



Mobile commerce applications service quality in enhancing customer loyalty intention: mediating role of customer satisfaction

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Abstract

Mobile shopping application can provide retailers the opportunity for showcasing their brands and shopping experiences to the customers since the use of smartphones are increasing. Therefore, this study was conducted to determine the e-service quality of mobile commerce applications (MCA) in enhancing customer loyalty intention behaviour to purchase the product via MCA among online shoppers in Malaysia through the use of the adapted SERVQUAL model. Additionally, the mediating effect of customer satisfaction on the relationship between MCA service quality dimensions and customer loyalty intention behaviour was studied. A purposive sampling technique was used and 120 data were collected through an online survey. The results for direct testing demonstrate that all the SERVQUAL dimensions were significantly influenced customer satisfaction, except reliability, security and usability. Meanwhile, analysis results for the mediating effects demonstrate that customer satisfaction mediates the relationship of SERVQUAL dimensions (assurance, personalization, responsiveness and information quality) and customer loyalty intention. Even though the SERVQUAL dimensions tested in this study were significant, the effect size is rather small. Nevertheless, all these factors are important to be considered for the improvement of MCA, especially everyone is moving forward to a digital business environment and e-service is regarded to play an important role.

Keywords Customer satisfaction · Mobile commerce applications · E-service quality · Customer loyalty intention behaviour · SERVQUAL

Introduction

Due to the COVID-19 pandemic, mobile commerce business is being driven into significant changes since everyone needs to go through social distancing. This social distancing causes all sectors to operate their business online (Sardjono et al. 2021). The government restrictions on the operation of shopping malls, service outlets, entertainment, and outdoor hobbies have resulted in changes in customer behaviour. Hence, the majority of the customers who previously only

trusted shopping at the physical stores are now preferring online shopping via mobile commerce applications (MCA) (Dumanska et al. 2021). Online shopping is becoming more essential, especially with the rapid growth of internet and mobile technologies that has changed the business landscape (Omar et al. 2021). Furthermore, the usage of smartphones has seen an increased surge and most of the internet consumption is being made through smartphones, rather than through personal computers as we can see in the past (Kim et al. 2021). Therefore, MCA can provide retailers the opportunity for showcasing their brands and shopping experiences, although the customer is not in the store (Omar et al. 2021). This is supported by previous study delineating that mobile shopping behaviour through smartphones has rapidly created tremendous changes within the market. Indeed, it has taken over most of the online shopping market (Lee and Wong 2015). Besides the primary function of smartphones as a communication tool, various applications and mobile internet functionality have been installed to make online shopping easier (Huang et al. 2015).

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In this era, consumer can easily download mobile shopping applications at App Store for them to get shopping services. Previously known as mobile commerce, MCA is a term that comes from e-commerce concept, emphasizing on the ability to buy, sell, advertise and conduct business operation on the go (Kim et al. 2021). In today's online shopping environment, mobile commerce is not only associated with laptops, but is also now primarily associated with smartphones and tablets (Kim et al. 2021). Moreover, many businesses have recently been looking into mobile commerce prospects in wearable devices such as smart watches. As a result, the capacity to use wireless devices for commercial transactions while on the road is the criteria of mobile commerce (Safieddine 2017). There are several MCA platforms such as Shopee, Lazada, Zalora, Hermo, Lelong and more that had been used by many consumers in Malaysia. According to Mahapatra (2017), due to the elements of convenience of mobile devices such as search, evaluation, possession and post purchase, it has become the most effective medium for shopping experiences. Pantano and Priporas (2016) also stated that customers are switching from e-channels to mobile channels due to the potential for enhanced buying experiences, prompting merchants to combine physical store environments with mobile shopping opportunities in order to compete in the active and multichannel retail market.

Since the customers nowadays are moving forward to use the MCA platform to buy their necessities and stuff, the existing online businesses and the newcomers are struggling to attract and retain the customers because the competition among the seller is increasing (Kim et al. 2021). Thus, it is essential for both physical and digital businesses to provide value and great experiences to their customers especially. Some of the retail outlets have been closed after the COVID-19 pandemic. One way for them to survive and continue their business operation is by using an online platform (Hasanat et al. 2020). However, there are many challenges for them to sustain their business digitally since there are many e-competitors globally. In this case, the product's value proposition plays an important role to attract online consumers (Laudon and Traver 2021). This function should be embedded in MCA since personalisation is one of the most important conditions for the success of MCA (Choi et al. 2017).

MCA platform is not only for making purchase on a mobile device, but is also used as a tool to identify the customers in terms of solutions to enhance their loyalty. Due to this reason, MCA platforms were developed with useful facilities to make it accessible and user-friendly for the mobile users (Nilashi et al. 2015). Nevertheless, MCA platform has the obstacles and the risks since it is done virtually. There are some issues regarding the usage of MCA such as security and responsiveness of the MCA (Knezevic et al. 2017). The aspect of security should not be neglected

due to the increase in the fraudulent activities online (Jalil et al. 2021). The same view is shared by Khan et al. (2019) indicating that privacy and security concerns should be addressed effectively although the use of online platform comes with benefits like ease, convenience and delivery. Therefore, the aspect of security should not be discounted with the benefits of using the online platform as it contains confidential information of the customers. On the other hand, the retailers must also be transparent with the customers as they are frequently anxious regarding the retailers' policy of information storage (Jalil et al. 2021). The anxiety demonstrated by the customers are reasonable as information leakage can occur anytime. In doing this, business strategic planning should be documented clearly to deliver outstanding service quality to their customers (Huang et al. 2015).

