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Incorporating perceived risks and Hygien belief into intention to use E-Wallet in Malaysia

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Abstract

E-wallets have become a popular payment method, widely used in many advanced countries. However, in Malaysia, efforts are still underway to develop the e-wallet market. This study focuses on users' perceptions of subjective norm, risk, hand hygiene beliefs, perceived usefulness, perceived ease of use, and continuance intention to use e-wallets. One reason for studying this topic is the lack of literature on the influence of hand hygiene beliefs on technology use. Survey questionnaires were used to measure respondents' responses to six variables from a research model. A total of 306 Touch 'n Go e-wallet users in Malaysia participated in this study. The researcher employed the Statistical Package for Social Science (SPSS) and Smart-PLS (Partial Least Squares) to analyze the collected data. The results indicated that subjective norm and risk significantly influenced perceived usefulness and perceived ease of use, which in turn affected the intention to use e-wallets. Additionally, hand hygiene beliefs did not significantly influence perceived usefulness but had a significant impact on continuance intention to use e-wallets. The findings can benefit both users and companies, aiding in product innovation and development in emerging markets.

Keywords: Hand Hygiene beliefs, Intention to use E-wallet, Perceived Ease of Use, Perceived Usefulness, Risk, Subjective norm.

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1. Introduction

An e-wallet is one of the e-payment methods classified within the credit payment system. An e-wallet can be defined as a digital or mobile wallet that enables users to make electronic transactions with other parties by exchanging digital currency units for goods and services. Typically, e-wallets are available as applications on smartphones, offering increased

security and convenience. The influence of e-wallets, Jayaseelan [1] presents that the application of e-wallets in daily life is a significant step towards helping Malaysia become a cashless society. There are several benefits to becoming a cashless society, such as lower crime rates and easier currency exchange internationally.

Therefore, the acceptance of e-wallets is a significant topic that influences people's intention to use e-wallets. Many previous studies have researched technology acceptance or adoption in various areas. For example, M-Banking adoption in Kenya [2] and adoption of software measures for project management and software process improvement [3]. According to Sidek [4], there are many studies that use TAM in different contexts, including research on technology acceptance related to e-payment, especially in Internet banking.[5-7] and e-shopping [8-10]". Studies on technology acceptance related to different types of technology [11-13].

E-wallet is one of the technologies that have been created in this era and further influence various areas, particularly in the business sector, which is e-commerce. In recent years, e-wallets have become a new trend in both developed and developing countries. Many people around the world are attempting to use e-wallets for daily transactions. There are certain reasons that can explain why users tend not to adopt and use e-wallets in their daily transactions. Yuen and Ma [14] stated that Subjective Norm (SN) is the degree to which an individual's perception can be affected by the people who are important to him or her, and whether they think he or she should use the technology or not. Hence, the SN can influence the user's perception and intention regarding the use of the e-wallet. This presents a problem when the important people in the user's life believe that the e-wallet is not useful, which may lead the user not to adopt the e-wallet.

Studies on an application of the extended TAM model related to mobile payment with Alipay had findings that conclude the risk perception has a negative effect on PU and PEOU [15]. Therefore, risk can influence the user's intention to use e-wallets. Risks associated with e-wallets include security problems, network fraud issues, and other operational risks. These risks may reduce users' willingness to adopt e-wallets. The present study aims to achieve the following research objectives: 1) to investigate the positive effect of subjective norm on perceived usefulness of e-wallets; 2) to examine the negative effect of risk on perceived usefulness of e-wallets; 3) to explore the negative effect of risk on perceived ease of use of e-wallets; 4) to assess the positive effect of hand hygiene belief on perceived usefulness of e-wallets; 5) to evaluate the positive effect of hand hygiene belief on continuance intention to use e-wallets.

