Research Article

Exploring the Factors of Using Cloud Service in Malaysia Higher Education Institutions During COVID-19 Pandemic Outbreak

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The advancement of technology has innovated higher education learning. Cloud educational services are becoming more popular and were adopted by higher education institutions (HEIs) during the pandemic of Covid-19. Using Unified Theory of Acceptance and Use of Technology (UTAUT) Technology Acceptance Model (TAM), this study shed some light on the HEIs students' intention to adopt cloud educational services in their learning. This study employed 385 students from various public and private Malaysian HEIs. The data demonstrated that social influence, perceived ease of use, and perceived usefulness were positively associated with the disposition to adopt cloud learning services. Furthermore, perceived ease of use and perceived usefulness mediate the relationship between social influence and cloud learning services adoption. The result in this study could provide a limelight to education providers in terms of redesigning and integrating cloud service in pedagogy to better adapt with the new norms of learning system.

1. Introduction

During the COVID-19 pandemic, education ministries around Asia countries had taken proactive mitigation measures to transit from physical to online learning using Microsoft Teams, Google Classroom, and Zoom (Gnaneswaran, 2020). This has allowed millions of students to continue their learning from home in the midst of preventing the transmission of the covid virus. Arising from the pandemic, the global educational system has since altered dramatically and has hastened the implementation of online teaching and learning (Mohamad, & Md Rodzi, 2021). In Malaysia, the

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educational learning systems across all levels has moved from physical teaching-learning practice to virtual learning (Utami, Fahmiyah, Ningrum, Fakhruzzaman, Pratama, & Triangga, 2022). In the implementation of virtual instructional delivery, educational institutions must contemplate a new educational environment which embraces digital support technologies and internet infrastructure. In light of this, cloud service technology has become an ideal ad hoc learning tool for the transitioning of traditional education to virtual teaching and learning. Microsoft 365 is one of the popular platforms of cloud services technology that is widely utilized to conduct online learning in Malaysia (Kurnia & Ahmad, 2021). This software through its video conferencing tools (e.g. Microsoft Teams) allows students and teachers to communicate digitally and exchange instructional information (Kurnia & Ahmad, 2021). There are various online learning platforms that emerged during the pandemic period such as Google Meet, Zoom, Voov, DingTalk, and others. Therefore, cloud educational services have been widely used in various education systems across the countries (Utami et al., 2022).

In the period of adopting the new way of learning, it is worthwhile to ensure that students are able to embrace the educational learning settings and technology (Atikuzzaman & Islam, 2020). Unfortunately, a significant number of students are reported to be facing uncertainties when using cloud service in their learning (Utami et al., 2022). They articulated that it was due to lack of proper training and limited experience in the application of cloud services in learning. In addition, unstable network connections have worsened the application of cloud service in learning as students felt frustrated and reluctant to embrace it for online learning (Atikuzzaman & Islam, 2020). The successful integration of technology into educational environments is contingent on students' behavioural intention; otherwise, the impacts of cloud service on educational learning are just transient.

Deriving from Unified Theory of Acceptance and Use of Technology (UTAUT), Dickhaut, Janson, and Leimeister (2020) postulate the need to integrate social influence (SI) as an important predictor of intention to use cloud service. In addition, past studies have supported that SI has significant influence towards the behavioral intention to use cloud services in the education system (Amron, Ibrahim, Bakar & Chuprat, 2019; Jaradat, Ababneh, Faqih & Nusairat, 2020). However, there are few reservation views between SI and adoption of cloud service as it claimed that SI only affects in the early phases of technological adoption and the effect diminishes over time (Ronaghi & Forouharfar, 2020). On the other hand, previous researchers examined Technology Acceptance Model (TAM)'s variables such as Perceived Usefulness (PU) and Perceived Ease of Used (PEOU) in relation to intention to use cloud computing in various workplace context namely banking, retails, hotels and education

industry (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019). However, little was known especially in the context of the PU and PEOU of cloud service in tertiary education peculiarly in Malaysia.

This study aims to bridge the previous research gap by understanding the factors that affect HEI students' intention to use cloud services in supporting their application and developmental learning process. Hence, this study attempts to integrate and test the TAM-UTAUT model using SI (from the model of UTAUT) with PU and PEOU (from TAM) to predict the students' intention to use cloud services application in tertiary education learning. This study would provide preliminary and useful insights to investigate a distinctive view of cloud services application in influencing students' learning behaviour. Moreover, this study will help to provide an understanding as to how cloud service can be utilized more effectively in the educational sector, thus, allowing HEIs to embrace cloud-based teaching and learning systems.

2. Literature Review

Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), developed by Fred Davis in 1989, is a conventional theory on information systems for understanding human behaviour on why new technologies are accepted or rejected. Based on TAM, perceived usefulness and perceived ease of use are the determinants of one's behaviour on accepting or rejecting in using a new technology. Thus, a person is more keen to accept the new technology if they find it useful and easy to use (Lina, Nani, & Novita, 2021; Sunardi, Hamidah, Buchdadi, & Purwana, 2022).

Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT), introduced by Venkatesh and Davis in 2003, to examine technology acceptance and its adoption factors. According to Almetere Kelana, and Mansor (2020), the UTAUT is a comprehensive model with significant predictive potential on intention for technology adoption. The UTAUT model proposes that behavioural intention to use a technology is warranted by performance expectancy, effort expectancy, social influence, and facilitating factors (Khechine & Augier, 2019).

Ironically, TAM factors are considered for principles on social psychology, while the UTAUT variables are considered to determine a user's behavioural intention. Robles-Gómez, Tobarra, Pastor-Vargas,

Hernández, and Haut (2021) acknowledge the value of integrating UTAUT and TAM as both are appropriate for validating individual intentions to adopt new technologies. In this study, the technological and social psychological dimensions are examined using TAM and UTAUT to examine HEIs students' intention to use cloud service in learning.

Intention to Use Cloud Service (INT)

Cloud service is an emerging trend in information technology systems and plays an important role in education where students and educators benefited from cloud services technology application. Cloud computing represents technological innovations in education, providing applications to develop practices and curricula in HEIs. The Covid-19 pandemic demonstrated the critical role of cloud service in meeting the urgent demands and challenges from learning institutions specifically for online learning (Asadi, Abdekhoda, & Nadrian, 2020).

Moslehpour, Pham, Wong, and Bilgiçli (2018) asserted that users are willing to use a new cloud service technology with a learning and storage platform arising from a positive experience from using it. The effectiveness of cloud service technology could be one of the motivating factors in attracting HEIs students to engage it in their learning. According to Albashtawi and Al-Bataineh (2020), an individual's intention to use is driven by internal or self-factor and affected externally from their surroundings and other people. In this context, perceived usefulness (PU), perceived ease of use (PEOU) and social influence (SI) are assessed to affect the user's acceptance of cloud service technology and its application. Therefore, this study would examine the willingness of HEIs students to use cloud services in their learning process.

Predictor Variables

In UTAUT, one of the main variables that affect intention to use is social influence. Social influence is defined as a person's behaviour based on his perception of what others think (Venkatesh, 2022), Furthermore, Ayaz and Yanartas (2020) suggested that social influence is when a person's behaviour is influenced by anticipating how others in a social group will view the person as a result of using the technology. For the students of higher education institutions, the peers can affect their behavioural intention to adopt cloud-based learning services. Examining university students in Lebanon, Kayali and Alaaraj (2020) highlight the potential benefits of e-learning as well as the challenges that may hinder its adoption. Results show that social influence from peers, teachers and family members, is

significantly related to intention to use the e-learning method. The authors suggest that from the results, policymakers and educators can develop effective strategies to promote the use of the e-learning method. Another study in non-pharmaceuticals intervention associated with Covid-19 virus, Haverila, McLaughlin, and Haverila (2022) also found that social influence affects behavioural intention to use non-pharmaceuticals intervention. To curb the spread of the Covid-19 virus, communities are advised to use non-pharmaceutical interventions. As social factors may affect an individual's willingness to comply, social influence would be relevant in understanding the adoption of such measures. Purwanto and Loisa (2020) concurred that social influence drives an individual who wants to obtain conceptual identity and peer recognition status to use a system. Hence, this study proposes that:

H1: Social influence has a significant relationship with intention to use cloud service.

Studies show that social influence is found to have a significant relationship with perceived ease of use. In UAE, Al Kurdi, Alshurideh, Salloum, Obeidat, and Al-dweeri (2020) found that social influence positively and significantly influenced perceived ease of use which in turn influenced behavioural intention to use the e-learning system. The study was conducted on university students to understand how they regard and accept e-learning system, and thus, its successful adoption. Another study in China on automated vehicle acceptance, Zhang et al., (2020) found that social influence affects perceived ease of use. It was reported that automated vehicles had not been commercialised, thus, individuals relied on media reports and opinions from friends and family to make decisions. The effect from social influence was further boosted by the culture of collectivism and group conformity in the country (Zhang et al., 2020). In collectivist societies, social networks are effective for affecting individual perceptions on the ease of use. As such, Sathye et al. (2018) suggested more social engagement through networks and organisations could promote rapid adoption of value-added services to the user. Therefore, this study proposes the following hypothesis:

H2: Social influence has a significant relationship with perceived ease of use.

Perceived ease of use, a construct from TAM, refers to an individual’s perception on the degree of ease when using a particular system, thus, assesses the possible success of technology adoption (Sorce & Issa, 2021). The ease of use factor for cloud services technology would lead to greater acceptance of an individual (Moslehpour et al., 2018). They claimed that students have the convenience of accessing the learning materials and class lessons as it has been recorded. This is further supported by Kayali and Alaaraj (2020) who concurred that perceived ease of use is related to easiness and worry-free users

perceive of using a particular technology. From their findings, both perceived usefulness and perceived ease of use affect users' willingness to use new technologies. They explained that lack of negative experience and stress derived from using the technology would positively influence the user's behavioural intention. Lanlan, Ahmi and Popoola (2019) examined small businesses in China and found that perceived ease of use and perceived usefulness significantly impacted the use of computerised accounting system. The study hopes to promote the understanding between acceptance and use of the system, so that such businesses can succeed. Thus, the following hypothesis is proposed:

H3: Perceived ease of use has a significant relationship with intention to use cloud service.