A plethora of studies has examined the relation among different factors of e-service quality in predicting overall e-service quality, customer satisfaction and customer loyalty intentions regarding the use of MCA platform. However, not all e-service quality evaluation scales are appropriate to be utilized in the context of mobile commerce (Choi et al. 2008; Desmal et al. 2019). Careful consideration should be taken when selecting the best e-service quality scales as each research setting is different from each other. In a similar vein, employing different models or scales at mobile commerce may lead for more complexity and wrong evaluation of data (Desmal et al. 2019). Furthermore, it is vital to draw attention to this study as it is still lacking of a comprehensive framework to evaluate service quality in the context of mobile commerce (Desmal et al. 2019). According to Khan et al. (2019), the current study is timely as limited studies have been devoted to understand the evaluation of e-service quality as compared to traditional service quality. In addition, the present study will bridge the knowledge gap as majority of the assessment on e-service quality has been previously conducted in the United States, followed by Taiwan, Germany, India and Spain (Nandankar et al. 2021).

This study aims to respond to this gap by assessing the mediating impact of the customer satisfaction of the quality of service provided by MCA provider on the relationship between MCA service quality dimensions and customer loyalty intention behaviour. To reach this goal, three research questions (RQ) are posed: (RQ1) How do the MCA service quality dimensions influence the customer's satisfaction with MCA?, (RQ2) How does customer satisfaction contribute to customer loyalty intention behaviour?, and (RQ3) Does customer satisfaction mediate the relationship between MCA service quality dimensions and customer loyalty intention behaviour?.

This paper is structured as follows. Section 2 provides an introduction to the theory adapted in this study and discussion on the proposed framework. Section 3 describes the research methods, and Section 4 presents the analytical



results. Section 5 draws conclusions, discusses the study's implications and limitations, and suggests directions for future research.

Theoretical background

SERVQUAL model

Service quality (SERVQUAL) is the model developed by Parasuraman et al. (1985), consisting of ten (10) dimensions that are used to measure the gap between customers' perceptions and expectations with regard to providing service quality (Aboubakr and Bayoumy 2022). The previous ten dimensions of SERVQUAL were then reduced to five (5) dimensions, namely (1) Reliability—the existence of knowledge, politeness, humility and the ability to transfer trust and confidence to the customers; (2) Tangibles—having the necessary facilities and equipment related to the indicated services; (3) Responsiveness—helping customers to provide services as soon as possible; (4) Empathy—the ability of the service to provide distinctive and caring attention to the customers and (5) Assurance—the ability of the application to provide the correct and reliable services it promised. These dimensions were claimed to be generic and can be used in different scenarios (Yuen and Thai 2015).

Previous study on service quality indicated that service quality structure derived from a judgement of what customers believe a business should be providing with the actual service performance of the company (Parasuraman et al. 2005). This is also supported by Iberahim et al (2017) who described service as the difference between service

standards and service perceived by customers. If the expectations surpass performance, then perceived quality is less than acceptable, and customer will be dissatisfied. Furthermore, e-commerce service is based on mutual flows of information between customers and retailers, making them different from the traditional services (Ahmad et al., 2017). Since it is much easier to compare product technical features and prices online than through additional platform, e-service quality is a key dimension for the customers (Santos 2003).

Furthermore, e-service operations are different and challenging compared to traditional service operations. The differences can be seen in three perspectives which firstly, e-commerce service quality involves an interaction between the customer and the virtual marketplace; secondly, the tangible component compared to the traditional marketplace are absent; and thirdly, the customers learn how to serve themselves (Carlson and O' Cass 2011). Hence, the measurement of e-service quality delivered through MCA is more challenging than measuring the traditional service quality towards the physical stores. Thus, in the current study, the SERVQUAL model has been adapted by excluding empathy, but including other variables that are essential to evaluate MCA service quality. Table 1 provides the operational definition of each construct, tested in this study.

Table 1 Construct operational definition

No.	Construct	Definition	References
1	Assurance	Assurance is the extent to which the MCA platform conveys trust and confidence	Zhang et al. (2021)
2	Information quality	Information quality refers to the extent to which the MCA platform offers high content quality	Swaid and Wigand (2007)
3	Personalization	Personalization refers to how much and how easily the site can be tailored to individual customers' preferences, histories, and ways of shopping	Zhang et al. (2021)
4	Reliability	Reliability refers to the extent to which the MCA platform performs services as promised and the correct technical functioning of the MCA platform	Zhang et al. (2021)
5	Responsiveness	Responsiveness is the effective handling of problems and returns through the MCA platform	Parasuraman et al. (2005)
6	Security	Security refers to the degree to which the customer believes the site is safe from intrusion and personal information is protected	Zeithaml et al. (2002)
7	Usability	Usability refers to the extent to which the MCA platform is well-structured and easy to navigate	Thakur (2018)
8	Customer satisfaction	Customer satisfaction is the feeling or attitude of a customer towards a product or service after it has been used	Parasuraman et al. (1985)
9	Customer loyalty intention behaviour	Customer loyalty intention is defined as an individual association of the product, attached with commitment that encourages the individual to repurchase the product and less vulnerable to switching	Oliver (1997)



Hypotheses development and conceptual framework

Assurance and satisfaction

Traditionally, the definition of assurance was related to the knowledge and courtesy of employees and their ability to inspire trust and confidence (Zhang et al. 2021). However, its definition has evolved due to the establishment of internet and mobile platform for the past few decades. Despite numerous definitions that facilitate assurance, the current study described assurance as the aspect of privacy and security of the online platform, which describes how personal information is managed to increase its credibility, confident and trust (Al-Dweeri et al. 2018; Rita et al. 2019; Top and Ali 2021). A breadth of literature has indicated that assurance is positively related to customer satisfaction in various online settings (Merugu et al. 2020; Pham and Tran 2018; Top and Ali 2021). This demonstrates the imperative role of assurance in promoting customer satisfaction and should not be overlooked, especially in the context of mobile commerce. Therefore, the following hypothesis is proposed based on the preceding discussion:

H1 Assurance of MCA service positively influences customer satisfaction towards the use of MCA.

