Factors Determining Academics' Behavioral Intention and Usage Behavior Towards Online Teaching Technologies During Covid-19: An Extension of the UTAUT

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Abstract—Faced with lockdowns and social isolation because of COVID-19, alternative teaching methods such as online teaching allow academics and lecturers to teach students. Hence, the study aimed to investigate academics' intention and behavioral patterns in adopting online educational technologies in Malaysia via the unified theory of acceptance and the use of technology (UTAUT) with an additional academics' ethical considerations. The data were collected randomly from a sample of 321 academics from five Malaysian research universities using a questionnaire. For model and hypothesis testing, partial least squares (PLS) regression was utilized. The findings revealed that (1) ease of use, social influence, and ethical considerations all influenced behavioral intention significantly; and (2) facilitating conditions had positive relationships with usage behavior. The present results are consistent with the original UTAUT model and ethical considerations as additional factor. The study findings serve as a beneficial guide for universities and educational planners who are programming online teaching technologies for use in universities.

Keywords—academics, behavioral intention, Covid-19, online teaching technology, usage behavior

1 Introduction

The COVID-19 pandemic has significantly impacted the higher education (HE) throughout the world, resulting in the unexpected closure of universities [1]. It is causing worldwide alterations over a broad range of social, economic, and cultural aspects [2]–[4]. In HE, the most significant development is the rapid virtualization of the didactic process, as seen by the widespread use of online teaching platforms and devices [5]. The forced transition to online teaching provides fundamentally new conditions for university education and leads to a shift in the educational paradigm [6].

Malaysia's Ministry of Education has adopted an emergency plan, mandating an immediate and urgent transfer to online teaching to assure ongoing delivery of education

to students under these present conditions, in keeping with the precautionary measures imposed by several countries [7]. Malaysian universities, particularly, have made a significant effort in terms of online education, employing a variety of pre-existing learning management system platforms [8]. This easy transition may be ascribed to the Malaysian HE system's online teaching infrastructure, which has allowed online teaching to be integrated into Malaysian institutions for years [9]. There are a variety of local (e.g., PutraBlast, UMTeachOnline, etc.) and international (e.g., Blackboard, Google Class, Zoom, etc.) teaching platforms available. Despite the fact that Malaysian educational administrations demanded the implementation of online teaching, academics did not always comply with it for many reasons, such as the lack of skills and experience, restriction of time, and having trouble coping with new teaching methods [10]. When the lockdown was put into place, academics were asked to totally use online teaching.

According to Ferri [11], there are three main pandemic online teaching challenges: (a) technological, (b) pedagogical, and (c) social. Besides that, Gamage [12] pointed out that the academics' ethical acceptance and usage of online teaching tools during pandemics might be a source of challenges. Some ethical issues, such as trust, knowledge, privacy, and human liberty, are inextricably linked to the latest technological adoption [13]. As universities are now shifting to online teaching methods as the new norm, it is necessary to do research academics' behavioral intention (BI) to accept these technologies and their usage behavior (UB). Several researches have looked at descriptive models in technology adoption to help forecast adoption in addition to in UB [14]. Despite a large body of research on students' inspiration, commitment, and happiness with e-learning, there is little research on academics' involvements, intentions, and behavior [15]. In light of the pandemic and "emergency online teaching" [16], [17], this topic remains unexplored [18]. Therefore, the current study aimed to develop a theoretical model based on the well-known UTAUT to investigate factors affecting academics' BI to accept online teaching tools and their UB.

2 Literature review

The implementation of online teaching is closely connected with the academics' accepting technological tools for education [11]. In spite of the extensive use of ICTs in education, the academics' inability to operate in the new digital educational environment is a serious issue [19]. Several models have been presented to aid understanding of the aspects that affect information technology uptake [20]. Among these ideas, Davis's [21] TAM has been a prominent paradigm for researching factors that impact consumers' technology adoption. According to the TAM, two variables, perceived ease of use (EE) and perceived usefulness, play a mediating role in the complicated relationship between system characteristics (external factors) and anticipated system usage. Previous research has found that the TAM has certain flaws. Venkatesh [22] combined the main components from a total of eight major technological acceptance models that comprised the TAM to build the UTAUT model and to address these constraints. As a result, to analyze the impacts of technology-related factors on technology adoption, the UTAUT model was used as the theoretical foundation. It was developed to look at how

various factors might encourage academics to adopt online educational tools in their classrooms.