Several studies also found a significant relationship between social influence and perceived usefulness. Haverila et al. (2022) found that social influence significantly impacted perceived usefulness. They postulated that the use of mass media communication could deliver the information to the audience and increase the perceived usefulness awareness toward an intervention technology. In another study by Beldad and Hegner (2018), a descriptive social norm was found to impact perceived usefulness of a fitness application. The study was prompted by the popularity of fitness apps in Germany, to understand users' preferences to continue using such technology. Furthermore, Izuagbe and Popoola (2017) observed that social influence has an influence on perceived usefulness of electronic resources in Nigeria universities. Hence, this study proposes that:

H4: Social influence has a significant relationship with perceived usefulness.

Perceived usefulness is defined as the user's belief that using a new technology could improve one's performance and thus leading to intention to use such technology (Sorce & Issa, 2021). In addition, Kayali and Alaaraj (2020) claimed that one is willing to use the technology even if it is not only easy to use, but could improve their work efficiency. If so, the perceived benefits brought by cloud services would be a stimulant factor to encourage user behaviour. Moslehpour et al. (2018) postulated that cloud service in learning is relatively more effective than traditional learning as students could access their stored learning materials and lessons. It provides the flexibility and usefulness to students to learn at their discretion and they could re-study the content to enhance their understanding of the subject matter. Therefore, the following hypothesis is proposed:

H5: Perceived usefulness has a significant relationship with intention to use cloud service.

Literature suggests that perceived usefulness and perceived ease of use have mediating influence on the relationships between social influence and behavioural intention (Chen & Aklikokou, 2020; Nuryyev et al., 2020). Chen and Aklikokou (2020) found that perceived usefulness and perceived ease of use mediate the relationships between social influence and behavioural intention to use e-government services. The authors suggested that the full potential of e-government initiative's cannot be realized without sufficient adoption. Thus, the study examines the public's adoption of e-government services in Togo, a developing country, where perceived usefulness and ease of use are crucial factors. From the context of cryptocurrency payments adoption among small to medium-sized enterprises (SMEs) in the tourism and hospitality industry, Nuryyev et al. (2020) found that perceived usefulness mediates the effects of social influence on behavioural adoption intention. The study fills the gap in the limited studies and contradictory findings on IT adoption by SMEs in the tourism and hospitality industry. As a result, the study offers an empirical investigation into the factors that affect the intention of tourism and hospitality SMEs to adopt cryptocurrency payments.

Hence, the current study proposes the following hypothesis for the mediating roles of perceived ease of use and perceived use on the relationship between social influence and intention to use cloud service:

H6: Perceived ease of use mediates the relationship between social influence and intention to use cloud service.

H7: Perceived usefulness mediates the relationship between social influence and intention to use cloud service.

Conceptual Model

Based on Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Acceptance Model (TAM), the conceptual model are drawn upon with the constructs of Perceived Usefulness, Perceived Ease of Use, Social Influence and Intention to Use Cloud Service. Figure 1 illustrates the variables and hypotheses relationships among the variables.

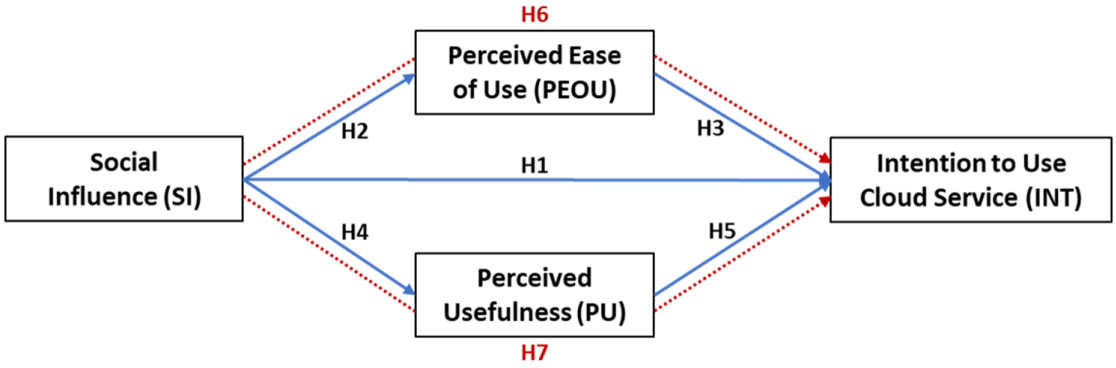

Figure 1. Conceptual Model

3. Research Methodology

3.1. Sample and Procedure

The target sample for the present study comprises HEIs students that have the prevalence to use online learning and teaching during the pandemic in Malaysia. The target respondent are derived from public and private HEIs which consists of five universities in Malaysia namely University of Technology Malaysia (UTM) in Johor, Universiti Tunku Abdul Rahman (UTAR) in Perak and Selangor, and Universiti Malaya (UM), Universiti Kebangsaan Malaysia (UKM), and Universiti Putra Malaysia (UPM) in Kuala Lumpur based on their inclusions in the top ten HEIs ranking in 2021. These universities have been chosen because of their usage of information technologies in their institutional systems (Arumugam, 2021). In this study, the snowball sampling method has been used to distribute the questionnaires. It is an effective means of collecting large amounts of data by inviting the friends and respondents' network to be the potential respondents (Parker, Scott, & Geddes, 2019). The online survey was designed in a way that prevented respondents from submitting replies if they did not fully address all the questions. A total of 450 sets of online questionnaires have been distributed and 385 sets of questionnaires have been returned, representing 85.5 percent of the total sample.