Information quality and satisfaction

Information quality refers to the extent to which the MCA platform offers high content quality (Swaid and Wigand 2007) and it is the main factor that influence customer satisfaction in internet retail or online shopping context (Kim et al. 2021; Ahmad et al 2017). Previous study in the context of e-commerce argued that in order to enhance customer satisfaction and purchase intentions, the online retailer should provide latest, accurate and relevant information to their potential customers (Lee and Lin 2005). An accurate information that the company provided regarding their products or services are able to influence the customer to purchase the product/service as well as enhance their satisfaction (Faisal et al. 2020). Recent study among mobile commerce users also has confirmed that the effects of information quality affect customer satisfaction (Kim et al. 2021) and loyalty intention behaviour through direct and indirect paths. Therefore, this study developed the following hypothesis.

H2 Information quality of MCA service positively influences customer satisfaction towards the use of MCA.

Personalization and satisfaction

According to Nandankar et al. (2021), personalization of online service should be prioritized to ensure that the essential dimension of system quality is addressed. The concept of personalization is not peculiar in the context of online service as it has been regarded as a major service quality dimension by some studies on mobile shopping service quality (Zhang et al. 2021). In fact, the concept of personalization has been largely adapted from the SERVQUAL's empathy dimension (Kim et al. 2015a, 2015b; Zhang et al. 2021). In a general sense, personalization is concerned with the degree to which a mobile retailer and individual employees attend to, understand and adapt to the specific needs of individual customers (Cameron et al. 2012; Zhang et al. 2021). Personalization is also related to the process of customizing and tailoring content for each individual consumer to enhance their shopping experience (Huang and Zhou 2018). Such process is not straightforward as the mobile retailer would need data mining/modelling and sometimes great expenditure to deliver personalized customer experience. Extant research among e-commerce users indicated that customer satisfaction can be influenced by the level of personalization provided by the company (Shahid Iqbal et al. 2018; Sundaram et al. 2017). Therefore, the following hypothesis is derived based on the above discussion:

H3 Personalization of MCA service positively influences customer satisfaction towards the use of MCA.

Reliability and satisfaction

Reliability has been regarded as the most powerful antecedent to customer satisfaction in an online context (Al-Dweeri et al. 2018). According to Zhang et al. (2021) and Raza et al. (2020), reliability can be described as the ability to perform the promised service dependably, accurately and unfaithfully. Reliability is also mainly related to compliance, and it is about delivering no errors during the online transaction (Al-Dweeri et al. 2018; Alarifi and Husain 2021). Reliability is vital in the context of mobile commerce as it ensures the smoothness of the transaction with no or minimal errors. Such positive experience will promote customers to use the same online platform again in the future. This will also lead to positive word-of-mouth among the users. Prior research demonstrated that reliability can positively influence customer satisfaction in the context of online business (Al-Dweeri et al. 2018; Alarifi and Husain 2021; Egala et al. 2021; Raza et al. 2020). Therefore, as enforced in the preceding literature review, the following hypothesis is proposed:



H4 Reliability of MCA service positively influences customer satisfaction towards the use of MCA.

Responsiveness and satisfaction

Responsiveness is the effective handling of problems and return through the MCA platform (Parasuraman et al. 2005). Other studies defined responsiveness as the action of dealing with problems faced and the service of delivering a prompt response and convenient way to resolve the problem (Camilleri et al. 2014). Responsiveness is associated with the service of representatives for users. It measures the ability of the website to provide a specific time for service accomplishment given to the customers. Besides, it always has the availability of representative on online for the response of customers' queries or complaints and provides online guarantees.

Other authors defined responsiveness as the ability for flexible and timely response to customer requirements (Ibrahim et al. 2016). Based on his findings, transformation of information technology has brought great changes in the business environment, and no other sector has been affected by advancements in technology as much as banking and financial institutions.

Furthermore, Hu et al. (2015) stated that responsiveness plays an important role in online shopping as it also affects the customer satisfaction during online shopping experience. The previous study by Felix (2017) indicated that there is a positive relationship between responsiveness and customer satisfaction. The result is consistent with the study by Ting et al. (2016) that has shown responsiveness having the largest impact on e-satisfaction of the online shopper. Therefore, the following hypothesis was constructed.

H5 Responsiveness of MCA service positively influences customer satisfaction towards the use of MCA.

Security and satisfaction

Security dimension of e-service quality concerns with how digital platform protects customers' personal and financial information (Desmal et al. 2019; Egala et al. 2021; Khan et al. 2019). According to Pooya et al. (2020), security can be associated with attributes such as integrity, authenticity and confidentiality. Interestingly, security has been claimed as the most influential and investigated dimension in the field of e-service quality (Al-Dweeri et al. 2018). In a study conducted in Ethiopia, security was regarded as a key factor in customers' perception of service quality during the COVID-19 era (Ketema 2020). This demonstrates the critical role of security during the pandemic as the majority of customers were required to stay at home and almost all transactions were performed online. Extant research has postulated that

customer satisfaction of e-service quality can be influenced by security (Egala et al. 2021; Ketema 2020; Khan et al. 2019). Thus, based on the aforementioned discussion, the following hypothesis is derived:

H6 Security of MCA service positively influences customer satisfaction towards the use of MCA.

Usability and satisfaction

Usability is mainly related to the friendliness of the mobile commerce's interface, including interface simplicity, easy navigation and ease of conducting mobile transactions (Thakur 2018). Usability is crucial in the context of e-service quality as customers may come from various categories of age and physical ability. For instance, the usability need for senior citizen may be different from the younger generation as younger people are more technology savvy. Another example is related to the aspect of physical ability, by which the invention of Amazon's user-friendly plug-ins made assistance for physically challenged or impaired users using this online e-book entirely possible (Raza et al. 2020). Prior studies have demonstrated a positive and significant relationship between usability and customer satisfaction in the context of e-service quality (Alarifi and Husain 2021; Egala et al. 2021; Ketema 2020; Raza et al. 2020). Hence, the following hypothesis is suggested based on the preceding discussion:

H7 Usability of MCA service positively influences customer satisfaction towards the use of MCA.