The UTAUT model (Figure 1) was used as the theoretical framework for identifying and studying the elements that impact users' BI to accept and utilize the online education resources designed to address COVID-19. UTAUT outperformed these models, according to Venkatesh [22], explaining up to 70% of the variance in BI and 50% of the variance in UB. Hu [23] supported the findings by Venkatesh [22] on the academics by their empirical study on UTAUT. Furthermore, UTAUT has been widely utilized to describe how people embrace new technologies. The UTAUT model acknowledges four key categories that act as direct predictors of BI and UB as technology acceptance influencing variables [24]: Ease of use (EE), Performance expectancy (PE), Social influence (SI), and Facilitating conditions (FC). All except FC directly affect BI, which also determines UB. FC and BI both directly impact user behavior.

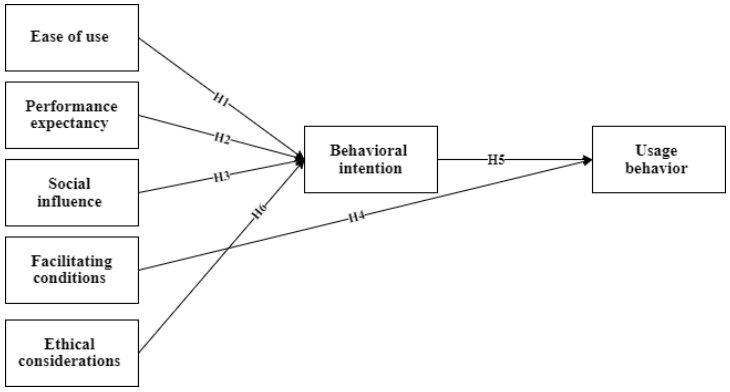

Fig. 1. Conceptual model

2.1 Ease of use and behavioral intention

EE refers to a user's belief that utilizing a specific technological tool is simple [25]. EE is "the degree of ease connected with the usage of the technological tools" [22]. In addition, BI refers to "the extent to which an individual has made conscious choices on whether or not to engage in a specific future activity". In the present study, EE refers to the academics' opinions on the EE of online learning. Academics' EE influences how they approach the adoption of new technology. According to Nikou and Economides' [26] research, a technology's EE has a substantial influence on BI. As a result, it has been proposed that:

H_1: EE positively influences academics' BI to use online technologies for teaching.

2.2 Performance expectancy and behavioral intention

PE may be described as an individual's perception that adopting technological tools would boost activity output [22]. PE concept, which anticipates BI's utilization of new

technology, is typically incorporated into the UTAUT model [27]. For instance, Sung [28] used the UTAUT paradigm to explore m-learning in the context of South Korea, concluding that it is strongly associated to BI. Several researchers have used the UTAUT model, and they supported the notion that PE and the BI were connected [29]. Literature has also found that PE has a substantial impact on the long-term desire to utilize online technology for education [30]. Thus, hypotheses 2 was developed as follows:

H_2: PE positively influences academics' BI to use online teaching technologies.

2.3 Social influence and behavioral intention

SI implies a person's view of the importance of other people's beliefs in persuading him or her to use a new technology [22]. The UTAUT defines SI as an individual's evaluation of the relevance of embracing a novel technological instrument [22]. Previous studies have been conducted to examine the function of SI, which encompasses colleagues, family members, and peer influences on individual adopting behavior [31], concluding that it is a key factor for predicting BI [32]. There appears to be a strong association between social pressure and competition with the application of online teaching and learning [33]. Thus, Hypothesis 3 suggests:

H_3: SI positively influences teachers' BI to use online teaching technologies.

