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Factors Affecting the Students' Actual Use Behaviour of Virtual Learning Environments (VLEs) during the Movement Control Order (MCO)

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Abstract: The Malaysian university students faced various obstacles and had unmet needs when it is no longer an option to carry out virtual learning during the COVID-19 pandemic. These challenges faced by students call into question their actual use behaviour and true acceptance of the virtual learning environment (VLE). Thus, this study investigated the students' actual use behaviour of VLEs, the factors that influence the actual use behaviour, the moderating effect of network connectivity on this relationship, and challenges faced by students while using this technology. The Technology Acceptance Model (TAM) and the Unified Theory Acceptance and Use of Technology 2 (UTAUT2) model were used as the theoretical basis of this study. An online survey was conducted among the International Medical University (IMU) students. The finding surmised that most of the students have adopted the VLE during the pandemic. The findings further revealed that factors such as hedonic motivation, perceived usefulness and perceived ease of use positively affect actual use behaviour, while network connectivity has no significant moderating effect on the relationship between the dimensions of the VLE and actual use behaviour. The key challenges include high cost associated with the VLE usage, and the students find the VLE is not entertaining or enjoyable. These results indicate that students will be inclined to accept the technology if there is high hedonic motivation, perceived usefulness, and perceived ease of use. Universities should focus on enhancing these factors to increase the acceptance of this technology among students, as VLEs have untapped potential for distance learning.

Index Terms: Virtual learning environments, actual use behaviour, network connectivity, COVID-19, technology acceptance.

1. Introduction

Virtual learning and virtual learning environments (VLEs) are closely related terms. Racheva defined virtual learning as "distance learning conducted in a VLE with electronic study content designed for self-paced (asynchronous) or live web-conferencing (synchronous) online teaching and tutoring" [1]. From this, it can be understood that virtual learning is a type of learning that has married the use of electronic devices, like computers and tablets, with the internet and it can occur both outside and within an educational institution's premises at any time. VLEs are online platforms that host and facilitate virtual learning activities with no location and time limitations, as well as provide digital solutions to enrich the teaching and learning experiences [2]. With the use of a VLE, teaching and learning become more meaningful and holistic

as it provides a platform for interaction, collaboration, and sharing of ideas between peers, as well as facilitating interactions between teachers and students.

In addition to that, a VLE augments in-class processes through features like quizzes, polls, breakout rooms, and other forms of communication technology to create a safe space for interactive active learning. Furthermore, it also assists educators in the creation, planning, storing, and distribution of good quality content that meet the learning needs of their students [1]. VLEs can range from simple classroom discussions to state-of-the-art immersive simulation games. Some of the advantages of VLEs include an access to an endless line-up of academic-related services supplied globally, customised learning processes, a safe space to learn, flexibility in terms of time, location, and space, economical, and time saving. In view of that, many universities include VLEs in their learning management systems (LMS).

During the COVID-19 pandemic, school closures involved every educational stage; from kindergartens right up to higher learning institutions [3]. Determined to maintain the continuum of educational services, teaching and learning activities transcended traditional brick-and-mortar classrooms into VLEs. To minimise disruption to the learning process, VLEs became the main mode of education. Moreover, curriculums had to be converted to become more VLE-friendly almost overnight, with faculty and support staff working at breakneck speed to seamlessly make the transition from physical classrooms to ones in the virtual realm. Looking at the glass half full, this pandemic has opened up a world of possibilities for virtual learning, and the use of educational technologies to transform the academic process, support sustainable instruction, and provide learners globally with a medium of instruction during remote learning [4, 5]. Moving education online can give teachers and students the ability to carry out academic activities at any convenient place and time, but the anticipated speed of this transition is unparalleled and startling. In fact, the necessity to employ technology for instructional objectives in pandemic education is unavoidable and the current literature has addressed this issue [4, 6-11]. During the initial days of the pandemic, faculties in affected countries focused on transitioning the academic contents to better fit an online ecosystem [8]. Unfortunately, this uncovered the glaring impact of underfunded learning institutions and socially disadvantaged students, namely those who do not have optimal access to essential technologies and the internet.

This struggle was also seen in Malaysia. Datuk Paramjit Singh, the President of the Malaysian Association of Private Colleges and Universities (MAPCU) highlighted that higher education institutions experienced obstacles, particularly in the early phases, because of the restricted access to decent quality internet bandwidth, particularly for students in rural regions or internet dead zones [12]. He also added that students who moved back to their home countries had to grapple with different time zones to attend classes based on Malaysian timing, and educators had different levels of capability to effectively deliver lessons online. Simply put, network connectivity, flexible timing and scheduling, and effectiveness were the major obstacles for effective virtual learning to take place. Similarly, an article in The Star newspaper highlighted the plight of Veveonah Mosibin, a student who had to climb and stay overnight atop a langsat tree in her rural Sabah home to obtain adequate network connection to prepare for her upcoming exams [13]. This highlights the issue of network connectivity and it was very obvious that a digital divide existed in our country, as well as the unequal distribution of infrastructure to support the access to online learning tools.

From this, it was apparent that student populations faced various obstacles and had unmet needs when forced to carry out virtual learning via a VLE, which was no longer an option but a necessity. While the usage of VLE technology for learning brings benefits for the users, its implementation or execution leads to various challenges. These challenges faced by students call into question their actual use behaviour and true acceptance of the VLE technology. In addition to that, administration and maintenance of a VLE system can be time consuming, expensive, and not fun, given the forced nature of its implementation. Moreover, the Malaysian government has acted swiftly to facilitate studying from home ever since the outbreak began. In specific, the Malaysian Ministry of Education has been looking for various education continuation strategies and one of them is virtual learning. However, the challenges involved in deploying technologies like virtual learning and intelligent tutoring are not fully understood and addressed, although they show enormous promise and become a quick substitute for the traditional classroom learning. Likewise, there is no much data available to evaluate how effective VLEs are. Therefore, gaining insight into students' actual use behaviour is necessary to plan for future direction with regards to the incorporation of VLEs for academic purposes.

In order to fill these gaps, this study proposed the following objectives: (1) to explore the actual use behaviour of VLEs of students; (2) to investigate the relationship between the dimensions of VLEs and actual use behaviour of students; (3) to investigate the moderating effect of network connectivity on the relationship between the dimensions of

VLEs and actual use behaviour of students; and (4) to highlight the challenges experienced by students that impeded learning via VLEs.

This study is expected to provide a meaningful approach to students' perceptions of the VLE technology, and their actual use behaviour relating to the technology. From a theoretical standpoint, this study will contribute to the existing literature on acceptance and actual use of a technology by proposing a hybrid model that utilises concepts from two models [i.e., Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)] to predict students' acceptance and actual use of VLEs. From a practical standpoint, this study will allow higher educational institutions to zoom in on the key features of virtual learning, which are also the dimensions of the VLEs, that will influence the virtual learning acceptance among students to form useful perspectives. By optimising on the variables with the higher impact towards students' use behaviour, faculties can strategically utilise VLEs to the maximum potential. Moreover, by improving on the features that fall short of expectations, faculties can fix the shortcomings to give students a better user experience. This study will create new insights on how to cater to the unique needs of student communities. This may lead to virtual learning being incorporated more in future curricula, which can appeal to not only a wider audience beyond country borders, but a more technologically savvy younger generation.

