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ORIGINAL ARTICLE

An empirical study to explore the influence of the COVID-19 crisis on consumers' behaviour towards cashless payment in Malaysia

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Abstract
To move into a cashless society, it is important to investigate how consumers' behaviour changes, particularly in response to extraordinary circumstances. Despite the movement restrictions implemented, the acceleration of e-commerce, initiatives taken by the government, and the modern payment system in Malaysia, cash remains the prevalent payment method. Hence, this study investigates how the coronavirus disease (COVID-19) crisis influenced consumers' perceptions and determines factors contributing to consumers' behavioural intention to use cashless payment. The research framework for this study is based on the unified theory of acceptance and use of technology (UTAUT). The study collected a total of 463 responses from the online survey. The data of this study were analysed using partial least square modelling techniques. This study demonstrates that the crisis significantly and positively influences consumers' perceptions of performance expectancy, effort expectancy, social influence, and facilitating conditions. All of these factors explain consumers' behavioural intention to use cashless payment, except facilitating conditions. The findings acknowledge the impact of the health crisis on consumer perceptions and influence their behavioural intentions to use cashless payment.

Keywords Cashless payment · Consumer behaviour · COVID-19 · Unified theory of acceptance and use of technology model · PLS-SEM

JEL Classification E42 · D10 · O33

Introduction

The coronavirus disease (COVID-19) has spread over the world from 2020 until today. People have to find ways to coexist with the virus. During the crisis, the imposition of lockdowns leads to closure of shop and services to reduce the infections. To counteract this situation, many merchants has changed their business model such as implement online shops and provide digital services to survive and thrive in the crisis.

Luckily, the world is moving towards technology. The rise of internet and the digitalization has rapidly uptake cashless payment as an alternative payment method. The payment systems have evolved from currency and cheques to payment cards such as credit and debit cards, and electronic payments such as e-money, internet banking, and mobile banking. The electronic payment system increases the speed of transactions and enhance customer experiences (Lim 2019).

The COVID-19 crisis has caused a total of 35,858 COVID-19 death cases in Malaysia as of July 2022 (Ministry of Health Malaysia 2022). People are losing their loved ones, suffering from COVID-19 sickness, the negative effects of economic shocks, and all kinds of pressure from the COVID-19 crisis. This forced people to make every possible effort to curb the spread of the virus, such as social distancing, staying at home, and avoiding handling cash to display preventive behaviour to preserve their health. Davis et al. (2015) describe behaviour as an individual's actions in respond to internal or external circumstances. The health belief model explains that people willing to change their behaviour from their health perceptions (Becker 1974). According to the protection motivation theory, people change their behaviour in a way of protecting themselves from perceived threats (Rogers 1975). People will cognitively adjust their behaviour

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to living with the virus. Cashless payment is an alternative payment method that could limit the spread of the virus. It allows the financial transactions to be completed without visit the brick-and-mortar stores.

Despite the various steps taken by the government, movement restrictions implemented, the acceleration of e-commerce, and the modern payment system, cash remains the preferred means of payment in Malaysia (Bank Negara Malaysia 2020). Only 5% of total daily cashless payment transactions were reported (Lim 2020). Additionally, the habit of using cash among Malaysian, especially in the rural areas. The McKinsey & Company (2020) estimates that 72% of the total transactions in Malaysia are using cash. These statistics imply the habit of using cash is widespread among Malaysians. Malaysia needs at least 20 years to fully transform into a cashless society (Sharon 2019). The COVID-19 crisis can change people's behaviour as a result of the contagion period, self-isolation and economic uncertainty (Kohli et al. 2020). Hence, it is essential to find out if the COVID-19 crisis is a stimulating factor that motivates consumers in Malaysia to use cashless payment?

In the literature, previous studies examine factors influencing electronic banking services adoption, such as online banking, electronic banking, and mobile banking, using different theories and different model under a normal circumstance (Martins et al. 2014; Bhatiasevi 2016; Sarfaraz 2017; Friadi et al. 2018; Savic and Vasic 2019; Singh and Srivastava 2020; Yang et al. 2021; Gupta and Dhingra 2022). Meanwhile, the studies that examined users' intention to use technology during the COVID-19 crisis are dominant in the fields of learning (Maphosa et al. 2020; Raza et al. 2021; Qiao et al. 2021), tourism (Pinto et al. 2022; Chang et al. 2022; Godovykh et al. 2022), and online purchase (Erjavec and Manfreda 2022; Puriwat and Tripopsakul 2021a), while studies on electronic payment usage during the crisis are focused on supplementing additional factors that influence intention of adoption to use (Musyaffi et al. 2021; Santosa et al. 2021; Upadhyay et al. 2022).

