which will then reduce the practical applicability of them. Thus, the selection of the participants approximately from the similar courses will enhance the usability of the research findings. Also, the

accessibility of the undergraduates of business management faculties of state universities was relatively high to the researcher during COVID-19. By considering aforementioned rationale, researcher has chosen only undergraduates from business management faculties of state universities in Sri Lanka as the participants of the study. Therefore, the study used convenience sampling as the data collection has done from the easily accessible sample unit (Sekaran, 2003).

The data was collected from December 2021 to March 2022. During this period of time, most of the university studies were conducted through synchronous online learning platforms such as Zoom. Thus, students participated in this survey had the sufficient experience in the synchronous online learning. A-priori sample size calculator was used to determine the minimal sample size (Soper, 2022). The minimum sample size was calculated as 127. Totally, 400 students responded to the questionnaire. During the data cleaning, 18 responses were removed due to the incompleteness. Among the 382 valid responses, 109 (28.5 percent) were male and 273 (71.5 percent) were female as portrayed in the Table 1. Also, more than half of the participants fell in the age group of 22-25, which was 69.90 percent, 23.8 percent of the remaining participants were between the age of 18-21, and 6.2 percent were between 26 and above.

Table 1: Descriptive statistics of the sample

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

Measures
The Five-point Likert scale were used 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 & Seaman, 2007). Because, Likert scale has been frequently used with rating questions (Saunders et al., 2007). The study used 22 items in the questionnaire to test the proposed hypotheses shown in the Table 3 and the source of the item were presented in the Table 2.

Table 2: Constructs and sources

Constructs	Items	Source
Attitude	04	(Taylor & Todd, 1995)
Perceived Usefulness	07	(Chiu & Wang, 2008; DeLone & Mclean, 2003; Hassanzadeh et al., 2012; Ho & Dzeng, 2010;)
Perceived Ease of Use	05	(DeLone & Mclean, 2003; Wang & Liao, 2008)
Perceived Self-Efficacy	03	(Taylor & Todd, 1995)
Behavioural Intention to Use	03	(Cheng et al., 2006)

Table 3: Constructs and items

Constructs	Items
Attitude	Using synchronous online learning is a good idea
	Using synchronous online learning is a wise idea
	I like the idea of using synchronous online learning
	Using synchronous online learning would be pleasant
Perceived Usefulness	I think that synchronous online learning helps to save time
	I think that synchronous online learning helps to save cost
	I think that synchronous online learning helps me to be self-reliable
	I think that synchronous online learning helps to improve my knowledge
	I think that synchronous online learning helps to improve my performance
	I think that synchronous online learning is effective
	I think that synchronous online learning is efficient
Perceived Ease of Use	I think that synchronous online learning is easy to use
	I think that synchronous online learning is easy to learn
	I think that synchronous online learning is easy to access
	I think that synchronous online learning is easy to understand
	I think that synchronous online learning is convenient
Perceived Self-Efficacy	I would feel comfortable using synchronous online learning system on my own.
	If I want to, I can use synchronous online learning system on my own easily.
	I would be able to use synchronous online learning system even if there is no one around to show me how to use it.
Behavioural Intention to Use	I would use synchronous online learning for my learning needs.
	Using synchronous online learning for learning is something I

would do.

I would see myself using synchronous online learning for doing my learning activities.

Findings and Discussion

The data analysis was conducted using partial least square structural equation modeling technique and SmartPLS 4 tool was used to perform the analysis. SmartPLS 4 was created by Ringle et al. (2005) and has been used effectively in various research investigations since 2005 (Wong, 2013).

Data Analysis

Assessment of measurement model - Reliability of the constructs and indicators

Cronbach's Alpha and Composite Reliability are the indicators of internal consistency or construct reliability (Dakduk et al., 2019). Cronbach's alpha assesses the degree to which elements included in a construct are linked (Dakduk et al., 2019). Cronbach's Alpha values less than 0.60 are regarded poor, 0.70 are considered good, and more than 0.80 are considered exceptional according to Sekaran (2003). Cronbach's Alpha readings should not be more than 0.95 (Nunnally, 1978; Hair et al., 2019). If so, the items are considered redundant as they measure same questions. Due to the conservative assessment of Cronbach's Alpha in PLS-SEM, several studies proposed utilizing composite reliability to estimate construct reliability (Bagozzi & Yi, 1988; Hair et al., 2012; Wong, 2013). The composite reliability criterion is 0.70 or higher (Bagozzi and Yi, 1988; Dakduk et al., 2019). Factor loading needs to be greater than 0.70 (Chin, 1998; He et al., 2020; Henseler et al., 2009)

As portrayed in the Table 4, Cronbach's alpha of all the constructs is greater than 0.80. The composite reliability of the variables is above 0.70. Factor loadings are greater than the threshold value of 0.70. Hence, there is substantial proof to assume that the measurement has established good reliability.

Table 4: Reliability of the constructs and indicators

Construct	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	AVE
	ATT_01	0.718			
Attitude	ATT_02	0.839	0.825	0.843	0.553
	ATT_03	0.785			

Construct	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	AVE
Perceived Usefulness	ATT_04	0.807			
	PU_01	0.768			
	PU_02	0.806			
	PU_03	0.728			
	PU_04	0.797	0.896	0.902	0.557
	PU_05	0.697			
	PU_06	0.805			
	PU_07	0.797			
Perceived Ease of Use	PEOU_01	0.865			
	PEOU_02	0.795			
	PEOU_03	0.816	0.893	0.898	0.629
	PEOU_04	0.806			
	PEOU_05	0.767			
Perceived Self-Efficacy	PSE_01	0.798			
	PSE_02	0.799	0.874	0.88	0.701
	PSE_03	0.910			
Behavioural Intention to Use	ITU_01	0.938			
	ITU_02	0.832	0.916	0.919	0.785
	ITU_03	0.884			

Convergent validity

Convergent validity refers to how closely the items designed to assess the construct are connected to other items designed to measure the same construct. Average Variance Extracted (AVE) was used to evaluate the convergent validity criterion. The AVE must be more than 0.50 (AVE >0.50) (Hair et al., 2010). The AVE values of the variables are greater than 0.50 as per Table 4. Therefore, it confirms that convergent validity has been established.