2. Literature Review

2.1. The Technology Acceptance Model (TAM)

TAM was developed by Fred D. Davis in 1989 [14]. It is one of the most prominent models used to explain the acceptance of technology and users' intention to use upcoming technologies, using two key constructs, namely perceived usefulness and perceived ease of use. According to the TAM, a user is more likely to develop intentions to use a particular technology, and later adopts and actually uses it, depending on the perception of the user regarding the technology's usefulness (i.e., productivity) and ease of use (i.e., 'easiness' or free of effort). This model has served as a theoretical foundation for many studies across various fields like online banking [15], healthcare [16], information and communications technology (ICT) [17, 18], and education [19-22]. In later years, the TAM has been used as a launching pad to develop newer theories, like the Unified Theory of Acceptance and Use of Technology (UTAUT) and UTAUT2, while also being expanded into TAM2 and TAM3.

2.2. The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

Venkatesh et al. [23] developed the UTAUT model. The model combined 8 models stemming from psychology and sociology to explain the acceptance and use of information technology by the users, one of which was the TAM developed by Davis [11]. The UTAUT model consisted of four main constructs, namely performance expectancy, effort expectancy, social influence, and facilitating conditions [24]. In the model, Venkatesh et al. [23] posited that performance expectancy, effort expectancy, and social influence directly affect the users' behavioural intention to use a technology, while facilitating conditions and behavioural intention have the ability to influence the actual use behaviour of the technology.

However, the UTAUT model sublimated key variables and events associated to the prediction of users' intention and use of technology that seem more suitable for organisational settings. Hence, Venkatesh et al. [24] extended the UTAUT to predict technology use and acceptance in the settings of consumerism, producing the UTAUT2 model. In the UTAUT2 model, three new variables were added, namely hedonic motivation, price value, and habit. Another change that was made to the UTAUT2 model in order to fit the context of consumer technology use, was the new inclusion of a direct relationship between facilitating conditions and behavioural intention [24]. In the literature on consumer acceptance and use of information technology, UTAUT2 has been utilised vastly in several contexts. Also included is a collection of studies in the educational settings in which UTAUT2 offered a sound theoretical foundation for a number of empirical investigations [25-29].

2.3. Conceptual Framework

Due to the robustness and well-established nature of both models, the TAM and UTAUT2 have been selected as the theoretical foundation of this study, to predict and explain the students' acceptance of the VLE technology to carry out virtual learning. Drawing a parallel from the UTAUT2, this study extended the model by leveraging a new context, and by introducing three new constructs, one of which will act as a moderator. Content quality and perceived schedule flexibility were introduced as two new dimensions of VLEs, and network connectivity was proposed as an important moderator of the relationship between dimensions of VLEs and actual use behaviour of students. UTAUT2 was initially created in the context of consumerism [24], and this study did not veer off the consumerism tangent. The consumerism in relation to the education sector was explored, which is evident through the students' behaviours and expectations regarding the VLEs.

According to the literature and to the best of this study's knowledge, no research has yet examined the unified impact of subject content quality and perceived schedule flexibility as an extension of the UTAUT2 model with the network connectivity acting as a moderator. Therefore, this study aimed at filling this research gap by integrating these constructs and the conceptual framework of this study is shown in Fig. 1.

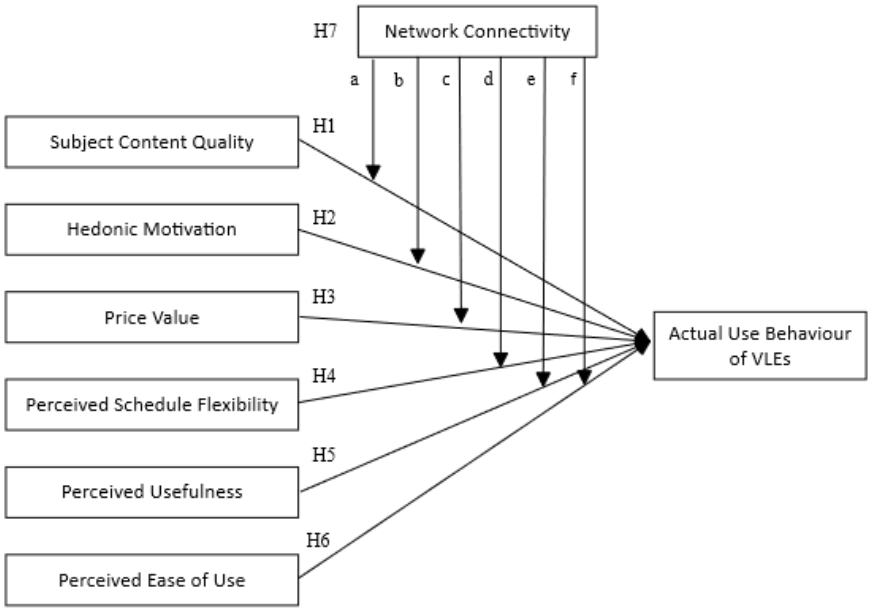

Fig. 1. Conceptual Framework

2.4. Development of Research Hypotheses

A. Factors Affecting the Actual Use Behaviour of VLEs

Prior to the pandemic, the experts were convinced that online learning will be the best alternative education mode due to its special and critical characteristics that it possesses. However, while the creator may belief in the technology's abilities and potential, true acceptance and adoption of a technology depend on users' beliefs, attitudes, perceptions and intentions [30]. The creator of the technology may whole-heartedly believe in the abilities and qualities of the products, but it will not be accepted by users unless the same beliefs of the technology are shared.

Hence, to answer the second research objective, this study proposed several factors that may influence university students' actual use behaviour of VLEs. These factors were derived from an extensive review of existing literature, including literature related to the TAM and the UTAUT2, both of which are well-established models in the prediction of technology acceptance. These factors include subject content quality, hedonic motivation, and price value, perceived schedule flexibility, perceived usefulness, and perceived ease of use. The strength of each individual relationship will enlighten on the most influential factors that determine the actual use behaviour of VLEs, and possibly be the key to optimising VLEs to meet the demands of student communities.

Delving into the discussion about the variables, an individual's assessment of the system's performance in supplying information based on his or her experience is referred to as the perceived information quality [31, 32]. Current literature on information quality, while rich and extensive, has mainly revolved around the definition and criteria. Jiang et al. [33] stated that consumers' information adoption is determined by information quality. Despite this evidence, due diligence has not been given to how information quality affects users' intention to adopt the technology that delivers the said information. For many, the purpose of learning is to gain meaningful information to appease an information hunger, while the purpose of an educational technology, like a VLE, is to facilitate the diffusion of this information to the learner.

According to Gu et al. [34], low-quality information raises the costs of looking for and processing information, whereas high-quality information enhances users' individual advantages by meeting their information need. Moreover, learners will regard an educational technology to be helpful and beneficial if they believe it can deliver robust, relevant, and recent course content that meets their specific needs [35]. In addition, high quality content can boost user loyalty by amplifying member satisfaction [36]. Therefore, it is reasonable to believe that receiving high quality information will enhance the perceived usefulness of a VLE, improve satisfaction of users with the technology, improve loyalty to the technology, and influence the actual use behaviour with regards to the usage of a VLE. Hence, it is posited that:

H1: Good subject content quality positively influences actual use behaviour of VLEs.

Venkatesh et al. [24] defined hedonic motivation as the "fun or pleasure derived from using a technology", and demonstrated its fundamental role in influencing new technology acceptance in the context of consumerism. From then on, hedonic motivation has been commonly cited in literature as a potent predictor of technology acceptance and adoption by its users. Studies in the areas of education [29], artificial intelligence [37], omnichannel retail [38], and luxury-brand retail [39] have demonstrated that hedonic motivation plays an essential role in determining behavioural

intention to continue using a new technology. In this study, hedonic motivation is proposed as a predictor of actual use behaviour because when new users begin exploring and utilising a new technology (i.e., VLE), they will focus on the innate novelty of the technology, and may even continue the usage of the technology because of the unusualness. Hence, the following is hypothesised:

H2: Hedonic motivation positively influences actual use behaviour of VLEs.