Unlike previous studies, this study adapts the Unified Theory of Acceptance and Use of Technology (UTAUT) model by incorporating consumers' personal adjustment to the fear of COVID-19 as a new variable in the research model to explore how the crisis stimulate and influence their perceptions on the key factors that determine the behavioural intention to use cashless payment. The findings may help to predict the consumers' payment behaviour and project market demand for cashless payments in Malaysia. The practical contribution of this study is to provide empirical evidence on the adoption of cashless payments in Malaysia with influence of the COVID-19 crisis. This would help practitioners such as policy maker, cashless payment service provider, and merchant to determine the appropriate strategies and intervention to address the shifting of consumer payment behaviour. We find that the crisis significantly and positively influences consumers' perceptions of performance expectancy, effort expectancy, social influence, and facilitating conditions. All of these factors explain consumers' behavioural intention to use cashless payment, except facilitating conditions.

The remainder of the paper is organized as follows. "Literature review" section discusses related literature and hypotheses. The research methodology is presented in "Research methodology" section. "Results" and "Discussion" sections present results and discussion. Lastly, "Conclusion" section presents conclusion.

Literature review

Theoretical background

Among the widely used frameworks for examining the acceptance of technologies are Theory of Reasoned Action (Fishbein and Ajzen 1975), Theory of Planned Behaviour (Ajzen 1985, 1991, 2006), Technology Acceptance Model (Davis 1989), and Unified Theory of Acceptance and Use of Technology (Davis 1989; Venkatesh et al. 2003).

The Unified Theory of Acceptance and Use of Technology (UTAUT) model is used in this study. The UTAUT model predicts consumer behavioural intentions to use technology more comprehensively as it integrates the above mentioned theories together with MM (Motivational model), MPCU (Model of PC Utilization), IDT (Innovation Diffusion Theory), and SCT (Social Cognitive Theory). This model examines the factors influencing technology acceptance with four key determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions). The strength of the UTAUT model in predicting the intention to use electronic payment is that it includes most of the factors that can occur as obstacles to the adoption (Tomić et al. 2022).

This model has been employed to examine acceptance of technology in various fields, including computing technologies (Dwivedi et al. 2019; Ayaz and Yanartas 2020), digital decision support system (Aljarboa and Miah 2021; Laka et al. 2021), learning technologies (Almaiah et al. 2019; Chao 2019; Altalhi 2021), social media (Al-Azawei 2018; Puriwat and Tripoposakul 2021b), and healthcare system (Alam et al. 2018; Nunes et al. 2019). The studies that examine adoption of technology for banking services with UTAUT model are well established (Martins et al. 2014; Bhatiasevi 2016; Sarfaraz 2017; Friadi et al. 2018; Savic and Vasic 2019; Singh and Srivastava 2020; Yang et al. 2021; Gupta and Dhingra 2022). Meanwhile, e-learning (Maphosa et al. 2020; Raza et al. 2021; Qiao et al. 2021); tourism (Pinto et al. 2022; Chang et al. 2022; Godovykh et al. 2022);

mobile food delivery (Puriwat and Tripopsakul 2021a); and online shopping (Erjavec and Manfreda 2022) are among the studies that use the UTAUT model to probe intention to use during the COVID-19 crisis. On the other hand, studies on electronic payment usage during the crisis are focused on supplementing additional factors to behavioural intention of adoption such as perceived security and personal innovativeness (Musyaffi et al. 2021); user satisfaction (Santosa et al. 2021); and perceived severity and self-efficacy (Upadhyay et al. 2022).

During the crisis, the World Health Organization (WHO) is encouraging people to use cashless transactions to limit the spread of the virus. The healthy behaviour theories such as the health belief model and protection motivation theory describe that people will adjust their behaviour in order to preserve their life from the health events like COVID-19. The health belief model postulates that the likelihood people adopts a behaviour is predicted by their belief in a personal threat of a disease and their belief in the effectiveness of the recommended behaviour of action. The behaviour action depends on benefits to action, barriers to action, self-efficacy, cues to action, risk susceptibility, and risk severity (Becker 1974; Champion and Skinner 2008). Additionally, the protection motivation theory predicts people's protective behaviour (Rogers 1975). According to Rogers (1975), fear is an important factor in predicting the behaviour and explaining the cognitive process that is involved. These two theories show that people will cognitively adjust their behaviour to avoid the infections of the COVID-19 virus. Cashless payment is an alternative payment method. It allows the financial transactions to be completed under the conditions of quarantine, social distancing, and maintaining personal hygiene. These are essential preventive measures to combat COVID-19. The crisis has negatively impacted on almost all of the sector, but it has had a positive impact on remote services, such as digital financial services (Kasradze 2020). Hence, the crisis is likely to increase the adoption of technology and digital services.