2. Literature Review

Technology Acceptance Model (TAM) was introduced by Davis et al. [12], that adapted from the Theory of Reasoned Action (TRA) [16] with two main factors that influence individuals' intention and decision to use new technology, perceived ease of use (PEOU) and perceived usefulness (PU). According to Hu et al. [17], current information systems (IS) literature has extensively researched and identified the factors that influence user acceptance of new technology. Technology acceptance theories or models are widely used in studies to predict and explain individual behaviors towards the acceptance and usage of new technologies [18].

TAM also explains "IT usage as a function of a four-stage process: external variables influence user beliefs about using the system; user beliefs influence their attitudes about using a system; user attitudes influence their intentions to use a system; user intentions determine the level of usage of the system" [19]. Within TAM, external variables are some of the key factors that can be observed in a specific application scenario. Davis [13] presents that the role of external variables can increase the predictive power of the TAM model. Legris et al. [20] also state that external variables are critically important to examine because they are the ultimate drivers for the use of technology.

There have been many research studies on the external variables used in the TAM model. Kim et al. [21] study uses the mobile application and employs five external factors, which are utility, content, entertainment, price, and design in the TAM model to observe their relationship with PU and PEOU. Shin and Choo [22] examine the level of acceptance by using the TAM model in a shopping application with five external variables which is Personalization, Playfulness, Instant Connectivity, Interaction and Information offers.

User belief, which includes PU and PEOU, is influenced by external variables. PEOU refers to the degree to which a prospective user believes that the use of technology will be free of effort, while PU pertains to the degree to which a prospective user believes that using the technology will enhance his or her job performance. Subsequently, user beliefs, namely PU and PEOU, can influence the user's attitude toward using (ATT) and the intention to use technology. Holden and Karsh [23] present that PU is specified to have an independent effect on behavioral intention (BI), while PEOU can affect PU. Behavioral intention is defined as the strength of one's intention to perform a specified behavior, which is intended to capture "acceptance-like" processes [12, 24, 25].

Many researchers study user acceptance on social media by using TAM models such as LINE, WeChat, and Facebook [26-28]. Another previous study, which is Kamal et al. [29] study in investigating the acceptance of telemedicine services through an extended Technology Acceptance Model (TAM). The findings of this study indicate that the usage intention of telemedicine services is a function of perceived ease of use (PEOU), technological anxiety, social influence, perceived usefulness (PU), trust, facilitating conditions, risk, and resistance to technology.

2.1. Subjective Norm

According to Ajzen and Fishbein [16], SN is a person's perception that most people who are important to him or her think that he or she should or should not perform the behavior. Studies on Teo [30] and Yuen and Ma [14] found that subjective norm significantly influenced perceived usefulness. Venkatesh and Davis [31] theorize a relationship between subjective norm and perceived usefulness because of internalization. Internalization refers to when an individual believes

that important persons in their life want them to use the system, which leads to the incorporation of these beliefs into their own belief structure, subsequently influencing their use of the system. Thus, the following hypothesis was proposed:

H_1: Subjective norms are positively related to the perceived usefulness of using an e-wallet.

2.2. Hand Hygiene Beliefs

Hand hygiene beliefs are a new variable for the TAM model that can also influence the adoption and acceptance of e-wallets. Due to COVID-19, hand hygiene has become important to prevent the spread of the virus. Using e-wallets such as Boost for payments allows users to maintain hand hygiene because it facilitates contactless transactions. E-wallets have become useful for people to ensure safety when making payments, which leads to an increased intention to use e-wallets. When people have strong hand hygiene beliefs, it directly increases their intention to use e-wallets. Thus, the following hypothesis was proposed:

H_2: Hand hygiene beliefs are positively related to the perceived usefulness of using e-wallet.

H_3: Hand hygiene beliefs are positively related to Continuance intention to use e-wallet.

