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How does quality of mobile food delivery services influence customer loyalty? Gronroos's service quality perspective

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Abstract

Purpose – The aims of this study are twofold: to examine mobile food delivery service (MFDS) from the perspectives of functional and technical quality, and to empirically evaluate the influences of functional and technical quality on customer loyalty toward MFDS.

Design/methodology/approach – A conceptual framework of customer loyalty toward MFDSs was developed based on Gronroos's service quality model. By using the PLS-SEM approach, the proposed model was empirically tested with a sample of 494 MFDS users through a survey via online social groups of food delivery service review.

Findings – The study validated the multi-dimensionality of MFDS functional quality including six dimensions (e.g. ease of use, app design, responsiveness, privacy and security, information quality, and personalization) and MFDS technical quality including two dimensions (e.g. safety and quality of delivered food, and quality of delivery service). The results indicated a significant direct link between functional quality and loyalty toward MFDS, while the effect of technical quality on loyalty was not found. Both functional quality and technical quality of MFDS demonstrated positive associations with customer perceived value of MFDS, which had a positive linkage with customer loyalty toward MFDS.

Research limitations/implications – The findings of the study advances Gronroos' (1990) service quality perspective to m-commerce contexts, therefore and also offers MFDS providers effective strategies to launch a successful food delivery service.

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Originality/value – The current study provides a first theoretical perspective on mobile service quality based on Gronroos's model, which has not yet been examined. This study broadens the understanding of the loyalty toward a mobile-based service, particularly MFDS from the influences of two perspectives of service quality, namely, functional and technical quality.

Keywords Perceived value, Customer loyalty, Functional quality, Technical quality, Mobile food delivery

Paper type Research paper

1. Introduction

The business of restaurant-to-consumer delivery has developed from telephone-based ordering systems to takeout counters, and now websites and mobile applications. Out of these platforms, restaurants or other food-selling proprietors have increasingly used mobile food delivery services (MFDSs) such as Zomato, UberEats, FoodPanda, Swiggy and Deliveroo, to provide their customers with a convenient way to create a food order and collection (Singh, 2019; Ray *et al.*, 2019). Especially amid the global pandemic Covid-19 since the beginning of 2020, MFDSs are helpful in certain ways, such as keeping the economy moving, mitigating food and beverage businesses from closing and responding to social distancing measures (Nagar, 2020). MFDS has revolutionarily transformed the restaurant and food delivery industry, bringing both business owners and consumers many benefits. On the one hand, MFDS helps businesses in many ways such as cost-cutting, productivity, online presence and customer relationship-enhancing (Li *et al.*, 2020). On the other hand, from the customer perspective, by using MFDS, consumers easily compare food service providers regarding menus, prices, discount offers, rating or reviews given by experienced consumers before placing an order. In addition, they can make payments via a smartphone and then track their orders as well as track food delivery vehicles' routes (Shastri, 2019; Singh, 2019).

Because of the benefits of MFDS on both supply and demand sides, various topics related to MFDS have been studied, providing insights into different behavioral perspectives related to MFDS such as behavioral adoption (Ray and Bala, 2021; Kaur *et al.*, 2021, 2020; Troise *et al.*, 2020; Gunden *et al.*, 2020; Belanche *et al.*, 2020; Annaraud and Berezina, 2020; Ray *et al.*, 2019; Hwang *et al.*, 2019; Roh and Park, 2019; Yeo *et al.*, 2017), satisfaction (Zhao and Bacao, 2020; Annaraud and Berezina, 2020; Al Amin *et al.*, 2020; Alalwan, 2020) and loyalty outcomes (e.g. continuance intention, word-of-mouth intentions or commitment) (Zhao and Bacao, 2020; Annaraud and Berezina, 2020; Al Amin *et al.*, 2020; Alalwan, 2020). However, certain gaps are needed to be filled in. First, the literature reveals that the service quality of MFDS has been found to be a key factor influencing such behavioral outcomes like usage intention, continuance intention, word-of-mouth intentions, satisfaction and commitment. Using traditional concepts of measuring service quality, such as the SERVQUAL model (Parasuraman *et al.*, 1985), previous studies of MFDS only emphasized the service quality that customers perceived from their interaction with technical apps (Cho *et al.*, 2019; Annaraud and Berezina, 2020; Yusra Agus, 2020; Jeon *et al.*, 2016). However, Gronroos (1990) introduced two aspects, namely, functional and technical quality, when considering service quality. Regarding the MFDS quality, functional quality denotes the quality throughout the customer–application interaction, while technical or outcome quality is supposed to be the excellence of delivery riders and food when customers receive their orders (Yang *et al.*, 2021). The evaluation of mobile service quality could be misspecified when only relying on the functional quality (Bernardo *et al.*, 2012; Zaibaf *et al.*, 2013). This gap should be addressed by investigating both functional quality and technical quality perspectives in studying mobile service quality.

Second, service quality plays an important role in service marketing of the hospitality industry (Keshavarz and Jamshidi, 2018). A review paper by Lai *et al.* (2018) indicated that service

quality has been found as a multilevel construct involving several sub-dimensions such as DINESERV for restaurants, TANSERV for food services or CASERV for casino. However, such quality scales only captured the service quality for an offline service in hospitality. There are so far only limited studies investigating the service quality for an online-to-offline service such as MFDS. Compared with other services, MFDS has unique features of a service on a mobile device and characteristics of a service on delivery. Therefore, it is essential to examine the multi-dimensionality of MFDS (Chan and Gao, 2021; Ahn and Kwon, 2021).

Third, MFDS is becoming one of the most preferred shopping trends, especially in Covid-19 disease outbreaks that create fierce competition among service providers (Nagar, 2020). Customer loyalty toward MFDS and its determinants are crucial to the success of businesses (Su *et al.*, 2022). In the field of MFDS, factors influencing customer loyalty aspects such as word-of-mouth and continuance intention have been mainly found from the perspective of the technology acceptance model (Zhao and Bacao, 2020; Al Amin *et al.*, 2020; Alalwan, 2020; Lee *et al.*, 2019; Yeo *et al.*, 2017). Few studies examined the influence of service quality on loyalty in this field (Suhartanto *et al.*, 2019; Yusra Agus, 2020). However, such previous studies focused on the impact of functional quality rather than the influence of both functional and technical quality on customer loyalty toward MFDS. Despite the importance of technical quality including food-related performance (e.g. food safety and food quality) (Byrd *et al.*, 2021) and employees' delivery service (Im and Cho, 2021) as discussed above, there have been few studies addressing the simultaneous effects of both types of quality on customer loyalty toward a MFDS, indicating a research gap that needs consideration.

To bridge the three above-mentioned gaps, the study has two main objectives:

(1) to examine two perspectives of MFDS quality, namely, functional quality and technical quality based on Gronroos's service quality model; and

(2) to empirically evaluate the mechanisms underlying the influences of functional and technical quality on customer loyalty toward MFDS.