Hypotheses development

Based on the above discussion, the research framework is developed as shown in Fig. 1. This study proposed that the personal adjustment to the fear of COVID-19 altered consumers' perceptions of performance expectancy, effort expectancy, social influence, and facilitating conditions, which affected their behavioural intentions to use cashless payment.

The behavioural intention to use (BI) is a motivational factor that influence a specific behaviour. The stronger a person's intention to engage in a behaviour, the more likely he or she will do so. It shows a person's tendency in determine to do or not to do any action (Ajzen 1985). In this study, BI

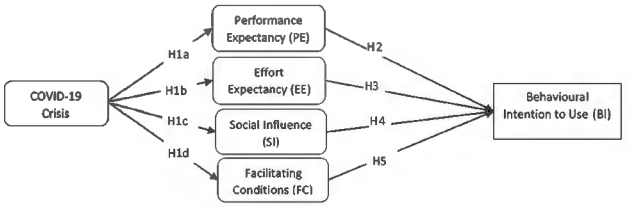


Fig. 1 Research framework

is a dependent variable to gauge the intention to use cashless payment among Malaysian.

Although the literature has limited evidence to show the influence of the COVID-19 on cashless payment. COVID-19 crisis has affected the way of our life. A surge in online shopping during this crisis to mitigate the infection risk (Kohli et al. 2020). A study that investigated the changes in consumer behaviour due to the COVID-19 crisis, shows that Malaysians are making the shift to online shopping (Vase.ai., April 2020). The cashless payment supports the online shopping platform and allows people to make contactless payment. Besides that, government used e-money to disburse the COVID-19 stimulus package (ePenjana, eYouth) to vulnerable group. Additionally, the health belief model and the protection motivation theory claim that people adjust their behaviour in order to preserve their life from the threatening events like COVID-19. A cashless payment is an alternative payment method that could limit the infection and a way to coexist with the COVID-19 virus. The COVID-19 crisis is believed to influence an individual's psychology and affect their payment behaviour. In this study, the COVID-19 crisis is the degree of personal adjustment make during the COVID-19 crisis that affect consumers' perceptions on performance expectancy, effort expectancy, social influence, and facilitating conditions for using cashless payment. This study hypothesizes that,

H1a: The COVID-19 crisis positively influences consumers' perceptions of performance expectancy for using cashless payment.

H1b: The COVID-19 crisis positively influences consumers' perceptions of effort expectancy for using cashless payment.

H1c: The COVID-19 crisis positively influences consumers' perceptions of social influence for using cashless payment.

H1d: The COVID-19 crisis positively influences consumers' perceptions of facilitating conditions for using cashless payment.

Performance expectancy (PE) measures a person's perception that adopting the technology will benefit them when

they perform certain activities (Venkatesh et al. 2003). PE has been discovered as the most influential factor influencing behavioural intention to adopt technology (Savic and Vasic 2019). The users of internet banking perceive that internet banking eases their financial transactions as it allows them to make payments in a more convenient way and with fast response and service effectiveness (Martins et al. 2014). The consistent findings are found for the adoption of mobile banking (Baptista and Oliveira 2015; Basri 2018). A person's intention to use technology is determined by a person's perception of the usefulness of the technology (Nambiar and Bolar 2022). PE reflects consumers' perceptions of whether the cashless payments will be beneficial to them and how that will influence their behaviour to use it in this study. This study therefore hypothesizes that by having perception that using cashless payment will help them achieve benefits (useful, effective, speed, and time savings) in performing payment transactions, the more likely consumers will use cashless payment.

H2: Performance expectancy positively influences consumers' behavioural intention to use cashless payment.

Effort expectancy (EE) measures how easy it is to perform the activities using technology (Venkatesh et al. 2003). It reflects the subjective feelings about the difficulties in adopting a new technology (Tomić et al. 2022). Studies show that the convenience and easy to use of the technology has a positive impact on an individual's behavioural intention to adopt mobile banking (Bhatiasevi 2016; Friadi et al. 2018). But, some studies show that EE is the weakest influence on intention to use mobile banking (Savic and Vasic 2019) and electronic payment system (Tomić et al. 2022). Based on the research gap, this study hypothesizes that when consumer believe that cashless payment system is convenience and easy to operate, the more likely consumers will use cashless payment.