2.3. Risk

Risk is one of the reasons that will influence the adoption and acceptance of e-wallets. Lee et al. [32] have stated that a new technology's important characteristic is risk. Therefore, as a recent technology in Malaysia, e-wallets have risk as a significant risk. Users' perception of risk can influence the adoption of e-wallet technology. A new payment system involves certain risks, such as operational risk, legal risk, technical risk, and network fraud. When the perceived risk of using e-wallets is high, it can diminish users' perceived usefulness and perceived ease of use, thereby further reducing their intention to use e-wallets. In summary, risk is a critical factor that must be considered because it can impact users' intention to adopt e-wallets. Consequently, the following hypothesis was proposed:

H_4: Risks are negatively related to the perceived usefulness of using an e-wallet.

H_5: Risks are negatively related to the perceived ease of use to use e-wallet.

Based on the above hypotheses, a research model is proposed (see Figure 1).

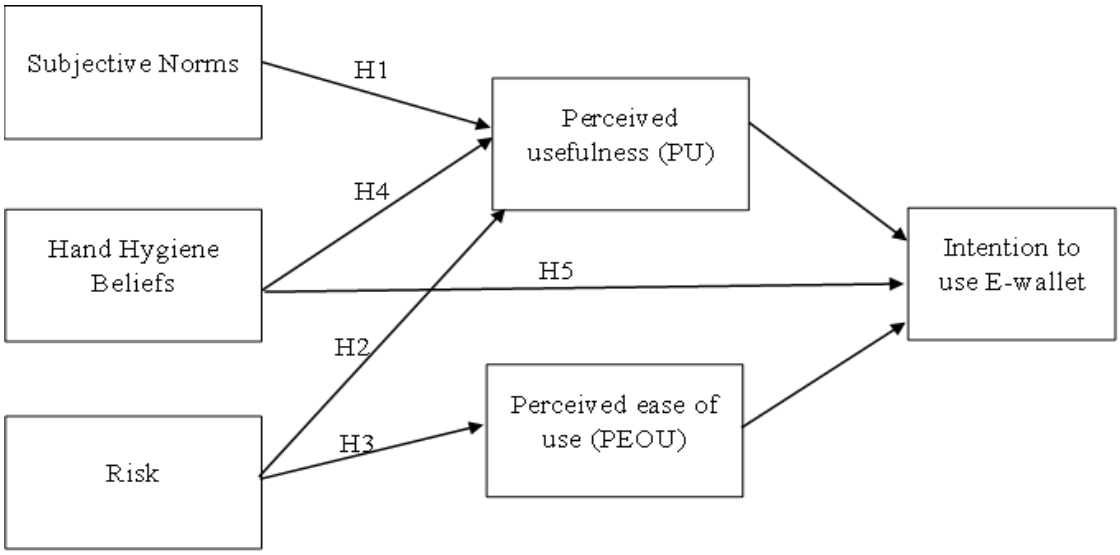

Figure 1.
Research model.

3. Research Methods

3.1. Population and Sampling Selection

The research respondents are e-wallet users, specifically all e-wallet users in Malaysia. The reason for choosing Touch 'n Go e-wallet users as respondents is that Touch 'n Go e-wallet is widely used in Malaysia compared to other e-wallets. Non-probability sampling technique was chosen for this research because the researcher does not know the probability that a person will be selected from the population. Convenient sampling, a type of non-probability sampling, was used in this research as it allows the researcher to select respondents based on convenience. According to the website Phnom Penh, Touch 'n Go eWallet has a network of over 10 million users. Based on this large population, the researcher used a sample size calculator on the website Check Market to determine the required sample size. To achieve a 95% confidence level and a 5% confidence interval, the required sample size is 385 respondents.

3.2. Data Collection Method

A survey approach was used to gather the necessary information in this study. The researcher had chosen primary data to collect. The primary data was collected using a questionnaire. A questionnaire is an appropriate quantitative data collection tool; it is an effective and inexpensive method for collecting data from a large sample size. The questionnaire was placed on social media platforms such as Facebook pages and WhatsApp to collect respondents' data. At the same

time, the researcher also invited all known students, friends, and family who have used Touch'n Go eWallet to answer the questionnaire.