Dodds et al. [40] defined price value as consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost. Given that the cost of a technology is often internalised together with the quality of the technology in determining the value of the product cognitively, the price or cost associated with the technology may have a significant influence on the users' perception of the technology's quality [41]. Similarly, the costs associated with the use of a VLE will be taken into consideration by the consumer in combination with its perceived benefits when deducing the worth of the VLE technology, and may influence the users' continued usage of the VLE technology. The effects of price value on users' adoption of technology in medical education [26], tourism [42], and alternative energy [43] showed that intention to use was significantly affected by the price value. Hence, it is inferred in this study that price value would also significantly influence the actual use behaviour, and the following hypothesis is proposed:

H3: Price value positively influences actual use behaviour of VLEs.

According to Lauver et al. [44], "flexibility" is a multi-faceted concept that includes many aspects such as subject scheduling, the ability to balance family, work, and school, the freedom to select when and where to study, and the freedom to have time for other activities like sports. Kamal et al. [45] explained that online learning allows students to carry out academic activities based on when and where they choose, potentially lowering the cost of distant education while also addressing students located in rural and remote locations. Looking at the findings of Kim et al. [46], over 60% of MBA students taking classes online felt that flexibility was important to them. Similarly, Britt [47] revealed that 81% of undergraduate and postgraduate students identified flexibility as a key advantage of online classes and the inherent quality of flexibility offered by a VLE may be an important determinant of subsequent acceptance and adoption by students. Hence, it is proposed that:

H4: Perceived schedule flexibility positively influences actual use behaviour of VLEs.

According to Davis [14], perceived usefulness refers to the degree to which a person believes that using a particular system would improve his or her ability to accomplish a job. The concept behind this construct is that users will be persuaded to adopt a technology mainly due to its ability to perform a desired function and to fulfil the users' end goal effectively. Many researchers have established and proven the relationship between perceived usefulness and use behaviour. For example, in mobile banking context, Mangin et al. [15] found that the effect of perceived utility (i.e., perceived usefulness) towards attitude of users was significant, while Park and del Pobil [17] found similar results with regards to tablet PC utilisation. Furthermore, in the context of education, Briz-Ponce and Garc á-Pe ñalvo [19] found that perceived usefulness influenced attitude towards using mobile applications in medical academics, which in turn affected behavioural intention. In view of this, it is inferred that perceived usefulness would be a strong determinant of the acceptance and adoption of a VLE by students if the VLE technology is able to carry out its required function to optimally fulfil the users' productivity goals. Hence, it is hypothesised that:

H5: Perceived usefulness positively influences actual use behaviour of VLEs.

According to Davis [14], perceived ease of use is the degree to which an individual believes that using an information technology will be free of effort. The concept behind this construct is that a user would cognitively decide a technology is easy to use if it requires him to expend minimal effort to utilise the technology to his benefit, and that he would regularly choose it over another technology that is significantly difficult to operate. Perceived ease of use has also been regularly cited in literature as an influential factor in determining technology acceptance and its long-term adoption by users. Studies from various contexts such as self-service technology in airports [48], library technology [49], mobile hotel booking [50], and construction [51] found that perceived ease of use significantly influenced intention to use. In line with these studies, it is inferred that perceived ease of use of the VLE technology relative to other technologies with similar functions may increase the likelihood of a VLE being adopted by its users and continuously chosen over the other technologies. Hence, it is posited that:

H6: Perceived ease of use positively influences actual use behaviour of VLEs.

B. The Moderating Effects of Network Connectivity

As for the third research objective, this study proposed network connectivity as an important moderator of the relationship between dimensions of VLEs and actual use behaviour of students. Network connectivity is referred to the extensive process of connecting different network components to one another through the use of routers, switches, and gateways [52]. The internet is the bridge that enables key VLE functions like real-time interaction, organisation, and access to academic resources, curriculum mapping, and more. The effects of inadequate network connectivity can result in disrupted interaction and class dynamics, inability to access study materials, inability to attend class activities, and delays in task submission [45, 53, 54]. While the literature on the effects of inadequate network connectivity has been

rich, comprehensive, and persuasive, the concept of inadequate network connectivity as a moderator in education technology use and acceptance has yet to be explored sufficiently. Hence, it is hypothesised in this study that:

H7a: Network connectivity moderates the relationship between good subject content quality and actual use behaviour of VLEs.
H7b: Network connectivity moderates the relationship between hedonic motivation and actual use behaviour of VLEs.
H7c: Network connectivity moderates the relationship between price value and actual use behaviour of VLEs.
H7d: Network connectivity moderates the relationship between perceived schedule flexibility and actual use behaviour of VLEs.
H7e: Network connectivity moderates the relationship between perceived usefulness and actual use behaviour of VLEs.
H7f: Network connectivity moderates the relationship between perceived ease of use and actual use behaviour of VLEs.

3. Methodology

3.1. Data Collection and Analysis

An online survey was administered among 121 students at the Bukit Jalil Campus, International Medical University (IMU), Malaysia. Given that the students in this university were already divided based on programmes, stratified random sampling technique was chosen to enable each subgroup to be adequately represented in the sample so that a more precise and meaningful conclusion can be drawn. The inclusion criterion of this study was students must have experienced the VLE usage for academic purposes. To answer this online survey, an invitation via email was sent to all these students using the IMU Outlook email system. This method of distribution was chosen as all students have a verifiable school-issued email address. A link to the survey was embedded in the email and answers provided were automatically recorded and saved into the cloud. This data collection method was decided due to the safety and health measures, and it also provided the highest level of convenience for the respondents to answer according to their own pace.

Table 1. Demographic Profile of Respondents

Category	Frequency	Percentage (%)
Gender		
Male	36	29.8
Female	85	70.2
Age Group		
16 to 20	66	54.5
21 to 25	41	33.9
26 to 30	5	4.1
31 to 40	9	7.4
Education		
Undergraduate	108	89.3
Postgraduate	13	10.7
Employment		
Full-time student	106	87.6
Employed for wages	12	9.9
Self-employed	2	1.7
Looking for a job	1	0.8
State of Residence		
Johor	5	4.1
Kedah	1	0.8
Kelantan	1	0.8
Malacca	3	2.5
Negeri Sembilan	6	5.0
Pahang	2	1.7
Penang	10	8.3
Perak	7	5.8
Sabah	1	0.8
Selangor	42	34.7
Kuala Lumpur	32	26.4
Overseas	11	9.1

Data was analysed using the IBM SPSS Statistics for Windows, version 25.0. Data analysis was conducted in two phases. The first phase was the preliminary data analysis in which the raw data was converted into researchable data by screening for missing values, suspicious response patterns and outliers. Then, the descriptive analysis was performed to study the demographic profile of the respondents and the study variables. This was followed by the validity and reliability tests. In the second phase, primary data analysis was performed to answer the research objectives. Descriptive

statistics were used to identify the actual use behaviour of VLEs and challenges experienced by students (i.e., research objectives 1 and 4). Multiple regression analysis was used to test the causal relationships between the dimensions of VLEs and actual use behaviour of students (i.e., research objective 2) and this was followed by multiple regression analysis with interaction terms to test the moderating effect of network connectivity on the relationship between dimensions of VLEs and actual use behaviour of students (i.e., research objective 3).