This study extends the literature of mobile service quality in many respects. First, while the majority of previous studies of MFDS discussed on intangible service-related factors (functional quality) belonging to the mobile app (Byrd *et al.*, 2021), the current research is the first, to the best of the authors' knowledge, to validate food and delivery-related factors (technical quality) forming MFDS. Second, this study extends the literature of relationship between mobile service quality and customer's loyalty by examining the impact of both functional quality factors and technical quality factors on customer loyalty toward MFDS in a single model rather than only focusing the determining role of pre-consumption factors (Ahn and Kwon, 2021; Chan and Gao, 2021). Third, unlike many prior studies examining negative perception of using MFDS such as perceived risks forming consumer behavior (Choe *et al.*, 2021; Hwang and Choe, 2019), this study considered customers' positive perception toward consuming MFDS such as customer perceived value as a mediator of the link between MFDS service quality and loyalty that contributes to advance the m-commerce literature. Practically, with consumers shifting away from the dining-out trend toward home delivery service, many food delivery startups and businesses have been entering the market to serve the increasing customer demand for this service. Therefore, a fully integrated food ordering and delivery app with technological advancements is paramount for businesses to keep up with ever-changing customer demands (Sofia, 2021; Daryna, 2020). In addition, because of a massive demand for online orders, one of the biggest challenges for food delivery companies was to ensure food quality standards and food handling issues (Gyaan, 2021). Overcoming such challenges is key to increase the competitive advantage and win customer loyalty (Gyaan, 2021). As a result, through understanding the quality of a mobile food delivery app, food quality and food delivery service quality, as well as their effects on customer loyalty, the current study offers

MFDS providers effective strategies to launch a successful food delivery service that can address the above demands and challenges and render customers loyal to their MFDS.

2. Literature review

Service quality results from customers' comparison between their expectations and perceived service (Grönroos, 1984). Meanwhile, Zeithaml (1988) conceptualized service quality as the consumers' subjective judgment about the distinction or superiority of service in general. Service quality has been widely studied in marketing and management literature because the higher the level of service quality an organization delivers, the greater competitive advantage it can gain (Ladhari, 2008). However, because of the elusive and abstract nature of service (Parasuraman *et al.*, 1985), no clear consensus about the dimensions and measurement of service quality exists (Brady and Cronin, 2001). A methodology to evaluate consumers' perceived quality throughout the service industry was the SERVQUAL model, which was initiated by Parasuraman *et al.* (1985). Another extensively studied model of service quality was Gronroos's (1984) model, which identified two distinct facets of service – functional (process) quality and technical (outcome) quality. Functional quality is the service quality that customer evaluated in their interaction process or how customers experience the service production and delivery process while technical quality pertains to the fulfilment of core services in meeting customers' expectations (McDougall and Levesque, 2000). Technical quality is what consumers get when interacting with service providers (McDougall and Levesque, 2000). It is usually determined in the final stage of the service-delivery procedure and substantially influences customers' overall perceptions of the core service. Regardless of this importance of technical quality, the existing SERVQUAL-based scales concentrate solely on service process dimensions or functional quality (Ladhari, 2008; Zaibaf *et al.*, 2013; Chan and Gao, 2021), and not on technical quality.

According to the extant literature, the perceived mobile-based service quality should be formulated based on both during the purchasing process and the product delivery (Huang *et al.*, 2015; Zaibaf *et al.*, 2013). Similarly, the MFDS should have unique features which are involved in the process of food ordering and the delivery of food after orders (Byrd *et al.*, 2021). However, the existing concepts of MFDS quality have not fully captured all quality dimensions that consumers perceive from their interaction with technical food apps and from person-to-person interaction after they make food orders. For example, Chan and Gao (2021) formulated the quality of online food delivery (DEQUAL), including, service quality, e-service and food quality. Food-related performance concerning food safety and quality was also explored in the study by Byrd *et al.* (2021). Albeit recent studies found food-related factors as a dimension measuring MFDS quality from the perspective of technical quality, the evaluation of such factors is still not enough to cover the complex process of MFDS involving pre- and post-interactions with the food mobile app. As a result, the theoretical innovation of the current research is to adapt Gronroos' (1990) service quality model in investigating the dimensionality of MFDS quality from both perspectives of face-to-app (functional) and face-to-face (technical) quality.

In the context of MFDS, previous studies examined the relationship between service quality and customer loyalty through frameworks in information systems such as the technology acceptance model, innovation resistance theory, the expectation-confirmation theory or the unified theory of use and acceptance of technology (Zhao and Bacao, 2020; Troise *et al.*, 2020; Al Amin *et al.*, 2020; Lee *et al.*, 2019). For example, Zhao and Bacao (2020) found effort expectancy, performance expectancy and perceived task-technology fit that were dimensions of service quality affecting customer loyalty. Other factors such as

perceived ease of use, usage barrier, effort and performance expectancy, information quality, design, convenience or perceived innovativeness were also validated as determinants customer loyalty toward online/MFDS (Alalwan, 2020; Al Amin *et al.*, 2020). Such dimensions lean toward functional quality rather than technical quality. As MFDS is considered as a complex experience process from food searching, order placement to payment and delivery, service providers need to provide a comprehensive service quality through all stages of service experience that determines customer satisfaction and loyalty (Chan and Gao, 2021; Suhartanto *et al.*, 2019). However, the existing literature lacks empirical research investigating the influences of technical quality of MFDS quality (e.g. food-related quality and delivery-related quality) on customer loyalty. As a result, this study provides a detailed discussion of these two perspectives of service quality in MFDS (functional and technical quality) and their role in forming customer loyalty toward MFDS in the following sections.

3. Research hypotheses development and conceptual framework

3.1 Functional quality of mobile food delivery service

Functional quality pertains to how customers experience the quality of the simultaneous production and consumption of a product or service (Grönroos, 1984). Scholars have associated functional aspects of services with intrinsic quality (Gerhard *et al.*, 1997) and interactive quality (Lehtinen and Lehtinen, 1991). Functional attributes have been explored in several contexts of mobile service quality using the SERVQUAL model, including, information quality, localization, function quality, personalization, design quality, reliability, connection quality and security (Heo and Kim, 2017).

Like other mobile service contexts, functional quality has also increasingly attracted research interest from previous scholars in the field of MFDS. Functional quality of MFDS denotes the quality of the MFDS throughout the customer–application interaction (Ladhari, 2010). Extant literature indicated that there are various functional quality dimensions of online/MFDSs. Table 1

	Functional service quality's dimensions					
Author (year)	(1)	(2)	(3)	(4)	(5)	(6)
Das (2018)		✓	✓	✓		
Jeon *et al.* (2016)	✓	✓	✓	✓	✓	
Song *et al.* (2017)		✓	✓		✓	
Ilhasm (2018)			✓	✓		
Cho *et al.* (2019)	✓		✓			
Suhartanto *et al.* (2019)		✓	✓	✓	✓	
Mohan and Kumar (2018)	✓		✓	✓		✓
Yusra and Agust (2018)		✓	✓	✓		
Chai and Yat (2019)		✓		✓		
Shah *et al.* (2019)		✓		✓	✓	✓
Panse *et al.* (2019)		✓			✓	
Sharma and Kumar (2019)	✓		✓			
Yusra and Agust (2020)		✓	✓	✓		
Annaraud and Berezina (2020)		✓		✓		
Hernando and Gudawan (2021)		✓		✓	✓	

Notes: (1) design of the app, (2) ease of use, (3) privacy and security, (4) responsiveness, (5) quality of information, (6) personalization

Table 1.
List of studies investigating functional service quality in the field of MFDS

summarizes five dimensions, including, design of the app, ease of use, privacy and security, responsiveness and information quality, which have been intensively examined as important attributes of an online/mobile food delivery app. In addition, the personalization dimension was also taken into account in this study, although it was only mentioned in a few studies (Kumar and Mohan, 2018; Shah *et al.*, 2019). The reason is that personalization is considered as an advanced technology-related attribute of an electronic service such as MFDS, which contributes to enhancing the experience of customers (Morosan and DeFranco, 2016). As a result, we considered six dimensions as functional quality attributes of an MFDS in the current study.