3.3. Research Instrument

This study used an online survey-based questionnaire to gather information. The questionnaire set is in English language format. The first section assessed the respondents' demographic data, which included gender, age, education level, occupation, and monthly income. The second section investigated the respondents' responses regarding the proposed variables of the present study, which are perceived usefulness [33], perceived ease of use [33], subjective norm [31,34], risks [35], hand hygiene belief [36] and continuance intention [37]. The measures used for each constraint above are entirely adapted from previous research. In the second section, these measurement items were assessed using five-point Likert scales ranging from strongly disagree (=1) to strongly agree (=5).

4. Findings

4.1. Demographic Profile of Respondent

There are 306 Touch 'n Go E-wallet users involved in this study. 59.2% of the respondents were female, and 40.8% were male. Out of 309 respondents, the major users within the 18-25 years old age group represent approximately 61.4% of all respondents, followed by 16.3% within the 26-35 years old group. Additionally, 68% of respondents have college or university-level education. The majority of respondents (48%) were students who chose Touch 'n Go as their payment tool. Furthermore, most users, approximately 46.4%, had no income account.

4.2. Descriptive Statistics Analysis

This study examined 306 Touch 'n Go E-wallet users in Malaysia. The standard deviation measures the spread of a data distribution. The standard deviations range from 0.55 to 1.4. The more spread out a data set is, the greater its standard deviation.

4.3. Assessment of the Measurement Model

The researcher examined the measurement models of reflective constructs using SmartPLS 3.0 software. There are four criteria for measurement models: indicator reliability, internal consistency, convergent validity, and discriminant validity. Indicator reliability is assessed through outer loadings. The analysis in Table 1 below demonstrates that all outer loadings are greater than 0.7. Thus, all indicator reliabilities in all reflective constructs have been achieved. Secondly, internal consistency is a measure used to examine whether a set of indicators is reliable in reflective constructs. Internal consistency can be measured using Cronbach's alpha (CA) and composite reliability (CR). Based on Table 1 below, all the CA and CR values are greater than 0.7, which indicates that internal consistency in reflective constructs has been achieved.

Thirdly, convergent validity can be measured by using average variance extracted (AVE), and the value of AVE should be greater than 0.5. Refer to Table 1 below, the results show that all the values of AVE are greater than 0.5, which means that convergent validity in reflective constructs is achieved. Finally, discriminant validity is significant to ensure how reflective constructs differ from each other. Table 2 presents the Fornell-Lacker Criterion: the square roots of the AVEs are greater than all inter-construct correlations, which provides evidence that discriminant validity is achieved.

Table 1.
Result of Measurement Model.

Construct	Item	Outer loadings	CA	CR	AVE
Subjective norms	SN 1	0.899	0.899	0.937	0.832
	SN 2:	0.920			
	SN 3	0.917			
Hand hygiene beliefs	H.hygiene 1	0.783	0.766	0.847	0.580
	H.hygiene 2	0.783			
	H.hygiene 3	0.732			
	H.hygiene 4	0.748			
Risk	Risk 1	0.949	0.949	0.967	0.907
	Risk 2	0.956			
	Risk 3	0.952			
Perceived usefulness	PU 1	0.887	0.821	0.893	0.735
	PU 2	0.892			
	PU3	0.790			
Perceived ease of use	PEOU 1	0.839	0.871	0.912	0.722
	PEOU 2	0.887			
	PEOU 3	0.884			
	PEOU 4	0.784			
Continuance Intention	CI 1	0.910	0.899	0.937	0.832
	CI 2	0.910			
	CI 3	0.916			

Table 2.
Fornell-Lacker Criterion.