2.4 Facilitating conditions and behavioral intention

FC is the degree to which a user feels that a system's technical and organizational infrastructure is enough to enable its usage [34]. The acceptance and implementation of online teaching must rely on the network infrastructure, which is a necessary component of online education [35]. Academics' perception of technology is affected by technical support, training on using online teaching, and administrative support. There was no significant influence of FC on BI in the study carried out by Teo and Noyes [36] using UTAUT. Oye and Iahad [37] found that there was a significant direct influence of FC on UB because academics get the technical support. As a result, Hypothesis 4 suggests:

H_4: FC positively influences teachers' BI to use online teaching technologies.

2.5 Behavioral intention and usage behavior

BI can be expressed in an individual's level of commitment to engage in a certain behavior [38]. Therefore, academics' BI toward online teaching may be measured by their level of commitment to accept and implement online technology resources to fulfil their educational goals [39]. Therefore, Hypothesis 5 implies:

H_5: BI is positively linked to academics' UB to use online teaching technologies.

2.6 Ethical considerations and behavioral intention

Individual cognitive processes have been conceptualized as EC [40]. Privacy, the proportionality principle, damage, and safety are among the EC's main concerns about technology. According to Lee and George [41], decisions and actions are frequently directed by applied ethical views, rather than a thorough grasp of what may or should be done. This study paid special attention to the function of EC, such that in addition to documenting the phenomena, it also examines the role of EC and acceptability in technological adoption. As a result, this research proposes to complete the UTAUT model. Although the ethical acceptability of technology in education among students has been extensively documented [42], the EC in adopting online teaching tools among academics, particularly during pandemics, has not been investigated. This research looks at values including voluntary usage, privacy, control, autonomy, well-being, justice, and safety to look at ethics in a broader sense. So far, nothing has been done to investigate the function of EC in shaping technological adoption. The technology acceptance models have traditionally been characterized as the use of technology as a result of a combination or trade-off between a technology's EE. These models call into question the EE, negative and positive emotions, anxiety, and social norms, all of which leads to the attractiveness of the technology. The notion of EC, on the other hand, has not been grasped. Ethics may be used to expand acceptance models beyond their usefulness, and critical literature can be used to develop acceptance models beyond the area of privacy. Cristina [43] confirmed that EC had a strong link with BI in terms of adopting new technologies. As a result, Hypothesis 6 is as follows:

Hypothesis 6: EC positively influences academics' BI to use online technologies for teaching.

3 Methodology

3.1 Research model

The original UTAUT model by Venkatesh [22] was chosen to accomplish the goal of this research since it included significant elements for predicting academics' BI towards technology and their UB. However, the model needed to be expanded to investigate technology acceptability among academics in HE institutions during the COVID-19 pandemic. As a result, EC was added as an independent construct.

3.2 Data collection and measures

This study's sample included academics from five Malaysian research institutions (MRUs), including UPM, UKM, UM, USM and UTM. The items from the available literature were used to construct the data gathering scale. With a total of 35 items, the items for assessing variables were derived from previous studies [22], [44], [45]. The construct measurement scale was built on a 5-point Likert scale. Shawver and Sen-

netti's [46] scale for edictal sensitivity was used to measure EC in terms of online teaching technology. The dimension consists of respect, safety issues, long-term effects, and respecting privacy. It was tested using a 12-item Likert scale. The sample item includes "using this technology for teaching maximizes benefits while minimizing harm in long-term". The responses of the participants were collected for analysis by distributing the questionnaire online. According to the criteria published by Raza [47], a sample of 50 is regarded poor, 300 is considered acceptable, 500 is considered very good, and 1000 is considered great for factor analysis. Therefore, we collected a total of 321 responses.

3.3 Demographics

Through stratified random sampling, a total of 321 respondents were chosen. There were 179 males and 141 females in the sample (M= 41, SD+2.87). Professors and associate professors accounted for 13.1 percent and 33.5 percent of academic posts, respectively, followed by senior lecturers (47.5%) and lecturers (47.5%). Table 1 indicates the respondents' educational backgrounds.