In service contexts, numerous studies have associated service quality with the benefits component in the customer perceived value equation and confirmed the linkage between service quality and perceived value (Hapsari *et al.*, 2017; Hellier *et al.*, 2003; Kuo *et al.*, 2009; Wang and Wang, 2010). According to Zeithaml (1988), perceived value is conceptualized as the comparison between obtained benefits and perceived sacrifices that consumers have made. High perceived value is prompted by superior functional quality – that is what consumers experience during the delivery service process (Bernardo *et al.*, 2012; Zaibaf *et al.*, 2013). In our study, functional quality refers to the ease of use, design of the app, information quality, personalization and responsiveness of the MFDS application. Suhartanto *et al.* (2019) argued that e-service quality – which captures the ease of use, security, responsiveness and information quality of application, strongly strengthens customer perceived value of MFDS. Attributes of MFDS applications such as convenience, design, trustworthiness and various food choices were confirmed to positively influence perceived value (Cho *et al.*, 2019). The findings of Shah *et al.* (2019) indicate that personalization and responsiveness of application (which relates to system quality in the mentioned study) as well as information quality strengthen customer perceived value toward MFDS. Overall, the six dimensions of functional quality proposed in this study have been empirically validated to have impact on perceived value by previous studies in the field of MFDS. Consequently, this study formulates a hypothesis as follows:

H1. Functional quality has a significant influence on perceived value of MFDS.

According to Gremler and Brown (1996), loyalty refers to attitudinal and behavioral perspectives, comprising favorable consumer attitudes toward service providers, intention to create positive word-of-mouth and re-purchase a product or service when a need for this product/services arises. As far as customers perceive the service performance as high quality, their relationship with the service provider will be strengthened, which leads to spreading positive statements about the company (Boulding *et al.*, 1993; Zeithaml *et al.*, 1996; Chaniotakis and Lymperopoulos, 2009), recommending the company or service to others (Kassim and Abdullah, 2010; Parasuraman *et al.*, 1988) and continuing to purchase from the company (Caceres and Paparoidamis, 2007; Cronin and Taylor, 1992; Zeithaml *et al.*, 1996). Numerous studies have validated the association between process-related quality and customer loyalty toward various services (Choi and Kim, 2013; Cronin *et al.*, 2000; Hapsari *et al.*, 2017; Shankar and Jebarajakirthy, 2019). Previous studies in delivery application also offer evidence about such a linkage; for example, information quality of delivery apps was found to reinforce consumer continuance intention (Lee *et al.*, 2019), while security and compatibility of delivery apps were confirmed to affect customers' word-of-mouth intention (Belanche *et al.*, 2020). Therefore, it is tenable to posit that once customers highly rate their experience of using a MFDS application, they will be more likely to continue using the app and recommend it to their friends. Thus, the link between functional quality and customer loyalty is proposed in the following hypothesis:

H2. Functional quality has a significant influence on customer loyalty toward MFDS.

3.2 Technical quality of mobile food delivery service

Technical quality could be comparable to physical quality as defined by Lehtinen and Lehtinen (1991) and extrinsic quality as defined by Gerhard *et al.* (1997). Customer perception of technical features of service can be determined by the behind-the-scenes processes of firms (Zeithaml and Bitner, 1996). Few technical quality attributes in electronic or mobile service quality have been examined in previous studies (Ali *et al.*, 2017; Keshavarz and Jamshidi, 2018). Very few studies have been performed to develop technical quality criteria in electronic commerce service and hotel service (Kang and James, 2004; Wu and Ko, 2013). While Kang and James (2004) assessed technical/outcome quality as a unidimensional construct, based on the qualitative survey and empirical research in hotel service, Wu and Ko (2013) found it as a multidimensional construct, including three dimensions of sociability, valence and waiting time. In another context of mobile-based services such as taxi and ride-hailing service, technical or outcome quality is supposed to be the excellence of delivery riders (e.g. punctuality, professional appearance, enthusiastic attitude, safe driving) and quality of vehicles (e.g. clean and fully equipped) (Nguyen-Phuoc *et al.*, 2020).

Technical quality means outcome quality, which measures what customer received when the service is rendered (Grönroos, 1984). This type of quality has rarely been studied, with only the recent study by Yang *et al.* (2021) using a qualitative research approach to explore the outcome quality (e.g. flavor, freshness, packaging and delivery quality). According to Nguyen-Phuoc *et al.* (2020), there is often a disparity between app-based service quality considered as benefits of a booking app and the service quality offered by genuine products or services. Adopting this approach, our study considers quality of delivered food (e.g. taste, freshness, presentation, temperature and nutrition) and quality of delivery service (delivery time, drivers' appearance and attitude) as the attributes of technical quality of MFDS.

Perceived value of services could be enhanced by either providing higher quality service or lowering customer perceptions of the expenses involved with using such services (Ravald and Grönroos, 1996). According to Sweeney and Soutar (2001), the consequences of service performance (outcome quality) are definitely taken into account when forming value perceptions. In the extant literature, the link between perceived value and outcome (technical) quality of various services has been empirically studied (Abdelfattah *et al.*, 2015; Ali *et al.*, 2017; Brodie *et al.*, 2009; Keshavarz and Jamshidi, 2018). Keshavarz and Jamshidi (2018) found that tourist perceived value toward hotel service would increase when they received services with higher valence and sociability and lower cost such as reduced waiting time. Accordingly, the perceived value of MFDS could be influenced by food and delivery quality criteria determined when customers received their ordered food. Indeed, when the food is of high quality, customers will tend to appreciate the value of purchasing food via MFDS (Suhartanto *et al.*, 2019). To validate the association between technical quality and perceived value, this study proposes the following hypothesis:

H3. Technical quality has a significant influence on perceived value of MFDS.

Delivering superior service provides consumers a reason to select and stick with a particular service provider, while an inferior service could lead to more defection (Ennew and Binks, 1996). Together with emotional attachment, a satisfactory outcome of service is a prerequisite to generating loyal consumers (Sierra and McQuitty, 2005). Food quality is a critical factor in restaurant service settings to shape customer propensity to revisit and recommend the restaurant (Mattila, 2001; Namkung and Jang, 2007). Also, it was confirmed

by Suhartanto *et al.* (2019) that food quality could positively reinforce consumer's loyalty toward an MFDS application. Furthermore, Nguyen-Phuoc *et al.* (2020) highlighted that once customers highly evaluated the outcome of ride-hailing delivery (by the excellence of delivery staff and condition of the vehicle), they would be more willing to continue using ride-hailing service apps and to recommend it to their friends. There is also empirical evidence supporting the technical quality–loyalty linkage in various services such as hotel service (Keshavarz and Jamshidi, 2018) and casino hotel service (McCain *et al.*, 2005). As a result, it is logical to propose the following hypothesis:

H4. Technical quality has a significant influence on customer loyalty toward MFDS.