	CI	H.hygiene	PEOU	PU	Risks	SN
Continuance Intention	0.912					
Hand hygiene beliefs	0.399	0.762				
Perceived Ease of Use	0.620	0.224	0.850			
Perceived Usefulness	0.692	0.321	0.683	0.857		
Risks	-0.532	-0.237	-0.607	-0.555	0.953	
Subjective norms	0.633	0.361	0.538	0.612	0.445	0.912

4.4. Assessment of Structural Model

A bootstrapping procedure (5000 subsamples) was used by the researcher in SMARTPLS 3.0 to obtain the structural model, which presents information about path analysis, explained variance (R^2), and predictive relevance (Q^2). The R-squared in Table 3 describes how well the endogenous variables have been influenced by the independent variables. The R-squared indicates the model accounts for 55.4%, 36.9%, and 48% of continuance intention, perceived ease of use, and perceived usefulness, respectively. The Q-Squared values are greater than zero, which means the predictive relevance of all endogenous constructs is verified. The results show that hypotheses H1, H2, H3, and H5 are supported, except H4, which is not supported.

Table 3.
Structural Model.

Endogenous Variable	R-Square	Q-Square (1-SSE/SSO)	
Continuance Intention	0.554	0.452	
Perceived Ease of Use	0.369	0.262	
Perceived Usefulness	0.480	0.340	
Relation	Path Coefficient	T-value	Hypothesis
Hand hygiene beliefs -> Continuance Intention (H5)	0.196***	4.078	Supported
Hand hygiene beliefs -> Perceived Usefulness (H4)	0.085	1.552	Not Supported
Perceived Ease of Use -> Continuance Intention	0.274***	4.587	Supported
Perceived Usefulness -> Continuance Intention	0.442***	6.941	Supported
Risks -> Perceived Ease of Use (H3)	-0.607***	17.940	Supported
Risks -> Perceived Usefulness (H2)	-0.344***	7.721	Supported
Subjective norms -> Perceived Usefulness (H1)	0.429***	7.719	Supported

Note: ***/**represent significant at 0.01/0.05 level.

4.5. Mediating Analysis

To examine the mediation effects, a series of indirect effect analyses were performed. Perceived usefulness as a mediator in the relationship between hand hygiene beliefs and continuance intention. In Table 4, there is no mediation effect; perceived usefulness as a mediator variable has no effect, causing an indirect effect that is not significant, while the direct effect is significant.

Table 4.
Mediating Analysis.

Relation	Direct effect	Indirect effect	Interpretation
Hand hygiene beliefs -> Perceived Usefulness -> Continuance intention	0.196***	0.038	No Mediation

Note: ***/**represent significant at 0.01/0.05 level.

5. Discussion

The research hypothesis 1 is supported, with the value of this path coefficient being 0.429, which indicates that subjective norms are positively related to perceived usefulness of using e-wallets. This is consistent with previous studies, Zhanga et al. [38] findings that subjective norm has a positive effect on the perceived usefulness of mobile payment. Schierz et al. [34] present in terms of mobile payment, subjective norm is the extent to which a social environment perceives e-wallet as desirable. Therefore, De et al. [39] explain how social influences, in the form of subjective norms, positively affect the perceived usefulness of adopting mobile payment services. Similar results, in which SN significantly affects customers' perception of PU, are present in Aji et al. [40].

Based on Table 3, research hypothesis 2 has been proved to be supported because the path coefficient is -0.344, which means risks are negatively related to the perceived usefulness of using e-wallets. Consistent with previous studies, such as Li et al. [15] mentioned that the user's risk perception is negatively related to the perceived usefulness of using mobile payment (Alipay). This means that when users perceive higher risks in using e-wallets, their perceived usefulness decreases simultaneously. A similar result was obtained in Mutahar et al. [41] study that perceived risk has a negative effect on perceived usefulness.