Discriminant validity

The degree to which a variable varies from other variables in the study model is referred to as discriminant validity (Chin, 1998). The variance of a construct's components will be compared to the variance of the other constructs in the model using AVE. The squared root of a variable's AVE must typically be

bigger than the correlations between the variable and any other variable in the model, and it must be greater than 0.50 (Fornell & Larcker, 1981). Cross-loadings imply an in-depth investigation of the indicators with constructs and must be considerably loaded with the latent constructs than the model's other constructs (Cheng and Chen, 2015). The Heterotrait-Monotrait ratio is used to measure discriminant validity in a variety of study domains (Henseler et al., 2015). The Heterotrait-Monotrait correlation ratio was recommended as an alternate approach for testing discriminant validity based on the multitrait-multimethod matrix (Henseler et al., 2015). Few researchers suggested that the threshold value of the HTMT ratio needs to be lower than 0.85 (Kline, 2011).

Table 5: Discriminant validity using Fornell-Larcker Scale

	ATT	ITU	PEOU	PSE	PU
ATT	0.744				
ITU	0.583	0.886			
PEOU	0.741	0.654	0.793		
PSE	0.637	0.644	0.684	0.837	
PU	0.797	0.630	0.834	0.667	0.746

As indicated in Table 5 discriminant validity using Fornell-Larcker criterion has met as the squared root of a variable's AVE must typically be bigger than the correlations between the variable and any other variable in the model. As in the Table 6, HTMT ratios criterion is also fulfilled. Thus, it can be assumed that the discriminant validity has been recognized.

Table 6: Discriminant validity using Heterotrait-Monotrait Ratio (HTMT) ratio

	ATT	ITU	PEOU	PSE	PU
ATT					
ITU	0.585				
PEOU	0.744	0.653			
PSE	0.638	0.644	0.684		
PU	0.799	0.628	0.834	0.666	

Assessment of structural model

Multicollinearity

Multicollinearity is assumed when one exogenous variable is substantially associated with another exogenous variable (Hair et al., 2010). It can be

assessed using VIF values and Tolerance. It is often assumed that VIF values less than 5 indicate the lack of collinearity (Hair et al., 2011; Ringle et al., 2015). In this study, all the VIF values are less than 5, indicates the absence of multicollinearity

Coefficient of determination -R^2

The R^2 value explains the variance in the dependent variable caused by all predictors (Dreheeb et al., 2016). According to Chin (1998), if the R^2 value is less than 0.19, it is extremely weak; between 0.19 and 0.33, it is weak; between 0.33 and 0.67, it is moderate; and larger than 0.67, it is significant Chin (1998). As appeared in Table 7, the respective independent variable caused nearly 66.2%, 50.5%, 46.6%, 71.3% variance in the Attitude, Behavioral intention to Use, Perceived Ease of Use and Perceived usefulness respectively.

Table 7: R^2 of the endogenous latent variables

Variable	R-square	R-square adjusted	Results
ATT	0.665	0.662	Moderate
ITU	0.510	0.505	Moderate
PEOU	0.467	0.466	Moderate
PU	0.713	0.712	High

Hypotheses testing

Table 8 and Figure 3 represents the summarized results of the proposed model. Except H1b and H3a, all the hypotheses are supported. The results showed that perceived usefulness influenced attitude (β= 0.542, t-value >1.96, p-value<0.05) and it has no significant influence on the behavioral intention to use (β= 0.131, t-value <1.96, p-value >0.05). Thus, the results lead to support H1a and reject H1b. The association between perceived ease of use and perceived usefulness (β= 0.710, t-value >1.96, p-value<0.05), attitude (β= 0.188, t-value >1.96, p-value<0.05) and behavioral intention to use (β= 0.268, t-value >1.96, p-value<0.05) were found to be statistically significant, leading to support H2a, H2b and H2c respectively.

As per the below presented evidences, Attitude has not influenced behavioral intention to use (β= 0.071, t-value <1.96, p-value >0.05). Thus, H3a is not supported. Further, perceived usefulness (β= 0.181, t-value >1.96, p-

value<0.05), perceived ease of use (β= 0.684, t-value >1.96, p-value<0.05), attitude (β= 0.147, t-value >1.96, p-value<0.05) and behavioral intention to use (β= 0.328, t-value >1.96, p-value<0.05) has been influenced by perceived self-efficacy. Thus, hypotheses H4a, H4b, H4c, H4d are supported.