3.3 Relationship between perceived value and customer loyalty

Based on the self-regulation process in goal and action identity theories, it is asserted that higher order goals regulate consumer activities at the lower level goals (Carver and Scheier, 1990; Vallacher and Wegner, 1987). Perceived value is a higher order goal as it is definitely what the buyer seeks from the purchase, whereas consumer loyalty is a lower order goal that serves as a means to obtain value (Sirdeshmukh *et al.*, 2002). Thus, providing products or services with excellent quality is one of the most efficient ways to deliver superior value and generate client loyalty (Brodie *et al.*, 2009; Gallarza and Saura, 2006; Keshavarz and Jamshidi, 2018). As the internet facilitates customer comparison of product features and prices, value perception is critical to online service providers (Suhartanto *et al.*, 2019). User perceived value was confirmed to have a direct substantial impact on loyalty toward e-services (Bernardo *et al.*, 2012; Chang *et al.*, 2009; Li and Shang, 2020; Wu *et al.*, 2014). Recently, scholars supported that user-perceived value of MDFS was linked to attitudes and intent to continue using the app (Cho *et al.*, 2019; Suhartanto *et al.*, 2019). It is assumed from the extant literature that customers would like to form favorable views about MDFS if their obtained benefits go beyond expenses, leading to their loyalty behaviors such as intention to produce word-of-mouth and usage continuance. Consequently, the following hypothesis was proposed:

H5. Perceived value has a significant influence on customer loyalty toward MFDS.

The five hypotheses of relationships between functional quality, technical quality, perceived value and customer loyalty toward MFDS are graphically presented in the proposed conceptual framework of the study (see Figure 1).

4. Methods of research

4.1 Research instrument development

To fully uncover both functional quality and technical quality of MFDS, which have not yet been studied in the literature, we adopted qualitative and quantitative research methods to get the insight into service quality in the context of m-commerce (Venkatesh *et al.*, 2013). The qualitative method aimed to identify attributes of the two qualities beyond pre-determined attributes in previous studies and develop more measurement items besides the existing scales adapted from the literature. This study collected the reviews and comments of MFDS's consumers on an online Facebook group of Review Now/Baemin/Grabfood/GoFood, which has over 60,000 members and an average of two new posts per day. Posts of customers with hashtags related to MFDS (e.g. Grabfood, Baemin, Now, Gofood, Loship, Reviewfood) from February to March 2021 were extracted for a content analysis procedure. A total of 533 posts were collected and manually coded according to quality attributes of

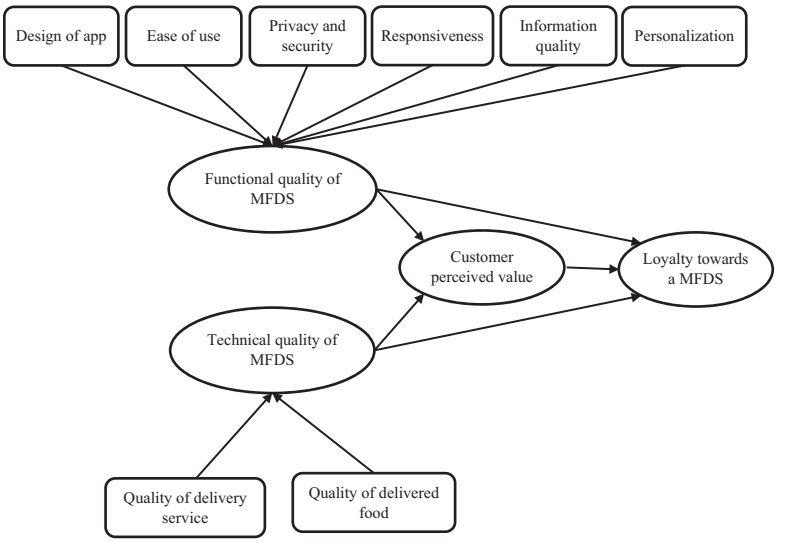

Figure 1.
The proposed framework of loyalty toward an MFDS

MFDS which were identified from the prior literature as discussed in Section 2. In particular, a codebook was developed based on six attributes of functional quality (design of the app; ease of use; privacy and security; responsiveness; quality of information; and personalization) and two attributes of technical quality (quality of delivery service and quality of delivered food). After that, review posts were read and reread many times to identify more patterns emerging. As a result, no other dimension was found to be different from the six ones of functional quality. Only some more items were added to measure such dimensions. However, apart from food quality and delivery service quality, the data indicated a theme of safety and hygiene emerging as another dimension of technical quality of MFDS. Table 2 presents the dimensions of MFDS quality and their measurement items with sources (e.g. from the literature and/or from the content analysis) cited for each item. Particularly, the functional quality of MFDS included six dimensions as found in the literature review, which were measured by 32 items. The technical quality included three dimensions and were measured by 15 items.

In addition, the measurement scales for the other two constructs in the proposed model, including, perceived value and customer loyalty toward MFDS, were adapted from previous studies. Perceived value was measured by five items (Chang *et al.*, 2009; Gounaris *et al.*, 2007) and six items were used to measure customer loyalty (Eid, 2011; Nguyen-Phuoc *et al.*, 2020). All 58 items were assessed using a seven-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7). As Vietnam is chosen for the case of research, the items adapted from the original scales in the literature were translated from English into Vietnamese, using back-translation technique. A cross-sectional questionnaire was then designed with four parts comprising:

(1) scanning questions that help filter suitable respondents for the study;

(2) questions about MFDS using experiences;

Constructs/dimension	Code	Source
Functional quality of food delivery service (MFDS)		
The MFDS app is visually appealing	FQU1	Lee and Lin (2005)
The user interface of the MFDS app is well-organized	FQU2	Lee and Lin (2005)
The MFDS app has well-arranged menu	FQU3	Wolfinbarger and Gilly (2003)
The MFDS app shows good food/beverage photos	FQU4	Yoo and Donthu (2001)
It is easy to complete a food/beverage order on the app	FQU5	Lee and Lin (2005)
It is easy to cancel or re-order through the app	FQU6	Nguyen-Phuoc *et al.* (2020)
The step-by-step instructions on the MFDS app are easy for users	FQU7	Yoo and Donthu (2001)
My interaction with the app is clear and understandable	FQU8	Barnes and Vidgen (2002)
I find the app easy to learn	FQU9	Barnes and Vidgen (2002)
The app shows the order tracking that is easy to follow	FQU10	Content analysis
The app has secure modes for financial transactions	FQU11	Wolfinbarger and Gilly (2003)
I can sign up an individual account with logon-id and password	FQU12	Ranganathan and Ganapathy (2002)
The app has security system to protect my personal information	FQU13	Ranganathan and Ganapathy (2002)
The app requires a reasonable amount of personal information that is necessary for its activity	FQU14	Yoo and Donthu (2001), Eid (2011)
The electronic payment on the app is safe	FQU15	Yoo and Donthu (2001), Eid (2011)
The app shows concern for privacy of its users	FQU16	Eid (2011)
The orders are managed by the 24/7 customer service teams	FQU17	Content analysis
The app promises fast delivery	FQU18	Yoo and Donthu (2001)
The app has quick process	FQU19	Yoo and Donthu (2001)
I can easily contact a customer service representative on the app	FQU20	Yang and Jun (2002)
Enquiries are answered promptly	FQU21	Yang and Jun (2002)
The app provides detailed information about restaurants and their offers	FQU22	Yoo and Donthu (2001)
The app provides rich information about the high-rated restaurants and their offers	FQU23	Yoo and Donthu (2001)
The app provides believable delivery information (e.g. time, pick-up location, delivery person)	FQU24	Barnes and Vidgen (2002), Suhartanto *et al.* (2019a)
The app accurately informs the delivery promise	FQU25	Suhartanto *et al.* (2019a)
The information on the app facilitates searching and ordering food	FQU26	Eid (2011)
The app provides up-to-date information about restaurants and their offers	FQU27	Eid (2011)
The app presents information that is easy to understand	FQU28	Eid (2011)
	FQU29	Wolfinbarger and Gilly (2003)