Research hypothesis 3 is supported because its path coefficient value in Table 3 above is -0.607***, which indicates that risk negatively influences perceived ease of use. The finding is consistent with the previous studies, Li et al. [15], suggesting that users' risk perception is negatively related to perceived ease of use of Alipay. The authors present several ways to decrease risk perception, such as establishing relevant laws and regulations to regulate online payments. Mutahar et al. [41] also mentioned that perceived risk has a negative relationship with perceived ease of use. Perceived ease of use is also weakened when there is a higher perception of risk.

Based on Table 3 above, the path coefficient is 0.085, which indicates that research hypothesis 4 is not supported. This suggests that the belief in hand hygiene does not positively influence the perceived usefulness of using e-wallets. Raes [42] studies have found that 64% of Europeans consider exchange banknotes and coins to be unhygienic or dirty. The COVID-19 outbreak has prompted people to prioritize hand hygiene to prevent the spread of the virus, leading to frequent hand washing in daily routines. Consequently, users now consider e-wallets useful or not, with many intending to use e-wallets because hand hygiene is essential to reduce pandemic transmission. The researcher concludes that beliefs about hand hygiene are not positively related to the perceived usefulness of e-wallets.

The research hypothesis is supported, with the path coefficient value being 0.196, indicating that hand hygiene beliefs are positively related to the continuance intention to use e-wallets. Due to the COVID-19 outbreak in 2020, hand hygiene became important in reducing the spread of the virus and further enhancing the intention to use e-wallets. Angelakis et al. [43] present that the fibrous surfaces of banknotes can become contaminated with disease-causing bacteria and viruses. Raes [42] mentioned that the majority of Europeans report using cards or contactless payments over cash to maintain better hygiene. Therefore, if users have a higher belief in hand hygiene, they are more likely to prefer contactless payments, which can further increase their intention to use e-wallets.

6. Conclusion and Implications

The results of this study suggest several practical implications for e-wallets. Subjective norm has been proven to be a significant determinant of perceived usefulness. This result can help e-wallet companies such as Touch 'n Go realize the importance of influential figures in fostering a culture of using e-wallets in daily life. E-wallet companies can invite well-known individuals who have a significant influence on the masses to actively promote the usefulness of e-wallets, which can positively affect users' perceptions of their value. Additionally, risk has also been identified as a significant determinant of perceived usefulness and perceived ease of use. This finding highlights the importance for e-wallet companies to be aware of risks that can influence users' intentions to adopt e-wallets. Therefore, e-wallet companies should develop strategies to mitigate these risks by enhancing security and protecting privacy, thereby making users feel safe and increasing their intention to use e-wallets.

References

[1] R. Jayaseelan, "The e-wallet race hots up. The Star Online," Retrieved: https://www.thestar.com.my/business/business-news/2017/07/29/the-ewallet-race-hots-up. [Accessed May 25, 2018]. 2017.

[2] I. Lule, T. K. Omwansa, and T. M. Waema, "Application of technology acceptance model (TAM) in m-banking adoption in Kenya," *International Journal of Computing & ICT Research*, vol. 6, no. 1, pp. 31-43, 2012.

[3] L. G. Wallace and S. D. Sheetz, "The adoption of software measures: A technology acceptance model (TAM) perspective," *Information & Management*, vol. 51, no. 2, pp. 249-259, 2014.

[4] N. Sidek, "Determinants of electronic payment adoption in Malaysia: The stakeholders' perspectives," 2015.

[5] B. Suh and I. Han, "Effect of trust on customer acceptance of Internet banking," *Electronic Commerce Research and Applications*, vol. 1, no. 3, pp. 247–263, 2002.

[6] T. C. E. Cheng, D. Y. C. Lam, and A. C. L. Yeung, "Adoption of Internet banking: An empirical study in Hong Kong," *Decision Support Systems*, vol. 42, no. 3, pp. 1558–1572, 2006.

[7] B. Alsajjan and C. Dennis, "Internet banking acceptance model: Cross-market examination," *Journal of Business Research*, vol. 63, no. 9–10, pp. 957–963, 2010.