Table 8: Results of the hypothesis testing

| Hypothesis	Relationship	Path	t-value	p-value	Decision	f^2	Results
H1a	PU → ATT	0.542	7.263	0.000	Supported	0.215	Large
H1b	PU→BITU	0.131	1.915	0.055	Not supported	0.008	Small
H2a	PEOU→PU	0.710	12.802	0.000	Supported	0.936	Large
H2b	PEOU→ATT	0.188	2.898	0.004	Supported	0.029	Medium
H2c	PEOU→BITU	0.268	3.149	0.002	Supported	0.039	Small
H3a	ATT→BITU	0.071	1.332	0.183	Not supported	0.003	Small
H4a	PSE→PU	0.181	3.761	0.000	Supported	0.061	Large
H4b	PSE→PEOU	0.684	12.449	0.000	Supported	0.877	Large
H4c	PSE→ATT	0.147	2.272	0.023	Supported	0.033	Medium
H4d	PSE→BITU	0.328	4.430	0.000	Supported	0.107	Small
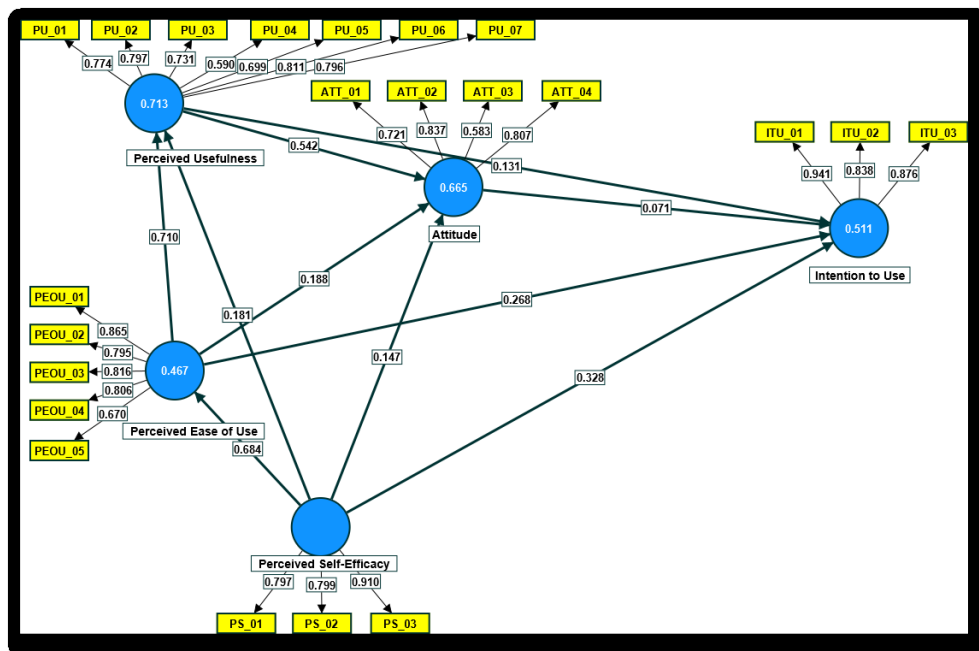
Figure 3: PLS-SEM path diagram

Effect Size- f^2

The effect size measures the changes in the R^2 values by omitting a particular construct from the model and predicts the extent to which the omitted constructs substantially impact the endogenous construct (Sarstedt et al., 2017). Effect size values represent 0.02, 0.15, and 0.35 indicate small, medium, and large effects (Cohen, 1988; Hair et al., 2014). Effect size of the construct on its associated dependent variable has been presented in Table 8.

Predictive relevance- Q^2

Q^2 measures the predictive relevance of the endogenous construct. Hair et al. (2014) recommended that the perfect model have the Q^2 value of 1, but it has also been accepted to have the Q^2 values greater than 0 for the endogenous variable. Predictive relevance of 0.02, 0.15, and 0.35 demonstrates that independent variable has a small, medium, and large predictive relevance on the dependent variable respectively (Wong, 2013). Predictive relevance of the endogenous variables namely ATT, BITU, PEOU and PU is reported as 0.293, 0.327, 0.362, 0.348 respectively. Thus, Q^2 value of the dependent variables is greater than 0. It indicates that the proposed model has good predictive relevance.

Discussion

According to Table 7, Attitude has been explained with the R^2 value of 66.2% by perceived usefulness, perceived ease of use and perceived self-efficacy. Thus, Attitude has moderately predicted by the identified external variables.

The results showed that perceived usefulness influenced attitude (β= 0.542, t-value >1.96, p-value<0.05), lead to support H1a. It is evidenced by several studies (Al-Adwan et al., 2013; Al-Azawei, 2019; Masrom, 2007; Mashroofa et al., 2019; Pal and Patra, 2021; Samsudeen et al., 2015; Smeda et al., 2017). Thus, it is important to emphasis that the synchronous online learning is beneficial as it improves the leaner's knowledge and the performance. Consequently, it will help to enhance the positive attitude towards synchronous online learning.

Perceived ease of use has a positive impact on attitude (β= 0.188, t-value >1.96, p-value<0.05), supports H2b. It is supported by Al-Adwan et al., 2013; Al-Azawei, 2019; Mashroofa et al., 2019; Masrom, 2007; Pal and Patra, 2021; Samsudeen et al., 2015; Smeda et al., 2017. Further, perceived-self efficacy has

the positive effect on Attitude (β= 0.147, t-value >1.96, p-value<0.05), supports H4c. This result is evidenced by (Smeda et al., 2017). This finding highlights that learners believe about the user friendliness of the synchronous online learning is therefore essential to form positive feeling about it. It is also important to be noted that the student's confidence on their own ability to engage in synchronous online learning without any helps from others is regarded as the significant mechanism to enhance the positive attitude of synchronous online learning.

According to Table 9, Behavioral intention to use has been explained with the R^2 value of 50.5% by perceived ease of use and perceived self-efficacy. Thus, Behavioral intention to use has moderately predicted by the identified external variables. Behavioral intention to use influenced by perceived ease of use (β= 0.268, t-value >1.96, p-value<0.05) and perceived-self efficacy (β= 0.328, t-value >1.96, p-value<0.05), it supports H2c (Al-Azawei, 2019; Ibrahim *et al.*, 2017; Khan *et al.*, 2020; Shao, 2020; Tarhini et al., 2014; Tan, 2019) and H4d (Shao, 2020) respectively. Attitude has not influenced behavioral intention to use (β= 0.071, t-value <1.96, p-value >0.05). Thus, H3a is not supported. This finding is consistent with the result of Masruf and Teng (2016) whereas several studies has proven the positive impact too (Ibrahim et al., 2017; Mashroofa et al., 2019; Samsudeen et al., 2015; Smeda et al., 2017). In order to increase the persistence usage intention, learners must believe that synchronous online learning facilitates easier learning and understanding. Also, students need to be confident enough in engaging the learning on their own through synchronous online learning platforms without the assistance from the external source. Therefore, increased believe on the ease of use and self-efficacy will definitely encourages students to use synchronous online learning continuously. As Davis et al. (1989) stated attitude towards the use tend to be uncertain in predicting intention to use the technology. Because, users will not always perceive the technology favorably even though they use it (Davis et al., 1989). The main reason for the insignificant finding of the attitude on behavioral intention to use is, the sudden shift towards the synchronous online learning has required the immediate adoption of the new-learning model whereas the class-room based learning was the primary mode of the education earlier. Thus, learners did not have the positive attitude on the synchronous online learning adoption although they engage in the synchronous online learning.