Table 1. Profile of respondents (N=321).

Demographic items	Frequency	Percentile	Mean	SD
Age			41	2.87
Gender				
Male	179	56%		
Female	142	46%		
Marital status				
Married	279	87%		
Single	35	11%		
Widowed	7	2%		
Academic background				
Engineering and architecture	77	24.08%		
Social sciences	53	16.7%		
Physical sciences	48	15.18%		
Medical sciences and health sciences	43	13.6%		
Business and administrations	35	10.99%		
Humanities and arts	33	10.47%		
Education	28	8.98%		
Educational background				
PhD	299	93.2%		
Master	22	6.8%		
Academic position				
Professors	42	13.1%		
Associate professors	107	33.5%		
Senior lecturers	152	47.6%		
Lecturers	18	5.8%		

3.4 Procedure

Permission was then acquired from the individual universities and deans of the faculties to perform the survey. The questionnaires were given after respondents completed a consent form. The data were collected over a two-month period, with respondents spending an average of 30 minutes on the questionnaire. A total of 350 surveys were sent out (92.85% response rate, 325 questionnaires). Four incomplete questions were eliminated, leaving only 321 questionnaires.

4 Data analysis and results

With the help of SmartPLS v. 3.3.3, data analysis was carried out utilizing components-based structural equation modelling (SEM). This study benefited greatly from the PLS [48].

4.1 Measurement model

The researchers kept all of the items since the data showed factor loading values of more than 0.60. Each variable item demonstrated convergent validity (Table 2). Convergent validity is attained with the following values [49], average variance extracted (AVE) = 0.50, composite reliability (CR) = 0.70, and Cronbach alpha = 0.70, respectively.

Table 2. Measurement model assessment

Constructs	A	rho_A	CR	AVE
EE	0.887	0.892	0.912	0.597
FC	0.877	0.882	0.908	0.621
PE	0.907	0.913	0.928	0.684
SI	0.917	0.924	0.93	0.573
BI	0.897	0.898	0.924	0.71
UB	0.884	0.903	0.917	0.691
EC	0.876	0.785	0.985	0.684

Note. Ease of use = EE, performance expectancy = PE, social influence = SI, facilitating conditions = FC, behavioral intention = BI, usage behavior = UB, Ethical considerations = EC.

Using empirical standards, discriminant validity assesses the degree to which one construct varies from another using Fornell and Larcker's [50] criteria with heterotrait-monotrait (HTMT) ratios of relations [51]. Thus, discriminant validity was achieved when the square root of each construct's AVE was larger than the correlation values of each construct pair. Furthermore, as shown in Tables 3, 4, the HTMT criteria were all below the 0.85 threshold value. As a consequence, this research demonstrated that all study factors can be distinguished.

Table 3. Fornell−Larcker criterion

	1	2	3	4	5	6	6
1. BI	0.842						
2. EC	0.733						
3. EE	0.628	0.682	0.773				
4. FC	0.684	0.7	0.611	0.788			
5. PE	0.66	0.646	0.544	0.637	0.827		
6. SI	0.702	0.649	0.596	0.626	0.59	0.757	
7. UB	0.607	0.518	0.468	0.509	0.578	0.441	0.831

Note. Ease of use = EE, performance expectancy = PE, social influence = SI, facilitating conditions = FC, behavioral intention = BI, usage behavior = UB, Ethical considerations = EC.

Table 4. HTMT criterion

	1	2	3	4	5
1. BI					
2. EE	0.699				
3. FC	0.769	0.687			
4. PE	0.729	0.601	0.713		
5. SI	0.763	0.651	0.692	0.645	
6. UB	0.676	0.52	0.572	0.636	0.484

Note. Ease of use = EE, performance expectancy = PE, social influence = SI, facilitating conditions = FC, behavioral intention = BI, usage behavior = UB, , Ethical considerations = EC.