[8] L.-D. Chen, M. L. Gillenson, and D. L. Sherrell, "Enticing online consumers: An extended technology acceptance perspective," *Information & Management*, vol. 39, no. 8, pp. 705–719, 2002.

[9] Y.-Y. Shih and K. Fang, "The use of a decomposed theory of planned behavior to study Internet usage behavior," *Internet Research*, vol. 14, no. 3, pp. 150–167, 2004.

[10] L. R. Vijayasarathy, "Predicting consumer intentions to use online shopping: The case for an augmented technology acceptance model," *Information & Management*, vol. 41, no. 6, pp. 747–762, 2004.

[11] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989. https://doi.org/10.2307/249008

[12] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, vol. 35, no. 8, pp. 982-1003, 1989.

[13] F. D. Davis, "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts," *International Journal of Man-Machine Studies*, vol. 38, no. 3, pp. 475-487, 1993.

[14] A. H. Yuen and W. W. Ma, "Exploring teacher acceptance of e-learning technology," *Asia-Pacific Journal of Teacher Education*, vol. 36, no. 3, pp. 229-243, 2008.

[15] J. Li, J. Wang, S. Wangh, and Y. Zhou, "Mobile payment with alipay: An application of extended technology acceptance model," *Ieee Access*, vol. 7, pp. 50380-50387, 2019.

[16] I. Ajzen and M. Fishbein, *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice-Hall, 1980.

[17] P. J. Hu, P. Y. K. Chau, O. R. L. Sheng, and K. Y. Tam, "Examining the technology acceptance model using physician acceptance of telemedicine technology," *Journal of Management Information Systems*, vol. 16, no. 2, pp. 91–112, 1999.