Also, Perceived usefulness has not influenced behavioral intention to use (β= 0.131, t-value <1.96, p-value >0.05). Thus, the results lead to reject H1b. the

findings is analogues with (Sinaga *et al.*, 2021; Kang & Shin, 2015). Also, Perceived Usefulness has positively influenced the behavioral intention to use ((Al-Adwan et al., 2013; Al-Azawei, 2019; Jamalova & Bálint, 2022; Khan et al., 2020; Liu, 2020; Masrom, 2007; Shao, 2020; Tarhini et al., 2014; Tan, 2019). This insignificant finding is due to the differences on research objects, features and differences of the respondents (Aprilia & Santoso, 2020). As this study has conducted during the COVID-19 pandemic, characteristics of the respondents, severity of the pandemic on education, immediacy to switch to new-normal model for learning has the influences on the feel of usefulness. Moreover, perceived utility tend to be depreciated when the respondents face many obstacles in accessing and using the application (Putri & Mahendra, 2017). According to Table 9, perceived usefulness has been explained with the R^2 value of 71.2% by perceived ease of use and perceived self-efficacy. Thus, perceived usefulness has highly predicted by the identified external variables. Perceived ease of use (β= 0.710, t-value >1.96, p-value<0.05) and perceived self-efficacy (β= 0.181, t-value >1.96, p-value<0.05) has the positive impact on perceived usefulness, leading to support H2a (Al-Azawei, 2019; Al-Adwan et al., 2013; Jamalova & Bálint, 2022; Liu, 2020; Masrom, 2007;Pal & Patra, 2021; Shao, 2020; Smeda et al., 2017; Tan, 2019), H4a (Shao, 2020) respectively. It indicates that learners feeling about the usefulness of the synchronous online learning is highly dependent on ease of use and self-efficacy. Thus, if educational institutions establish sound policies to ensure that synchronous online learning is easy to use and learners have sufficient level of confidence to engage in academic sessions then students will feel synchronous online learning is beneficial and useful.

According to Table 9, perceived ease of use has been explained with the R^2 value of 46.6% by perceived self-efficacy. Thus, perceived ease of use has moderately predicted by the identified external variable. Perceived-self efficacy has positively predicted perceived ease of use (β= 0.684, t-value >1.96, p-value<0.05) supports H4b (Smeda et al., 2017; Shao, 2020). Thus, students will perceive synchronous online learning is easy to use if they primarily believe on their ability to use it without any facilitation from others.

Implications

Theoretical Implications
This study has significant contributions to the existing theory in the several ways. In theoretical point of view, this study has considered TAM as the base to investigate the impact of factors on predicting the adoption to synchronous

online learning in the Sri Lankan context during the COVD-19. Even though TAM has the wider-spread applicability, it has rarely empirically investigated in the synchronous online learning context. Further, in this study TAM has been extended using a new variable called perceived self-efficacy and the conceptual model has also been empirically validated. Thus, the findings highlight new pathways using which the adoption can be further accelerated. Especially, the inclusion of the new factor emphasized a larger influence on perceived usefulness and ease of use. It indicates that the students must primarily have a believe that they can engage in synchronous online learning like the way they learn in the class-room setting. Their confidence in this respect will have a significant chance to enhance their perception towards the usefulness and ease of use. Learners will therefore feel that the synchronous online learning is beneficial and it does not require any additional efforts if they have confidence on their ability.

Similarly, the conceptual framework of the study has consolidated and validated all possible relationships of TAM core variables in the synchronous online learning context. Thus, the study provides more comprehensive TAM based framework for the future exploration. Importantly, this study extends the knowledge in the existing literature by analyzing the leaners adoption towards the synchronous online learning in the developing country like Sri Lanka with the primary support of TAM to fulfill the dearth identified in the literature. As a result, this study will be a point of reference to the upcoming synchronous online learning related studies especially in the developing countries. Most importantly, the researcher initially experienced some problems in adapting and validating the questionnaire due to the lack of researches in this context. As the result, researcher adapted items from various context and validated to make them appropriate to this context. Future researchers can use the validated instrument to explore the synchronous learning in different context. Future TAM related researches can use this study as the base to conduct the rigorous empirical analysis using PLS-SEM with more diagnostics like effect size and predictive relevance.

Practical Implications
The core contribution of this study to the practice is, it communicates the empirical evidences on the adoptability of the synchronous online learning. Thus, the findings provide several insights on the viability of the synchronous online learning even after the COVID-19 and social distancing has been relaxed. It is therefore helpful to the government to establish a sound framework to

incorporate information communication technology to the education. Especially, Sri Lanka experiences severe economic crisis due to the depletion of the foreign reserves and people therefore face many hardships to afford the essential goods and services (Sharma et al., 2022). The findings suggested by this study can help to develop policies and procedures to integrate synchronous online learning in the higher education sector to significantly reduce the hardships faced by the leaners during the economic crisis especially in Sri Lanka.

Also, this study conveys the essential factors to be focused by university administration, academicians, software designers, application developers and students to accelerate the adoption to synchronous online learning. Briefly, deploying the online learning culture with the focus on motivating students to involve synchronous online learning by conveying the usefulness of it, the importance of having the belief on student's ability to engage in the learning without the direct support of the lecturers and peers is highly necessary. Besides, software designers and developers can also be encouraged to design and develop user friendly synchronous online learning applications.