4.2 Structural model

Once the measurement model evaluated in terms of reliability and validity, the structural model was constructed. As can be seen in Figure 2, exogenous variables explained 65.9% of the variance in BI and 38.5 percent of the variance in UB, suggesting a modest ability to predict behavior. The significance of the relationships between the variables was then determined by bootstrapping method (Table 5). To determine the significance of path estimates, the bootstrap approach entailed resampling a sub-sample of 5,000 occurrences, which result was similar to the verified results. It was calculated using a two-tail significance of 5%.

H_1 was acceptable since the result revealed that EE and BI had a significant relationship (β=0.114, t=2.536, p=0.012). The findings supported H_2 as there was a significant association between PE and academics' BI (β=0.212, t=5.58, p=0.000). The current findings indicated that SI had a significant influence on academics' BI (β=0.299, t=8.363, p=0.000); H_3 was, therefore, supported. Furthermore, the results of the path coefficient revealed that the FC factor (β=2.961, t=0.175, p=0.003) was significantly related to BI; hence, H_4 was supported. Finally, the present findings also supported H_5 as there was a significant association between BI and UB of academics (β=0.488, t=9, p=0.000). Thus, H_6 was supported. The findings revealed that there was a relationship between academics' EC and BI (β=0.325, t=7.409, p=0.000). Thus, H_6 was accepted.

Table 5. Hypotheses testing (bootstrapping).

Hypothesis	Path	Std β	T Statistics (|O/STDEV|)	P Values	BC 95% LL	BC 95% UL	Decision
H_1	EE→BI	0.114	2.536	0.012	0.036	0.204	Supported
H_2	PE→BI	0.212	5.58	0	0.129	0.283	Supported
H_3	SI → BI	0.299	8.363	0	0.231	0.366	Supported
H_4	FC→UB	0.175	2.961	0.003	0.046	0.28	Supported
H_5	BI → UB	0.488	9	0	0.372	0.583	Supported
H_6	EC→BI	0.325	7.409	0	0.231	0.393	Supported

Note. Ease of use = EE, performance expectancy = PE, social influence = SI, facilitating conditions = FC, behavioral intention = BI, usage behavior = UB, Ethical considerations = EC.

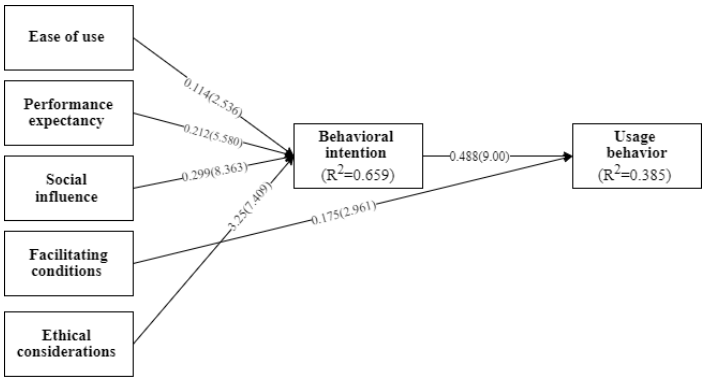

Fig. 2. Structural model

VIF values were used to determine collinearity, which were less than 5 for all constructs studied, implying that collinearity was not an issue [51].

Table 6. Collinearity of structural models (inner VIFs)

Construct	1	2	3	4	5	6	7
1. BI							0.206
2. EC	0.121						
3. EE	118						
4. FC							0.027
5. PE	0.069						
6. SI	0.131						
7. UB							

Note. Ease of use = EE, performance expectancy = PE, social influence = SI, facilitating conditions = FC, behavioral intention = BI, usage behavior = UB, , Ethical considerations = EC.

In addition to R^2 and f^2, the Q^2 value was used to measure the structural model's predictive importance. The structural model has a predictive value if the Q^2 value for a given reflecting endogenous latent variable is larger than zero; if not, the model does not have predictive value [52]. The results of the blindfolding demonstrated that BI

(0.438) and UB (0.247) were both predictively significant [51]. The analysis verified the structural models' overall fit with a standardized root-mean-square residual score of 0.06, which was much lower than the 0.10 threshold [51] (Table 7).

