



# Predicting the Intention and Adoption of Mobile Shopping During the COVID-19 Lockdown in Malaysia

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## Abstract

This study examined the effect of ubiquitous connectivity, service quality, system quality, perceived usefulness, perceived ease of use, and perceived enjoyment on the intention and adoption of mobile shopping among consumers in Malaysia. A total of 316 respondents were collected from consumers in Malaysia using the online platform. The findings revealed that ubiquitous connectivity, perceived usefulness, perceived ease of use, and perceived enjoyment had a significant positive effect on the behavioral intention to adopt mobile shopping whereas service quality and system quality contributed insignificant impact on consumers' intention to adopt mobile shopping. The results identified that consumers' behavioral intention exhibited higher significant impact on the adoption of mobile shopping during the COVID-19 lockdown. The findings further revealed that intention to adopt mobile shopping mediated the association between ubiquitous connectivity, perceived usefulness, ease of use, and enjoyment on the adoption of mobile shopping. The current study contributed significant theoretical and practical implications for marketers and mobile service providers to better promote the adoption of mobile shopping consumers in Malaysia through the implementation of an effective strategy.

## Keywords

consumers' behavioral intention, adoption of mobile shopping, COVID-19 lockdown, Malaysia

## Introduction

The advancement of mobile technology has evolved significantly in recent years in driving innovation (Ghazali et al., 2018). Today, we observe the vast usage of mobile devices for various kinds of services, such as for mobile payments, mobile commerce, and mobile social networking, given the flexibility of communication networks without the constraints of distance and time (O'Dea, 2020). The advancement in technology has also given rise to m-commerce in extending e-commerce business activities conducted via wireless mobile devices. According to a statistic reported by the Merchant Savvy website in February 2020, the growth of global mobile commerce sales has tripled from USD 1 trillion to \$3 trillion between 2016 and 2020 and is expected to be rise to \$3.56 trillion in 2021 (Savvy, 2020). In line with these, the development of mobile commerce has introduced mobile shopping, which has significantly affected businesses and convenience to consumers (Madan & Yadav, 2018; Saprikis et al., 2018), particularly with the ongoing uncertainties of the COVID-19 pandemic. Previous studies mainly focused on consumers' satisfaction and behavior of m-commerce (Chauhan et al., 2021; Kalinić et al., 2021; Saprikis et al., 2018). However,

studies on predicting consumers' behavioral intention and adoption of mobile shopping during the COVID-19 crisis have remained scarce. Despite the strength of mobile commerce, there is a gap between antecedents of consumers' behavioral intention (e.g., ubiquitous connectivity, service quality, system quality, perceived usefulness, perceived ease of use, and perceived enjoyment) and adoption of mobile shopping during the COVID-19 crisis. Thus, the current study aimed to examine factors that influence consumers' intention to adopt mobile shopping and its impact on their adoption of mobile shopping during the COVID-19 lockdown.

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The total population in Malaysia is around 32.16 million, with about 40.69 million mobile phone connections, which represents around 127% of the population. Among the population, the breakdown of Malaysia online shoppers is around 16.53 million users, with around 62% of mobile users purchasing via mobile devices (Embassies, 2019); around 20 million Malaysians are adopting mobile shopping activities. Morgan (2019) also mentioned that user shopping via mobile devices in Malaysia now accounts for 47% of all e-commerce transactions. Indeed, mobile shopping is anticipated to grow at an annual compound growth rate of 31.4% by 2021, representing \$5.6 billion (RM23.9 billion) in consumer sales. As such, mobile shopping has evolved as a further shopping channel among e-shoppers in Malaysia.

Mobile shopping involves product browsing, information searching from multiple sources, price comparison, and product or service purchases from retailers via mobile devices, presenting a variety of benefits, such as improved accessibility, convenience, security, usability, timeliness, ambiguity, personalization, localization, and recognition (Phong et al., 2018). In addition to these benefits, the emergence of mobile devices and mobile networks have released mobile shoppers from temporal and spatial constraints, enabling them to conduct purchase transactions through smartphone devices instantaneously, whenever and wherever, given such devices are personalized and user-friendly. Thus, it reshapes the experiences of consumers compared to traditional shopping at physical stores. The transformation of online shopping to mobile shopping has evolved to become a novel trend to many and recognized as a new business opportunity (Ghazali et al., 2018) for different business sectors, especially for retailers (Alalwan et al., 2020). Therefore, the importance of mobile shopping from its unique benefits is realized by many users, which is expected to further proliferate in future given its ability to strengthen the connection between customers and businesses.

Having said that, it is also crucial for retailers to adapt and develop m-commerce as the new online shopping alternative for consumers from a business perspective. Mobile shopping has the potential to stimulate spontaneous buying behavior, followed by increasing the online sales margin for goods and services incrementally. Importantly, the mobility of transaction enabled devices will no doubt promote the adoption of m-commerce as a key driver for the next wave of retail spending in addition to acting as a new source of competitive advantage (Sun & Chi, 2018) given its convenience and accessibility. No doubt, m-commerce has been recognized to have a notable promising future in the telecommunication service market due to the value offered to customers, for example, time-critical needs and arrangements, spontaneous needs and decision-making, and the demand for entertainment and efficiency (Madan & Yadav, 2018).

However, mobile shopping's apparent benefits are occasionally obstructed by fear and anxiety attributed to the use of technology, which could result in an unwillingness and

reluctance to engage in mobile shopping transactions. Based on the statistical report of Malaysia's e-commerce activities in September 2019, it was shown that 91% of users aged between 16 and 64 years searched online for products or services to buy. However, only 32% of users made an online purchase via a mobile phone (Kemp & Moey, 2019). Therefore, we can observe that mobile shopping is still at an early stage of adoption in Malaysia and the attitude of local consumers' toward this medium remains ambiguous. Ghazali et al. (2018) mentioned that limited studies had investigated the prediction of consumer intention to engage in mobile shopping. Moreover, there remains a level of uncertainty on the factors affecting the consumers' desire to adopt mobile shopping, especially in emerging economies like Malaysia. Ghani et al. (2017) suggested that research on mobile shopping and m-retail in Malaysia are also quite limited. Therefore, there is a need to investigate and determine the drivers of mobile shopping engagement.

The concept of online shopping has been widely adopted among consumers (Zhou, 2016). Previous studies indicated that the perception of m-commerce leads to different attitudes toward mobile systems among consumers from developed and emerging nations, leading to different levels of mobile shopping adoption (Chi, 2018; F. Yang et al., 2021). Therefore, this has motivated the need to examine the predicting role of consumers' intention that affect mobile shopping among consumers in emerging nations. This also aids the policymakers in these countries and businesses in formulating appropriate policies in creating and delivering mobile shopping services to meet customer demands. However, despite the increase and need for better performance, accessibility of mobile devices, and the successful execution of mobile shopping systems, online shopping is still favorable to users compared to mobile shopping, though leading to a relatively low adoption rate in mobile shopping (Marriott et al., 2017). As such, this becomes questionable regarding the reasons why consumers choose or do not choose to adopt mobile shopping activities.

As mentioned by the studies above, we can conclude that research into mobile shopping is limited, and further understanding of the determinants that affect the adoption intention of mobile shopping is required. In addition, given the advancement of 5G communication technologies and the internet, m-commerce has experienced faster growth, prompting further attention in this domain from researchers. A comprehensive understanding of the determinants that influence consumer intention to adopt mobile commerce is relatively limited, given it is continuing to develop and evolve (Khoi et al., 2018). As such, mobile service providers need to acquire sound knowledge in order to offer consumers personalized and customized services. This will not only help to retain customers but also attract new customers.