Mediating effect of customer satisfaction on the relationship between mobile commerce applications service quality and customer loyalty intention

Customer satisfaction is the feeling or attitude of a customer towards a product or service after it has been used (Parasuraman et al. 1985). In electronic commerce (e-commerce) context, customers are having less chance to do repeat purchase from the same mobile commerce platform, unless they experience the best value and excellent services by the service provider. Kim et al. (2021) also stated that if the online customers have had a good prior experience with mobile shopping applications, then they may have cumulative satisfaction, which will finally lead to customer loyalty. This is also support by recent study which stated that customer experience with the MCA is essential to the success of these business platforms (Molinillo et al. 2022). Thus, if they are not satisfied, they will simply look for other MCA platform to get better value that is worth for their money and time.



Other studies also argued that customer satisfaction is essential to the success of every company and also one of the most critical fields of scrutiny because it helps companies in their efforts to improve productivity and achieve excellence (Moriuchi and Takahashi 2016). Additionally, the method of maintaining current customers is less costly for businesses that emphasize on customer satisfaction and not to focus on seeking new customers (Yousuf 2017). Hence, customer satisfaction is important in contributing to the success, failure and profitability of a business.

Moreover, customer satisfaction is seen as a primary outcome of a customer's evaluation of overall buying and consumption experiences in relation to goods or services (Moriuchi et al. 2016). Ludin and Cheng (2014) also added that customer satisfaction can only be achieved when the customers' experience meets or surpasses their expectations. This statement is also supported by Salameh et al. (2015) who stated that customer satisfaction is expected to be achieved through MCA services after customers have experienced the quality of systems and services delivered to them. Therefore, the current study would like to test the mediating effect of customer satisfaction to figure out the potential indirect effects of service quality of MCA on customer loyalty intention through the extension of the SERVQUAL model.

The mediation of customer satisfaction from MCA service quality positively increases customer loyalties on purchasing the product/service from the same platform (Kim et al. 2021). They also mentioned the importance of customer satisfaction with the service of MCA, leading to loyalties to the shopping platform. This is also supported by Omar et al. (2021) that strongly highlighted the significant impact of MCA on customer satisfaction, which in turn impacts customer loyalty. Therefore, service quality, customer satisfaction and customer loyalty are undoubtedly becoming essential dimensions to measure the success of

MCA service providers. Based on the above reviews, this study constructed the following hypotheses and the proposed model can be shown in Fig. 1.

H8 Customer satisfaction on MCA service quality positively influences customer loyalty intention.

H9 Customer satisfaction on MCA service quality mediates the relationship between assurance of MCA and customer loyalty intention.

H10 Customer satisfaction on MCA service quality mediates the relationship between information quality of MCA and customer loyalty intention.

H11 Customer satisfaction on MCA service quality mediates the relationship between personalization of MCA and customer loyalty intention.

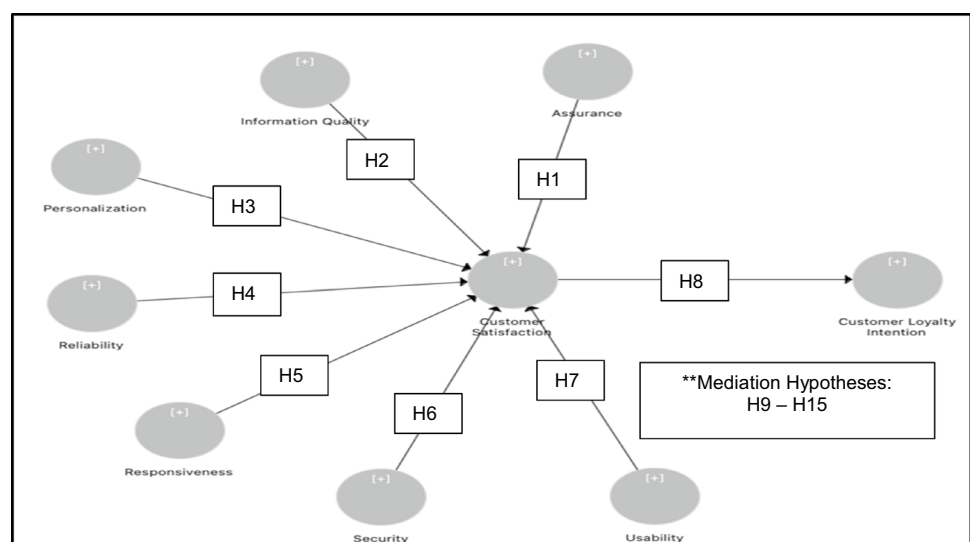
H12 Customer satisfaction on MCA service quality mediates the relationship between reliability of MCA and customer loyalty intention.

H13 Customer satisfaction on MCA service quality mediates the relationship between responsiveness of MCA and customer loyalty intention.

H14 Customer satisfaction on MCA service quality mediates the relationship between security of MCA and customer loyalty intention.

H15 Customer satisfaction on MCA service quality mediates the relationship between usability of MCA and customer loyalty intention.

Fig. 1 Research model (MCA service quality-satisfaction-loyalty)



Research method

Target respondents for this study were online customers who have experience in online shopping via MCA platforms such as Shopee, Lazada, Zalora, among others. Since online customers are categorized as public users, it is crucial to identify the appropriate respondents for the study, hence the purposive sampling technique was used. This sampling technique helped the researchers to choose the representative sample and represent the entire population. GPower calculation software was used to calculate the minimum sample size. Since the model had a maximum of seven predictors (Fig. 1) with the effect size being small (0.15) and the power needed at 0.85, thus the minimum sample size required was approximately 120. Based on this calculation, the total of 120 data that were collected, fulfilled the study and the response rate was 100%. The online survey of the questionnaire was made up via the Google Form and the URL link was shared via Facebook page and WhatsApp group. For ethical considerations, several issues have been considered, including the statement of confidentiality and informed consent for participants. The analysis of the study began with analysing the profile of the respondents using IBM Statistical Package for Social Sciences (SPSS) version 26. The IBM SPSS was also used for data cleaning and normality testing. For model assessment, Partial Least Square-Structural Equation Modelling (PLS-SEM) version 3.3.6 was used to test the measurement model and structural model of the study. PLS-SEM is designed primarily for exploratory research by focusing on explaining the variance in the dependent variables when analyzing proposed models. Thus, this analysis is the preferred method for the context of the current study.