The demographic profile of the respondents is shown is Table 1. 29.8% were male respondents (n = 36) and 70.2% were female respondents (n = 85). Nearly half of the respondents were between the ages of 16 to 20 (n = 66, 54.5%). Undergraduate programs made up the bulk of the respondents (n = 108, 89.3%), while postgraduate students made up 10.7% (n = 13) of the respondents. 87.6% of the respondents were full-time students (n = 106), 9.9% of the respondents were employed for wages (n = 12), 1.7% of respondents were self-employed (n = 2) and 1 respondent was looking for a job (0.8%). During the first movement control order (MCO), most of the respondents resided in the states of Selangor (n = 42, 34.7%), Kuala Lumpur (n = 32, 26.4%), and Penang (n = 10, 8.3%), while a substantial number of students resided overseas (n = 11, 9.1%).

3.2. Measurement Scale Development

The online survey consisted of three sections: (1) demographic information; (2) digital access information; and (3) extended UTAUT2 constructs. In addition to items requesting demographic information as stated in Table 1, the digital access section was aimed at collecting information regarding network connection, VLE utilisation during the MCO, frequency of the usage of a VLE, perceived digital literacy skills, and first experience with virtual learning. The extended UTAUT2 constructs include subject content quality (7 items), hedonic motivation (3 items), price value (3 items), perceived schedule flexibility (7 items), perceived usefulness (3 items), perceived ease of use (4 items), network connection (3 items), and actual use behaviour (4 items). The items used for this section were adopted and adapted from various studies, as shown in Table 3. All constructs were measured using a 6-point Likert scale, anchored from 1 (strongly disagree) to 6 (strongly agree).

4. Findings

4.1. Digital Access Characteristics of Respondents

Table 2 describes the digital access characteristics of the respondents during the first MCO. From this table, it can be seen that a large majority of students reported having adequate network connectivity (n = 104, 86%), while only 14% (n = 17) reported experiencing inadequate network connectivity. Also, a majority of students (n = 107, 88.4%) utilised a VLE for learning activities. A majority of the respondents reported using a VLE nearly every day (n = 47, 38.8%), while 26.4% (n = 32) reported using a VLE multiple times a day. Cumulatively, that means that 65.2% (n = 79) of respondents used a VLE at least once a day. A majority of the respondents perceived themselves having good digital literacy skills (n = 48, 39.7%), and cumulatively, 95.1% (n = 115) of students felt they had at least adequate digital literacy skills. For many students (n = 75, 62.0%), using a VLE for academic purposes during the first MCO was a first-time experience, while 38.0% (n = 46) reported that this was not their first time utilising a VLE. Overall, the findings revealed that most of the students displayed a higher level of use frequency and had adopted the VLEs during the pandemic.

Table 2. Digital Access Characteristics of Respondents

Variables	Frequency	Percentage (%)
Adequate Network Connectivity		
Yes	104	86.0
No	17	14.0
VLE Utilisation during MCO		
Yes	107	88.4
No	14	11.6
Frequency of VLE Use		
1-2 times/week	16	13.2
3-5 times/week	26	21.5
Nearly every day	47	38.8
Multiple times a day	32	26.4
Perceived Digital Literacy Skills		
Excellent	11	9.1
Very good	26	21.5
Good	48	39.7
Adequate	30	24.8
Limited	4	3.3
Poor	1	0.8
Not sure	1	0.8
First Experience of a VLE		
Yes	75	62.0
No	46	38.0

4.2. Validity and Reliability

The data collected were first subjected to Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity to test the scale's structure validity (refer Table 3). The KMO measure yielded a value of more than 0.6 with a significant Bartlett's test ($p < 0.001$) for each construct. Four items (PSF2, PSF4, PEU1 and AUB4) were removed during this process due to relatively low factor loadings (< 0.6). All values of Cronbach's alpha for all constructs ranged from 0.783 to 0.943, greater than the requirement of 0.7, indicating that the measurement for all constructs had good internal consistency reliability.

4.3. Descriptive Statistics of Study Variables

Table 3 summarises the mean score ($\bar{X}$) of the study variables. Price value ($\bar{X}$ = 3.43) and hedonic motivation ($\bar{X}$ = 3.48) reported a mean score below the average, when compared to other variables which were subject content quality ($\bar{X}$ = 4.48), perceived schedule flexibility ($\bar{X}$ = 4.23), perceived usefulness ($\bar{X}$ = 3.94), perceived ease of use ($\bar{X}$ = 4.64), network connection ($\bar{X}$ = 4.25), and actual use behaviour ($\bar{X}$ = 4.45). This revealed that price value and hedonic motivation are the major challenges experienced by the students in adopting the VLEs. To understand why these two factors reported a low mean score, this study further analysed the items of the variables. For price value, about two-thirds of the respondents (70.2%) felt that the VLE usage was not good value for money, half of the respondents (54%) felt that a VLE is expensive, and one-fourth of the respondents (25.1%) felt financially burdened with the use of VLE. For hedonic motivation, about 41.3% of the respondents described that the VLE usage as not being fun, while nearly half of the respondents (47.1%) did not find the VLE usage entertaining, and about 39.7% of the respondents reported that using virtual learning for studies was not enjoyable.

4.4. Multiple Regression

Multicollinearity was tested before the multiple regression analysis. According to Armitage et al. [55], multicollinearity occurs when the independent variables are too highly correlated with each other. All constructs did not exhibit multicollinearity as all Variance Inflation Factor (VIF) values were less than 5, and tolerance values exceeded 0.20, as suggested by Hair et al. [56].

Multiple regression analysis was then performed to determine the effects of the predictor constructs (UTAUT2 variables) on the actual use behaviour of VLEs. Table 4 summarises the goodness of fit of the multiple regression model, which informs on the predictive capability of the model. The R2 value of 0.501 revealed that the UTAUT2 constructs (predictor variables) accounted for approximately 50.1% of the variance in actual use behaviour of VLEs (dependent variable). Moreover, the F-value was significant (F = 19.103, p = 0.001), indicating that there was a high probability that there would be at least one or more significant regression coefficients. Table 5 exhibits the results of the multiple regression analysis. 3 out of 6 hypotheses were supported (i.e., H2, H5 and H6) with hedonic motivation (HM) had the strongest effect on actual use behaviour (AUB) ($ß$ = 0.274), followed by perceived usefulness (PU) ($ß$ = 0.233), and perceived ease of use (PEU) ($ß$ = 0.197). H1, H3, and H4 did not meet the minimum requirement of statistical significance ($p < 0.05$) and thus, they were not supported.

Table 3. The Test of the Scale

Construct	Code	Item	Adapted from	Mean	SD	KMO	α
Subject Content Quality (SCQ)	SC1	The information received in virtual classes/sessions sufficiently completed my learning needs.	[57]	4.48	0.76	0.832**	0.893
	SC2	The information from virtual classes/sessions included all necessary values about my learning.					
	SC3	The information from virtual classes/sessions had sufficient breadth and depth.					
	SC4	The information from virtual classes/sessions was applicable for my learning.					
	SC5	Virtual classes/sessions provided me with the most recent information.					
	SC6	Virtual classes/sessions provided me with the most current information.					
	SC7	The information received from virtual classes/sessions was up to date.					
Hedonic Motivation (HM)	HM1	Using virtual learning for my studies was fun.	[24]	3.48	1.24	0.764**	0.943
	HM2	Using virtual learning for my studies was enjoyable.					
	HM3	Using virtual learning for my studies was entertaining.					
Price Value (PV)	PV1	I believe that using a virtual learning environment (VLE) during the MCO delivered good value for money	[24] [58]	3.43	1.20	0.642**	0.794
	PV2	I believe that utilising a virtual learning environment (VLE) during the MCO was not expensive for me					
	PV3	Using a virtual learning environment (VLE) for my studies was not a financial burden for me.					