Overall, this article is organized as follows. In the next section, recent studies on the impact of consumers' intention to adopt mobile shopping and adoption of mobile shopping

during the COVID-19 crisis were reviewed. Then, the conceptual model, constructs, and data sources are discussed. The next section focuses on partial least square (PLS) analysis and presents the obtained results on the relationship between behavioral intention and adoption of mobile shopping. Major findings and policy implications are discussed in the final section of this article. Focusing on consumers' adoption of mobile shopping, the current study presented significant policy implications related to portable information technology service adoption and decision-making of consumers' intention to adopt mobile shopping during the COVID-19 crisis.

## Literature Review

### Theoretical Foundation

The current study used the concept of technology acceptance model (TAM), which was developed by Fred Davis in 1989. The model was modified from the theory of reasoned action (TRA; Fishbein & Ajzen, 1975; Thakur & Srivastava, 2014). The concept of TAM was used in the study to evaluate consumers' behavioral intention (e.g., ubiquitous connectivity, service quality, system quality, perceived usefulness, perceived ease of use, and perceived enjoyment) and adoption of mobile shopping during the COVID-19 lockdown. The adoption of the model was intended to gain better understanding on the consumers' viewpoint and behavioral intention toward the adoption of technology innovations (Falcao et al., 2019). Cheong and Mohammad-Baksh (2019) asserted that TAM is generally used in information system models. This study employed TAM to measure the impact of ubiquitous connectivity, service quality, system quality, perceived usefulness, perceived ease of use, and perceived enjoyment on consumers' behavioral intention on their adoption of mobile shopping. Zhou (2011) discovered the significant impact of system quality and information quality on the consumers' belief in adopting a mobile website, while Chen, Huang and Davison (2017) examined the system and information quality using the TAM. When consumers' experience a better quality of the information system, it will influence their behavioral intention toward adoption of mobile shopping that fulfils their needs and demands. Hence, TAM is adopted to effectively forecast the consumers' intention of mobile shopping among Malaysian consumers, since TAM is a parsimonious, flexible, and inexpensive model. The TAM is suitable for explanatory objectives over a broad context (Falcao et al., 2019; Wang & Lin, 2012). In this study, perceived usefulness, perceived ease of use, and perceived enjoyment under the concept of TAM, are considered as the prediction of consumers' intention of mobile shopping. Consumers' ubiquitous connectivity, service quality, and system quality are considered as a concept of extension of technology accepted model for evaluating consumers' intention and their adoption of mobile shopping.

## Ubiquitous Connectivity

Ubiquitous connectivity (UC) refers to the user's accessibility to the mobile store in conducting purchasing activities facilitated through wireless technology whenever and wherever they wish (Roy & Moorthi, 2017; Zhou, 2016). According to Falcao et al. (2019), users often demand real-time information and access to content via a mobile internet connection allowing them to approach various types of product categories and services whenever and wherever they need (Alalwan et al., 2020). Given the features of UC in m-commerce, it provides great convenience and flexibility to customers. Previous studies highlighted ubiquitous connectivity as consumers' capability to perform mobile purchase or commercial activities through wireless technology or mobile networks without the barriers of time and space (Falcao et al., 2019; Roy & Moorthi, 2017). Siyal et al. (2021) focused on predicting continued use of mobile taxi apps. Meanwhile, Alalwan et al. (2020) found ubiquitous connectivity as the most prominent determinant that motivates consumers' engagement in mobile shopping. The current study examined the relationship between ubiquitous connectivity and consumers' intention to adopt mobile shopping during the COVID-19 lockdown. Thus, the following hypothesis was proposed for testing:

*H<sub>1</sub>: Ubiquitous connectivity has positive impact on consumers' intention to adopt mobile shopping during the COVID-19 lockdown.*

## Service Quality

Service quality (SQ) is described as the distinction between the consumers' perception of the SQ provided before utilizing and subsequent to utilizing (Mogenhalli et al., 2008). It refers to the users' perceived value on the system's reliability, assurance, responsiveness, personalization, being both secure and credible (Lin et al., 2017; Tarhini et al., 2019). According to Zhou (2011), SQ considers the reliability, responsiveness, assurance, and empathy of the services provided to individuals. Rahman, Bhuiyan, et al. (2021) highlighted that higher service quality improves consumers' higher satisfaction, while Rahman, Gazi, et al. (2021) discussed the effects of service quality and consumer performance. Thus, service quality can be perceived as a critical determinant of effectiveness and efficiency to assess m-commerce performance levels. An organization that provides better service quality would gain higher market share and return on investment (ROI); thus, generating long-term profitability (Powers & Valentine, 2008). Among the perceived value mentioned, Tarhini et al. (2019) asserted that two of the most crucial SQ factors are personalization and interactivity relatively to consumers' mobile shopping adoption. Siyal et al. (2019) examined mobile banking acceptance in the context of Chinese bank customers. Consumers are more willing to

adopt mobile shopping if mobile shopping retailers provide high standard of service quality. Tarhini et al. (2019) found that service quality adopted from the IS success theory significantly affected consumers' intention toward mobile shopping. Thus, the current study postulated the following hypothesis for testing:

*H<sub>2</sub>: Service quality has positive impact on consumers' intention to adopt mobile shopping during the COVID-19 lockdown.*

### System Quality

System quality (SYQ) is defined as the quality of the technology system that focuses on the technical success level regarding information production to perform tasks or daily activities (Wang & Lin, 2012). Lee et al. (2020) explained the relationship between the quality of virtual reality and intention, while Kang et al. (2021) found a link between system quality and consumers' perceived behavior. X. Yang (2021) identified the relationship between system quality and consumers' continuance behavioral intention. In the m-commerce context, consumers can buy goods or services through a website or via a mobile application via the internet. The empirical study of the effect of system quality proves that it has a significant effect on intention through perceived ease of use as a mediator (Lin et al., 2017; Wang & Lin, 2012). Low-quality systems mitigate their expectation and forgo the desire to adopt the IS. For instance, if the system offers slow to access, it may require a longer time for a response to be received by the system. Zhou (2012) claimed that system quality constitute better visual appeal and navigational structure forms the users' first impressions toward mobile banking. Siyal et al. (2021) focused on consumer satisfaction and suggested the use of mobile app-based services for taxi booking. After all, the mobile shopping alternative intends to offer consumers convenience and a quick alternative; if the system is not able to meet consumers' demands, consumers' intention to adopt mobile shopping would lessen. Thus, the following hypothesis was proposed for testing:

*H<sub>3</sub>: System quality has positive impact on consumers' intention to adopt mobile shopping during the COVID-19 lockdown.*

### Perceived Usefulness

Perceived usefulness (PU) is the extent to which an individual perceives the technology system used is able to enhance the efficiency and productivity of his/her task performance or daily activities in a timely manner (McLean et al., 2020). Previous studies indicated perceived usefulness as a purpose-oriented functionality infrastructural element of a perceived

level that can impact consumers' behavioral intention toward the adoption of mobile shopping sites (Amirtha et al., 2021; Thakur & Srivastava, 2013). PU is adopted from TAM, which proposes that individuals are willing to accept new technology if they determine it to be useful in facilitating the result in gaining a positive outcome (Ghazali et al., 2018; Pipitwanicharkarn & Wongtada, 2019). In this sense, the higher the PU, the higher the behavioral intention of the users. Most empirical research has found that PU is impacted toward the consumers' intention to adopt mobile service systems such as mobile payment, mobile shopping apps, and mobile commerce (Bailey et al., 2017; Pipitwanicharkarn & Wongtada, 2019; Sun & Chi, 2018). Mobile sites or mobile apps with a user-friendly design will enhance the consumers' intention to adopt the technology as the design quality will affect the traffic of consumers while information quality will encourage consumers to make purchases (Sun & Chi, 2018). Consumers will feel positive toward mobile shopping if they can easily access their mobile device from their pocket or bag and browse through the shopping list in a simple process in order to adopt the mobile shopping channel. According to Ghazali et al. (2018), this shopping alternative will minimize their shopping time and experience through personalizing their intention to purchase goods through mobile shopping apps. Personalization and flexibility features are added advantages to the usefulness of the mobile devices and platform, offering consumers the ability to interact and communicate directly with retailers, hence driving their behavioral intention toward mobile shopping. Moreover, the better the mobile shopping system support, the more useful consumers will perceive m-commerce to be, and consequently, the higher intention to adopt the technology (Wei et al., 2009). Thus, the following hypothesis is proposed:

*H<sub>4</sub>: Perceived usefulness has positive impact on consumers' intention to adopt mobile shopping during the COVID-19 lockdown.*

### Perceived Ease of Use

Perceived ease of use (PEU) refers to the extent to which a person's perception toward the use of technology is free from physical and mental effort (Ghazali et al., 2018; Thakur & Srivastava, 2014). Grob and Sohn (2021) examined the relationship between perceived ease of use and behavioral intention in the context of consumer mobile shopping touchpoints. The effort reflects the learning process surrounding the system or application of the technology innovation to given the complexity of the process involved. Thus, the difficulty in using it will create a significant obstacle for them to adopt new technology (Cheong & Mohammed-Baksh, 2019) despite the large benefits gained (Choi, 2018). Users are more likely to select an application that is shown to be easy to use such as browsing, collecting information, and executing

transactions (Aboelmaged, 2010). PEU is recognized as a key factor proposed in TAM to examine the users' intention to utilize the services provided in the information technology system (Wei et al., 2009). In the m-commerce context, PEU has been verified in previous empirical research to be a strong factor affecting consumers' behavioral intention of mobile shopping (Choi, 2018; Sun & Chi, 2018). The previous studies have shown that perceived ease of use is insignificantly associated with consumers' intention in adopting mobile shopping (Wei et al., 2009; Wu & Wang, 2005). Yadav et al. (2016) stated that observing the PEU act as a weak predictor of m-commerce engagement, and PEU does not directly impact the consumers' behavioral IMS to actual utilization but indirectly influences behavioral IMS to use through PEU (Wu & Wang, 2005). Even though some studies have shown no effect, most of the studies found the validity effect; the theory suggests that it has an effect. Hence, the following hypothesis is proposed:

*H<sub>5</sub>: Perceived ease of use has positive impact on consumers' intention to adopt mobile shopping during the COVID-19 lockdown.*

### Perceived Enjoyment

Perceived enjoyment (PE) refers to the extent to which users recognize the use of a specific technology system to be enjoyable regardless of any performance outcomes from using the system (McLean et al., 2020). Grob and Sohn (2021) found a significant link between perceived enjoyment and behavioral intention to adopt mobile shopping. Lu and Su (2009) claimed that PE is a basic dimension of mobile shopping, while K. Yang (2012) believes that the individual will be favorable to shop through the mobile device if they have fun when searching for products and services or interacting within the mobile shopping environment. Hence, enjoyment can also define the consumers' direct experience of instant delight and pleasure from adopting mobile shopping sites. In the context of mobile shopping, K. Yang (2012) found that PE is a robust factor influencing one's positive attitude toward mobile shopping adoption compared to other variables from TAM theory. Kim et al. (2009) stated that consumers' PE to mobile phone usage had the largest direct effect on the consumers' attitudes and their behavioral intention toward mobile shopping adoption as users often enjoy a strong connection with their mobile devices (i.e., smartphones). Therefore, this indicates the significance of hedonic aspects of mobile interaction and its possible impact on the positive assessment of mobile device utilization from users for communication. Overall, limited researchers have linked the inherent stimulation concerning the perceptions of happiness and gratification with online shopping activities. In this study, TAM is adopted as the theory to explain the impact of PE on the consumers' intention of mobile shopping. Hence, the following hypothesis is proposed:

*H<sub>6</sub>: Perceived enjoyment has positive impact on consumers' intention to adopt mobile shopping during the COVID-19 lockdown.*

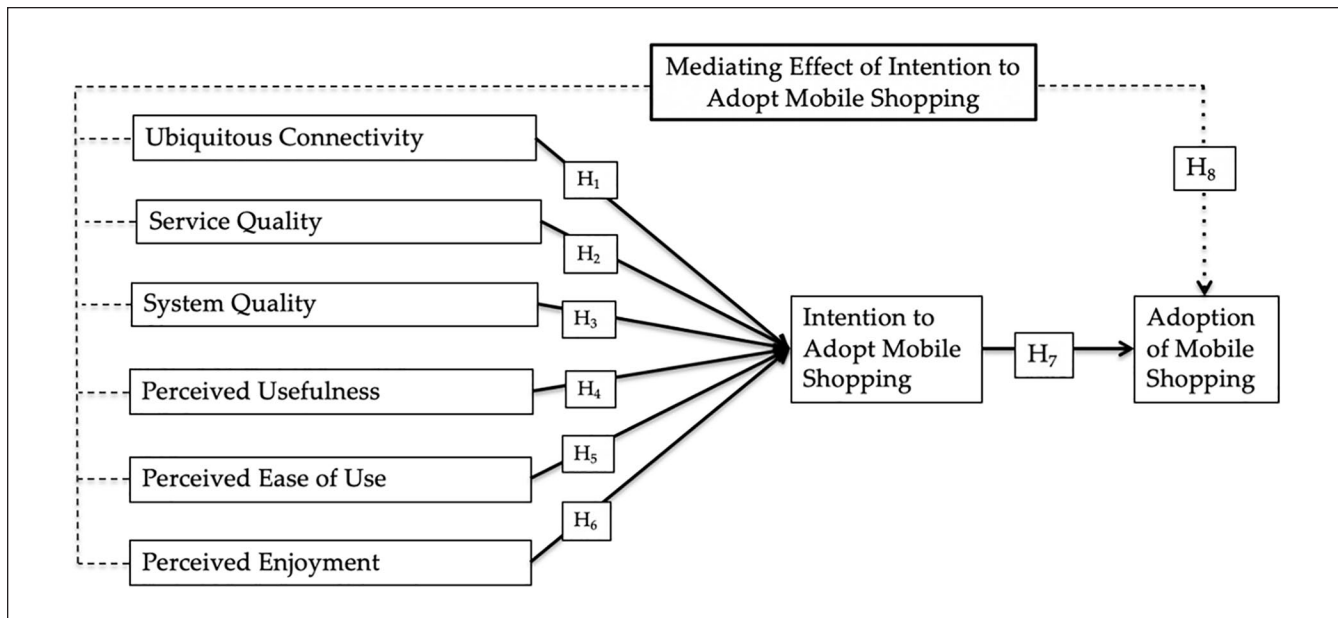
### Behavioral Intention and Adoption of Mobile Shopping

Behavioral intention (BI) refers to the intention of an individual in performing various behaviors (Davis, 1989; Mamun et al., 2021; Surendran, 2012). Wu and Wang (2005) described behavioral intention as the probability of the customers performing online transactions through mobile devices. Previous studies identified perceived usefulness as a crucial predictor for actual purchase behavior (Bailey et al., 2017; Hsiao, 2021; Saprikis et al., 2021). Kasilingam (2020) explored consumers' intention to adopt smartphone chatbots for shopping, while Singh and Sinha (2020) focused on the influencing role of consumers' intention to adopt mobile wallet technology. Due to the ongoing uncertainty of the COVID-19 pandemic, consumers' intention to adopt mobile shopping can reflect their adoption of mobile shopping. Thakur and Srivastava (2014) found that consumers' behavioral intention correlates with their actual behavior of mobile shopping adoption. This study examined the relationship between consumers' behavioral intention and adoption of mobile shopping (AMS) during the COVID-19 lockdown. Therefore, the following hypothesis was proposed for testing:

*H<sub>7</sub>: Intention to adopt mobile shopping has positive impact on consumers' adoption of mobile shopping during the COVID-19 lockdown.*

### Mediating Effects of Intention to Adopt Mobile Shopping

The intention to adopt mobile shopping refers to the intention or willingness of an individual in performing various behaviors (Davis, 1989; Surendran, 2012; Yuan et al., 2021) and the probability of customers in the engagement of online shopping via mobile devices (Wu & Wang, 2005). Studies have explored various constructs such as perceived usefulness (Bailey et al., 2017), perceived ease of use (Cheong & Mohammed-Baksh, 2019), system quality (Salameh et al., 2018), and service quality (Zhou, 2011) to determine individuals' intention toward technology adoption (Ghazali et al., 2018), especially in m-commerce. Consumers derive shopping enjoyment from the use of innovative technology functions and features mediated in the mobile shopping environment. There is evidence found in previous studies showing that the intention of an individual correlates with actual behavior. Thakur and Srivastava (2014) found that intention correlates with actual behavior in mobile shopping adoption. Hence, consumers' intention of mobile shopping is taken as a mediator role in identifying the actual utilization of mobile



**Figure 1.** Conceptual framework.

shopping among consumers. Thus, the following hypothesis is proposed:

*H<sub>8</sub>: Consumers' intention to adopt mobile shopping mediates the relationships of ubiquitous connectivity, service quality, system quality, perceived usefulness, perceived ease of use, and perceived enjoyment with the adoption of mobile shopping during the COVID-19 lockdown.*

Based on the above theoretical discussion, a conceptual model (Figure 1) was proposed in this study.

## Research Methodology

This study adopted a cross-sectional design and collected quantitative data to measure the effect of selected variables on the consumers' behavioral intention and adoption of mobile shopping. The population of this study comprised Malaysian consumers aged between 18 years and above since this age has accordingly increased their time spent using a mobile device that can be speculated as a continuous trend (Jusoh & Ling, 2012). Self-administered questionnaire sets (Google form) were distributed via online social media platforms among conveniently sampled participants. The data collection for this cross-sectional study was undertaken from August to October 2020. This study used G\*Power 3.1 to determine the minimum sample size. The obtained results revealed effect size of 0.15 and power of 0.99 that exceeded the threshold value of 0.80 (Chin et al., 2003). The calculated sample size was 203. This study successfully gathered a total of 316 completed questionnaire sets, which exceeded than the calculated sample size of 203.

## Survey Instrument

Five-point Likert scale ranging from 1 to 5 (strongly disagree to strongly agree) was used to measure independent and dependent variables. A 7-point Likert scale ranging from 1 to 7 (strongly disagree to strongly agree) was used to determine the AMS among the respondents. The survey instrument is presented in Table 1.

## Common Method Variance (CMV)

Harman's one-factor test is recommended as an approach to measure the issue of CMV among the study's constructs (Podsakoff et al., 2003). The use of one-factor Harman's test confirmed that CMV was not a critical issue, as the highest factor accounted for a variance of 38.649%, which is less than the suggested limit of 50% (Podsakoff et al., 2003). Furthermore, this study evaluated common method variance according to Kock's (2015) recommendation to test the full collinearity of all constructs. All study's constructs regressed on the common variable. The recorded variance inflation factor (VIF) values for ubiquitous connectivity (2.029), service quality (2.363), system quality (2.371), perceived usefulness (2.282), perceived ease of use (2.431), perceived enjoyment (2.323), intention to adopt mobile shopping (2.836), and adoption of mobile shopping (1.844) were less than 5, indicating the absence of bias from the single-source data.

## Multivariate Normality

The results of multivariate normality test confirmed that the overall data set was not normal, as Mardia's multivariate

**Table 1.** Survey Instrument.

Code	Questions	Source
UC-Item 1	I can access to mobile shopping apps anytime for the necessary information or service	Alalwan et al. (2020)
UC-Item 2	I can use mobile shopping apps “anywhere” and “anytime” at the point of need	
UC-Item 3	Mobile shopping apps enable me to order products or service anywhere at any time	
UC-Item 4	I can access mobile shopping apps anywhere for the necessary information or service	
UC-Item 5	I feel that I am always connected with mobile shopping apps.	
SQ-Item 1	The mobile shopping apps provide on-time services	Zhou (2011); Wang and Lin (2012)
SQ-Item 2	The mobile shopping apps provide prompt responses to my questions	
SQ-Item 3	The mobile shopping apps provide personalized and professional services	
SQ-Item 4	Mobile shopping apps understand and adapt to the user’s specific needs	
SQ-Item 5	Mobile shopping apps that I used exhibit a professional and competent image	
SYQ-Item 1	The mobile shopping site is reliable	Zhou (2011); Wang and Lin (2012); Lin et al. (2017).
SYQ-Item 2	The layout of mobile shopping apps is clear	
SYQ-Item 3	Mobile shopping apps services keep transaction error-free	
SYQ-Item 4	Mobile shopping apps offer easy navigation to retrieve information	
SYQ-Item 5	Mobile shopping apps have fast response times and transaction processing	
SYQ-Item 6	Mobile shopping has a better operability	
SYQ-Item 7	Mobile shopping is more visually attractive	
PU-Item 1	Relatives and friends have an influence on my decision to use mobile shopping	Phong et al. (2018); Sun and Chi (2018)
PU-Item 2	Mass media (e.g., newspaper, radio, and TV) have an influence on my decision to use mobile shopping	
PU-Item 3	I would use mobile shopping more often if the service was widely used by people in my community	
PU-Item 4	It is the current trend to use mobile shopping	
PU-Item 5	Mobile shopping can save my time	
PU-Item 6	Mobile shopping contributes to a betterment of life	
PEU-Item 1	Learning to use mobile shopping is easy for me	Ghazali et al. (2018); Sun and Chi (2018); Wang and Lin (2012)
PEU-Item 2	The use of mobile shopping does not require a lot of mental effort	
PEU-Item 3	It would be easy for me to use mobile device for shopping	
PEU-Item 4	It would be easy for me to become skilful in using mobile shopping	
PEU-Item 5	I find mobile shopping to be flexible to interact with	
PEU-Item 6	My interaction with mobile shopping platform is clear and understandable	
PE-Item 1	I would have fun shopping by mobile phone	K. Yang (2012)
PE-Item 2	The actual process of mobile shopping would be pleasant	
PE-Item 3	I would find using mobile shopping to be enjoyable	
PE-Item 4	Mobile shopping helps me to relax	
PE-Item 5	Mobile shopping involves something to do when I am alone	
IMS-Item 1	Given the chance, I intend to use mobile shopping	K. Yang (2012); Khoi et al. (2018)
IMS-Item 2	I expect my mobile shopping to continue in the future	
IMS-Item 3	I intend to purchase products or services via mobile phone	
IMS-Item 4	I am ready to use mobile devices to shop and make commercial transaction	
IMS-Item 5	I plan to use mobile shopping in the next few months	
AMS-Item 1	In the past 6 months, I have used mobile shopping apps in order to purchase online products	Chopdar et al. (2018)
AMS-Item 2	In the past 6 months, I have used mobile shopping apps in order to shop for products from different online retailer	
AMS-Item 3	In the past 6 months, I have used mobile shopping apps to make personal purchases	
AMS-Item 4	I have used different kinds of mobile shopping apps in the las 6 months	

Note. UBC=ubiquitous connectivity; SQ=service quality; SYQ=system quality; PU=perceived usefulness; PEU=perceived ease of use; PE=perceived enjoyment; IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping.

coefficient  $p$ -values did not exceed .05. Therefore, this study considered partial least squares structural equation modeling (PLS-SEM), as PLS-SEM, as a non-parametric analysis

instrument, is associated with having no assumption surrounding multivariate normality in the data (Hair et al., 2019).