Comprehensively, study found a significant positive association of perceived usefulness on attitude. Thus, universities can instruct the advantages of the synchronous online learning through knowledge sharing sessions and this will enhance the positive attitude of synchronous online learning. In the routine basis, instructor involve in synchronous online teaching can convince the students that the synchronous online learning actually effective and efficient way of learning during the pandemic time. Consequently, such positive attitudes will increase the intention to use and involve in the synchronous online lectures and tutorials. It will help to resolve the poor attendance issues pertaining in the online classes. The study also discovered that perceived ease of use has high significant positive influence on perceived usefulness. Meaning that, academicians and instructors on a routine basis, need to motivate the students that synchronous online learning does not require additional effort to progress on their learning and it is much similar to class-room based leaning. Further, educational technologist and software developers can more focus on application features to make synchronous online learning easy to use, easy to access and easy to understand. For instance, individual recording facility with the permission of the host, user friendly icons and menus, group discussion forums can further helpful to enhance the usefulness through user-friendliness. As the result, students will realize the usefulness of the synchronous online learning. It will obviously boost up positive attitudes and will result in the positive adoption behavior.

Moreover, perceived-self efficacy has the high significant positive impact on perceived ease of use. Thus, the university administration with the support of experienced academicians and industrial experts can arrange motivational speeches to increase the confidence of students about the learning with synchronous online learning platforms in order to make them realize that synchronous online learning will not require additional effort and it is easier way to involve in the learning process. Thus, this will definitely drive up the intention of involving in the learning through synchronous online learning platforms. Subsequently, student will become more-engaged and interestingly participate in learning.

Limitations and future research

Even though this research has provided significant contribution to the existing theory and practice on the adoption to synchronous online learning, it has identified with several shortfalls which pave numerous ways for the future researches. This study has mainly focused on the Sri Lankan student's perception on synchronous online learning on a single point of time. Thus, it lacks the generalizability of the result. Student's perception with different cultural orientation and technological background can be considered in longitudinal study to understand the synchronous online learning adoption comprehensively. Secondly, several moderators have been considered in TAM related literature. Future research direction can more focus on the specified gap by incorporating demographic factors such as gender, age, experience as moderators of the study (Al-Azawei, 2019; Tarhini et al., 2014).

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

References

Ajmal, M., Alrasheedi, S., Keezhatta, M. S., &Yasir, G. M. (2020). COVID-19 and online English LanguageTeaching: Students' Response and Feedback. *Asian ESP Journal*, 16(52), 39–56.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.

Al-Adwan, A., Adwan, A. A., & Smedley, J. (2013). Exploring Students Acceptance of E-Learning Using Technology Acceptance Model in Jordanian Universities. *International Journal of Education and Development using*

Information and Communication Technology, 9(2), 4–18.

Al-Azawei, A. (2019). The Moderating Effect of Gender Differences on Learning Management System Acceptance: A Multi-Group Analysis. *Italian Journal of Educational Technology*, 27(3), 257–278.

Al-Azawei, A., Parslow, P., & Lundqvist, K. (2016). Barriers And Opportunities of E-Learning Implementation in Iraq: A Case of Public Universities. *International Review of Research in Open and Distance Learning*, 17(5), 126–146.

Al Faruq, A. Z., Ngadiso, N., & Supriyadi, S. (2022). Students' Perceptions of Synchronous Online Learning using Google Meet in a Reading Class. *AL-ISHLAH: Jurnal Pendidikan*, 14(3), 4053–4066.

Alfadda, H. A., & Mahdi, H. S. (2021). Measuring Students' Use of Zoom Application in Language Course Based on the Technology Acceptance Model (TAM). Journal of Psycholinguistic Research, 1–18. https://doi.org/10.1007/s10936-020-09752-1

Allen, I., & Seaman, C. A. (2007). Likert Scales and Data Analyses. *Quality Progress*, 40,64–65.

Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic : Students perspectives. *Journal of Pedagogical Sociology and Psychology*, 2(1), 2–8.

Aprilia, A. R., &Santoso, T. (2020). Pengaruh Perceived Ease Of Use, Perceived Usefulness Dan Attitude Towards Using Terhadap Behavioural Intention To Use Pada Aplikasi Ovo. *Agora*, 8(1),1–6.

Athiyaman, A. (2002). Internet Users' Intention to Purchase Air Travel Online: An Empirical Investigation. *Marketing Intelligence & Planning*, 20(4), 234–242.

Bagozzi, R. P., & Yi, Y. (1988). On the Evaluation of Structural Equation Models. *Journal of the Academy of Marketing Science*, 16(1), 74–94.

Bandura, A. (2005). The Primacy of Self-Regulation in Health Promotion. *Applied Psychology:An International Review*, 54(2), 245–254.

Bhatt, S., & Shiva, A. (2020). Empirical Examination of the Adoption of Zoom Software During Covid-19 Pandemic: Zoom Tam. *Journal of Content*, *Community and Communication*, 12, 70–88.

Chau, P. Y. K., & Hu, P. J. (2001). Information Technology Acceptance by Individual Professionals: A Model Comparison Approach. *Decision Sciences*, 32(4), 699–719.

Cheng, T., Lam, D. Y., & Yeung, A. C. L. (2006). Adoption of Internet Banking : An Empirical Study in Hong Kong. *Decision support systems*, 42(3), 1558–1572.

Cheng, W. T., & Chen, C. (2015). The Impact of e-Learning on Workplace On-the-job Training. *International Journal of E-Education, E-Business, E-Management and E-Learning*, 5(4), 212.

Chin, W. W. (1998). The Partial Least Squares Approach to Structural Equation Modeling. *Modern Methods for Business Research*. London: Lawrence Erlbaum Associates Publishers.