3.2. Measures

Survey questionnaire is used to measure all the constructs. The items in the questionnaires are extracted and modified from pre-existing measures for the setting of cloud service (Table 1). A five-

point Likert scale, spanning from 1 representing strongly disagree to 5 representing strongly agree, was used in the questionnaire design.

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Constructs	Items	References
Perceived Usefulness (PU)	PU1: Using cloud service for study purposes suits me.	Keržič, TomažKeržič, Tomaževič, Aristovnik, & Umek (2019)
	PU2: Using cloud services makes my study easier.	
	PU3: I am able to complete my work more quickly because of Cloud Service.	
	PU4: Using cloud services can improve my study performance.	
	PU5: I find cloud services useful to my study.	
	PU6: Using cloud services improves my study effectiveness.	
Perceived Ease of Use (PEOU)	PEOU1: Using cloud services for study purposes is not difficult for me.	Keržič, Tomaževič, Aristovnik, & Umek (2019) Venkatesh et al. (2003)
	PEOU2: It will be easy for me to find information through cloud services.	
	PEOU3: My interaction with cloud services is understandable.	
	PEOU4: It will be impossible to use cloud services without expert help.	
	PEOU5: It takes too long a time to learn to use cloud services.	
	PEOU6: Learning using cloud services requires a lot of mental effort.	
Social Influence (SI)	SI1: I will use cloud service when my family and friends advise me to use cloud services in my studies.	Cheung & Vogel (2013) Chen & Chang (2013)
	SI2: I will discuss the benefits of cloud services with my family and friends	
	SI3: I will use cloud computing services because I am influenced by my family and friends.	
	SI4: I will use cloud computing service when I realised that my family and friends around me have received benefits by	

Constructs	Items	References
	using cloud services.	
Intention to Use Cloud Services	INT1: I intend to frequently use cloud services to discuss assignments or communicate with friends.	Ghani, Hamzah, Ramli, Daud, Romli, & Mokhtar (2019)
	INT2: I intend to use cloud services heavily.	
	INT3: I intend to use cloud services throughout this semester and the next.	
	INT4: I intend repetitively use cloud services as often as possible.	
	INT5: I believe that it is a good idea for me to use cloud services for my future coursework.	

Table 1. Constructs and Measurement Items

3.3. Data Analysis

This study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) because it is well suited in achieving the objectives of predicting university students' intention to utilize cloud services in learning (Utami et al., 2022). Furthermore, this analysis approach is suitable for exploring the applicability and theoretical development of UTAUT and TAM (Hair, Matthews, Matthews, & Sarstedt, 2017). SmartPLS Version 3.3.9 software was used to analyse the data.

4. Results

4.1. Descriptive Analysis

The study comprises 385 students from 5 HEIs which consists of male (53.2%) and female (46.8%). The result indicates the majority of the students (77.1%) were aged between 21 to 23, followed by 24 years and above and the least is 18 to 20 years old. Most of them have a Bachelor's degree (81.6%) and the rest are Foundation (3.1%), Diploma (2.9%), and Master's degree (12.5%). The result showed that 197 (51.2%) students have been using cloud services for 2 to 3 years, followed by 165 (42.9%) students with 3 years and above experience, 22 (5.7%) students with 1-2 years experience, and 1 (0.3%) student

have been using less than a year. Meanwhile, students spent their time on cloud services for 11 hours and above (30.1%), 6 to 10 hours (45.7%), 1 to 5 hours (22.3%), and 7 of them spent less than an hour in a day. All in all, the majority of HEI students found that cloud service is helpful and some of them are unsure of how cloud service is helpful to their studies. The detail of descriptive analysis is illustrated in Table 2.