**Table 2.** Demographic Characteristics.

	N	%
Gender		
Female	165	52.2
Male	151	47.8
Total	316	100.0
Age group		
Below 21 years	25	7.9
21–25 years	230	72.8
26–30 years	21	6.6
31–35 years	8	2.5
36–40 years	13	4.1
41–45 years	7	2.2
46–50 years	1	0.3
51–55 years	10	3.2
56–60 years	1	0.3
Total	316	100.0
Living area		
Urban	282	89.2
Rural	34	10.8
Total	316	100.0
Marital status		
Single	273	92.9
Married	20	6.8
Divorced	1	0.3
Total	294	100.0
Education		
Secondary school certificate	26	8.2
Diploma/technical school certificate	45	14.2
Bachelor degree or equivalent	227	71.8
Master's degree	16	5.1
Doctoral degree	2	0.6
Total	316	100.0
Average monthly income (RM)		
Below 2,500	192	60.8
2,501–5,000	79	25.0
5,001–7,500	25	7.9
7,501–10,000	12	3.8
10,001–12,500	3	0.9
More than 12,500	5	1.6
Total	316	100.0

### Data Analysis Method

SmartPLS 3 was used in this study to analyze the obtained quantitative data. All gathered data were processed into meaningful information through data analysis and statistical calculations. SEM-PLS was applied in this study, as it is a component-based method and consists of three crucial sets of correlations (Chin et al., 2003). Firstly, SEM-PLS is typically used for the assessment of measurement model that indicates the link between latent and observed factors, estimating the reliability, convergent validity, and discriminant validity. Secondly, SEM-PLS is also applied for the evaluation of structural model that shows the relationships among

the constructs. Thirdly, SEM-PLS measures the weight relationships among the latent variables. Gefen et al. (2000) postulated the establishment of SEM-PLS with significant path coefficient. Hair et al. (2013) stated that variance-based structural equation modeling is adopted to analyze the explanatory nature and non-normality issues in a study to provide an in-depth explanation of the variance in the structural equation model's dependent constructs.

### Data Analysis

#### Demographic Characteristics

Table 2 shows the respondents' demographic profile collected from 316 Malaysian consumers, including their gender, age group, ethnicity, marital status, educational background, average monthly income, and living area.

#### Reliability and Validity

After understanding the respondents' demographic profile, the next step was to evaluate the reliability of the questionnaire using Cronbach alpha ( $\alpha$ ) measurement of each independent variable. According to Bonett and Wright (2015), Cronbach alpha ( $\alpha$ ) measurement is a technique developed by Cronbach (1951) used for checking the internal consistency of the scale for each variable. In reference to Table 3, the reliability coefficients ( $\alpha$ ) of each independent construct are greater than the threshold value of .7, indicating that all the questions in the questionnaire are reliable in collecting information, with a higher degree of consistency in variable measurement. Other criteria observed for the reliability evaluation included Dijkstra and Henseler's rho ( $\rho_A$ ) and composite reliability (CR). All the constructs values for both criteria are above the minimum value of .7 (Chin, 1998; Hair et al., 2019), as shown in the results of Table 3. Therefore, from these three criteria, the measurement model is reliable and performed well for the next stage of analysis.

For the validity, there were two types of validity to be tested in this study: convergent and discriminant validity, in order to check whether the indicators of each construct measure what they are intended to measure. Convergent validity is the degree to which the construct converges to explain the variance of its items, and the technique that is used to test this validity in PLS-SEM is average variance extracted (AVE) with an acceptable value of .5 and above (Hair et al., 2019). Table 3 shows that the AVEs for all the constructs ranging between .511 and .816, indicating that the variance explained by the variables exceed the variance explained by the error and the unidimensionality for each construct is approved. Hence, the convergent validity of the model is satisfied.

Three methods were used in this study to examine the construct's discriminant validity: Fornell-Larcker criterion and Hetrotrait and monotrait ratio (HTMT; Table 4) and the item loading and cross-loading (Table 5). Referring to the



**Table 3.** Reliability and Validity.

Variables	No. items	M	SD	CA	Rho_A	CR	AVE	VIF
UC	5	4.368	0.591	0.868	.875	.903	.652	1.935
SQ	5	3.771	0.709	0.872	.877	.908	.663	2.328
SYQ	7	3.818	0.592	0.840	.851	.879	.511	2.451
PU	4	3.921	0.651	0.853	.866	.890	.577	2.538
PEU	6	4.207	0.583	0.732	.756	.831	.553	2.234
PE	5	3.846	0.791	0.888	.897	.918	.691	2.064
IMS	5	4.101	0.712	0.901	.903	.927	.718	1.000
AMS	4	5.689	1.339	0.924	.945	.946	.816	—

Source. Author's data analysis.

Note. UC=ubiquitous connectivity; SQ=service quality; SYQ=system quality; PU=perceived usefulness; PEU=perceived ease of use; PE=perceived enjoyment; IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping; SD=standard deviation; CA=Cronbach's Alpha; rho\_A=Dijkstra and Henseler' rho; CR=composite reliability; AVE=average variance extracted; VIF=variance inflation factors.

Fornell-Larcker criterion in Table 4, the square root of all the AVE values (the diagonal items) is larger than all the correlation coefficients between the constructs (off-diagonal items). As such, this represents the appropriate discriminant validity of the measures. Whereas for the HTMT ratio in Table 4, the ratio should be less than 0.9 for the model to have discriminant validity. As shown in Table 4, the HTMT ratio for all the comparison of constructs is below 0.9 (ranging from 0.324 to 0.823), indicating that the measurement model achieves satisfactory discriminant validity.

Furthermore, a further technique that is used to examine discriminant validity is the loadings and cross-loadings. Hair et al. (2019) stated that loadings above 0.5 are recommended.

Two items of perceived usefulness, which recorded loadings of less than 0.5, were removed from the subsequent analysis. As shown in Table 5, the item loadings in *Italic font* range from 0.621 to 0.945. In summary, the model exhibited satisfactory reliability, convergent, and discriminant validity by demonstrating the appropriateness of the measurement model, which can produce a better result for the research.

## Path Analysis

After determining the satisfactory of the reliability and validity of the measurement model, the subsequent measurement for model assessment was used to test the hypotheses. In

**Table 4.** Discriminant Validity.

	UC	SQ	SYQ	PU	PEU	PE	IMS	AMS
Fornell-Larcker criterion								
UC	0.808							
SQ	0.573	0.814						
SYQ	0.515	0.707	0.715					
PU	0.536	0.524	0.592	0.744				
PEU	0.632	0.540	0.596	0.673	0.759			
PE	0.502	0.550	0.579	0.626	0.631	0.832		
IMS	0.543	0.455	0.516	0.656	0.632	0.674	0.847	
AMS	0.458	0.290	0.359	0.481	0.459	0.496	0.677	0.903
Heterotrait-Monotrait ratio (HTMT)								
UC	—							
SQ	0.640	—						
SYQ	0.579	0.821	—					
PU	0.646	0.664	0.748	—				
PEU	0.726	0.631	0.697	0.823	—			
PE	0.533	0.625	0.662	0.771	0.718	—		
IMS	0.585	0.509	0.580	0.790	0.708	0.750	—	
AMS	0.482	0.324	0.401	0.576	0.513	0.543	0.731	—

Source. Author's data analysis.

Note. UC=ubiquitous connectivity; SQ=service quality; SYQ=system quality; PU=perceived usefulness; PEU=perceived ease of use; PE=perceived enjoyment; IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping.