Findings

A total of 120 MCA users responded to the questionnaire via Google form that has been disseminated to them via Facebook and WhatsApp groups. Majority of the respondents are female ($n = 83$) compared to male ($n = 37$) and most of them are Bumiputera ($n = 112$) compared to non-Bumiputera ($n = 8$). In terms of age, majority of the respondents are at the category of over than 26 years of age ($n = 80$) compared to the respondents below 26 years old ($n = 40$). The highest level of education of many respondents are Bachelor's degree ($n = 45$) followed by Diploma ($n = 38$), Master's degree ($n = 7$). Meanwhile, the other respondents only obtained primary and secondary levels of education ($n = 30$).

Majority of the respondents received monthly income less than RM5000 ($n = 113$) compared to the respondents

earning income more than RM5000 ($n = 7$). These respondents usually paid for online shopping using online bank transfer ($n = 66$). The details of the respondent's profile are presented in Table 2.

Based on the results of the MCA platform usually used by the respondents, it was found that most of them were using Shopee ($n = 100$) as shown in Fig. 2. This is perhaps due to the category of income of the respondents having less than RM5000 since Shopee is the platform that mostly targeted by this category of users.

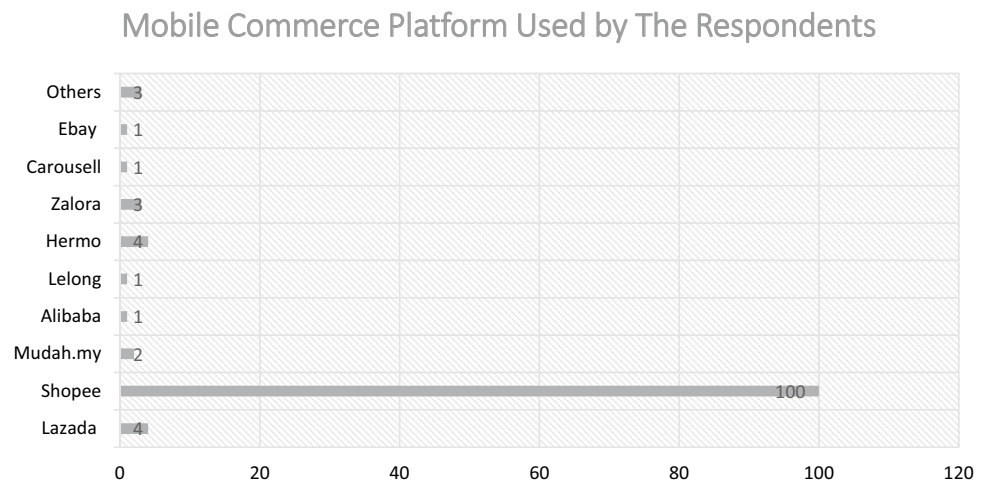
Common method bias (CMB)

As the data of this study were gathered from a single source, a full collinearity assessment was run to test whether

Table 2 Demographic details

Demographic variables	Frequency	Percent
<i>Gender</i>		
Male	37	30.8
Female	83	69.2
<i>Race</i>		
Bumiputera	112	93.3
Non-Bumiputera	8	6.7
<i>Age group</i>		
Less than 18 years old	6	5.0
18–25 years old	34	28.3
26–35 years old	60	50.0
36–45 years old	11	9.2
46–55 years old	9	7.5
<i>Education level</i>		
UPSR/SRP/PMR/SPM	19	15.8
STPM/matriculation/foundation	11	9.2
Diploma	38	31.7
Bachelor's degree	45	37.5
Master's degree	7	5.8
Ph.D/DBA	0	0.0
<i>Monthly income</i>		
Less than RM1000	28	23.3
RM1000–RM1999	31	25.8
RM2000–RM2999	34	28.3
RM3000–RM3999	11	9.2
RM4000–RM4999	9	7.5
More than RM5000	7	5.8
<i>Payment method for online shopping</i>		
Online bank transfer	66	55.0
Debit card	28	23.3
Credit card	5	4.2
E-wallet	13	10.8
PayPal	4	3.3
Others	4	3.3



Fig. 2 Mobile commerce platform used by the respondents**Table 3** Full collinearity estimates

Constructs	VIF
Assurance	1.089
Customer loyalty intention	1.866
Customer satisfaction	1.616
Information quality	1.995
Personalization	2.781
Reliability	2.947
Responsiveness	2.059
Security	1.538
Usability	1.345

common method bias was a concern in this study as suggested by Kock and Lynn (2012). In doing that, a dummy variable was created using the random function in Excel; then, all the related constructs (including the dependent variable) were regressed in the research model against this common variable using SmartPLS. The results are shown in Table 3 indicating that no serious concern was present as the VIFs were all below the threshold of 3.3.

Measurement model validation

The measurement model was tested to assess loading of each item, construct reliability, convergence validity and discriminant validity (Hair et al. 2017). This technique is called confirmatory factor analysis (CFA). As shown in Table 4, all the item's loadings were higher than 0.7, except only one item to measure information quality (IQ5_information_easy_to_understand) with loading score at 0.645. The reliability and validity test results were shown that the composite reliabilities (CR) exceeded the threshold value of 0.7. Meanwhile, the average variance extracted (AVE) for each construct was greater than 0.5; thus, the cut-off values ensure that at least 50% or more of the variances in the construct are explained

by the set of indicators. The collected data had been verified for its reliability by calculating the Cronbach's Alpha (CA) and the value of CA for each construct was higher than 0.7, which is acceptable. The details of construct's reliability and validity are presented in Table 4 and the results of the measurement model show that all the constructs are valid measures based on their parameter estimates and statistical significance (Hair et al. 2010).