(*continued*)

Table 2. Measurement scales development

Constructs/dimension	Code	Source
The app stores my food preferences or habits and offers me suitable products/services		
The app predicts what kinds of products/services I might want and make suggestions	FQU30	Wolfinbarger and Gilly (2003)
The app has features that are personalized for me	FQU31	Wolfinbarger and Gilly (2003)
The app presents logical filter functions (e.g. coupons, discounts, customer feedback, etc.) to search for my specific needs	FQU32	Content analysis
Technical quality of food delivery service (TQU)		
Delivery riders arrive on time	TQU1	Nguyen-Phuoc *et al.* (2020)
Delivery riders have good appearance	TQU2	Nguyen-Phuoc *et al.* (2020)
Delivery riders have enthusiastic attitude	TQU3	Nguyen-Phuoc *et al.* (2020)
I find easy to recognize delivery riders at the pick-up point	TQU4	Content analysis
Delivery riders are willing to answer my questions and handle my complaints	TQU5	Content analysis
The food container is kept clean and hygienic	TQU6	Content analysis
The food container meets the industrial standards of food storage (e.g. for hot/cold food)	TQU7	Content analysis
Delivery drivers keep their hands clean	TQU8	Content analysis
The delivered food is tasty	TQU9	Namkung and Jang (2007)
The delivered food is kept in appropriate temperature that is safe for consumption	TQU10	Namkung and Jang (2007)
The delivered food is fresh	TQU11	Namkung and Jang (2007)
The delivered food is healthy	TQU12	Namkung and Jang (2007)
The delivered food is well-presented	TQU13	Namkung and Jang (2007)
The delivered food is the same as the photo shown on the app	TQU14	Content analysis
The delivered food is kept in eco-friendly packaging	TQU15	Content analysis
Customer perceived value		
I get what I pay for through this food delivery app service	PVA1	Chang *et al.* (2009)
Food ordered from this food delivery app service is worth the money paid	PVA2	Chang *et al.* (2009)
Comparing to alternative MFDS, this service offers me a very good value for money	PVA3	Chang *et al.* (2009)
It is pleasant to order food from this MFDS	PVA4	Gounaris *et al.* (2007)
I love to order food from this MFDS	PVA5	Gounaris *et al.* (2007)
Customer loyalty (European Commission)		
I will continuously use this MFDS in the future	LOY1	Eid (2011), Nguyen-Phuoc *et al.* (2020)
I consider this MFDS to be my first choice when I want to order food	LOY2	Nguyen-Phuoc *et al.* (2020)
I prefer using this MFDS to others	LOY3	Nguyen-Phuoc *et al.* (2020)
I do recommend this MFDS to someone who seeks my advice	LOY4	Eid (2011)
I will encourage friends and relatives to use this MFDS	LOY5	Nguyen-Phuoc *et al.* (2020), Janda *et al.* (2002)
I will say positive things about this MFDS	LOY6	Nguyen-Phuoc *et al.* (2020), Janda *et al.* (2002)

Table 2.

(3) questions about respondents' evaluation on 58 measurement items presented in Table 2; and

(4) questions about demographic information of respondents.

To check the validity of the questionnaire, an expert review panel including three lecturers in e-commerce courses and three senior staff of food order and delivery companies were invited to review the relevance of measurement scales for constructs in the model and the appropriateness of questionnaire with the target population. Most measurement items were approved by experts with some suggestions for repeated items, grammar, wording and sentence structures. Finally, a pilot study was conducted with 50 hospitality bachelor's degree holders to discover the ambiguity and confusing meaning of questions. After all the above steps, the questionnaire was finalized for data collection.

4.2 Data collection and data analysis

Those who have ordered food through MFDS are considered the target population in this study. Therefore, a scanning question, "Have you ever ordered food through a mobile food delivery app?" was asked to confirm the target respondents of the research. Using a non-probability convenience sampling technique, we collected data in April 2021 from MFDS users in Vietnam when Vietnam had been experiencing the most severe wave of Covid-19. Because of the restrictions of face-to-face interaction during the Covid-19 pandemic, we used an online survey to collect data. The survey link was posted on online social networks of review for MFDSs (e.g. Now, Grabfood, GoFood, etc.) in Vietnam, which have at least 10,000 members. To increase the response rate, we re-posted the survey link once a week and sent private messages to members of these groups. Finally, 516 respondents participated in our study; however, we retained 494 valid cases after data screening. Table 3 presents the demographic information and information of MFDS users' experiences (e.g. frequency of using MFDS, used MFDS and most preferred MFDS) of the 494 respondents in this study.

This study applied a procedure for analyzing data using two statistics packages, including, IBM-SPSS V.23 and Smart-PLS 3.0. Findings of exploratory factor analysis (EFA), measurement model evaluation and structural model evaluation are discussed in more detail in the following sections.

5. Findings and results

5.1 Factor analysis of functional quality and technical quality of mobile food delivery service

5.1.1 Functional quality of mobile food delivery service. An EFA was initially conducted by using IBM-SPSS V.23 to identify the latent dimensions of functional quality of MFDS from the original list of 32 measurement items. First, the Kaiser–Meyer–Olkin (KMO) value is 0.927, greater than the threshold value of 0.6, and Bartlett's test of sphericity ($\chi^2 = 673.384$, $p < 0.001$) was significant. The communities of all 32 items were all well above 0.3, as suggested by Kaiser (1974). The 32 items having factor loading above 0.4 were extracted into six dimensions: information quality (seven items), privacy and security (six items), responsiveness (five items), ease of use (six items), personalization (four items) and design of app (four items) (see Table 4). Cronbach's alpha values of six factors were all higher than 0.7 as suggested by Hair *et al.* (2019), indicating satisfactory internal consistency.

The reflective measurement model evaluation was then performed to confirm the reliability and validity of measurement scales of six functional quality dimensions, which were formed after an EFA. Outer loadings should be above the recommended value of 0.7 (Hulland, 1999). The item IFQ29 was removed as its outer loading was 0.550, below 0.6. In addition, the item FQU7 with the outer loading value of 0.602 was also deleted from the

	n	(%)		*n*	(%)
Gender			*Age*		
Female	370	74.9	15–24	374	75.7
Male	124	25.1	25–34	90	18.2
Occupation			35–44	26	5.3
Skilled worker	109	22.1	45–54	3	0.6
Student	323	65.4	65 and over	1	0.2
Unskilled worker	7	1.4	Others	41	8.3
Freelancer	13	2.6	*Monthly income (US$)*		
Retired	1	0.2	<300	317	64.2
Education			300 to <500	101	20.4
High school or equivalent	6	1.2	500 to <800	47	9.5
College	11	2.2	≥800	29	5.9
Bachelor's degree	405	82.0	*Used MFDS*		
Postgraduate	70	14.2	Delivery Now	400	81.0
Others	2	0.4	Baemin	217	43.9
Frequency of using MFDS			Grabfood	289	58.5
More than two times per week	114	23.1	GoFood	119	24.1
One to two times per week	139	28.1	Others	23	4.7
One to two times per month	136	27.5	*Most preferred MFDS*		
Rarely (less than one time per month)	105	21.3	Delivery Now	311	63.0
			Grabfood	76	15.4
			Baemin	76	15.4
			GoFood	22	4.5
			Other	9	1.8