**Table 5.** Loadings and Cross-Loading..

Code	UC	SQ	SYQ	PU	PEU	PE	IMS	AMS
UC-Item 1	<b>0.843</b>	0.438	0.405	0.418	0.516	0.313	0.395	0.315
UC-Item 2	<b>0.827</b>	0.374	0.353	0.384	0.520	0.311	0.358	0.324
UC-Item 3	<b>0.833</b>	0.407	0.409	0.451	0.534	0.361	0.403	0.314
UC-Item 4	<b>0.833</b>	0.477	0.400	0.363	0.488	0.368	0.378	0.326
UC-Item 5	<b>0.693</b>	0.543	0.458	0.486	0.472	0.565	0.564	0.487
SQ-Item 1	0.553	<b>0.741</b>	0.542	0.368	0.424	0.383	0.341	0.318
SQ-Item 2	0.420	<b>0.808</b>	0.524	0.400	0.406	0.434	0.396	0.202
SQ-Item 3	0.422	<b>0.857</b>	0.593	0.460	0.431	0.498	0.342	0.213
SQ-Item 4	0.481	<b>0.815</b>	0.577	0.437	0.431	0.415	0.348	0.225
SQ-Item 5	0.467	<b>0.845</b>	0.637	0.466	0.499	0.501	0.412	0.230
SQ-Item 1	0.335	0.520	<b>0.723</b>	0.413	0.434	0.399	0.365	0.275
SYQ-Item 2	0.361	0.536	<b>0.697</b>	0.398	0.420	0.376	0.329	0.282
SYQ-Item 3	0.279	0.423	<b>0.684</b>	0.293	0.352	0.324	0.274	0.196
SYQ-Item 4	0.474	0.580	<b>0.788</b>	0.470	0.495	0.421	0.392	0.257
SYQ-Item 5	0.351	0.458	<b>0.707</b>	0.395	0.418	0.365	0.329	0.258
SYQ-Item 6	0.410	0.524	<b>0.769</b>	0.485	0.455	0.464	0.479	0.306
SYQ-Item 7	0.333	0.474	<b>0.621</b>	0.461	0.382	0.517	0.356	0.202
PU-Item 1	0.305	0.441	0.481	<b>0.643</b>	0.371	0.481	0.370	0.278
PU-Item 2	0.441	0.387	0.418	<b>0.740</b>	0.465	0.376	0.443	0.381
PU-Item 3	0.379	0.334	0.380	<b>0.767</b>	0.515	0.441	0.493	0.336
PU-Item 4	0.455	0.419	0.495	<b>0.814</b>	0.612	0.559	0.604	0.418
PEU-Item 1	0.503	0.313	0.345	0.543	<b>0.757</b>	0.407	0.502	0.385
PEU-Item 2	0.411	0.403	0.366	0.371	<b>0.644</b>	0.435	0.325	0.265
PEU-Item 3	0.508	0.406	0.486	0.599	<b>0.795</b>	0.496	0.555	0.369
PEU-Item 4	0.462	0.448	0.460	0.462	<b>0.777</b>	0.461	0.447	0.313
PEU-Item 5	0.488	0.466	0.511	0.516	<b>0.745</b>	0.545	0.448	0.359
PEU-Item 6	0.503	0.448	0.533	0.537	<b>0.826</b>	0.540	0.551	0.381
PE-Item 1	0.472	0.451	0.509	0.540	0.591	<b>0.892</b>	0.623	0.482
PE-Item 2	0.483	0.517	0.531	0.557	0.644	<b>0.831</b>	0.580	0.440
PE-Item 3	0.471	0.445	0.487	0.579	0.579	<b>0.880</b>	0.603	0.449
PE-Item 4	0.315	0.447	0.460	0.458	0.381	<b>0.796</b>	0.496	0.325
PE-Item 5	0.316	0.430	0.414	0.458	0.390	<b>0.750</b>	0.479	0.342
IMS-Item 1	0.360	0.369	0.449	0.554	0.519	0.635	<b>0.788</b>	0.504
IMS-Item 2	0.495	0.339	0.433	0.564	0.541	0.522	<b>0.861</b>	0.565
IMS-Item 3	0.435	0.356	0.415	0.546	0.523	0.567	<b>0.860</b>	0.558
IMS-Item 4	0.505	0.456	0.486	0.595	0.584	0.586	<b>0.874</b>	0.610
IMS-Item 5	0.498	0.402	0.400	0.518	0.508	0.546	<b>0.851</b>	0.624
AMS-Item 1	0.445	0.274	0.328	0.467	0.439	0.428	0.663	<b>0.934</b>
AMS-Item 2	0.428	0.277	0.333	0.429	0.409	0.490	0.635	<b>0.936</b>
AMS-Item 3	0.451	0.277	0.356	0.461	0.442	0.469	0.666	<b>0.945</b>
AMS-Item 4	0.309	0.212	0.273	0.372	0.364	0.406	0.445	<b>0.787</b>

Source. Author's data analysis.

Note. (1) UC=ubiquitous connectivity; SQ=service quality; SYQ=system quality; PU=perceived usefulness; PEU=perceived ease of use; PE=perceived enjoyment; IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping. (2) The bold and italic values in the matrix above are the item loadings and others are cross-loadings.

Table 6 below, the adjusted  $r^2$  value for the three input variables, including UC, SQ, and SYQ on the IMS, explains 57.7% of the change in the consumers' intention to adopt mobile shopping. The predictive relevance ( $Q^2$ ) value for this part of the model is 0.403, which shows a medium predictive relevance. The adjusted  $r^2$  for the intention of mobile shopping explains 45.8% of the change in the AMS, while

the predictive relevance ( $Q^2$ ) value for the model is 0.361, therefore indicating a medium predictive relevance.

According to Table 6, among the seven hypotheses of this study, five are statically significant at the  $p < .05$  level, and another two are insignificant. The path coefficient between UC and IMS ( $\beta = .149$ ;  $p = .002$ ) shows a significant positive effect of the UC on the IMS, thus providing evidence to

**Table 6.** Path Coefficients.

Hypo		$\beta$	CI-Min	CI-Max	t	p-Value	$r^2$	$f^2$	$Q^2$	Decision
Factors effecting intention to adopt mobile shopping										
H <sub>1</sub>	UC → IMS	.149	0.063	0.228	2.971	.002		0.027		Accept
H <sub>2</sub>	SQ → IMS	-.074	-0.179	0.024	1.210	.113		0.006		Reject
H <sub>3</sub>	SYQ → IMS	.037	-0.044	0.152	0.612	.270	.577	0.001	0.403	Reject
H <sub>4</sub>	PU → IMS	.269	0.156	0.367	4.262	.000		0.077		Accept
H <sub>5</sub>	PEU → IMS	.151	0.036	0.267	2.218	.014		0.021		Accept
H <sub>6</sub>	PE → IMS	.354	0.239	0.442	5.647	.000		0.144		Accept
Factor effecting adoption of mobile shopping										
H <sub>7</sub>	IMS → AMS	.677	0.613	0.738	18.347	.000	.458	0.844	0.361	Accept

Source. Author's data analysis.

Note. UC=ubiquitous connectivity; SQ=service quality; SYQ=system quality; PU=perceived usefulness; PEU=perceived ease of use; PE=perceived enjoyment; IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping.

support H<sub>1</sub>. However, the effect of UC on IMS is marginal with the effect size,  $f^2$  value of 0.027. Furthermore, the path coefficient between SYQ and IMS ( $\beta = -.074$ ;  $p = .113$ ) indicates an insignificant and negative effect of the SQ on the IMS, and as such, H<sub>2</sub> is not supported. The negative effect is relatively small, with an  $f^2$  value of 0.006. The path value for the SYQ and consumers' behavioral IMS ( $\beta = .037$ ;  $p = .270$ ) indicates an insignificant and positive effect of the SYQ on the IMS having an  $f^2$  value of 0.001, thus providing no support for H<sub>3</sub>. The path between PU and IMS ( $\beta = .269$ ;  $p = .000$ ) indicates a significant and positive effect of PU to the IMS having an  $f^2$  value of 0.077; therefore, H<sub>4</sub> is supported. For the path between PEU and consumers' behavioral IMS ( $\beta = .151$ ;  $p = .014$ ), the effect of the PU on the IMS is positive and significant with an  $f^2$  value of 0.021; thus, H<sub>5</sub> is supported. The path coefficient of the PE and IMS ( $\beta = .354$ ;  $p = .000$ ) indicates a significant and positive effect of PE on the intention to adopt mobile shopping with an  $f^2$  value of 0.144; thus, H<sub>6</sub> is supported. In brief, H<sub>1</sub>, H<sub>4</sub>, H<sub>5</sub>, and H<sub>6</sub> are supported, while H<sub>2</sub> and H<sub>3</sub> are not supported.