This study also ran the discriminant validity testing by using the HTMT criterion suggested by Henseler et al. (2015). Based on the Henseler et al. (2015), if the ratios were lower than $HTMT_{0.85}$, then the conclusion could be made that all measures were discriminant. Moreover, based on Franke and Sarstedt (2019), if the upper limit of the HTMT bootstrapping value does not contain a 1, then the measures are discriminant. As shown in Table 5, all the ratios were below a cut-off value of 0.90; as such, the measures are distinct.

Structural model: hypotheses testing

The structural model was tested by assessing the significance and magnitude of the hypothesized relationships using bootstrapping procedure. As suggested by Hair et al. (2019), the path coefficient, t values, p values, and the standard errors were reported for the structural model using a 5000-sample re-sample bootstrapping procedure. Additionally, Hahn and Ang (2017) argued that p values are not a good criterion for testing the significance of hypothesis and many PLS expert suggested using a combination of criteria such as p values, confidence intervals, and effect sizes. Table 6 shows a summary of the criteria used to test the hypotheses developed. For measuring the effect size, this study used guideline by Cohen (1988), whereby the values of 0.02, 0.15 and 0.35 represent small, medium and large effects, respectively.

The analysis result has shown that there are three hypotheses to test the direct effect of e-service quality on customer



Table 4 Construct reliability and validity

Construct and items	Outer loading	Mean	SD	Construct reliability and validity		
				α	CR	AVE
<i>Assurance</i>		3.992	0.565	0.779	0.859	0.604
AS1_security_policy_accessible	0.869					
AS2_privacy_policy_accessible	0.781					
AS3_contains_company_details	0.700					
AS4_widely_known_good_reputation	0.750					
<i>Customer loyalty intention</i>		4.302	0.607	0.868	0.910	0.718
CL1_present_service_continues_not_switch_to_other	0.841					
CL2_always_first_choice_particular_type_of_purchase	0.864					
CL3_to_me_best_platform_to_make_purchase	0.885					
CL4_overall_like_using_mobile_commerce_platform	0.796					
<i>Customer satisfaction</i>		4.233	0.590	0.894	0.927	0.760
CS1_decision_wise_one	0.889					
CS2_very_satisfied_internetbased_transactions	0.858					
CS3_very_satisfied_products_services_offered	0.901					
CS4_overall_very_satisfied_with_online_shopping_experience	0.838					
<i>Information quality</i>		4.085	0.503	0.802	0.863	0.560
IQ1_information_current_timely	0.736					
IQ2_information_accurate_relevant	0.712					
IQ3_information_right_level_of_detail	0.840					
IQ4_information_what_need_to_carry_out_tasks	0.794					
IQ5_information_easy_to_understand	0.645					
<i>Personalization</i>		4.089	0.584	0.867	0.918	0.790
PS1_gives_personal_attention	0.898					
PS2_enables_order_product_meets_my_needs	0.891					
PS3_understands_specific_needs	0.877					
<i>Reliability</i>		4.125	0.527	0.839	0.886	0.610
RL1_delivers_what_promised	0.742					
RL2_has_relevant_order_confirmation_details	0.852					
RL3_order_cancellation_returns_confirmed	0.839					
RL4_provide_order_tracking_available_until_delivery	0.716					
RL5_accessible_all_time	0.748					
<i>Responsiveness</i>		3.975	0.556	0.851	0.894	0.629
RS1_shows_sincere_interest_in_solving_problems	0.864					
RS2_automated_human_email_give_prompt_service	0.818					
RS3_emails_responses_relevant_and_accurate	0.802					
RS4_emails_content_appropriate_to_requirements	0.699					
RS5_existing_documentation_publicity_and_advertising_channel	0.773					
<i>Security</i>		3.923	0.620	0.831	0.888	0.667
SC1_protects_information_online_shopping_behavior	0.835					
SC2_not_share_personal_information_with_other_sites	0.848					
SC3_protects_information_creditordebit_other_payment_method	0.876					
SC4_risk_associated_low	0.694					
<i>Usability</i>		3.992	0.598	0.820	0.878	0.642
US1_mobile_commerce_platform_well_organized	0.839					
US2_navigation_consistent_and_standardized	0.805					
US3_scrolling_pages_kept_to_minimum	0.786					
US4_graphics_and_animation_do_not_detract_use	0.774					



Table 5 Discriminant validity (HTMT)

Construct	1	2	3	4	5	6	7	8	9
(1) Assurance									
(2) Customer loyalty intention	0.581								
(3) Customer satisfaction	0.805	0.915							
(4) Information quality	0.700	0.621	0.671						
(5) Personalization	0.734	0.696	0.703	0.607					
(6) Reliability	0.770	0.656	0.675	0.838	0.698				
(7) Responsiveness	0.891	0.623	0.752	0.684	0.711	0.819			
(8) Security	0.860	0.510	0.680	0.672	0.740	0.642	0.682		
(9) Usability	0.559	0.385	0.473	0.866	0.435	0.763	0.528	0.454	

Table 6 Hypothesis testing

Dependent variable								R^2
Customer loyalty intention								0.650
Customer satisfaction								0.579
Hypothesis relationship	Beta	Std error	t value	p value	Confidence interval bias corrected		Result	
					Lower (5%)	Upper (95%)		
<i>Direct effect</i>								
(H1) Assurance → Customer satisfaction	0.248	0.119	2.073	0.019	0.065	0.424	Supported	
(H2) Information quality → Customer satisfaction	0.192	0.095	2.021	0.022	0.014	0.348	Supported	
(H3) Personalization → Customer satisfaction	0.203	0.109	1.863	0.032	0.02	0.395	Supported	
(H4) Reliability → Customer satisfaction	0.022	0.109	0.201	0.420	-0.15	0.241	Not-supported	
(H5) Responsiveness → Customer satisfaction	0.206	0.083	2.501	0.006	0.065	0.345	Supported	
(H6) Security → Customer Satisfaction	0.074	0.095	0.775	0.219	-0.089	0.208	Not-supported	
(H7) Usability → Customer satisfaction	-0.040	0.081	0.496	0.310	-0.185	0.064	Not-supported	
(H8) Customer satisfaction → Customer loyalty intention	0.806	0.048	16.931	0.000	0.688	0.863	Supported	
<i>Mediating effect</i>								
(H9) Assurance → Customer satisfaction → Customer loyalty intention	0.200	0.096	2.079	0.019	0.060	0.340	Supported	
(H10) Personalization → Customer satisfaction → Customer loyalty intention	0.164	0.092	1.774	0.038	0.015	0.339	Supported	
(H11) Responsiveness → Customer satisfaction → Customer loyalty intention	0.166	0.066	2.540	0.006	0.054	0.274	Supported	
(H12) Usability → Customer satisfaction → Customer loyalty intention	-0.032	0.065	0.494	0.311	-0.146	0.052	Not-supported	
(H13) Security → Customer satisfaction → Customer loyalty intention	0.060	0.077	0.777	0.219	-0.073	0.163	Not-supported	
(H14) Reliability → Customer satisfaction → Customer loyalty intention	0.018	0.089	0.199	0.421	-0.117	0.197	Not-supported	
(H15) Information quality → Customer satisfaction → Customer loyalty intention	0.155	0.079	1.956	0.026	0.013	0.286	Supported	