H3: Effort expectancy positively influences consumers' behavioural intention to use cashless payment.

Social influence (SI) measures how an individual is influenced by the important person around them when using technology (Venkatesh et al. 2003). They would be influenced to engage in the behaviour by the opinions of an important person around them (Bhatiasevi 2016; Savic and Vasic 2019). Sarfaraz (2017), on the other hand, showed that the behavioural intention to use mobile banking in Jordan is unaffected by social influence. Based on the research gap, this study hypothesizes that by having the majority of important people around us believe that cashless payment is a wise payment method, the more likely consumers will use cashless payment.

H4: Social influence positively influences consumers' behavioural intention to use cashless payment.

Facilitating conditions (FC) is elements in the environment that make an act easier to be accomplished. It measures a person's belief in the availability of organizational and technological infrastructure to enable the use of technology. Facilitating conditions is the most essential factor driving the adoption of mobile financial services (Gupta and Dhingra 2022). The availability of resources and expectations of simplicity of use increase the likelihood of using e-money with a smart phone (Friadi et al. 2018). However, some studies show that facilitating conditions do not influence consumers' behavioural intention to use technology (Bhatiasevi 2016; Iskandar et al. 2020; Yang et al. 2021). Based on the research gap, this study hypothesizes that the availability of facilitating conditions such as infrastructure, facilities, resources, technical support, and knowledge to use cashless payment, the more likely consumers will use cashless payment.

H5: Facilitating conditions positively influences consumers' behavioural intention to use cashless payment.

Research methodology

Sampling and data collection

This study uses convenience sampling techniques to gather primary data to explore what determines a consumer's behavioural intention to adopt cashless payment in Malaysia amid the COVID-19 crisis.

The data of this study was gathered through an online survey from the consumers in Malaysia. The online self-administered questionnaire was distributed through email and social media during November to December 2020. A total of 463 completed questionnaires were collected.

The survey's participation was entirely voluntary and the objective of the study was informed before the participant answered the questionnaire.

Survey instrument

Table 1 depicts questionnaire's structure and sources. The research model of this study incorporates six latent constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, COVID-19 crisis, and behavioural intention to use. The items of the questionnaire are measured on a five-point Likert scale that ranged from (1) Strongly Disagree to (5) Strongly Agree to show respondent's agreement level. The questionnaire was created



Table 1 The structure and sources of questionnaire

Variables	Questions	Cronbach's alpha	Sources
PE	8	0.933	Davis (1989) and Venkatesh et al. (2003)
EE	8	0.900	Davis (1989), Moore and Benbasat (1991) and Venkatesh et al. (2003)
SI	6	0.858	Ajzen (1991) and Venkatesh et al. (2003)
FC	5	0.928	Ajzen (1991) and Venkatesh et al. (2003)
COVID-19 crisis	10	0.895	Vase.ai (April 2020)
BI	5	0.981	Ajzen (2006) and Venkatesh et al. (2003)

Table 2 Full collinearity testing

Behavioural intention	COVID-19	Performance expectancy	Effort expectancy	Social influence	Facilitating conditions
3.590	2.489	3.081	3.648	1.553	2.885

using a multiple-item measurement scale adopted from past studies.

Although the questionnaire's items were adopted from past studies, a pilot test was conducted on 40 respondents to ensure the content validity. High internal consistency is shown by a Cronbach's alpha of higher than 0.7. Hence, the questionnaire developed is reliable.

Since this study gathered data from single source, full collinearity test is conducted to examine the issue of Common Method Bias (Kock and Lynn 2012; Kock 2015). The VIF ≤ 5 (Kock and Lynn 2012) and ≤ 3.3 (Kock 2015) indicate that the single source data is not biased. Table 2 shows that the VIF for most of the latent variables are ≤ 3.3, only VIF for Behavioural Intention and Effort Expectancy are ≥ 3.3 but ≤ 5, so single source bias does not exist in the data for this study.