### Mediation

The mediating effects (Table 7) of consumers' intention to adopt mobile shopping on the relationships between the

latent and observed variables were examined. The results revealed significant mediating effect of IMS on the relationship between UC and AMS ( $\beta = .101$ , CI-min=0.042, CI-max=0.156,  $p = .002$ ), providing sufficient evidence to support the hypothesized effect of IMS on the relationship of UC and AMS. The mediating effect of mobile shopping intention between SQ ( $\beta = .025$ ,  $p = .272$ ) and mobile shopping adoption shows an insignificant but positive relationship, thus providing evidence of not supporting this hypothesis. Besides, the mediating effect of mobile shopping intention on the relationship between PU ( $\beta = .182$ ,  $p = .000$ ) thus provides evidence to support this relationship. The mediating effect of mobile shopping intention on the relationship between PEU and mobile shopping adoption ( $\beta = .102$ ,  $p = .013$ ) depicts a significant and positive relationship, and as such, the hypothesis is supported. The mediating effect of mobile shopping intention on the relationship between PE and mobile shopping adoption ( $\beta = .240$ ,  $p = .000$ ) shows a significant and positive relationship, and thus the hypothesis is supported. In short, the mediating effect of mobile shopping intention on the relationship between UC, PU, PEU, PE, and mobile shopping adoption is accepted and supported, while the mediating effect of mobile shopping intention on the relationship between SQ, SYQ, and mobile shopping adoption is not supported.

**Table 7.** Mediating Effect.

Associations	$\beta$	CI-Min	CI-Max	t	p-Value	Decision
UC → IMS → AMS	.101	0.042	0.156	2.922	.002	Full mediation
SQ → IMS → AMS	.025	-0.031	0.104	0.606	.272	No mediation
SYQ → IMS → AMS	-.050	-0.125	0.016	1.181	.119	No mediation
PU → IMS → AMS	.182	0.104	0.258	3.937	.000	Full mediation
PEU → IMS → AMS	.102	0.026	0.177	2.227	.013	Full mediation
PE → IMS → AMS	.240	0.158	0.308	5.259	.000	Full mediation

Source. Author's data analysis.

Note. UC=ubiquitous connectivity; SQ=service quality; SYQ=system quality; PU=perceived usefulness; PEU=perceived ease of use; PE=perceived enjoyment; IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping.

**Table 8.** Predictive Model Assessment.

	$Q^2_{\text{Predict}}$	RMSE (PLS-SEM)	RMSE (LM)	Difference	Predictive power
IMS-Item 1	0.405	0.710	0.694	0.015	
IMS-Item 2	0.385	0.623	0.635	-0.012	
IMS-Item 3	0.381	0.662	0.686	-0.024	Medium predictive power
IMS-Item 4	0.441	0.572	0.599	-0.027	
IMS-Item 5	0.361	0.718	0.761	-0.043	
AMS-Item 1	0.266	1.208	1.272	-0.064	
AMS-Item 2	0.273	1.222	1.275	-0.053	High predictive power
AMS-Item 3	0.286	1.201	1.282	-0.081	
AMS-Item 4	0.194	1.531	1.600	-0.069	

Source. Author's data analysis.

Note. IMS=intention to adopt mobile shopping; AMS=adoption of mobile shopping; RMSE=root mean square error; LM=linear regression model.

## Predictive Assessment

Predictive assessment of the study's model disclosed that the model's predictive power. IMS displayed high predictive power, as most of the  $Q^2$  predict values exceeded zero.  $Q^2$  predict values of above zero suggest that the prediction errors of the PLS-SEM results are smaller than the prediction errors of simply using the mean values; thus, suggesting better predictive performance (Shmueli et al., 2019). Most of the linear regression model (LM) benchmarks yielded more errors than the root mean square error (RMSE) values of the PLS-SEM model. Based on the obtained results, the current study offered critical evidence that the PLS-SEM model performed well in predicting IMS. The other parts of the study's model that predicted the AMS exhibited high predictive power. The  $Q^2$  predict values were all above zero; thus, confirming the predictive power of the other parts of the model. Moreover, all LM benchmarks yielded more errors than the RMSE values of the PLS-SEM model. In other words, this PLS-SEM model had high predictive power (see Table 8).

## Discussion

The purpose of this study was to explore the adoption of mobile shopping among Malaysian consumers and the mediating effects of behavioral intention in relation to mobile shopping. With respect to TAM, the obtained results of this study proved the positive and significant effects of ubiquitous connectivity, perceived usefulness, perceived ease of use, and perceived enjoyment on the intention to adopt mobile shopping among Malaysian consumers. The results further indicated the insignificant effects of service quality and system quality on consumers' intention to adopt mobile shopping. This suggests that high quality offered by mobile shopping site providers and the mobile shopping platform will not enhance the interest of consumers toward mobile shopping.

As stated, based on the obtained results, the current study obtained adequate evidence to confirm the significant impact

of ubiquitous connectivity on consumers' intention to adopt mobile shopping during the COVID-19 lockdown ( $H_1$ ). Chen et al. (2018) highlighted similar findings on consumers' mobile shopping behavior. Besides that, the current study found that service quality ( $H_2$ ) and system quality ( $H_3$ ) were not significantly related to consumers' intention to adopt mobile shopping during the COVID-19 lockdown. These findings may be attributed to the cultural differences and the COVID-19 lockdown itself. Tarhini et al. (2019) focused on consumers' adoption of mobile commerce activities in the context of developing countries and similarly identified that system quality has no significant impact on consumers' behavioral intention in relation to mobile commerce. However, the findings of this study contradicted the findings of most prior studies, such as Mogenhalli et al. (2008), Zhou (2011), and Lin et al. (2017). Based on the current study's findings, Malaysian consumers appear to be less concerned about service quality and system quality when it comes to adopting mobile shopping.

Ghazali et al. (2018) also asserted that consumers express higher behavioral intention when the system is less complex and relatively easy-to-use. Consumers are generally concerned about the aspects of ubiquitous connectivity, perceived ease of use, perceived usefulness, and perceived enjoyment. Besides that, as service quality and system quality are related to the physical attributes of shopping, consumers are more inclined toward experiencing freedom and less crowded space as well as maintaining social distance when they shop, particularly during the lockdown. Based on the obtained results, this study revealed the significant impact of perceived ease of use on consumers' intention to adopt mobile shopping during the COVID-19 lockdown ( $H_4$ ). This particular finding was deemed relevant to the discussion of a study by Lu and Su (2009) on consumers' perception and mobile shopping behavior. Adding to that, perceived usefulness was found to be associated with consumers' intention to adopt mobile shopping ( $H_5$ ). Several previous studies by Roy and Moorthi (2017) and Chen et al. (2018), which focused on consumers' intention of mobile shopping, reported similar findings.

Additionally, this study obtained adequate evidence to support  $H_6$  on the significant influence of perceived enjoyment on consumers' intention to adopt mobile shopping. This particular finding was deemed relevant to Ghazali et al. (2018) and Chen et al. (2018), which identified a positive relationship between perceived enjoyment and behavioral intention.