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Demographic	Frequency (n=385)	Percentage (%)
Gender:		
Male	205	53.2
Female	180	46.8
Age:		
18 to 20	25	6.5
21 to 23	297	77.1
24 and above	63	16.4
University:		
University of Malaya	33	8.6
University Putra Malaysia	38	9.9
University of Technology Malaysia	47	12.2
Universiti Kebangsaan Malaysia	50	13
Universiti Tunku Abdul Rahman	213	55.3
Others	4	1
Current Education Qualification:		
Foundation	12	3.1
Diploma	11	2.9
Bachelor's Degree	314	81.6
Master's Degree	48	12.5
How long have you been using cloud service?		
Less than 1 years	1	0.3

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Demographic	Frequency (n=385)	Percentage (%)
1 to 2 years	22	5.7
2 to 3 years	197	51.2
3 years and above	165	42.9
How long time you spend on cloud service a day:		
Less than 1 hour	7	1.8
1 to 5 hours	86	22.3
6 to 10 hours	176	45.7
11 hours and above	116	30.1
Cloud service is helpful:		
Yes	372	96.6
No	0	0
Maybe	13	3.4

Table 2. Demographics Profile of Respondents

4.2. Assessment of Measurement Model

Before PLS-SEM analysis is performed, the study needs to fulfill the measurement and structural model assessment. Firstly, the measurement model assesses the relationship between each latent variable and its items. The initial step in measuring the reflective measurement model is to test the reliability and validity of all of the constructs. Composite reliability analysis provides the reliability of the constructs and has a threshold value of 0.70 (Hair, Hult, Ringle, & Sarstedt, 2014). All the constructs are reported to have a threshold value of 0.70 and above (composite reliability values of 0.902 to 0.944. Next, convergent validity of constructs is measured using Average Variance Extracted (AVE). AVE summarizes the indicator loadings of each construct and the rule of thumb for an AVE is to be above 0.5 which indicates that more than half of the construct is adequately converged (Hair et al.,

2017). It is reported that the AVE of all the constructs range from 0.605 to 0.772, meeting the minimum threshold of 0.5. The outer loadings for the indicators have to meet the minimum value of 0.708 (Hair et al., 2014). However, the outer loadings for PEOU 4 was 0.678 which is less than the recommended threshold value, but this indicator was retained as the AVE and CR are deemed adequate (Ramayah et al., 2018). Table 3 depicts the assessment of reliability and validity.

Constructs	Items	Loadings	CR	AVE	VIF
Intention to Use Cloud Services (INT)	INT1	0.895	0.944	0.772	3.424
	INT2	0.863			2.752
	INT3	0.872			2.922
	INT4	0.866			2.893
	INT5	0.897			3.344
Perceived Ease of Use (PEOU)	PEOU1	0.843	0.902	0.605	2.283
	PEOU2	0.782			1.832
	PEOU3	0.811			2.104
	PEOU4	0.678			1.597
	PEOU5	0.76			1.862
	PEOU6	0.783			2.029
Perceived Usefulness (PU)	PU1	0.891	0.935	0.706	3.322
	PU2	0.853			2.792
	PU3	0.819			2.46
	PU4	0.817			2.192
	PU5	0.816			2.272
	PU6	0.843			2.654
Social Influence (SI)	SI1	0.874	0.907	0.709	2.287
	SI2	0.818			1.922
	SI3	0.801			1.96
	SI4	0.874			2.459

Table 3. The assessment of reliability and validity

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Note: SI= Social Influence; PEOU= Perceived Ease of Use; PU= Perceived Usefulness; INT= Intention to use Cloud Services; CR= Composite Reliability; AVE= Average Variance Extracted; VIF= Variance Inflation Factor

Next, this study uses heterotrait-monotrait ratio of correlations (HTMT) for the assessment of discriminant validity. The HTMT value was found to be greater than 0.90 given that the HTMT value is adequate if the value is lesser than 1 (Henseler, Ringle & Sarstedt, 2015). Thus, the HTMT inference between the two factors is smaller than 1 (as shown in Table 4).

	INT	**PEOU**	**PU**	**SI**
Intention to Use Cloud Services (INT)	-	-	-	-
Perceived Ease of Use (PEOU)	0.919	-	-	-
Perceived Usefulness (PU)	0.951	0.927	-	-
Social Influence (SI)	0.947	0.957	0.954	-

Table 4. The assessment of the heterotrait-monotrait ratio of correlations (HTMT)

4.3. Assessment of Structural Model

The structural model assessment evaluates the relationship between latent variables consisting of (1) collinearity assessment; (2) assessment of the significance and relevance of path coefficient model (3) explanatory power assessment; and (4) predictive power assessment.

4.3.1. Collinearity Assessment

After the assessment of the validity and reliability, the next assessment is the structural model in testing the relationship of the path coefficients. First, the variance inflation factor (VIF) was checked to ensure that there is no multicollinearity issue prior to the structural model assessment. The VIF values for this model are all below 3.3 (below the threshold value of 5) (shown in Table 3) (Hair et al., 2014).

4.3.2. Assessment of the Significance and Relevance of Path Coefficient Model

4.3.2.1. Direct Effects

Next, the bootstrapping approach was used to measure the structural model with 10,000 subsamples. Table 5 presents the results of direct and indirect effects of path coefficients among the constructs. The statistical results indicate the direct effects of H1 to H5. Results of H1 supported that SI has a significant relationship with INT ($\beta = 0.258$; $p < 0.01$). H2 was supported that SI has significant impact on PEOU ($\beta = 0.847$; $p < 0.01$). The results for H3 indicates that PEOU has a significant impact on INT ($\beta = 0.222$, $p < 0.01$). H4 was developed that SI has a significant relationship with PU ($\beta = 0.853$; $p < 0.01$). H5 is also established in which PU has a significant relationship with INT ($\beta = 0.451$; $p < 0.01$).