Table 7. The structural model's predictive relevance

Construct	SSO	SSE	Q^2 (=1-SSE/SSO)
BI	2,180.00	1,225.39	0.438
UB	2,180.00	1,642.46	0.247

Note. Behavioral intention = BI, usage behavior = UB.

5 Discussion

The findings confirmed the UTAUT model. This contrasted with the findings of other researches, such as Gunasinghe [53], who revealed that EE was a predictor of BI to utilize innovative technologies among Malaysian academics. The findings of Oye [54] showed that there was a strong association between PE and BI among academics' willingness to accept new technologies and they were validated in this study. Furthermore, our result is consistent with other researches that show that the academics feel that utilizing new technology will aid them in improving their performance [55]. This finding is consistent with other studies that show a link between SI and academics' willingness to utilize new technology [56], [57]. However, the present findings rejected the findings of Hu [23] who showed that SI had no prediction of academics' adoption of teaching technologies. This conclusion is consistent with the UTAUT model's initial theoretical background [22], in which SI is a key factor in the model. This finding can be attributed to the comparatively significant effect of close co-workers and acquaintances in educational environments. Furthermore, Zhao [58] discovered that Asian nations' collectivist cultures indicated that other people's opinions were important in deciding whether or not to accept new technology. As claimed by Zhang [59], differences in technology adoption are linked to cultural factors. Individualistic cultures place a greater emphasis on straight and formal sources of information whereas collectivist cultures, like those in Southeast Asia, place a greater emphasis on subjective innovation assessments provided by like-minded individuals who have already embraced the innovation [58]. Our findings were consistent with those of Nikou and Economides [26], who reported that FC increased the desire to use current technology. This conclusion supported the UTAUT model's initial prediction, as well as Kung-Teck's [60] findings that FC predicted the academics' intentions to employ cutting-edge technology. The academics' intentions to use technologies such as Blackboard, Zoom, and other platforms for instructional purposes may be influenced by variables such as time, financial, and technological resources. This is in line with Venkatesh's [22] findings that BI leads to UB. The findings supported previous research, such as Elbeltagi and Agag [61] and Faiq [62], who found that EC could influence users' behavioral intentions.

6 Conclusion

This study explored the determinants of online teaching tools among academics in Malaysian research universities using the UTAUT paradigm. The proposed theoretical model was validated in the original model. The structural model revealed that EC was a factor that explained academics' willingness to accept new teaching technologies.

7 Implications

This study theoretically investigates the academics' BI and UB towards online teaching tools during the COVID-19 pandemic. The results contributed to relevant research on online teaching using UTAUT. Following COVID-19's quarantine directives, technological development of teaching has recently become a vital cornerstone of education since it is the only method to continue education. Next, this research examined how factors in the UTAUT model changed in response to the crisis, affecting online teaching uptake. The conclusions of this study give some practical suggestions for technology developers and promoters. It is advised for the technology developers to re-evaluate external factors and identify new determinants that will affect the application of new technology in order to promote new technology. When offering new tools for individual users, the EC as a set of principles and values should be carefully considered. Users' feelings should be taken into account by technology developers since these intangible variables might be a game changer when it comes to marketing new technologies. When supporting new technologies, governments should also give adequate funding and policy assistance.

8 Limitations and direction for future studies

Several limitations hindered the current findings. The research looked at some of the factors that influenced academics' intention to embrace online teaching technologies. One limitation of the current analysis is the inability to generalize the study results. This study involved only a few small groups of academics who were invited to fill out questionnaires. The respondents may not be representative of the broader sample population, and their responses may not be generalizable. While this study used validity and reliability testing to develop a fair testing instrument and measuring scales, the study's internal validity may require additional attention as a result of how participants filled out the questionnaires. The research, like all others, relied on a self-administered questionnaire, suggesting that the respondents might have provided superficial replies. Furthermore, some responders might have aggravated the problem by supplying information that they hoped would impress the researchers. To address this flaw, future studies should use a different strategy to investigate, such as a longitudinal study. A new longitudinal or qualitative method might give more information about the study.

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