Demographic analysis

Table 3 shows the demographic profile of 463 respondents, with 66.31% being female and 33.69% being male. The majority of respondents are between the age of 18–24 (63.50%), followed by the respondents in the age range of 25 to 34 (14.69%), 35 to 44 (11.88%), 45 to 54 (4.75%), 55 to 64 (3.02%) and aged 65 and above (2.16%). This study is dominated by respondents with a college/university education level (74.73%). The remaining respondents being in graduate school (13.18%), primary school (5.83%), high school (5.40%) and others (0.86%). There is a total of 57.88% Malay respondents, 28.94% Chinese respondents, 10.58% Indian respondents, and 2.60% other races respondents. Majority of the respondents indicated that they are dependent (35.21%), while 24.84% respondents' monthly income is RM1000 and below, 15.33% in the RM5,000 and above monthly income range, 14.04% in the RM1,000 to RM2,999 monthly income range and 10.58% in the RM3,000 to RM4,999 monthly income range. The respondents are resided in urban area (67.82%) and rural area (32.18%).

Table 3 Respondents' demographic profile

Demographic	Frequency	Percentage (%)
Gender		
Male	156	33.69
Female	307	66.31
Age		
18–24	294	63.50
25–34	68	14.69
35–44	55	11.88
45–54	22	4.75
55–64	14	3.02
65 and above	10	2.16
Education level		
Primary school	27	5.83
High School	25	5.40
College/University	346	74.73
Graduate School	61	13.18
Others	4	0.86
Ethics		
Malay	268	57.88
Chinese	134	28.94
Indian	49	10.58
Others	12	2.60
Income level		
≤RM1,000	115	24.84
RM1,000–RM2,999	65	14.04
RM3,000–RM4,999	49	10.58
≥RM5,000	71	15.33
Dependent	163	35.21
Residence area		
Urban	314	67.82
Rural	149	32.18

Results

The statistical method for this study is partial least square structural equation model (PLS-SEM). This approach allows researchers to use it for theory confirmation or theory development (Chin 1998). In this study, SEM is conducted to test the new model, which is the consumers' personal adjustment to the fear of COVID-19 as a new variable in the research model. The SmartPLS 3.0 version was used to assess the measurement and structural model (Ringle et al. 2015).

Measurement model

The convergent validity and discriminant validity tests are conducted to measure the construct's validity. The convergent validity assessment is used to determine whether the multiple indicators of the same construct are highly correlated by assessing the loadings, Cronbach's alpha, composite reliability (CR), and the average variance extracted (AVE) (Hair et al. 2019).

Table 4 illustrates the construct's convergent validity. The loadings for the constructs are acceptable, except for few items (COVID1, PE7, EE6, and EE8), which are less than the threshold value of 0.5. The results also show that Cronbach's alpha and CRs are greater than 0.7, and AVEs are greater than 0.5 for all the constructs.

Next, the HTMT criterion is to measure the discriminant validity (Franke and Sarstedt 2019). Table 5 shows that the HTMT values were less than ≤ 0.85 for all constructs. This shows that the respondents understood the latent variables distinctly, the item of constructs do not contain overlapping items from the respondents' perception.

Structural model

The results of hypothesis testing for this study are shown in Table 6. The results reveal that the COVID-19 crisis is positively and significantly influencing consumers' perceptions of performance expectancy ($\beta = 0.671$, $p < 0.01$), effort expectancy ($\beta = 0.699$, $p < 0.01$), social influence ($\beta = 0.505$, $p < 0.01$) and facilitating conditions ($\beta = 0.685$, $p < 0.01$). Further, the results also show that the performance expectancy ($\beta = 0.385$, $p < 0.01$), effort expectancy ($\beta = 0.320$, $p < 0.01$), and social influence ($\beta = 0.120$, $p < 0.01$) are positively and significantly related to behavioural intention to use cashless payment. The hypotheses of H1a, H1b, H1c, H1d, H2, H3, and H4 are thus supported.

Next, PLSpredict is a holdout sample-based approach that estimate predictive power by analysing the root mean square error (RMSE) with 10-fold procedure (Shmueli et al. 2019). The PLS RMSE is lower than LM RMSE for majority of the items. Thus, the model in this study has a moderate predictive power as shown in Table 7.

Discussion

The results described in the preceding section show that performance expectancy is the stronger predictor that determines a consumer's behavioural intention to use cashless payment. Consumers' willingness to use cashless payment increases when they perceive the benefits of it. This is supported by the result that the COVID-19 crisis has had a positive and significant impact on consumers' perceptions of performance expectancy. During the lockdown period, people can use cashless payments effectively to purchase and conduct financial transactions. This reduces the risk of virus transmission during the contactless payment transactions. Additionally, consumers benefit from usage incentives such as rewards and cashback bonuses offered by cashless payment providers. Our results is consistent with previous studies such as Venkatesh et al. (2003) and Tarhini et al. (2016).