Chinyamurindi, W. & Shava, H. (2008). An investigation into e-learning acceptance and gender amongst final year students. *South African Journal of Information Management*, 17(1), 1–9.

Chiu, C. M., & Wang, E. T. G. (2008). Understanding Web-based Learning Continuance Intention: The Role of Subjective Task Value. *Information & Management*, 45, 194–201.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd edn.). New York: Psychology Press.

Contreras-Castillo, J., Pe´rez-Fragoso, C., & Favela, J. (2006). Assessing the Use of Instant Messaging in Online Learning Environments. *Interactive Learning Environment*, 14(3), 205–218.

Cross, J. (2004). An Informal History of E-Learning. *On the Horizon*, 12(3), 103–110.

Dakduk, S., González, Á., & Portalanza, A. (2019). Learn About Structural Equation Modeling in SmartPLS With Data From the Customer Behavior in Electronic Commerce Study in Ecuador (2017). London: SAGE Publications, Ltd.

Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319–339.

DeLone, W., & Mclean, E. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems, 19(4)*, 9–30.

Deshpande, S. G., & Hwang, J. N. (2001). A Real-Time Interactive Virtual Classroom Multimedia Distance Learning System. *IEEE Transactions on Multimedia*, 3(4), 432–444.

Dharma, H. R. C., Asmarani, D.. & Dewi, U. P. (2017). Basic Japanese grammar and conversation e-learning through Skype and Zoom online application. *Procedia Computer Science*, 116, 267–273.

Dreheeb, A. E., Basir, N., & Fabil, N. (2016). Impact of System Quality on Users' Satisfaction in Continuation of the Use of e-Learning System. *International Journal of E-Education, E-Business, E-Management and E-Learning*, 6(1), 13.

Duemer, L., Fontenot, D., Gumfory, K., Kallus, M., Larsen, J., Schafer, S., & Shaw, B. (2002). The Use of Synchronous Discussion Groups to Enhance Community Formation and Professional Identity Development. *The Journal of Interactive Online Learning*, 1(2), 1-12.

Erandi, K. K. W. H., Mahasinghe, A. C., Perera, S.S.N., & Jayasinghe, S. (2020). Effectiveness of the Strategies Implemented in Sri Lanka for Controlling the COVID–19 Outbreak. *medRxiv*, 2020, 1–10.

Faisal, A., Handayanna, F., & Purnamasari, I. (2021). Implementation Technology Acceptance Model (Tam) on Acceptance of the Zoom Application in Online Learning. *Jurnal Riset Informatika*, 3(2), 85–92.

Ferns, S., Cappon, A., Duff, A., Marshall, A., Ryan, B., Thompson, B., & Gray, G. (2020) Technology tools for teaching in higher education, the practical

handbook series. *Centre for Higher Education Research, Policy & Practice (CHERPP).*

Fornell, C. G., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39–50.

Galit.N. (2018). Technophobia among Older Internet Users. *Educational Gerontology*, 44(2–3), 148–162.

Gao, H. L. (2020). Understanding the Attitude of Antecedents and Consequences towards E-learning : An Integration Model of Technology Acceptance Model and Theory of Planned Behavior. *International Journal of Liberal Arts and Social Science*, 8(3),55–71.

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Inexperience and Experience with Online Stores: The Importance of TAM and Trust. *IEEE Transactions on Engineering Management*, 50(3), 307–321.

Guitton, M. J. (2020). Cyberpsychology research and COVID-19. Computers in Human Behavior, 111, 106357.

Hair, J. F., Hult, G.T. M., Ringle, C.M., & Sarstedt, M. (2014). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (2nd ed.). Los Angeles: SAGE Publications, Inc.

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.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–151.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2012). Partial Least Squares: The Better Approach to Structural Equation Modeling?. *Long Range Planning*, 45(5–6), 312– 319.

Hair, J. J., Black, W.C., Babin, B.J. and Anderson, R.E. (2010). Multivariate Data Analysis: A Global Perspective. London: Pearson.

Hassanzadeh, A., Kanaani, F., & Elahi, S. (2012). A Model for Measuring E-Learning Systems Success in Universities. *Expert Systems with Applications*, 39, pp. 10959–10966.

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*, 40(13), 1406–1416.

Heijden, V. (2004). User Acceptance of Hedonic Information Systems. *MIS Quarterly*, 28(4), 695–704.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modelling. *Journal of the Academy of Marketing Science*, 43(1),115–135.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing. *Advances in International Marketing*, 20,277–319.

Ho, C. L., & Dzeng, R. J. (2010). Construction Safety Training via E-Learning: Learning Effectiveness and User Satisfaction. *Computers & Education*, 55,

858–867.

Hrastinski, S. (2006). The Relationship between Adopting a Synchronous Medium and Participation in Online Group Work: An Explorative Study. *Interactive Learning Environment*, 14(2), 137–152.

Huang, Y.M., Kuo, Y.H., Yen-Ting, L., & Cheng, S.C. (2008). Toward Interactive Mobile Synchronous Learning Environment with Context-Awareness Service. *Computers and Education*, 51(3), 1205–1226.

Ibrahim, R., Leng, N. S., Yusoff, R. C. M., Samy, G. N., Masrom, S., & Rizman, Z. I. (2017). E-Learning Acceptance based on Technology Acceptance Model (TAM). *Journal of Fundamental and Applied Sciences*, 9(4S), 871–889.

Ironsi, C. S. (2021). Google Meet as a synchronous language learning tool for emergency online distant learning during the COVID-19 pandemic: perceptions of language instructors and preservice teachers. *Journal of Applied Research in Higher Education*, 14(2), 640–659.

Jamalova, M., & Bálint, C. (2022). Modelling Students' Adoption of E-Learning During the COVID-19 Pandemic: Hungarian Perspective. *International Journal of Emerging Technologies in Learning*, 17(7), 275–292.