Perceived Schedule Flexibility (PSF)	PSF1	Virtual learning involved less work and time commitment for me than a regular class.	[59]	4.23	1.13	0.846**	0.885
	PSF2*	I could do virtual learning anytime while traveling.	[60]				
	PSF3	I believe virtual learning was compatible with my daily routine tasks.					
	PSF4*	Using a virtual learning environment (VLE) for studies was convenient because I could use it anytime.					
	PSF5	I like virtual learning because of flexibility of classes.	[44]				
	PSF6	I believe time required was lower for virtual learning.					
	PSF7	Virtual learning is convenient and allows me to meet the demands of my work and family schedule.	[61]				
Perceived Usefulness (PU)	PU1	I found the virtual learning environment useful for learning.	[24]	3.94	1.21	0.726**	0.880
	PU2	Virtual learning enabled me to accomplish tasks more quickly.					
	PU3	Using virtual learning environments for learning increased my productivity.					
Perceived Ease of Use (PEU)	PEU1*	My communications with the lecturers and other students while using a VLE were clear and understandable.	[24]	4.64	0.88	0.685**	0.868
	PEU2	It was easy for me to become skilful at using a VLE.					
	PEU3	Learning to operate the VLE was easy for me.					
	PEU4	I found the VLE easy to use.					
Network Connection (NC)	NC1	I think that my internet network provider had very reliable service.	[58]	4.25	1.15	0.731**	0.911
	NC2	I think that the speed of my internet was fast.					
	NC3	I think that my network connection was secure to use.					
Actual Use Behaviour (AUB)	AUB1	I regularly use a Virtual Learning Environment (VLE) in my studies.	[29]	4.45	0.93	0.697**	0.783
	AUB2	Virtual Learning Environment (VLE) usage is a pleasant experience.					
	AUB3	I currently use a Virtual Learning Environment (VLE) as a supporting tool in my studies.					
	AUB4 *	I spend a lot of time with Virtual Learning Environment (VLE) use in my studies.					

Note: * These items and scale have been excluded from further analyses due to low factor loadings (0.6)
** $p<0.001$

Table 4. Goodness of Fit of the Multiple Regression Model

R value	R^2 value	Adjusted R^2	F-value	Sig.
0.708	0.501	0.475	19.103	0.001

Table 5. Hypothesis Testing of the Effects of the UTAUT2 Constructs on the Actual Use Behaviour of VLEs

Hypothesis	Path	Standardised Coefficients (ß)	Sig.	Decision
H1	SCQ → AUB	0.111	0.227	Not Supported
H2	HM → AUB	0.274	0.010	Supported
H3	PV → AUB	0.047	0.554	Not Supported
H4	PSF → AUB	0.053	0.547	Not Supported
H5	PU → AUB	0.233	0.045	Supported
H6	PEU → AUB	0.197	0.012	Supported

4.5. Moderating Effect of Network Connectivity

This study had performed the multiple regression analysis with interaction terms to test the moderating effect of network connectivity on the relationship between UTAUT2 constructs and actual use behaviour of VLEs. According to Awang [62], if one fails to prove that the interaction term is statistically significant, then it can be concluded that there is no moderation effect in the X-Y relationship. Table 6 provides the summary of the moderation analysis. The findings revealed that all interaction terms were not statistically significant ($p > 0.05$). Thus, it can be concluded that network connectivity did not moderate the relationships between the UTAUT2 variables and actual use behaviour of VLEs. Hence, H7a, H7b, H7c, H7d, H7e, and H7f were not supported.

Table 6. The Results of Testing the Moderating Effect of Network Connectivity

Hypothesis	Path	Sig.	Decision
H7a	SCQ x NC → AUB	0.500	Not supported
H7b	HM x NC → AUB	0.714	Not supported
H7c	PV x NC → AUB	0.802	Not supported
H7d	PSF x NC → AUB	0.695	Not supported
H7e	PU x NC → AUB	0.143	Not supported
H7f	PEU x NC → AUB	0.744	Not supported

5. Discussion

The first research objective of this study was to capture the students' actual use behaviour of VLEs. The finding surmised that majority of the students have adopted the VLEs during the pandemic. According to the World Economic Forum, there was already substantial growth and adoption in education technology before COVID-19 with global educational technology (edtech) investments exceeding USD 18.66 billion in 2019 [63]. It is also estimated that the whole market for online education to reach USD 350 billion by 2025. This indicates that there will be a significant surge in the usage of edtech and that VLEs will eventually become an integral component of higher education. In the same vein, Kamal et al. [45] found an increased positivity among students to embrace online learning in the STEM-related subjects. With students' adoption of this technology, as found by this study, future implementation of this technology into curricula by universities would be a good investment. The future widespread use of VLEs may reduce traffic in campuses, encourage social distancing, increase class sizes, open classes and courses to include remote learners, reduce the required teaching force, and increase innovativeness to enhance teaching and learning activities. The rigid nature of higher education can potentially be made to be more inclusive and decentralised from actual buildings.

As for the second research objective, the majority of explanatory power for the actual use behaviour came from hedonic motivation, followed by perceived usefulness and perceived ease of use. This finding is consistent with Venkatesh et al. [24], who stated that hedonic motivation, perceived usefulness, and perceived ease of use are important determinants of behavioural intention to use a technology. This indicates that refinement of a VLE usage focusing on these three qualities will improve the user experience, leading to better utilisation rates and inclination towards the technology. Not only that, increased likability and novelty of the VLE technology may even prompt users to incorporate its usage into their daily lives, beyond the scope of academic activities. With that in mind, instructors are encouraged to wisely choose and use available resources of VLEs that best facilitate effective course activities and support instructional objectives.

On the other hand, subject content quality, price value and perceived schedule flexibility remained insignificant. Since a huge majority of respondents had adequate network connectivity, they may have not experienced significant internet-related troubles like lagging and poor audio-visual quality, that would have hindered the comprehension of subject materials and classroom discussions [45, 53, 54]. Hence, it is possible that quality of modules and subjects serves no effect on students' subconscious decision to adopt VLEs. Subsequently, the VLE usage was not as cost-friendly to the students as initially thought, resulting in the lackluster response towards the VLE acceptance and adoption. A high cost in exchange for the VLE usage may detract students from adopting and accepting the VLE. Next, the insignificant result between perceived schedule flexibility and the actual use behaviour of VLEs could possibly be due to the student population of the study not needing to balance social, occupational, family, and academic obligations simultaneously.

The finding related to the third research objective revealed that network connectivity had no significant moderating effect on the relationship between the dimensions of the VLEs and actual use behaviour. This finding is inconsistent with Azlan et al. [64], who brought into focus the importance of having an optimum network connection, especially during synchronous mode whereby the effectiveness of teaching and learning activities rely heavily on strong network connections. This suggests that anything less than stellar may disrupt live sessions, affecting quality of course content delivery. Moreover, spotty network connectivity may disrupt precious interactions between classmates and lecturers, resulting in less enjoyable learning sessions and would exacerbate feelings of isolation during a pandemic such as COVID-19. Similarly, Kamal et al. [45] also mentioned that a technical issue like internet connection is one of the reasons for students being absent from online classes and completing online activities and assessments. However, this study reported that network connectivity has no significant moderating effect probably due to the reason that a huge majority of respondents (86%) already had an adequate network connectivity.