The effort expectancy is the second significant factor that influence consumer's behavioural intention to use cashless payment. The simplicity of the cashless payment system makes it easy to use by consumers, increasing their behavioural intention to use it (Bhatiasevi 2016; Sarfaraz 2017; Friadi et al. 2018). This study shows that the COVID-19 crisis has positively and significantly influenced consumers' perception of effort expectancy. People are staying at home and working remotely, which has compelled them to use technology more frequently than they did prior to the crisis. This enhanced their skills in operating technology. As a result, consumers can operate the cashless payment system and instruments independently.

Additionally, this study discovered that social influence has a positive and significant relationship with behavioural intention to use cashless payment and that COVID-19 significantly influenced consumers' perceptions of social influence to use cashless payment. As the respondents in this study were dominated by those aged 18 to 24, young adults are particularly susceptible to peer pressure (Do et al. 2018) and family influence (Hollifield and Conger 2015). Furthermore, this health crisis has put many people under stress, as a result, the important people in our lives have a significant influence on our decision-making during this period. This is in line with previous studies such as Bhatiasevi (2016) and Savic and Vasic (2019).

Furthermore, this study indicated that COVID-19 crisis significantly and positively influenced consumers' perceptions of facilitating conditions. Many merchants started to participate in online selling during the lockdown period.



Table 4 The construct's convergent validity

Construct	Items	Loading	Cronbach's Alpha	CR	AVE
Behavioural intention to use					
I plan to adopt cashless payment in the future transactions	BI1	0.915	0.952	0.963	0.838
I think I will adopt cashless payment in the future transactions	BI2	0.910			
I intend to adopt cashless payment for my next transactions	BI3	0.915			
I believe that opting a cashless payment is a wise choice	BI4	0.914			
I could see myself making payment transactions cashless	BI5	0.924			
COVID-19 crisis					
I make purchases via cashless payments more frequently than before COVID-19 crisis	COVID2	0.535	0.914	0.930	0.603
I stay at home and purchase online during the COVID-19 crisis	COVID3	0.821			
I use cashless payment for purchase during the COVID-19 crisis	COVID4	0.891			
I use cashless payment for purchase to protect myself from the infection of COVID-19	COVID5	0.854			
I use cashless payment when visit stores to buy goods during COVID-19 crisis	COVID6	0.793			
I shop online and use cashless payment during COVID-19 crisis	COVID7	0.860			
Many retail merchants in my area accept cashless payment during COVID-19 crisis	COVID8	0.624			
I prefer not to handle cash and opt for cashless payment during COVID-19 crisis	COVID9	0.711			
I would continue using cashless payments in the future	COVID10	0.823			
Performance expectancy					
I can accomplish my financial transaction more quickly with the cashless payment system	PE1	0.906	0.941	0.953	0.744
Using the cashless payment system would improve the efficiency of my financial transactions	PE2	0.876			
Using cashless payment system would be easier for me to do the financial transactions	PE3	0.917			
I feel that cashless payment system is useful in doing my financial transactions	PE4	0.935			
I will save time on doing my financial transactions if I use cashless payment system	PE5	0.866			
The cashless payment would enable me to access to financial services whenever I needed them, 24 h a day and 7 days a week	PE6	0.832			
The cashless payment would ensure that all citizens have an equal opportunity to conduct their financial transactions	PE8	0.682			
Effort expectancy					
It would be simple for me to learn how to operate the cashless payment system	EE1	0.920	0.960	0.968	0.833
The interaction with the cashless payment system would be simple and easy for me	EE2	0.913			
I think the cashless payment system is flexible to interact with	EE3	0.912			
I find it easy to learn and master on how to use the cashless payment system	EE4	0.926			
I think that a cashless payment system would be simple to operate	EE5	0.921			
Overall, I believe the cashless payment system is simple to operate	EE7	0.882			
Social influence					
Most of the important people around me use cashless payment for transactions	SI1	0.793	0.922	0.939	0.720
My family are likely to recommend me using cashless payments	SI2	0.812			
My close friends are likely to recommend me using cashless payments	SI3	0.885			
My family believe that I should pay with cashless payment	SI4	0.849			
My close friends believe that I should pay with cashless payment	SI5	0.899			
The important people around me influence my behaviour and believe that I should pay with cashless payment	SI6	0.848			
Facilitating conditions					
The environment in my living area encourages me to use cashless payment	FC1	0.800	0.876	0.910	0.670
I have the knowledge to use cashless payment	FC2	0.900			
I do not need help when using cashless payment	FC3	0.820			
Cashless payment facilities are widely available in my residence area	FC4	0.718			
I have necessary resource (internet connection, devices) to use cashless payment	FC5	0.842			