Lim (2008) and Zhou (2011) emphasized the ease of use and the usefulness of mobile shopping sites, which contribute to the increase in consumers' intention toward mobile shopping, especially if they enjoy shopping using a mobile device. The current study's results indicated the significant relationship between consumers' behavioral intention and adoption of mobile shopping during the COVID-19 lockdown ( $H_7$ ). This particular finding was found to be consistent with what Zhang et al. (2012) reported. In other words, consumers are more likely to adopt mobile shopping if they have higher intention toward mobile shopping. Furthermore, the obtained results of this study confirmed the mediating effects of consumers' intention to adopt mobile shopping on the relationships of ubiquitous connectivity, perceived ease of use, perceived usefulness, and perceived enjoyment with the adoption of mobile shopping ( $H_8$ ). However, consumers' intention to adopt mobile shopping did not mediate the impact of service quality and system quality on adoption of mobile shopping during the COVID-19 lockdown.

## Implications

Mobile shopping has become an emerging and unavoidable trend nowadays following the advancement of technology. The current study presented significant theoretical and practical implications for mobile shopping providers and managers, allowing them to promote and implement strategy that can benefit consumers when they shop via mobile device. The obtained findings also provide better understanding on the determinants that shape Malaysian consumers' behavioral intention and adoption of mobile shopping, which benefit practitioners and researchers who are interested in the mobile shopping domain. Theoretically, this study proved the significance of ubiquitous connectivity, perceived usefulness, perceived ease of use, and perceived enjoyment as crucial factors for consumers' behavioral intention that subsequently reflects their adoption of mobile shopping during the COVID-19 lockdown. In line with this, mobile shopping providers can design and develop more innovative and effective m-shopping services to maximize consumer value and satisfaction; thus, attracting a broader customer base to adopt mobile shopping.

From the practical viewpoints, with the development of m-commerce, the number of mobile shopping applications has increased, as vendors target the potential of m-commerce and future opportunities. With that, many corporations are heavily invested in research and development by hiring IT experts in software development in order to gain competitive

advantage. In this study, service quality and system quality were found to have insignificant impact on consumers' intention to adopt mobile shopping despite the significance of ubiquitous connectivity, perceived usefulness, perceived ease of use, and perceived enjoyment as the most crucial determinants that increase the consumers' desire toward mobile shopping adoption, particularly during the COVID-19 lockdown in Malaysia. Therefore, managers should direct their focus more on the users' experience and demands rather than solely concentrating on developing the most advanced and modern mobile shopping sites. Besides, the main purpose of buying products from particular mobile shopping sites are the emotional rewards that are gained from such sites, which is also important to consumers during their shopping journey. Indeed, managers should include this consideration while implementing a strategy in developing m-commerce capabilities. No doubt, this will help the company to enhance customer satisfaction and build their trust and loyalty. In addition, it will help to heighten the frequency of consumers to revisit the same mobile shopping sites in the future; thus, corporates can create a competitive advantage and help in sustaining the business longer.

Notwithstanding, managers need to be aware of the strong effect of UC, PU, and PEU. Consumers nowadays expect to conduct mobile purchases wherever they wish. If the service connections are unreliable or inaccessible, consumers will refrain from browsing through the applications of mobile stores' and instead feel frustrated and may lose interest to use a mobile device for shopping. Hence, telecommunication service providers need to cooperate with the Malaysian Communications and Multimedia Commission (MCMC), a government regulatory body responsible for overseeing communications and multimedia industry regulations, for enhancing the overall connectivity infrastructure in Malaysia by looking beyond fibre technology, and to address the connectivity gaps between the areas with good connections and poor connections. This is because, without reliable and quality connections for users, mobile shopping service providers are unable to promote their m-commerce activities among consumers.

Also, consumers will be unaware of the existence of mobile shopping and forgo the opportunity to enjoy the benefits. In addition, to widen the consumer base in the AMS, managers should direct their effort toward the projection of the usefulness of m-commerce, as proven by the result in this study that perceived usefulness and perceived ease of use had a significant effect on consumers' adoption of mobile shopping. For example, the interface of mobile store applications can be designed elegantly and simply with user-friendly features attached to mobile shopping apps. This would allow users to recognize such features related to the perceived ease of use and usefulness of the system. Moreover, usability pre-testing should be undertaken prior to launching the app. This is important as it would allow consumers to search and obtain details of the products or services quickly and allow them to

readily perform their buying transactions without spending much effort and time. Also, mobile shopping providers need to collect feedback from existing users about their user experience or any problems encountered during their use through regular usability testing to ensure that users are free from encountering issues and are able to conduct their shopping journey in a productive and efficient manner.

### Limitations and Future Directions

The study encountered several limitations. Firstly, the questionnaire survey in this study only focused on consumers in Malaysia. Thus, the collection of data was limited to a sample from the Malaysian population. It is recommended for future research to explore different countries and different consumers' views in order to acquire evidence on the impact of service quality and system quality on consumers' behavioral intention and adoption of mobile shopping. Secondly, the current study only focused on the concept of TAM to evaluate the proposed conceptual model. Therefore, it is recommended for future research to consider integrating both TAM and information system success model (ISSM) in order to gain a more comprehensive overview of consumers' behavioral intention and adoption of mobile shopping.

### Conclusions

The study explored the determinants of consumers' intention to adopt mobile shopping. Based on the study's findings, ubiquitous connectivity, perceived usefulness, perceived ease of use, and perceived enjoyment were found to have significant impact on consumers' behavioral intention, which in turn reflect consumers' adoption of mobile shopping. Although service quality and system quality were found to have insignificant impact on consumers' behavioral intention toward the adoption of mobile shopping, both factors are crucial, particularly during the COVID-19 lockdown. Given the recent outbreak of COVID-19 globally, the implementation of lockdown policies across countries have restricted the global population from exploring beyond their home space freely, forcing retail shops to close during the lockdown period. Therefore, all shopping activities can only be performed through the digital platform, either through online websites or via mobile shopping apps. The COVID-19 pandemic has pushed the growth of m-commerce, in which the business environment of m-commerce has now become increasingly competitive, with the emergence of various mobile shopping sites. Therefore, the current study's findings can assist businesses to understand consumer behavior and construct effective strategies and policies accordingly based on the determinants that have significant impact on the adoption of mobile shopping among consumers; thus, helping various firms to gain competitive advantage. Furthermore, the study validated the obtained results with respect to TAM.

Considering the strong effects of ubiquitous connectivity, perceived usefulness, perceived ease of use, and perceived enjoyment on the adoption of mobile shopping among Malaysian consumers, the Malaysian government and relevant parties need to be aware of the need to emphasize and promote consumers' interest and increase the number of m-commerce users, as m-commerce activities can help to grow the economy by increasing Malaysia's gross domestic product (GDP). As such, the study's findings are useful and applicable to mobile shopping providers and practitioners when a new business model in the retail industry is launched, such as adopting effective marketing strategies that promote mobile shopping.

### Availability of Data and Materials

All data generated or analyzed during this study are included in this published article (Submitted with the Manuscript: Additional supporting file).

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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### Ethical Approval and Consent to Participate

Local ethics committees (UCSI University, Malaysia) ruled that no formal ethics approval was required in this particular case. This study has been performed in accordance with the Declaration of Helsinki. Written informed consent for participation was obtained from respondents who participated in the survey. For the respondents who participated the survey online (using google form), they were asked to read the ethical statement posted on the top of the form (*There is no compensation for responding nor is there any known risk. In order to ensure that all information will remain confidential, please do not include your name. Participation is strictly voluntary and you may refuse to participate at any time*) and proceed only if they agree. No data was collected from anyone under 16 years old.

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