satisfaction (H4, H6 and H7) were not supported due to insignificance of p value which is higher than 0.05. Assurance to be shown to have a dominant direct effect on customer satisfaction ($\beta=0.258$, t value = 2.073**, $f^2=0.05$) among other e-service quality dimensions. Information quality ($\beta=0.192$, t value = 2.021**, $f^2=0.034$), personalization ($\beta=0.203$, t value = 1.863**, $f^2=0.05$) and responsiveness

($\beta=0.206$, t value = 2.501***, $f^2=0.04$) positively influenced customer satisfaction. Thus, all four hypotheses, H1, H2, H3 and H5 were supported and have small effect size on customer satisfaction. All the indicated e-service quality dimensions explained about 57.9% of the variance in customer satisfaction. The analysis finding also found that customer satisfaction positively influenced customer loyalty



intention behaviour among the mobile commerce customers. Thus, H8 was supported. Customer satisfaction explained 65% of the variance in customer loyalty intention behaviour.

The mediating effect and level of significance were measured using *t* value and the differences of the confidence interval. The results of the mediation analysis shown in Table 6 reveal that customer satisfaction only mediated four relationships while the other three relationships were not. Customer satisfaction mediated the relationships of (1) assurance ($\beta=0.200$, *t* values = 2.079**), (2) personalization ($\beta=0.164$, *t* values = 1.774*), (3) responsiveness ($\beta=0.166$, *t* values = 2.540*** and (4) information quality ($\beta=0.155$, *t* values = 1.956**) on customer loyalty intention behaviour. The results indicated that assurance, personalization, responsiveness and information quality via customer satisfaction on MCA platform for online shopping promotes customer loyalty intention to continue online shopping but not the platforms of usability, security and reliability. The details of the result are shown in Tables 6, 7 and Fig. 3.

Consumers did not depend on the satisfaction they gained on the platform of usability, security and reliability. Instead, they were satisfied with the platform of assurance, personalization, responsiveness and information quality that the

platform offers during their online shopping. Hence, it was argued that satisfaction could have direct relationship with loyalty behaviour (Lai et al. 2019; Sharma 2017), rather than served as a mediator.

Discussion

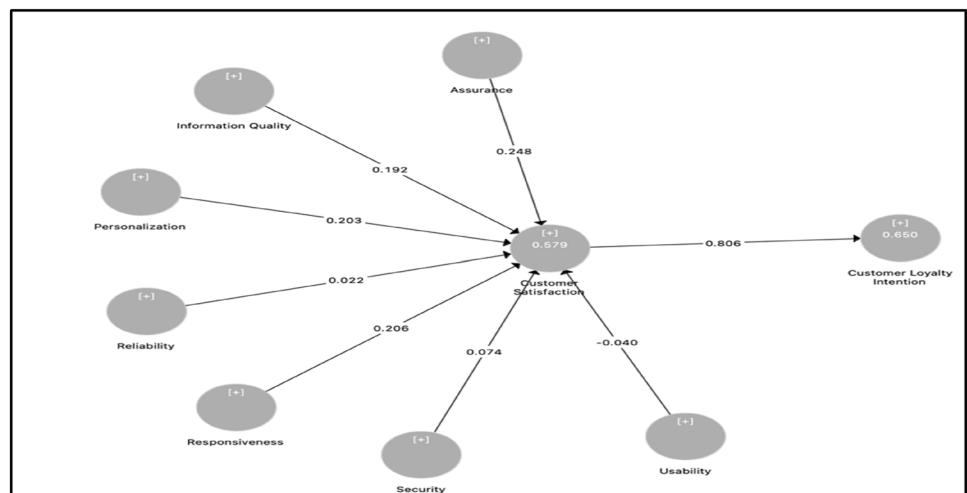
The findings of the current study demonstrate that customer satisfaction towards online shopping platform is strongly influenced by assurance. This is followed by responsiveness, personalization and information quality. In terms of assurance contribution, the finding is consistent with the study conducted by Mousavizadeh et al. (2016) delineating that it is important for online sellers to publish their assurance statement such as privacy policy and security policy to gain customers' trust. Furthermore, assurance statement is also needed in order to resolve customer issues, problems or concerns. This is vital to ensure the solutions provided for the customers are consistent depending on the type or severity of the problems. Arcand et al. (2007) also highlighted that assurance is another dimension that is able to support e-commerce or MCA customers. Therefore, referring to the previous research above, it clearly highlights that assurance was one of the important dimensions in e-service quality in order to influence customer satisfaction.