COVID1, PE7, EE6, and EE8 were deleted due to loadings value < 0.5

Table 5 Discriminant validity assessment

	1	2	3	4	5	6
1. BI						
2. COVID-19 crisis	0.734					
3. EE	0.808	0.737				
4. FC	0.732	0.750	0.818			
5. PE	0.824	0.709	0.775	0.724		
6. SI	0.562	0.537	0.496	0.596	0.508	

Table 6 The results of hypothesis testing

Hypothesis	Relationships	Std Beta	Std Error	*t*-values	*p* values	BCI LL	BCI UL	f^2	Decision
H1a	COVID-19 -> PE	0.671	0.034	19.571	$p < 0.003$	0.613	0.724	0.817	Accept
H1b	COVID-19 -> EE	0.699	0.033	20.922	$p < 0.005$	0.639	0.750	0.954	Accept
H1c	COVID-19 -> SI	0.505	0.042	12.101	$p < 0.006$	0.429	0.567	0.343	Accept
H1d	COVID-19 -> FC	0.685	0.028	24.109	$p < 0.004$	0.631	0.727	0.884	Accept
H2	PE -> BI	0.385	0.054	7.167	$p < 0.001$	0.299	0.477	0.209	Accept
H3	EE -> BI	0.320	0.062	5.155	$p < 0.001$	0.222	0.424	0.112	Accept
H4	SI -> BI	0.120	0.035	3.416	$p < 0.002$	0.063	0.178	0.034	Accept
H5	FC -> BI	0.013	0.049	0.263	0.396	-0.067	0.095	0.000	Reject

This study uses 95% confidence interval and a 5,000 bootstrapping (Ramayah et al. 2018)

Besides that, the government distribute the stimulus package (ePenjana, eYouth) via cashless payment method such as e-money. Therefore, consumers perceived that the infrastructure, facilities, resources, technical support, and knowledge facilitates their use of cashless payment. However, the results show that facilitating conditions have no relationship with the behavioural intention to use cashless payment. Boonsiritomachai and Pitchayadejanant (2017) found that the facilitating conditions have indirect impact on behavioural intention to use technology. Venkatesh (2000) added that this is because effort expectancy captures the effect. Studies of Bhatiasevi (2016), Iskandar et al. (2020) and Yang et al. (2021) also found the same results.

Theoretical implications

This study extended the unified theory of acceptance and use of technology (UTAUT) by incorporating the influence of health issue—the COVID-19 crisis—into the research framework. The original UTAUT model examining the behavioural intention to use technology looking purely from a technological perspective; which are, performance expectancy, effort expectancy, social influence, and facilitating conditions of the technology. An omission in this original model is the external factors that could affect an individual's perceptions on the four main constructs, before the behavioural intention to use a technology can be determined. Furthermore, most of the relevant studies that examine the intention to use technology during the COVID-19 crisis add additional factors to the original UTAUT model (Musyaffi et al. 2021; Santosa et al. 2021; Upadhyay et al. 2022).

In this study, we incorporated the influence of health issues that change or affect consumers' perceptions on the expectancy performance, effort expectancy, facilitating conditions, and social influence, which then determine the behavioural intention to use cashless payment. This study discovers that the COVID-19 crisis has significantly affect consumers' perception on the expectancy performance, effort expectancy, facilitating conditions, and social influence. This highlights the stimulating effects of the COVID-19 crisis, where people's personal adjustments to the fear of COVID-19 change their perceptions and influence their behavioural intention to use cashless payment.