The last research objective focused on the challenges experienced by students that impeded learning via VLEs. These findings were obtained from the mean score of the study variables. One of the challenges was the price value or better described as the monetary cost associated with the use of VLEs during the pandemic. Delving into the individual items of the variable that contributed to a low mean score, a majority of respondents (70.2%) felt that the VLE usage was not good value for money, half of the respondents (54%) felt that a VLE is expensive, and one-fourth of the respondents (25.1%) felt that they were financially burdened with the use of a VLE. Exorbitant monetary cost associated with the VLE usage is an education accessibility issue. Therefore, for a VLE to become more likable by users and to make education more accessible to students, universities, network providers, and technology companies should work together to create student-friendly data packages, subsidised digital devices, monthly repayment schemes, and support funds. Another challenge facing the student was hedonic motivation, the 'fun' factor that determines the acceptance of the technology. Individual items reported that about 41.3% of the respondents described that the VLE usage as not being fun, while nearly half of the respondents (47.1%) did not find the VLE usage entertaining, and about 39.7% of the respondents reported that using virtual learning for studies was not enjoyable. To ensure the continuous use of a VLE, instructors have to find ways to make learning through a VLE an enjoyable experience for students,

possibly through the use of eye-catching graphics, an increased engagement via breakout groups and interactive activities, and by switching up between synchronous and asynchronous modes.

6. Limitations of the Study

This study was conducted in International Medical University (IMU), which is a private healthcare university with predominantly healthcare-related courses and programmes. When assessing the applicability of the study results and generalising to other universities such as public and private universities with a wide variety of courses ranging from the mathematical sciences to arts and business, the results may not be suitable. Moreover, due to the nature of healthcare programmes that require heavy hands-on skills practice, using a VLE as a substitute for these hands-on sessions may have skewed preferences for the technology. Also, IMU is a private university located in the country's capital where cost of living is higher, with most of the students originating from well-off backgrounds. The effects of high cost may not have been adequately captured in this study.

Another limitation to the study was the inability to capture the fundamental roles of the educators in relation to a VLE acceptance. Before the pandemic, most of the lecturers were used to facilitating sessions physically in a classroom or lecture theatre, and may not have been familiar with mediating live sessions across a screen with students. However, one can never imagine the frustration and anxiety educators may have felt during the initial stages of converting and restructuring all their planned teaching and learning materials in the cloud, on top of learning the common practices and etiquettes of online classes. They may have also experienced technical difficulties and overwhelming task load during that massive shift. These negative feelings may have reflected onto students, causing a skewness to their intention to adopt and accept a VLE.

Although a VLE offers convenience, flexibility and the ability to work from home, students have to keep track of their time management. Prolonged exposure to digital devices can cause mental illness such as stress and burnout among students and this was a serious issue reported during the pandemic [65]. Hence, the negative feelings associated with burnout and other mental health deterioration may also have skewed the intentions towards the adoption of a VLE technology.

7. Recommendations for Future Studies

Future studies should look at widening the study population to include various universities in Malaysia, ranging from public to private institutions, mathematical sciences to arts and business, and rural to urban institutions, or even do a comparative study to compare the actual use behaviour of students in Malaysia with another country. This may yield meaningful data due to differences in demographic variables, network connectivity, and cost associated with the use of a VLE. Also, a comparative study that examines undergraduate and postgraduate students, especially students that are required to balance social, work, and family obligations with academic obligations may provide insights regarding the students' appreciation for schedule flexibility and convenience enabled through the usage of a VLE.

Moreover, future studies that intend to explore the acceptance and use of a VLE in higher education may look into a longitudinal study design, whereby the actual use behaviour is measured at intervals. This is because the initial use of the technology may be riddled with technical difficulties, stress and anxiety, that may lessen over prolonged use and time. These types of studies are crucial to capture the nature and magnitude of changes in teaching and learning, before and after the pandemic.

Additionally, future studies should also investigate the association between VLEs and mental health and well-being of students. This is to examine if excessive use of digital devices and prolonged time facing tablets and screens are causing any mental health impacts on students. The education system is truly responsible to ensure that the VLEs are adopted to provide students the opportunities for educational achievement and not to cause depression or stress that interfere with their abilities to perform.

The fear of technology, also known as technophobia, can lead to anxiety or frustration at the early stage when using a new technology. This is surprisingly common and should be expected. Future studies that are looking at the behavioural intention or the actual usage of a new technology, should look at providing on-the-go training and optimum technical support to minimise these reactions, especially for students and educators who are not technologically savvy or possess high digital literacy skills. Minimising these initial reactions may improve the overall acceptance of the technology. Moreover, the concept working from home is relatively new to students and educators. Thus, teaching them how to set boundaries to their time and cordoning off a predetermined number of hours in a day for work may reduce burnout and mental health deterioration with regards to an effective use of a VLE.

8. Conclusion

This study investigated how the dimensions of the VLE affected the actual use behaviour of students, by extending the UTAUT2 model proposed by Venkatesh et al. [24]. This study also examined the moderating role of network connectivity on the relationship between the various modified UTAUT2 constructs and actual use behaviour. This study revealed that hedonic motivation, perceived usefulness and perceived ease of use positively affected the actual use

behaviour of VLEs. Moreover, network connectivity was shown to not significantly moderate these relationships. The challenges faced by students that were highlighted in this study include the high cost associated with the use of a VLE, and the unpleasant experience of the VLE. Overall, the students did demonstrate actual use behaviour with regards to the VLE usage, indicating acceptance and adoption of the technology.

Based on the results of this study, it can therefore be concluded that the VLE usage started off as a temporary emergency solution to allow students access to instruction and learning materials to ensure continuity of the academic process. However, this technology has a strong potential to take the higher learning education in Malaysia to new heights. Nevertheless, the challenges that present across localities to adopt VLEs should be ameliorated to allow every student to have an equal opportunity to gain the knowledge and learning he/she seeks. The less-than-perfect implementation and usage experience across the board also calls for a 'whole-of-society' approach to improve the users' experience related to VLEs.