Kang, M. & Shin, W. S. (2015). An Empirical Investigation of Student Acceptance of Synchronous E-Learning in an Online University. *Journal of Educational Computing Research*, 52(4), 475–495.

Kanwal, F., Rehman, M. & Asif, M. M. (2020). E-Learning Adoption and Acceptance in Pakistan: Moderating Effect of Gender and Experience. *Mehran University Research Journal of Engineering and Technology*, 39(2), 324–341.

Kapasia, N., Paul, P., Roy, A., Saha, J., Zaveri, A., Mallick, R., Barman, B., Das, P., & Chouhan, P. (2020). Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. *Children and Youth Services Review,* 116, 105194.

Khan, S. A., Zainuddin, M., Mahi, M., & Arif, I. (2020). Behavioral Intention to Use Online Learning During COVID-19 : An Analysis of the Technology Acceptance Model. *Proceedings of the International Conference on Innnovative Methods of Teaching and Technological Advancements in Higher Education*, 3–12.

Kim, E. J., Kim, J. J. & Han, S. H. (2021). Understanding student acceptance of online learning systems in higher education: Application of social psychology theories with consideration of user innovativeness. *Sustainability (Switzerland)*, 13(2), 1–14.

Kim, S. S. (2021). Motivators and concerns for real-time online classes: focused on the security and privacy issues. *Interactive Learning Environments,* doi: 10.1080/10494820.2020.1863232.

Kline, R. B. (2011). Convergence of Structural Equation Modeling snd Multilevel Modeling. SAGE Publications Ltd.

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The Technology Acceptance Model Past, Present and Future. *Communications of the Association for Information Systems*, 12(50), 752–780.

Liu, C. (2020). The Adoption of E-Learning beyond Moocs for Higher Education. *International Journal of Accounting and Information Management*, 29(2), 217–227.

Long, N. N., & Khoi, B. H. (2020). The Intention to Study Using Zoom During the SARSCoV-2 Pandemic. *International Journal of Emerging Technologies in Learning*, 15(21), 195–216. https://doi.org/10.3991/ijet.v15i21.16777

Lowenthal, P. R., Jered.B., Richard.E.W., & Leanna.A. (2020). Thinking Beyond Zoom: Using Asynchronous Video to Maintain Connection and Engagement during the Covid-19 Pandemic. *Journal of Technology and Teacher Education*, 28(2), 383–391.

Mashroofa, M. M., Jusoh, M., & Chinna, K. (2019). Influence of Attitudinal Belief on E-learning Behavior among Academics in State Universities of Sri Lanka. *International Journal of Recent Technology and Engineering*, 8(3S3), 15–18.

Masrom, M. (2007). Technology Acceptance Model and E-Learning. Proceedings of the 12th International Conference on Education, Sultan Hassanal Bolkiah Institute of Education, University Brunei Darussalam, 21-24 May.

Masruf, M. N., & Teng, P. K. (2016). Understanding Student's Behavioural Intentions to Use E-Learning System in Higher Education Institution in Klang Valley, Malaysia. Journal of Services & Management, 6, 3–15.

McNeil, S., Robin, B., & Miller, R. (2000). Facilitating Interaction, Communication and Collaboration in Online Courses. *Computers and Geosciences*, 26, 699–708.

McVey, M., Edmond, A. & Montgomery, D. (2019). Supporting Students to Develop their Digital Literacies using Microsoft Teams. in *ALT Winter Conference 2019,11-12 December*.

Nadlifatin, R., Ardiansyahmiraja, B. & Persada, S. F. (2020). The measurement of university students' intention to use blended learning system through technology acceptance model (tam) and theory of planned behavior (TPB) at developed and developing regions: Lessons learned from Taiwan and Indonesia. *International Journal of Emerging Technologies in Learning*, 15(9), 219–230.

Nemec, R., Berkova, A. J. & Hubalovsky, S. (2020). Identification Elements Symmetry in Teaching Informatics in Czech Secondary School during the Covid-19 Outbreak from the Perspective of Students. *Symmetry*, 12(11), 1768.

Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H. C. (2007). Empirical Examination of the Adoption of Webct Using TAM. *Computers & Education*, 48(2), 250–267.

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hil.

Pal, D., & Patra, S. (2021). University Students' Perception of Video-Based Learning in Times of COVID-19: A TAM/TTF Perspective. *International Journal of Human-Computer Interaction*, 37(10), 903–921.

Pal, D., & Vanijja, V. (2020). Perceived usability evaluation of Microsoft Teams as an online learning platform during COVID-19 using system

usability scale and technology acceptance model in India. *Children and Youth Services Review*, 119(July). https://doi.org/10.1016/j.childyouth.2020.105535

Park, S. Y. (2009). An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use E-Learning. *Educational Technology & Society*, 12(3), 150–162.

Purwanto, E. & Tannady, H. (2020). The Factors Affecting Intention to Use Google Meet Amid Online Meeting Platforms Competition in Indonesia. *Technology Reports of Kansai University*, 62(06), 2829–2838.

Putri, L. F. S. & Mahendra, I. (2017). Analisa Faktor-Faktor Yang Mempengaruhi Penerimaan Dan Penggunaan Aplikasi Go-Jek Menggunakan Unified Theory of Acceptance and Use of Technology (UTAUT). *Jurnal Pilar Nusa Mandiri*, 13(1), 136–144.

Pirapuraj, P., Rishan, U. M., & Ali, S. N. (2019). E-learning at home vs traditional learning among higher education students: a survey based analysis. 9th International Symposium, South Eastern University of Sri Lanka, November, 213–221.

Raab, R. T., Ellis, W. W. and Abdon, B. R. (2001). Multisectoral partnerships in e-learning: a potential force for improved human capital development in the Asia Pacific. The Internet and higher education, 4(3),217–229.