[18] F. W. Dulle and M. Minishi-Majanja, "The suitability of the Unified Theory of Acceptance and Use of Technology (UTAUT) model in open access adoption studies," *Information Development*, vol. 27, no. 1, pp. 32-45, 2011.
[19] A. Burton-Jones and G. S. Hubona, "The mediation of external variables in the technology acceptance model," *Information & Management*, vol. 43, no. 6, pp. 706-717, 2006.
[20] P. Legris, J. Ingham, and P. Collerette, "Why do people use information technology? A critical review of the technology acceptance model," *Information & Management*, vol. 40, no. 3, pp. 191-204, 2003.
[21] B. Kim, I. Lee, and S. Kang, "The different effects of perceived value on satisfaction and loyalty in the context of mobile data services," *Telecommunications Policy*, vol. 36, no. 7, pp. 602–610, 2012.
[22] D. H. Shin and H. Choo, "Ecological views of TAM and user engagement in smartphone apps: An integrated model," *Computers in Human Behavior*, vol. 62, pp. 442–450, 2016.
[23] R. J. Holden and B.-T. Karsh, "The technology acceptance model: its past and its future in health care," *Journal of Biomedical Informatics*, vol. 43, no. 1, pp. 159-172, 2010.
[24] V. Venkatesh and H. Bala, "Technology acceptance model 3 and a research agenda on interventions," *Decision Sciences*, vol. 39, no. 2, pp. 273-315, 2008. https://doi.org/10.1111/j.1540-5915.2008.00192.x
[25] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: Toward a unified view," *MIS Quarterly*, vol. 27, no. 3, pp. 425-478, 2003.
[26] W. Van De Bogart and S. Wichadee, "Exploring students' intention to use LINE for academic purposes based on technology acceptance model," *International Review of Research in Open and Distributed Learning*, vol. 16, no. 3, pp. 65-85, 2015.
[27] Z. Yu, "Extending the learning technology acceptance model of WeChat by adding new psychological constructs," *Journal of Educational Computing Research*, vol. 58, no. 6, pp. 1121-1143, 2020.
[28] R. Rauniar, G. Rawski, J. Yang, and B. Johnson, "Technology acceptance model (TAM) and social media usage: an empirical study on Facebook," *Journal of Enterprise Information Management*, vol. 27, no. 1, pp. 6-30, 2014.
[29] S. A. Kamal, M. Shafiq, and P. Kakria, "Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM)," *Technology in Society*, vol. 60, p. 101212, 2020. https://doi.org/10.1016/j.techsoc.2019.101212
[30] T. Teo, "A path analysis of pre-service teachers' attitudes to computer use: Applying and extending the technology acceptance model in an educational context," *Interactive Learning Environments*, vol. 18, no. 1, pp. 65-79, 2010.
[31] V. Venkatesh and F. D. Davis, "A theoretical extension of the technology acceptance model: Four longitudinal field studies," *Management Science*, vol. 46, no. 2, pp. 186-204, 2000.
[32] T. M. Lee, E. M. Markowitz, P. D. Howe, C.-Y. Ko, and A. A. Leiserowitz, "Predictors of public climate change awareness and risk perception around the world," *Nature Climate Change*, vol. 5, no. 11, pp. 1014-1020, 2015.
[33] I. Ramos-de-Luna, F. Montoro-Ríos, and F. Liébana-Cabanillas, "Determinants of the intention to use NFC technology as a payment system: An acceptance model approach," *Information Systems and E-Business Management*, vol. 14, pp. 293-314, 2016. https://doi.org/10.1007/s10257-015-0284-5
[34] P. G. Schierz, O. Schilke, and B. W. Wirtz, "Understanding consumer acceptance of mobile payment services: An empirical analysis," *Electronic Commerce Research and Applications*, vol. 9, no. 3, pp. 209-216, 2010.
[35] Y. Lu, S. Yang, P. Y. Chau, and Y. Cao, "Dynamics between the trust transfer process and intention to use mobile payment services: A cross-environment perspective," *Information & Management*, vol. 48, no. 8, pp. 393-403, 2011.
[36] T. Van de Mortel, "Development of a questionnaire to assess health care students' hand hygiene knowledge, beliefs and practices," *Thea F van de Mortel*, vol. 26, 03/01 2009.
[37] Q. Zhao, C.-D. Chen, and J.-L. Wang, "The effects of psychological ownership and TAM on social media loyalty: An integrated model," *Telematics and Informatics*, vol. 33, no. 4, pp. 959-972, 2016. https://doi.org/10.1016/j.tele.2016.02.007
[38] A. Zhanga, X. Yue, and Y. Kong, "Exploring culture factors affecting the adoption of mobile payment," in *2011 10th International Conference on Mobile Business*, 2011: IEEE, pp. 263-267.
[39] K. De, A. K. Kar, and P. V. Ilavarasan, "Factors affecting adoption of digital payments by small and medium enterprises in India," *Journal of Enterprise Information Management*, vol. 31, no. 3, pp. 468–488, 2018.
[40] H. M. Aji, I. Berakon, and A. F. Riza, "The effects of subjective norm and knowledge about riba on intention to use e-money in Indonesia," *Journal of Islamic Marketing*, vol. 12, no. 6, pp. 1180-1196, 2021. https://doi.org/10.1108/JIMA-10-2019-0203
[41] A. M. Mutahar, N. M. Daud, T. Ramayah, O. Isaac, and A. H. Aldholay, "The effect of awareness and perceived risk on the technology acceptance model (TAM): Mobile banking in Yemen," *International Journal of Services and Standards*, vol. 12, no. 2, pp. 180-204, 2018.
[42] C. Raes, "The Dirty Cash, Dirty Habit report: Overview of key expert findings and analysis," 2014.
[43] E. Angelakis, E. I. Azhar, F. Bibi, A. Al-Ghamdi, A. M. Ashshi, and A. Al-Salamah, "Paper money and coins as potential vectors of transmissible disease," *Future Microbiology*, vol. 9, no. 2, pp. 249–261, 2014.