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References

[1] Racheva, V. (2017) What is virtual learning? VEDAMO. [online] https://www.vedamo.com/knowledge/what-is-virtual-learning/ (Accessed 15 June 2021).
[2] Ngai, E.W., Poon, J.K.L., & Chan, Y.H. (2007) 'Empirical examination of the adoption of WebCT using TAM', Computers & Education, Vol. 48, No. 2, pp.250–267.
[3] Azouzi, S., Hajlaou, J.E., Brahmi, Z. and Ghannouchi, S.A. (2021) 'Collaborative e-learning process discovery in multi-tenant cloud', International Journal of Intelligent Systems and Applications, Vol. 13, No. 2, pp.21–37.
[4] Sukendro, S., Habibi, A., Khaeruddin, K., Indrayana, B., Syahruddin, S., Makadada, F.A. and Hakim, H. (2020) 'Using an extended Technology Acceptance Model to understand students' use of e-learning during Covid-19: Indonesian sport science education context', Heliyon, Vol. 6, No. 11, p.e05410.
[5] Adigun, J.O., Irunokhai, E.A., Adeniji, O.A., Areo, Y.M., Onihunwa, J.O., Sada, Y.A. and Jeje, C.A. (2021) 'Role of Coronavirus outbreak on adoption of electronic education in New Bussa, Niger State, Nigeria', International Journal of Education and Management Engineering, Vol. 11, No. 5, pp.13–22.
[6] Aguilera-Hermida, A.P. (2020) 'College students' use and acceptance of emergency online learning due to COVID-19', International Journal of Educational Research Open, Vol. 1, p.100011.
[7] Ali, W. (2020) 'Online and remote learning in higher education institutes: a necessity in light of COVID-19 pandemic', Higher Education Studies, Vol. 10, No. 3, pp.16–25.
[8] Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P. and Lam, S. (2020) 'COVID-19: 20 countries' higher education intra-period digital pedagogy responses', Journal of Applied Learning & Teaching, Vol. 3, No. 1, pp.1–20.
[9] Hassounah, M., Raheel, H. and Alhefzi, M. (2020) 'Digital response during the COVID-19 pandemic in Saudi Arabia', Journal of Medical Internet Research, Vol. 22, No. 9, p.e19338.
[10] Kamaludin, K., Chinna, K., Sundarasen, S., Khoshaim, H.B., Nurunnabi, M., Baloch, G.M., Sukayt, A. and Hossain, S.F.A. (2020) 'Coping with COVID-19 and movement control order (MCO): experiences of university students in Malaysia', Heliyon, Vol. 6, No. 11, p.e05339.
[11] Budiarto, M.K., Rejekiningsih, T. and Sudiyanto, S. (2021) 'Implementation of computer-assisted learning in high school: teachers and students' perspective', International Journal of Education and Management Engineering, Vol. 11, No. 4, pp.26–34.
[12] Arumugam, T. (2020) Covid19: Education sector grapple with technology, virtual online classrooms. New Straits Times. [online] https://www.nst.com.my/news/nation/2020/04/585687/covid19-education-sector-grapple-technology-virtual-online-classrooms (Accessed 25 July 2021).
[13] Lee, S. (2020) Sabah student stays overnight in tree to get better internet connection for online university exams. The Star Online. [online] https://www.thestar.com.my/news/nation/2020/06/16/sabah-uni-student-stays-overnight-in-tree-to-get-better-internet-connection-for-online-exams (Accessed 17 July 2021).
[14] Davis, F.D. (1989) 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', MIS Quarterly, Vol. 13, No. 3, pp.319–340.
[15] Mangin, J.P.L., Bourgault, N. and León, J.A.M. (2011) 'Testing the application of the technology acceptance model in the French Quebecer banking environment', International Advances in Economic Research, Vol. 17, No. 3, pp.364–365.
[16] Holden, R.J., Asan, O., Wozniak, E.M., Flynn, K.E. and Scanlon, M.C. (2016) 'Nurses' perceptions, acceptance, and use of a novel in-room pediatric ICU technology: testing an expanded technology acceptance model', BMC Medical Informatics and Decision Making, Vol. 16, No. 1, pp.1–10.
[17] Park, E. and del Pobil, A.P. (2013) 'Technology acceptance model for the use of tablet PCs', Wireless Personal Communications, Vol. 73, No. 4, pp.1561–1572.
[18] Ramayah, T. and Ignatius, J. (2005) 'Impact of perceived usefulness, perceived ease of use and perceived enjoyment on intention to shop online', ICFAI Journal of Systems Management (IJSM), Vol. 3, No. 3, pp.36–51.
[19] Briz-Ponce, L. and Garc á-Peñalvo, F.J. (2015) 'An empirical assessment of a technology acceptance model for apps in medical education', Journal of Medical Systems, Vol. 39, No. 11, pp.1–5.
[20] Lazim, C.S.L.M., Ismail, N.D.B. and Tazilah, M.D.A.K. (2021) 'Application of technology acceptance model (TAM) towards online learning during covid-19 pandemic: accounting students perspective', International Journal of Business, Economics and Law, Vol. 24, No. 1, pp.13–20.

[21] Mailizar, M., Burg, D. and Maulina, S. (2021) 'Examining university students' behavioural intention to use e-learning during the COVID-19 pandemic: an extended TAM model', Education and Information Technologies, Vol. 26, No. 6, pp.7057–7077.
[22] Tsai, Y.R. (2015) 'Applying the Technology Acceptance Model (TAM) to explore the effects of a Course Management System (CMS)-Assisted EFL writing instruction', Calico Journal, Vol. 32, No. 1, pp.153–171.
[23] Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003) 'User acceptance of information technology: toward a unified view', MIS Quarterly, Vol. 27, No. 3, pp.425–478.
[24] Venkatesh, V., Thong, J.Y. and Xu, X. (2012) 'Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology', MIS Quarterly, Vol. 36, No. 1, pp.157–178.
[25] Aria, R. and Archer, N. (2018) 'Using an educational video vs. in-person education to measure patient perceptions of an online self-management support system for chronic illness', Computers in Human Behavior, Vol. 84, pp.162–170.
[26] Azizi, S.M., Roozbahani, N. and Khatony, A. (2020) 'Factors affecting the acceptance of blended learning in medical education: application of UTAUT2 model', BMC Medical Education, Vol. 20, No.1, pp.1–9.
[27] El-Masri, M. and Tarhini, A. (2017) 'Factors affecting the adoption of e-learning systems in Qatar and USA: extending the unified theory of acceptance and use of technology 2 (UTAUT2)', Educational Technology Research and Development, Vol. 65, No. 3, pp.743–763.
[28] Mtebe, J.S., Mbwilo, B. and Kissaka, M.M. (2016) 'Factors influencing teachers' use of multimedia enhanced content in secondary schools in Tanzania', The International Review of Research in Open and Distributed Learning, Vol. 17, No. 2, pp.65–84.
[29] Nikolopoulou, K., Gialamas, V. and Lavidas, K. (2020) 'Acceptance of mobile phone by university students for their studies: an investigation applying UTAUT2 model', Education and Information Technologies, Vol. 25, No. 5, pp.4139–4155.
[30] Bagozzi, R.P. (1982) 'A field investigation of causal relations among cognitions, affect, intentions, and behavior', Journal of Marketing Research, Vol. 19, No. 4, pp.562–584.
[31] McKinney, V., Yoon, K. and Zahedi, F.M. (2002) 'The measurement of web-customer satisfaction: an expectation and disconfirmation approach', Information Systems Research, Vol. 13, No. 3, pp.296–315.
[32] Nelson, R.R., Todd, P.A. and Wixom, B.H. (2005) 'Antecedents of information and system quality: an empirical examination within the context of data warehousing', Journal of Management Information Systems, Vol. 21, No. 4, pp.199–235.
[33] Jiang, G., Liu, F., Liu, W., Liu, S., Chen, Y. and Xu, D. (2021) 'Effects of information quality on information adoption on social media review platforms: moderating role of perceived risk', Data Science and Management, Vol. 1, No. 1, pp.13–22.
[34] Gu, B., Konana, P., Rajagopalan, B. and Chen, H.W.M. (2007) 'Competition among virtual communities and user valuation: the case of investing-related communities', Information Systems Research, Vol. 18, No. 1, pp.68–85.
[35] Liu, I.F., Chen, M.C., Sun, Y.S., Wible, D. and Kuo, C.H. (2010) 'Extending the TAM model to explore the factors that affect intention to use an online learning community', Computers & Education, Vol. 54, No. 2, pp.600–610.
[36] Lin, H.F. (2008) 'Determinants of successful virtual communities: contributions from system characteristics and social factors', Information & Management, Vol. 45, No. 8, pp.522–527.
[37] Cabrera-Sánchez, J.P., Villarejo-Ramos, Á.F., Liébana-Cabanillas, F. and Shaikh, A.A. (2021) 'Identifying relevant segments of AI applications adopters–expanding the UTAUT2's variables', Telematics and Informatics, Vol. 58, p.101529.
[38] Tyrväinen, O., Karjaluoto, H. and Saarijärvi, H. (2020) 'Personalization and hedonic motivation in creating customer experiences and loyalty in omnichannel retail', Journal of Retailing and Consumer Services, Vol. 57, p.102233.
[39] Martín-Consuegra, D., Díaz, E., Gómez, M. and Molina, A. (2019) 'Examining consumer luxury brand-related behavior intentions in a social media context: the moderating role of hedonic and utilitarian motivations', Physiology & Behavior, Vol. 200, pp.104–110.
[40] Dodds, W.B., Monroe, K.B. and Grewal, D. (1991) 'Effects of price, brand, and store information on buyers' product evaluations', Journal of Marketing Research, Vol. 28, No. 3, pp.307–319.
[41] Zeithaml, V.A. (1988) 'Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence', Journal of Marketing, Vol. 52, No. 3, pp.2–22.
[42] Nathan, R.J., Victor, V., Tan, M. and Fekete-Farkas, M. (2020) 'Tourists' use of Airbnb app for visiting a historical city', Information Technology & Tourism, Vol. 22, No. 2, pp.217–242.
[43] Lau, L.S., Choong, Y.O., Wei, C.Y., Seow, A.N., Choong, C.K., Senadjki, A. and Ching, S.L. (2020) 'Investigating nonusers' behavioural intention towards solar photovoltaic technology in Malaysia: the role of knowledge transmission and price value', Energy Policy, Vol. 144, p.111651.
[44] Lauver, K.J., Drum, D.M., Windsor, J.M. and Miller, S.M. (2013) 'Preference of education mode: examining the reasons for choosing and perspectives of courses delivered entirely online', Journal of Applied Research in Higher Education, Vol. 5, No. 1, pp.113–128.
[45] Kamal, A.A., Shaipullah, N.M., Truna, L., Sabri, M., & Junaini, S.N. (2020) 'Transitioning to online learning during COVID-19 Pandemic: case study of a Pre-University Centre in Malaysia', International Journal of Advanced Computer Science and Applications, Vol. 11, No. 6, pp.217–223.
[46] Kim, K.J., Liu, S. and Bonk, C.J. (2005) 'Online MBA students' perceptions of online learning: benefits, challenges, and suggestions', The Internet and Higher Education, Vol. 8, No. 4, pp.335–344.
[47] Britt, R. (2006) 'Online education: a survey of faculty and students', Radiologic Technology, Vol. 77, No. 3, pp.183–190.
[48] Taufik, N. and Hanafiah, M.H. (2019) 'Airport passengers' adoption behaviour towards self-check-in Kiosk Services: the roles of perceived ease of use, perceived usefulness and need for human interaction', Heliyon, Vol. 5, No. 12, p.e02960.
[49] Izuagbe, R., Ibrahim, N.A., Ogiamien, L. O., Olawoyin, O. R., Nwokeoma, N. M., Ilo, P.I. and Osayande, O. (2019) 'Effect of perceived ease of use on librarians'e-skills: basis for library technology acceptance intention', Library & Information Science Research, Vol. 41, No. 3, p.100969.
[50] Ozturk, A.B., Bilgihan, A., Nusair, K. and Okumus, F. (2016) 'What keeps the mobile hotel booking users loyal? Investigating the roles of self-efficacy, compatibility, perceived ease of use, and perceived convenience', International Journal of Information Management, Vol. 36, No. 6, pp.1350–1359.