Table 3.
Descriptive statistics of data (n = 494)

measurement scales as its removal could significantly increase the AVE value of the "ease of use" dimension from 0.496 to 0.539. Hair *et al.* (2014) also argued that the measurement items with outer loadings above 0.6 should be retained if the deletion of those items had not dramatically changed the AVE values of their associated constructs. As a result, this study still retained seven items FQU4 (0.673), FQU5 (0.688), FQU6 (0.639), FQU12 (0.640), FQU17 (0.699), FQU22 (0.693) and FQU25 (0.668) having outer loading values from 0.6 to 0.7. The AVE values of all six constructs were above 0.5, indicating the satisfactory validity of measurement scales.

To check the reliability, Table 4 indicates that the composite reliability (CR) values of six reflective constructs were all greater than 0.7, ranging from 0.850 (for design of app) to 0.881 (for information quality) after deleting two items, FQU7 and FQU29. This finding confirmed that the measurement scales have satisfactory internal consistency reliability (Hair *et al.*, 2019).

5.1.2 Technical quality of mobile food delivery service. A similar EFA and measurement model evaluation procedure was also conducted to validate the measurement scales for technical quality of MFDS. First, an EFA provided the results of KMO value of 0.926 and Bartlett's test ($\chi^2 = 3755.520$, $p < 0.001$), achieving sufficient sample size for factor analysis. All items had communalities above 0.3 as recommended by Kaiser (1974). By applying the same principal component analysis with varimax rotation method, 15 measurement items were extracted into two dimensions, yielding 57.757% of total variance. They were labeled "quality of delivered service" and "safety and quality of delivered food." Although these constructs' labels were not precisely the same as those proposed from the literature, they were named to fulfill the meaning of scales. These

Factors/items	EFA				Measurement model evaluation		
	Factor loadings	Eigen values	Explained variance	Cronbach's alpha	Outer loadings	CR	AVE
Functional quality of MFDS's dimension 1: Information quality (IQU)		10.283	32.134	0.841		0.881	0.515
FQU22	0.534				0.693		
FQU23	0.653				0.740		
FQU24	0.691				0.758		
FQU25	0.504				0.668		
FQU26	0.615				0.728		
FQU27	0.665				0.725		
FQU28	0.616				0.706		
Functional quality of MFDS's dimension 2: Privacy and security (PRS)		2.344	7.324	0.841		0.883	0.557
FQU11	0.663				0.757		
FQU12	0.589				0.640		
FQU13	0.772				0.803		
FQU14	0.628				0.762		
FQU15	0.644				0.778		
FQU16	0.562				0.727		
Functional quality of MFDS's dimension 3: Responsiveness (RES)		1.686	5.269	0.808		0.866	0.565
FQU17	0.544				0.699		
FQU18	0.621				0.725		
FQU19	0.529				0.772		
FQU20	0.797				0.805		
FQU21	0.789				0.752		
Functional quality of MFDS's dimension 4: Ease of use (EOU)		1.643	5.135	0.783		0.853	0.539
FQU5	0.458				0.688		
FQU6	0.620				0.639		
FQU7	0.530				0.602		
FQU8	0.715				0.818		
FQU9	0.666				0.738		
FQU10	0.669				0.719		
Functional quality of MFDS's dimension 5: Personalization (PER)		1.300	4.062	0.779		0.851	0.656
FQU29	0.715				0.550		
FQU30	0.750				0.791		
FQU31	0.777				0.759		
FQU32	0.439				0.807		
Functional quality of MFDS's dimension 6: Design of app (DES)		1.111	3.470	0.763		0.850	0.587
FQU1	0.756				0.797		
FQU2	0.719				0.800		
FQU3	0.751				0.788		
FQU4	0.539				0.672		

Table 4.
Factor analysis of functional quality of MFDS

Factors/items	EFA Factor loadings	EFA Eigen values	EFA Explained variance	EFA Cronbach's alpha	Measurement model evaluation Outer loadings	Measurement model evaluation CR	Measurement model evaluation AVE
Technical quality of MFDS's dimension 1: Safety and quality of delivered food (QDF)		6.967	46.45	0.910		0.927	0.562
TQU6	0.453				0.707		
TQU7	0.578				0.708		
TQU8	0.683				0.773		
TQU9	0.719				0.771		
TQU10	0.695				0.792		
TQU11	0.644				0.774		
TQU12	0.829				0.774		
TQU13	0.850				0.776		
TQU14	0.769				0.732		
TQU15	0.906				0.679		
Technical quality of MFDS's dimension 2: Quality of delivery service (QDS)		1.696	57.76	0.803		0.865	0.563
TQU1	0.702				0.742		
TQU2	0.563				0.754		
TQU3	0.761				0.805		
TQU4	0.903				0.711		
TQU5	0.716				0.736		

Table 5.
Factor analysis of technical quality of MFDS

two dimensions have Cronbach's alpha values above the threshold value of 0.7, meeting the requirement of reliability.

Two dimensions of technical quality were confirmed by the measurement model evaluation procedure using Smart-PLS 3.0. The CR values and AVE values of the two constructs were all above 0.7 and 0.5, respectively. Most of the items had outer loading values above 0.7. Findings indicated that the scales for two technical quality dimensions (quality of delivered services and safety and quality of delivered food) met the requirements of both reliability and validity.

5.2 Measurement model evaluation of the model

After the factor analysis procedure, functional quality and technical quality of MFDS were found to be second-order constructs. This study applied a two-stage approach to evaluate the measurement model of these two second-order constructs. Accordingly, information quality (IQU), privacy and security (PRS), responsiveness (RPO), ease of use (EAS), personalization (PER) and design of app (DES) were six indicators of functional quality. Technical quality was measured by two indicators, quality of delivered service (QDS) and safety and quality of delivered food (QDF).

Table 6 presents the results of measurement evaluation of the four constructs in the proposed model. These four constructs all had CR values above 0.7, demonstrating the internal consistency reliability of measurement scales (Nunnally

Factors/items	Outer loadings	CFA CR	AVE
Functional quality of MFDS		0.889	0.572
IQU	0.861		
PRS	0.781		
RPO	0.707		
EAS	0.759		
PER	0.742		
DES	0.676		
Technical quality of MFDS		0.920	0.792
QDF	0.894		
QDS	0.885		
Customer-perceived value		0.883	0.602
PVA1	0.720		
PVA2	0.742		
PVA3	0.803		
PVA4	0.820		
PVA5	0.792		
Customer loyalty		0.884	0.658
LOY1	0.770		
LOY2	0.828		
LOY3	0.846		
LOY4	0.833		
LOY5	0.833		
LOY6	0.753		

Table 6. Reliability and convergent validity evaluation of measurement scales

	AVE	Functional quality	Technical quality	Perceived value	Loyalty
Functional quality	0.572	*0.756*			
Technical quality	0.792	0.644	*0.890*		
Perceived value	0.602	0.649	0.656	*0.776*	
Loyalty	0.658	0.645	0.566	0.698	*0.811*

Table 7. Discriminant validity evaluation of measurement scales

and Bernstein, 1994). Most measurement items had outer loadings exceeding the recommended value of 0.7 (Hulland, 1999). The AVE values of all four constructs were greater than 0.5, indicating the convergent validity of measurement models. DES had an outer loading value of 0.676; however, the CR and AVE values of functional quality were satisfactory. Therefore, DES was retained in the measurement model.