Rahayu, D. (2020a). Synchronous Zoom Web Conference System: An Exploratory Study on Students' E-Learning Experience. *JER Journal of ELT Research,* 5(1), 68–79.

Rahayu, D (2020b). Students' e-learning experience through a synchronous Zoom web conference system. *Journal of ELT Research: The Academic Journal of Studies in English Language Teaching and Learning*, 5(1), 68–79.

Ramayah, T., Hazlina, N., & Lo, M. (2010). The Role of Quality Factors in Intention to Continue Using an E-Learning System In Malaysia. *Procedia Social and Behavioral Sciences* , 2, 5422–5426.

Ringle, C.M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. Boenningstedt: SmartPLS GmbH 584.

Ringle, C. M., Wende, S., & Will, A. (2005). SmartPLS 2.0 (Beta). Hamburg: University of Hamburg.

Rissa, J. (2014) An empirical study on the e-learning acceptance among the Finnish labor (Master's thesis, Aalto University, Espoo, Finland). Retrieved from: https://aaltodoc.aalto.fi/bitstream/handle/123456789/14177/hse_ethesis_13742.pdf?sequence=1&isAllowed=y.

Samsudeen, S. N., Thowfeek, M. H., & Rashida, M. F. (2015). School Teachers ' Intention to Use E-Learning Systems in Sri Lanka : A Modified TAM Approach. *Information and Knowledge management*, 5(4), 54–60.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial Least Squares Structural Equation Modeling (PLS-SEM), Handbook of Market Research. Cham: Springer International Publishing.

Saunders, M., Lewis, P., & Thornhill, A. (2007). Research Methods for Business Students (4th ed.). USA: Pearson Education Limited.

Sekaran, U. (2003). Research Methods For Business: A Skill Building Approach (4th ed.). United States of America: John Wiley & Sons.

Shao, C. (2020). An Empirical Study on the Identification of Driving Factors of Satisfaction with Online Learning Based on TAM. *Advances in Economics, Business and Management Research*, 110, 1067–1073.

Sharma, D. S., Anawade, P., Sahu, A., & Sharma, M. (2022). The economic crisis faced by island nation-Sri Lanka: An empirical study. *Journal of Contemporary Issues in Business and Government*, 28(03), 920–927. https://doi.org/10.47750/cibg.2022.28.03.074

Sinaga, O. S., Marpaung, F. K., Dewi, R. S. & Sudirman, A.(2021). Kontribusi perceived usefulness, perceived ease of use dan perceived security terhadap behavioral intention to use aplikasi JAKET. *Insight Management Journal*, 1(3), 86–94.

Smeda, A. M., Shiratuddin, M. F., & Wong, K. W. (2017). Measuring the Moderating Influence of Gender on the Acceptance of E-Book Amongst Mathematics And Statistics Students at Universities in Libya. *Knowledge Management and E-Learning*, 9(2), 177–199.

Soper, D. S. (2022). A-priori Sample Size Calculator for Multiple Regression [Software]. doi: https://www.danielsoper.com/statcalc.

Sun, H., & Zhang, P. (2005). An Empirical Study on Causal Relationships between Perceived Enjoyment and Perceived Ease of Use. *Journal of the Association for Information Systems*, 7(9), 618–645.

Sun, H., & Zhang, P. (2006). The Role of Moderating Factors in User Technology Acceptance', *International Journal of Human Computer Studies*, 64, 53–78.

Taipjutorus, W., Hansen, S., & Brown, M. (2012). Investigating a Relationship between Learner Control and Self-Efficacy in an Online Learning Environment. *Journal of Open, Flexible and Distance Learning*, 16(1), 56–69.

Tan, P. J. B. (2019). An Empirical Study of How the Learning Attitudes of College Students toward English E-Tutoring Websites Affect Site Sustainability. *Sustainability (Switzerland)*, 11(6), 1748.

Tarhini, A., Hone, K. & Liu, X. (2013). Extending the TAM model to empirically investigate the students' behavioural intention to use e-learning in developing countries. in Science and Information Conference (SAI). IEEE, 732–737.

Tarhini, A., Hone, K., & Liu, X. (2014). Measuring the Moderating Effect of Gender and Age on E-Learning Acceptance in England: A Structural Equation Modeling Approach for an Extended Technology Acceptance Model. *Journal of Educational Computing Research*, 51(2), 163–184.

Taylor, S., & Todd, P. A. (1995). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research*, 6(2), 144–176.

Teo, T., Wong, S. L. & Chai, C. S. (2008). A Cross-cultural Examination of the Intention to Use Technology between Singaporean and Malaysian pre-service Teachers: An Application of the Technology Acceptance Model (TAM).

Educational Technology & Society, 11(4), 265–280.

Trombley, B. K., & Lee, Y. (2002). Web-Based Learning in Corporations: Who is Using it and Why, Who Is Not And Why Not?. *Journal of Educational Media*, 27(3), 137–146.

Venkatesh, V., & Davis, F. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, 46(2), 186–204.

Wang, Y. (2004). Supporting Synchronous Distance Language Learning With Desktop Videoconferencing. *Learning & Technology*, 8(3), 90–122.

Wang, Y., Dong, C., & Zhang, X. (2020). Improving MOOC learning performance in China: An analysis of factors from the TAM and TPB. Computer Applications in Engineering Education, 28, 1421–1433. https://doi.org/10.1002/cae.22310

Wang, Y. S., & Liao, Y. W. (2008). Assessing E-Government Systems Success: A Success., Validation of the Delone and Mclean Model of Information Systems Government. *Information Quarterly*, 25(4), 717–733.

Wolf, P. D. (2006). Best Practices in the Training of Faculty to Teach Online. *Journal of Computing in Higher Education*, 17(2), 47–78.

Wong, K. K. K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin*, 24(1), 1–32.