Managerial implications

The managerial implications of this study are derived from the study's findings. First, it is essential to acknowledge that the health crisis has changed consumers' perceptions in using technology. Due to the COVID-19 crisis, people are making a concerted effort to use cashless payment in order to avoid infection and spread of the virus. Throughout the period, the technical infrastructure, the availability of point-of-sale terminals, and necessary resources has been improved to increase the use of cashless payment. This empirical evidence may serve as a guideline for

Table 7 PLS predict

Item	PLS RMSE	LM RMSE	PLS-LM
BI1	0.711	0.712	−0.001
BI2	0.701	0.710	−0.009
BI3	0.696	0.717	−0.021
BI4	0.700	0.689	0.011
BI5	0.666	0.651	0.015
EE1	0.741	0.733	0.008
EE2	0.745	0.746	−0.001
EE3	0.756	0.747	0.009
EE4	0.669	0.660	0.009
EE5	0.675	0.677	−0.002
EE7	0.688	0.691	−0.003
FC1	0.732	0.747	−0.015
FC2	0.685	0.686	−0.001
FC3	0.838	0.845	−0.007
FC4	0.819	0.785	0.034
FC5	0.770	0.757	0.013
PE1	0.714	0.725	−0.011
PE2	0.737	0.724	0.013
PE3	0.718	0.701	0.017
PE4	0.708	0.689	0.019
PE5	0.784	0.781	0.003
PE6	0.818	0.820	−0.002
PE8	0.805	0.807	−0.002
SI1	0.840	0.855	−0.015
SI2	0.923	0.928	−0.005
SI3	0.79	0.796	−0.006
SI4	0.925	0.933	−0.008
SI5	0.817	0.825	−0.008
SI6	0.855	0.869	−0.014

practitioners in devising effective strategies for digitalizing additional financial services, such as insurance, finance, and investment.

Next, in comparison to physical cash payment, a cashless payment system can record all the transactions done. This feature enables consumer to manage their finances more effectively. The cashless payment services provider can leverage this feature by including additional financial services such as personal financial planning and wealth management in the system. This can improve the customers experience and increase customer satisfaction.

In addition, ensuring smooth and reliable internet connectivity is necessary to enhance the use of cashless payment. Consumers need internet access and devices such as smartphones and laptops to perform cashless payments. Besides that, cashless payments service providers and merchants can conduct activities such as talk, advertising, creating infographic posters and catchy songs to show the ways operate cashless payment.

Lastly, referral incentives such as cashback, instant cash rewards, and discount coupons are an important marketing activity for increasing the adoption of cashless payment. Furthermore, the posts related to the use of cashless payment that are shared by their peers and family members on Instagram, Facebook, and Twitter can influence consumers' behavioural intention to use it.

Limitations and future directions

Firstly, the data of the study are collected through online survey. This is the optimal approach to collect data due to the movement control restrictions that implemented in Malaysia. Next, this study was dominated by younger consumers (generation Z) with a college/university education, although they are an active internet user and a potential cashless payment user. However, we should exercise caution when generalizing the findings and discussions in relation to this group. Therefore, future research will benefit from focus on the respondents from millennial generations. Today's ecosystem is dominated by millennial generations. Hence, their responses provide valuable information for the study. Moreover, we recommend that future researchers further integrate external factors, such as potential cyber security risks to construct a different model that was not included in this study. This would develop a deeper insight into the factors that drive the adoption of cashless payment. Besides that, it is suggested that future research extend the study to investigate the post-adoption behaviour by measuring consumer's satisfaction with cashless payment. This would provide understanding on the continuance intention of using cashless payment. Lastly, the adoption of cashless payment is likely to increase in the "new normal" of life. It is recommended that future research focus on the fraud management framework. This would provide an in-depth discussion on fraud prevention policies that could enhance the confidence of cashless payment users.

Conclusion

When facing a threatening event like the COVID-19 crisis, people always make adjustments to adapt to the current environment to continue to survive. This study adding a new variable to the UTAUT model. This study reveals that consumers' personal adjustment during the COVID-19 crisis has positively and significantly influenced consumers' perceptions of performance expectancy, effort expectancy, social influence, and facilitating conditions. Among them, performance expectancy, effort expectancy, and social influence are found to be the significant factors explaining behavioural intention to use cashless payment in Malaysia. Amid the COVID-19 crisis, cashless payments play an

important tool to keep economic activity running. Online shopping and ordering food online has become the way of life for most people during this period. Cashless payments bring convenient and efficient payment services. People perceived the benefits of cashless payment. Besides that, people are using technology more frequently than before the crisis. Hence, adopting a new cashless payment method has become relatively easier. Furthermore, the uncertainty that happens during this period has affected a person's psychology, the influence of important people around them is significant in this period. This study is important because the COVID-19 crisis will have a lasting impact on consumers' behaviour. The empirical evidence gathered in this study may serve as reference sources and provide greater insight into consumers' behaviour towards cashless payment. It enlightens practitioners such as policy maker, cashless payment providers and merchants to have better understanding and acknowledged the influence of health crisis on consumer behaviour in formulating policies and best strategies for coping with crisis.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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