This study also found that most of the respondents agreed the responsiveness of the online shopping platform and the personalization function play an important role to enhance their satisfaction on the MCA. Therefore, this will lead them to re-purchase the product from the same platform that they have experienced previously. A similar study by Felix (2017) indicated that the relationship between responsiveness and customer satisfaction is strongly correlated. Kim et al. (2021) also found that intrinsic information quality and contextual information quality significantly affect

Table 7 Effect size

Construct	f-Squared	Effect size
(H1) Assurance → Customer satisfaction	0.050	Small
(H2) Information quality → Customer satisfaction	0.034	Small
(H3) Personalization → Customer satisfaction	0.046	Small
(H4) Reliability → Customer satisfaction	0.000	No Effect
(H5) Responsiveness → Customer satisfaction	0.037	Small
(H6) Security → Customer satisfaction	0.006	Small
(H7) Usability → Customer satisfaction	0.002	Small

Fig. 3 Hypothesis testing



consumers' perceptions of information quality and in turn influence consumer satisfaction. In the current study, the information quality is tested as a first order factor and was found to be significantly related to customer satisfaction. Therefore, it is essential for the platform providers and the retailers to consider describing their products or services in detail (country of origin, manufacturing process, the origin of materials) at the MCA.

The findings of the current study reveal that customers who are satisfied with MCA will demonstrate the likelihood to be loyal. In other words, the customers will display positive behavioural outcomes such as repurchase intention and they may also spread positive words of mouth to others. This finding lends support to prior research conducted by Chang and Chen (2009) as well as Reichheld and Schefer (2000) as both studies indicated that loyalty will be established if customers are satisfied with their previous purchasing experience.

Other studies also found that if the customers are contented with the services given by the providers, they will exhibit repeat purchase behaviour, spread good words about the organization, and also tend to compare the services or products with other competitors (El-Adly and Eid 2016; Rizan et al. 2014). Therefore, it is important for the providers to ensure the online services delivered through MCA are following certain specified criteria or standards that can attract customers to continue using the MCA for shopping. In a similar vein, the current result also confirmed the mediating role of customer satisfaction on the relationship between some dimensions of e-service quality and customer loyalty. This indicates that MCA providers and retailers must play their role to improve their online service in the future. Few considerations on improving some MCA features should be taken seriously for online business sustainability.

Implications

This research offers both theoretical and practical contributions by expanding current knowledge about MCA service quality dimensions and the indirect impact of these dimensions on customer loyalty through customer satisfaction on the service provided when they used MCA. Therefore, the study believed that the research findings will be of interest to future researchers and MCA providers. The findings of the study would also contribute to the business owner in developing and enhancing online business strategies in the future.

In terms of theoretical implications, this study contributes to the field of e-commerce and customer services research by clarifying the predictive power of the service quality dimensions especially the relationship between assurance, responsiveness, personalization and information quality on customer satisfaction and loyalty intentions towards MCA. To the best of our knowledge, the mediating analysis of

customer satisfaction of MCA adds value to academics who are keen on studying the service quality variables and customer loyalty intention due to the lack of previous e-commerce studies investigating the indirect effect of customer satisfaction of MCA on the relationship between service quality dimensions and customer loyalty intentions.

In terms of practical view, this study highlights three implications for the MCA providers and online retailers to enhance their online service for e-commerce sustainability. First, since many customers use MCA to perform their online shopping nowadays, thus it is vital for the MCA providers to deliver superior online services. The superior online services can be in terms of assurance, responsiveness, personalization and information quality of the online shopping platform. MCA's platform is completely different from the physical store setting. It is different in terms of communication, shopping experiences and problem-solving method. This notion is supported by Hsin Chang and Wang (2011) denoting that the difference between the physical and online store can be seen from the context of customer shopping experience which subsequently will influence their future behaviour to repurchase, revisit and spread word-of-mouth (WOM), regardless it is positive or negative. In addition, delivering superior online services to the customers will make them satisfied and have a high chance to stay loyal. This view is also supported by Gounaris et al. (2010) signifying that online seller should provide superior online service experiences to the customers, therefore, they will have the intention to repurchase and stay loyal to the shops or businesses.

Furthermore, providing value added services to the MCA platform users is one of the ways to make them satisfied which subsequently will lead to loyalty intentions. As a result, loyal customers will generate more value and profit to the businesses. This notion is supported by Shafiee and Bazargan (2018) implying that MCA platform companies should provide interesting and attractive offers and services in order to trigger the customer to return. There are several offers or services that are able to delight the MCA platform customer such as first-time sign-up discount, birthday coupon, free shipping, early-bird price, free gifts and membership special price. All these initiatives should not be neglected as it is considered as one of the powerful tools to foster customer satisfaction and loyalty.

MCA platform enables the users or customers to browse and have online shopping experience by using their mobile devices or gadgets. Thus, MCA providers should consider user-friendly and attractive interface design of the platform as it can contribute to customer satisfaction. According to Albardaneh and Qusef (2017), the design should be professional and have well organized interfaces for MCA in order to achieve high level of customer satisfaction. Other than that, highly organized interface design will quickly help customers



to become more familiar with the application. It is also helpful for the customers with smaller size screen to browse the application. Moreover, user interface should also be well organized to fit in the screen and able to have all functions needed in a MCA. MCA providers who consider all these aspects would go a long way in increasing the service quality of their platform.

Conclusion

In conclusion, it is highly recommended that future studies to be carried out in other industrial sectors such as education, transportation, financial institutions, tourism and others that provide services through MCA platform. It is to see whether there are any similarities in the findings to show that e-service quality dimensions are crucial and impactful to customer satisfaction and customer loyalty intentions.

For future research, it is also suggested to explore other approaches to explore customer loyalty intention behaviour in the context of Internet of Things (IoT). One approach that can be considered is qualitative, whereby the future researcher can use Focus Group Discussion (FGD) to interview the selected participants and the key informants to provide in-depth situation on how to improve the MCA service features. Furthermore, the concept of metaverse in the MCA platform should also be explored as it will become an important element to enhance shopping experiences digitally.

Finally, the current study only used 120 collected data from the respondents that have the experience of using MCA platforms for shopping purpose. Hence, for future study, it is highly recommended to increase the number of the sample size to produce more convincing result. Therefore, the issue of the sample size should be considerable in order to be generalized across the population. Based on Sekaran (2016), generalizability refers to the scope of applicability of the research finding in one setting to other settings.

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Declarations

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

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