[51] Wong, T.K.M., Man, S.S. and Chan, A.H.S. (2021) 'Exploring the acceptance of PPE by construction workers: an extension of the technology acceptance model with safety management practices and safety consciousness', Safety Science, Vol. 139, p.105239.
[52] Akhtar, S.N. (2021) 'Future opportunities for personalized online global learning', in Khan B.A., Kuofie, M.H.S. and Suman, S. (ed.): Handbook of Research on Future Opportunities for Technology Management Education, IGI Global, pp.88–101.
[53] Chung, E., Subramaniam, G. and Dass, L.C. (2020) 'Online learning readiness among university students in Malaysia amidst COVID-19', Asian Journal of University Education, Vol. 16, No. 2, pp.46–58.
[54] Selvanathan, M., Hussin, N.A.M. and Azazi, N.A.N. (2020) 'Students learning experiences during COVID-19: work from home period in Malaysian Higher Learning Institutions', Teaching Public Administration, pp.1–10.
[55] Armitage, P., Berry, G. and Mathews, J.N. (2002) Statistical Methods in Medical Research, Blackwell Science, Oxford, UK.
[56] Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2010) Multivariate data analysis, 7th ed., Pearson.
[57] Zhang, M., Liu, Y., Yan, W. and Zhang, Y. (2017) 'Users' continuance intention of virtual learning community services: the moderating role of usage experience', Interactive Learning Environments, Vol. 25, No. 6, pp.685–703.
[58] Cheong, J. H. and Park, M.C. (2005). Mobile internet acceptance in Korea. Internet Research, Vol. 15, No. 2, pp.125–140.
[59] Wanner, T. and Palmer, E. (2015) 'Personalising learning: exploring student and teacher perceptions about flexible learning and assessment in a flipped university course', Computers & Education, Vol. 88, pp.354–369.
[60] Kim, C., Mirusmonov, M. and Lee, I. (2010) 'An empirical examination of factors influencing the intention to use mobile payment', Computers in Human Behavior, Vol. 26, No. 3, pp.310–322.
[61] Clayton, K.E., Blumberg, F.C. and Anthony, J.A. (2018) 'Linkages between course status, perceived course value, and students' preference for traditional versus non-traditional learning environments', Computers & Education, Vol. 125, pp.175–181.
[62] Awang, Z. (2012) Structural Equation Modelling using AMOS Graphic. UiTM Press, Selangor, Malaysia.
[63] World Economic Forum (2020) The COVID-19 pandemic has changed education forever. This is how. [online] https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/ (Accessed 26 August 2022).
[64] Azlan, C.A., Wong, J.H.D., Tan, L.K., Huri, M.S.N.A., Ung, N.M., Pallath, V., Tan, C.P.L., Yeong, C.H. and Ng, K.H. (2020) 'Teaching and learning of postgraduate medical physics using Internet-based e-learning during the COVID-19 pandemic–a case study from Malaysia', Physica Medica, Vol. 80, pp.10–16.
[65] Gao, W., Ping, S. and Liu, X. (2020) 'Gender differences in depression, anxiety, and stress among college students: a longitudinal study from China', Journal of Affective Disorders, Vol. 263, pp.292–300

Authors' Profiles

Dr Nandinii Kumarasamy is currently a junior doctor, working for the Malaysian Ministry of Health. After securing a place in the School of Medicine in the International Medical University (IMU), she went on to realize her passion for surgery in her third year of medical school. She joined the Surgical Society and went on to be elected as the Vice President. Through her work with fellow surgical enthusiasts, they had created opportunities for medical students to hone their knotting and suturing skills, build non-technical surgical skills, and attend conferences. They also encouraged research work, created a platform for volunteerism, and highlighted the need for diversity in surgical ranks. That experience honed her belief in the power of uniting diverse healthcare professionals around the purpose of fulfilling various healthcare needs, and the empowerment of student community, to bring about a positive change. After medical school, Nandinii became a peer tutor in IMU, spearheading student sessions that addressed clinical competency and acumen, identified lagging skills, and built student confidence via positive reinforcement. In 2022, Nandinii completed a Master of Business Administration in Healthcare Management, with a vision of bringing healthcare and communities together.

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