4.3.2.2. Indirect Effects: Mediation Analysis

The indirect effects of variables are examined as H6 and H7 in this study. VAF (Variance Accounted For) technique is used to determine the strength of mediation effects by computing the ratio of the indirect-to-total effect. H6 was supported since the statistical results showed that PEOU mediates the relationship between SI and INT ($\beta = 0.188$; $p < 0.01$). The VAF value is calculated by dividing the indirect effect of 0.188 with the total effect of 0.446, resulting in 0.4215 (42.15 percent), which falls between the threshold of 20 percent and 80 percent. The findings supported H6 by demonstrating that PEOU partially mediated the relationship between SI and INT. Likewise, H7 supported that PU mediates the relationship between SI and INT ($\beta = 0.384$, $p < 0.01$). The VAF value was calculated by dividing the indirect effect of 0.384 with the total effect of 0.642, resulting in 0.5981 (59.81 percent). Thus, the finding supports H7 which explains that PU partially mediated the relationship between SI and INT.

Path	Path Coefficient		Standard Deviation	Total Effect	VAF	T-values	P-values	Decision
	Direct Effect	Indirect Effect						
SI -> INT (H1)	0.258		0.063			4.062	0.00	Supported
SI-> PEOU (H2)	0.847		0.020			42.312	0.00	Supported
PEOU-> INT (H3)	0.222		0.056			3.948	0.00	Supported
SI-> PU (H4)	0.853		0.023			37.243	0.00	Supported
PU-> INT (H5)	0.451		0.062			7.217	0.00	Supported
SI->PEOU-> INT (H6)		0.188	0.048	0.446	42.15	3.885	0.00	Supported
SI-> PU -> INT (H7)		0.384	0.058	0.642	59.81	6.638	0.00	Supported

Table 5. Path Coefficient Assessment

*Note: SI, Social Influence; PEOU, Perceived Ease of Use; PU, Perceived Usefulness; INT, Intention to use Cloud Services; *P < 0.01*

4.3.3. Explanatory Power of Structural Model

The coefficient of determination (R^2) is the analysis of regression output value interpreted as the proportion of variation in endogenous variables that may be predicted by the exogenous variable (Cohen, 2013). It assesses the prediction accuracy of the model. As suggested by Hair et al. (2017), R^2 ranging from 0.75 is regarded as substantial, 0.50 as moderate, and 0.25 is considered weak. Table 6 reveals the R^2 results of INT (0.823, substantial), PEOU (0.717, moderate) and PU (0.728, moderate).

The effect size, or f^2, is a statistical term that measures the strength of a predictor construct's link to an independent variable (Cohen, 1988). In other words, f^2 evaluates the impact of exogenous constructions on endogenous constructs. When an exogenous construct is removed from the model, f^2

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investigates the change in R^2 value. According to Hair, Risher, Sarstedt, and Ringle (2019), a f^2 value of 0.02 indicates a little influence, a value of 0.15 indicates a medium effect, and a value of 0.35 indicates a significant effect. The results in Table 6 showed that SI (0.088), PEOU (0.067) and PU (0.258) gained the medium effects in producing R^2 for INT. In addition, SI obtained the largest effect in producing PU (2.673) and PEOU (2.563).

In PLS-SEM, the blindfolding process was used to get the Stone and Geisser's Q^2 data to report the predictive relevance of the model (Hair et al., 2019). When Q^2 values greater than 0 showed that the model's predictive relevance had been established. According to Hair et al. (2019), a Q^2 value of 0.02 indicates a modest predictive relevance, a value of 0.15 indicates a medium predictive relevance, and a value of 0.35 indicates a big predictive relevance. Table 6 concluded that INT, PEOU and PU achieved the large predictive relevance as all the values were larger than 0.35 respectively.

Predictor	Outcome	R^2	Consideration	f^2	Effect Size	Q^2	Predictive Relevance
SI	INT	0.832		0.088	Medium	0.626	
PEOU			Substantial	0.067	Medium		Large
PU				0.258	Medium		
SI	PEOU	0.717	Moderate	2.536	Large	0.416	Large
SI	PU	0.728	Moderate	2.673	Large	0.506	Large

Table 6. Explanatory Power of Structural Model

Note: SI, Social Influence; PEOU, Perceived Ease of Use; PU, Perceived Usefulness; INT, Intention to use Cloud Services

4.3.4. Predictive Power Assessment

Shmueli, Ray, Estrada, and Chatla (2016) proposed PLSpredict, an out-of-sample prediction approach to examine the model's ability to forecast new or future observations. Table 7 shows that the Q^2 predict values of the model variables (i.e. PEOU, PU, and INT) were greater than zero, with the lowest value being 0.233 and the highest being 0.639. Following that, the PLS-SEM analysis's root-mean square error (RMSE) values were then compared with the linear regression model (LM) values for each

indicator of the endogenous constructs of this model (Hair, 2020). The results indicated that the majority of the indicators in the PLS-SEM analysis have lower RMSE values compared to the RMSE values in the LM analysis. Thus, this model has achieved a medium predictive power.