The findings shown in Table 7 indicated that the square root of AVE of each construct, functional quality, technical quality, perceived value and loyalty were higher than its correlation values with any other construct. This demonstrated the discriminant validity of measurement models in this study.

In summary, the findings indicated that all four constructs proposed in the model met the requirements of reliability, convergent and discriminant validity of the measurement model. They were confirmed to be reliable and valid for the next step of structural model evaluation.

5.3 Structure model evaluation

5.3.1 Evaluation of model fit. First, the set of fit measures included the standardized root mean square (SRMR) below 0.08 (Byrne, 2001), the normed fit index (NFI) above 0.8 (Hu and Bentler, 1998), the squared Euclidean distance (d-ULS) and the geodesic distance (d-G). As a result, the SRMR, NFI, d-ULS and d-G were 0.061, 0.828, 0.709 and 0.304, respectively, indicating acceptable fit statistics of the model.

5.3.2 Evaluation of direct and indirect path relationships. By applying the bootstrap procedure recommended by Zhao *et al.* (2010) with 494 cases and 5,000 resamples, the study provided the results of direct effects evaluation in the model based on the significance of path coefficients, *t*-values and *p*-values (see Table 8). According to Hair *et al.* (2014), the path relationships were significant when their corresponding *t*-values were greater than 1.96 and 2.57 at the significance level of 5% and 1%, respectively. Regarding direct path relationships, functional quality was found to significantly affect both perceived value ($\beta_{\text{Functional quality} \rightarrow \text{Perceived value}} = 0.386$, $t = 6.758$, $p < 0.001$) and loyalty toward MFDS ($\beta_{\text{Functional quality} \rightarrow \text{Loyalty}} = 0.306$, $t = 6.253$, $p < 0.001$). Technical quality had a direct influence on perceived value ($\beta_{\textit{Technical} \text{ quality} \rightarrow \text{Perceived value}} = 0.408$, $t = 7.736$, $p < 0.001$); however, the hypothesis of relationship between technical quality and loyalty was not supported ($p > 0.1$). Perceived value had the greatest effect on loyalty with the highest path coefficient ($\beta_{\text{Perceived value} \rightarrow \text{Loyalty}} = 0.452$, $t = 8.298$, $p < 0.000$).

The similar bootstrapping method was also applied to evaluate the indirect path relationships in the proposed model. The results shown in Table 8 indicated the mediation effects of perceived value on the causal links from functional and technical quality to loyalty toward MFDS with *t*-values greater than 2.57 ($p < 0.001$)

5.3.3 Evaluation of predictive capability. The coefficient of determination (R^2) is the first criterion to evaluate the predictive accuracy of the model, which reports a substantial, moderate and weak level of predictive accuracy equivalent to the R^2 value of 0.67, 0.33 and 019, respectively (Chin, 1998). Accordingly, the R^2 value of loyalty was 0.551, achieving a moderate level of predictive accuracy of the model. This means that 55.1% of total variance in loyalty was explained by two predictors, functional quality and perceived value.

The next criterion for structural model evaluation is Stone–Geiser's Q^2 value, which refers to the model's predictive relevance (Geisser, 1974). By running the blindfolding procedure in Smart-PLS 3.0, the Q^2 of loyalty was 0.359, which was well above the threshold value of 0 (Chin, 1998), indicating an acceptable predictive relevance of the model. In summary, the proposed model achieved satisfactory predictive capability.

Table 8. Results of direct and indirect path relationships

Path relation (hypothesis)	Path coefficient	*t*-values	*p*-values	Supported (Yes/No?)
Direct path relationships				
H1: Functional quality → Perceived value	0.386	6.758	0.000	Yes
H2: Technical quality → Perceived value	0.408	7.736	0.000	Yes
H3: Functional quality → Loyalty	0.306	6.253	0.000	Yes
H4: Technical quality → Loyalty	0.073	1.505	0.132	No
H5: Perceived value → Loyalty	0.452	8.298	0.000	Yes
Indirect path relationships				
Functional quality → Perceived value → Loyalty	0.174	6.721	0.000	Yes
Technical quality → Perceived value → Loyalty	0.184	4.824	0.000	Yes

6. Discussion, limitations and suggestions for future research

6.1 Conclusion

Based on the results, the study concludes that consumers evaluate MFDS quality based on sub-dimensions: ease of use; app design; privacy and security; responsiveness; information quality; personalization; safety and quality of delivered food; and quality of delivery service. These sub-dimensions form two primary dimensions of functional and technical quality of MFDS. In addition, we verified the model of customer loyalty toward MFDS through validating the indirect and direct relationships between functional quality and technical quality of MFDS and customer loyalty. In particular, the study provides empirical evidence to support *H1*, *H2*, *H3* and *H5* and reject *H4*. As a result, our research has the following theoretical and practical implications.

6.2 Theoretical implications

Our study extends the m-commerce literature on various fronts. First, limited studies have investigated the downstream outcomes, particularly customer perceptions such as customer perceived value and loyalty in the context of MFDS regardless of its recent rapid growth (Ahn, and Kwon, 2021). Technology applications or the mobile system have been the focus of most studies in the stream of food delivery application research (Gunden *et al.*, 2020; Hwang and Choe, 2019). Departing from such prior studies, the current study considers predictive validity of the concept "MFDS" by examining its downstream outcomes. Our study therefore addresses the call for more investigations into essential components of MFDS quality that can shape customers' positive perceptions toward MFDS (Ahn, and Kwon, 2021; Chan and Gao, 2021) such as perceived value and loyalty.

Second, our study advances the m-commerce literature by providing empirically based conceptualization and validation of the multi-dimensionality of MFDS functional quality and MFDS technical quality. This also adds to the existing literature in terms of SERVQUAL and e-service quality. While some of dimensions of functional quality (i.e. ease of use; app design; privacy and security; responsiveness; information quality; and personalization) have been studied separately in previous studies, the findings of this research confirmed that all six dimensions reliably and validly represent a "face-to-app" quality of a mobile service, particularly an MFDS. Moreover, the study is the first, to the best of the authors' knowledge, to validate two attributes (e.g. safety and quality of delivered food, and quality of delivery service) as components of technical quality of a MFDS. Indeed, delivered food quality (e.g. food taste, hygiene and packaging condition and delivery service quality (e.g. on-time delivery, appearance and attitude of delivery staff) are the most critical factors in forming customer evaluations of post-ordering service quality in this study.

Third, our study places functional quality factors and technical quality factors in a single model of customer loyalty toward MFDS in light of Gronroos' (1990) service quality perspective. By doing so, the present research is the first endeavor to offer empirical evidence for Gronroos' (1990) service quality perspective as a valid theoretical framework within m-commerce contexts, as well as expand this theory by examining customer outcomes (customer perceived value and loyalty toward MFDS) of service quality other than customer satisfaction. Our study also supports the integration of factors from m-commerce technology acceptance model such as ease of use (Troise *et al.*, 2020; Roh and Park, 2019) and mobile service quality (MS-QUAL) model such as responsiveness, information quality and app design (Huang *et al.*, 2015), which have been rarely encountered in an m-commerce context.