INDICATORS	Q^2predict	PLS-SEM		LM		PLS- LM
		RMSE	MAE	RMSE	MAE	RMSE
INT1	0.62	0.342	0.236	0.325	0.195	0.017
INT2	0.493	0.392	0.261	0.398	0.271	-0.006
INT3	0.515	0.393	0.251	0.382	0.238	0.011
INT4	0.538	0.358	0.251	0.36	0.251	-0.002
INT5	0.616	0.329	0.229	0.331	0.218	-0.002
PEOU1	0.639	0.322	0.228	0.321	0.199	0.001
PEOU2	0.483	0.381	0.285	0.375	0.262	0.006
PEOU3	0.515	0.359	0.265	0.363	0.255	-0.004
PEOU4	0.233	0.548	0.358	0.553	0.357	-0.005
PEOU5	0.33	0.472	0.323	0.474	0.321	-0.002
PEOU6	0.33	0.501	0.313	0.496	0.331	0.005
PU1	0.615	0.345	0.221	0.336	0.192	0.009
PU2	0.462	0.397	0.269	0.389	0.272	0.008
PU3	0.498	0.384	0.267	0.386	0.259	-0.002
PU4	0.485	0.399	0.264	0.404	0.265	-0.005
PU5	0.465	0.387	0.279	0.388	0.282	-0.001
PU6	0.536	0.371	0.247	0.378	0.246	-0.007

Table 7. Predictive Power

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Note: PEOU, Perceived Ease of Use; PU, Perceived Usefulness; INT, Intention to use Cloud Services

5. Discussion

The notion of this study is to integrate TAM and UTAUT models to predict students' intention to use cloud services at the tertiary education level. The underpinning theory postulates on how social influence demonstrates the perception of the usefulness and ease of use of the cloud services and thus enabling a successful behavioral intention. Similarly, it is also articulated that individuals and groups affect students' intention in using cloud services in the early phases of technological adoption and was supported by Alharbi (2017).

First, the findings depict social influence positively affecting students' intention in using cloud services which the result is consistent with Ayaz and Yanartas (2020) and Venkatesh (2022). This further explains that students' intention to use cloud services depends on the people around them who enhance their behaviour to act. Second, social influence is found to be positive and significant to perceived ease of use as the students are influenced by their peers, friends, and community on the simplicity and compatibility of using cloud services. This can be seen through the students' understanding of the accessibility and adaptability of cloud services without the help of an expert and easy-to-use service. This has shown that the result is consistent with the work of Al Kurdi, Alshurideh, Salloum, Obeidat, and Al-dweeri (2020) and Zhang et al. (2020). Thirdly, the results also indicated that perceived ease of use affects students' intention to use cloud services. This implies that when cloud service is perceived as being easy to use, the students are more likely to have the intention to use it. Simple and easy-to-understand operations are more attractive to students in assisting them to complete tasks quickly and easily. This finding is in line with the studies conducted by Source & Issa (2021) and Lanlan et al. (2019). Fourthly, this study depicts a significant relationship between social influence and perceived usefulness. This further justifies that the people around the students share or advise a positive thought and the benefits of using cloud services. The finding is similar to the work by Beladad and Hegner (2018) and Harverila et al. (2022). Next, perceived usefulness is seen to significantly influence students' behavioral intentions. This relationship is consistent with the studies conducted by Moslehpour et al. (2018) and Source and Issa (2021). This relationship further iterates that when the application of cloud service is useful, students are more likely to adopt the cloud service. For example, the usefulness of the cloud service such as the functions and features assist students ability in improving their academic performance and completing their work.

The mediation of perceived ease of use between social influence and students' intention was tested and found to have a significant relationship. The empirical result reveals that perceived ease of use exerts a positive influence on social influence and behavioral intention (Chen & Akilikokou, 2020). This implies that the ease of using cloud services information could be convinced by social communities such as family and friends and thus increase the likelihood to use the cloud service. This relationship was found to be a complementary mediation relationship of perceived ease of use between social influence and students' intention based on the positive significance level. Lastly, the result also indicated that perceived usefulness mediates the relationship between social influence and students' intention to use cloud services. This explains that the use of cloud services is seen to be spreading fast among the community and it enhances students' judgment based on the practicality and suitability of the cloud service which in turn lead to intention to use. Perceived usefulness bridges the relationship between social influence and student's intention and this relationship further supports a complementary mediation.

The overall findings show a moderate to substantial explanatory power such as perceived ease of use (0.717), perceived usefulness (0.728), and intention (0.823). This implies that 71.7% and 72.8% of the variance can be explained by social influence while 82.3% of the variance can be explained by social influence, perceived ease of use, and perceived usefulness.

Theoretical implications

This study applies TAM and UTAUT theories to explain the interrelationship between perceived ease of use, perceived usefulness, social influence and intention. In light of this, TAM and UTAUT models are commonly used for examining technology acceptance in which, this study integrates both theories to further explain the intention to adopt cloud services among university students in Malaysia.