Fourth, this study identifies customer perceived value of MFDS as a mediation pathway for the effects of both functional and technical quality of MFDS on customer loyalty toward

MFDS. This mediating role of customer perceived value has been reported in some research on the e-service quality–customer loyalty linkage (Jiang *et al.*, 2016; Suhartanto *et al.*, 2019). Nevertheless, in m-commerce contexts, customer perceived value tends to serve as a mediator for the relationships between service quality factors and satisfying experience or repurchase intention (Chopdar and Balakrishnan, 2020), whereas customer satisfaction leans to serve as a mediator for the relationship between m-service quality and customer loyalty (Chan and Gao, 2021; Omar *et al.*, 2021). Furthermore, our study extends the m-commerce literature by introducing customer perceived value as a mediator for the effects of both functional and technical quality of m-commerce service on customer loyalty.

Furthermore, both direct and indirect relationships are established between functional quality of MFDS and customer loyalty toward MFDS, while the indirect, but not the direct, relationship exists between technical quality of MFDS and customer loyalty toward MFDS. This indicates that functional quality of e-commerce service is more likely to exert a direct effect on customer loyalty than is technical quality of e-commerce service. Our findings are not in line with Suhartanto *et al.* (2019), who confirmed the direct relationship between food quality – one aspect of technical quality in our study – and customer loyalty toward MFDS. According to Mittal and Lassar (1998), for service with limited interpersonal contact, the primary concern of customer is value that they can expect and perceive from technical quality of the service. Thus, albeit technical quality may not directly affect customer loyalty, it may indirectly affect it through a full mediation of customer perceived value.

In summary, the study's overall contribution is to identify mechanisms that shape customer loyalty toward MFDS from Gronroos' service quality perspective, thereby extending the current m-commerce literature. While the between e-service quality factors and customer loyalty toward e-service has been substantially examined in the service marketing literature (Giovanis and Athanasopoulou, 2014; Kaya *et al.*, 2019; Khan *et al.*, 2019; Jiang *et al.*, 2016; Viswanathan *et al.*, 2020; Zhou *et al.*, 2019), this relationship and its underlying mechanisms have not been fully understood in m-commerce contexts as reflected in a recent review of Tang (2019) regarding mobile apps in m-commerce. The few studies in this stream of research in m-commerce contexts include McLean *et al.*'s (2020) investigation into attitudes toward mobile apps and customer loyalty, and a work by Omar *et al.* (2021) that reveals the link between mobile shopping service quality and customer loyalty. The current research advances this stream of research by investigating customer loyalty toward a specific m-service, namely, MFDS.

6.3 Managerial implications

From practical perspectives, this study provides valuable insights for service providers in the field of MFDS. First, functional quality is found to boost both perceived value and loyalty toward MFDSs. Accordingly, functional aspects conceptualized and validated in our study provide platform managers with a guideline to establish a successful MFDS application. In terms of information quality, developing a quality control mechanism is necessary to assure the quality of posted information as well as ensure that customers make right decisions. Platform managers can also encourage customers to share their service experiences by posting their reviews, photos, videos or comments concerning their food apps. Furthermore, solutions-oriented ideas are encouraged to promote the delivery service in the new normal of the Covid-19 pandemic; for example, the app may display the full vaccination status of delivery drivers on the order-tracking page. In addition, the ease of use of the food delivery app is critical in creating customer values as it requires minimal user effort to operate the app because not every mobile user is tech-savvy (Cho *et al.*, 2019). Furthermore, practitioners should pay attention to the app design, particularly they should

build a simple application but with attractive and visual user interface to ensure that the system is easy to navigate seamlessly for customers in searching their desired food menu and ordering food. It is essential to consistently provide a high level of responsiveness of the app by adding more values to platforms such as proof of delivery, navigation to tracking and chat box. Applying the artificial intelligence such as behavioral data mining features to create recommendations-based offs, the customer's previous order, weather or other factors is also highly suggested to allow companies to deliver the personalized food experiences to customers.

Second, this study highlights technical quality – a crucial part in capturing total service quality that has yet to be investigated in the field of MFDS. It is revealed that superior quality of delivery service and quality of food is key to generating value for customers, thereby turning them into loyal customers. MFDS managers should control the delivery time and improve the excellence of delivery riders to create a better customer experience for food delivery service. For example, food delivery by drones was tried in many developed countries as a method to assist MFDS in avoiding traffic congestion. Also, delivery personnel should be equipped with nice outfits and decent interpersonal skills – which requires training from service providers. Furthermore, this study recommends that service providers have a set of criteria to ensure food quality in MFDS, the majority of which are determined by restaurants. Correspondingly, a close partnership between MFDS providers and restaurants is essential to mitigate problems such as giving erroneous menus or failing to assure the quality of the food as promised in the posted photo. Apart from flavor and presentation of food, restaurants that adhere to sanitation regulation, standards of freshness and ingredient transparency should be targeted for collaboration and promotion in MFDS marketing efforts. Besides, to ensure the quality of delivery service in the new normal, MFDS should build contactless procedures for delivery staff from when they take orders in restaurants until delivering food to customers. Overall, MFDS providers are suggested to acquire proper logistics management to achieve both time and quality targets for delivered food.

Finally, the current research acknowledges the mediating effect of perceived value in the relationships between service quality and customer loyalty toward MFDS. When the perceived benefits of using MFDS outweigh the expenses, customers will be more likely to continuously use the app and suggest it to others. Consumers can readily compare the rates offered by multiple MFDS providers online, and, hence, cost advantage is vital in the MFDS industry. Restaurants and MFDS providers must work together to create a mutually beneficial commission system that lowers foodservice costs for customers (Lee *et al.*, 2019). Also, financial incentives strategies (competitive rates, discounts, coupons when subscriptions, free meals after a certain number of deliveries, points and rewards scheme) should be used by MFDS providers to increase values for customers.

6.4 Limitations and future research

Despite the theoretical and practical contributions, the study has some limitations providing recommendations for future research. First, MFDS in a developing Asian country such as Vietnam is growing so rapidly that it is a good study case; however, customers' perception of service quality can vary across different cultural groups (Furrer *et al.*, 2000). In addition, a cross-national study by Morgeson *et al.* (2015) found that the relationship between service quality and customer loyalty toward mobile services was different between emerging and developed markets. Therefore, examining MFDS quality and its relationship with customer loyalty based on cross-culture market segmentations (e.g. between developing countries or/and developed countries) is a good idea for further research. Second, as the measurement

scales for MFDS quality were developed based on content analysis of online customer reviews on popular food ordering and delivery apps in Vietnam and some Southeastern Asian countries such as Grabfood, Baemin, Now, Gofood and Loship, service quality attributes could be not comprehensively covered in this study. Thus, studies of other giant services such as JustEat, Uber Eats, DoorDash and Deliveroo in the US and Europe market or Meituan Dianping in China are also worthy for future research to uncover more latent dimensions of both functional and technical quality of MFDS. Lastly, it would be interesting to compare the influence of service quality on behavioral outcomes between different types of on-demand delivery platforms (e.g. Web-based and mobile on-demand food delivery systems) that can contribute to broaden our understanding about consumer behavior toward the food delivery service.

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