The contribution has also been made to the development of existing theories by applying these theories in the filed of education. Significant results from this research validate the generalizability of these theories. The construct of perceived usefulness and perceived ease of use enhance students' intention in adopting cloud services, these findings are in line with empirical studies conducted by Moslehpur et al. (2018) and Sorce & Issa (2021) in relation with technology adoption. Meanwhile, perceived benefits and advantages brought by cloud services are considered a perceived usefulness, and perceived ease of use reflects a user's belief in cloud service to be effortless. For social influence, our findings show that the variable influences intention, and this is also reflected in a study by Zhang

et al., (2020) which examined acceptance of a new technology that lacked first-hand usage experience. Additionally, our findings reveal that perceived usefulness and perceived ease of use have both direct and indirect influence on intention to use a technology-based service. Such findings are similar to Chen and Aklikokou (2020) which also showed that perceived usefulness and perceived ease of use mediated the relationship between social influence and behavioural intention.

Our study demonstrates the relevance of the TAM and UTAUT models in explaining the acceptance of cloud service in the context of education. Cloud service is one of many technological innovations that has surfaced in recent years. As more applications and services are developed and introduced, researchers may find it useful to incorporate the constructs of perceived usefulness and perceived ease of use, and social influence when examining intention to accept these technological innovations, especially in the field of education. The insight from this research should shed new light on the exact nature on the adoption of cloud services in higher education.

Practical Implications

This study provides insight to practitioners on the importance of social influence in the overall behavioral intention to adopt cloud-based services. The presence of social influence indicates how individuals respond to the social world in which social influence leads to an increase in students' intentions. Following through, this indicates that social influence, to a certain extent, should be focal within an HEI to improve the performance and establish a positive image of its cloud services in the mind of the social group.

The findings of this study show that social influence has the largest impact on perceived ease of use and perceived usefulness. When individuals are exposed to positive value and easiness to use cloud service from their social group, they tend to react positively to use the platform. This study not only denotes the empirical results of how a high social influence group would lead to creating successful student's intention in using cloud services but as well deliberately highlight the condition on how HEIs could be molded in discerning the usefulness and usability to perform the tasks in the cloud-based safely, effectively, efficiently, while enjoying the experience of the services.

This study also demonstrates how perceived usefulness is vital in enhancing students' intention in using cloud services. When students believe that cloud services will help them to achieve their goals and performance (i.e., study purposes, study effectiveness, task completion), it will then enhance their readiness to use the cloud services. Specifically, it indicates the role of the organization in developing

a useful cloud service. This is to increase the likelihood of the students using the services and thus they are more likely to have the intention to use it. Thus, the organization should not overlook the impact of perceived usefulness in developing or improving the performance of the cloud services in their planning per se activity. Similarly, students are more likely to have the intention to use cloud services when the services are perceived as easy to use. When cloud services are understandable and take less effort in learning while using, it increases the positive learning experience, and they may intend to use the platform regularly. Thus, perceived ease of use leads to the intention of students in using the services.

On the other hand, social group influence will have an impact on students' perceived usefulness as well as their intention to use cloud services. It should be well noted by now that social influence (e.g., internal and external factors such as surroundings and other individuals) influences students' decision to accept the use of cloud services. Organizational management plays an essential role in understanding how social groups influence the willingness of university students to use cloud services through their perception of ease. All in all, the findings provide a highlight to both the educational industry and organizations to provide an up-to-date user experience in improving the performance of cloud services. Specifically, understanding students' expectations of cloud services are pivotal for both industries in improving user comprehension of cloud service applications in different methods such as helpdesks, encouraging participation from students and lecturers, and training programs to maximize the capabilities of the cloud services. In this similar vein, it is believed that social influence is more likely to influence students' intention to use cloud services when the services are beneficial and easy to use.

6. Conclusion

This study has some shortcomings which could be further improvised in the future research. To begin, data for the current study were gathered from a sample of students from Malaysian higher institutions who employed cloud service in their studies. Therefore, further research can be conducted in other countries to validate the findings of the current study. Secondly, this study model was evaluated with one-time cross-sectional data. Hence, there is a need for further investigation to validate the TAM-UTAUT model by applying longitudinal data. Third, this study focused on student adoption of cloud services in higher education; future research should focus on academicians, government, and other authorities who use cloud services in other service entities. Forth, this study only indicated the

university students' intention to use cloud service during the pandemic outbreak, whereas future research should examine the post-adoption phase to verify the effectiveness of using cloud service in their studies. Thus, it is recommended that future study should examine the utilisation of cloud service in the education industry from a qualitative standpoint through interviews or focus group discussions. It is also encouraged to conduct mix-method studies by comparing the results from these two methodologies. Finally, the model of this study only achieves medium predictive power. Hence, future researchers can add other variables such as psychological aspects which can contribute to cloud service adoption. Additionally, other mediators or moderators such as learner involvement, information quality, social interaction and so on might be included in the existing model to test their impact on cloud service adoption. Future researchers are suggested to make comparisons with student academic performance before and after using cloud service to predict the usefulness of cloud service in their academic achievement.

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