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Role of mobile food-ordering applications in developing restaurants' brand satisfaction and loyalty in the pandemic period

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ABSTRACT

Retailers and their supply-chain partners should reconsider their competitive advantages in today's technology-enhanced environment and search for opportunities to collaborate. Mobile applications have emerged as a special form of e-commerce that provide convenience for consumers by saving time and effort. In the pandemic days, people prefer using mobile applications in particular to order food from restaurants and protect themselves from COVID-19. Even though there are many previous studies regarding mobile application usage, they have investigated the antecedents of mobile app adoption. Today, consumers already have adopted them, yet there is a need to understand the outcomes of mobile application usage, especially for mobile food-ordering apps (MFOAs). To fill this gap, this study first positions the MFOAs among other mobile food applications regarding their business models. Then, a structural model was developed and tested by focusing on the outcomes of MFOA usage. A survey of 217 participants was conducted, and the data were analyzed using partial least squares path modeling (PLS-PM). The main contribution of the results is the finding that MFOA satisfaction plays a critical role in developing restaurants' brand satisfaction and loyalty. Thus, brands should cooperate with MFOA providers.

1. Introduction

The number of active Internet users was almost 4.66 billion as of October 2020, encompassing 59 percent of the global population. Among them, mobile users have been of primary importance because they account for 91 percent of total Internet users (Statista, 2020c). This has encouraged new online business models such as mobile commerce, or m-commerce. M-commerce is the fastest growing form of e-commerce—by up to 50 percent per year in some areas, especially retail sales (Laudon and Laudon, 2014). M-commerce's share of e-retail sales in Turkey was 46% in 2018 (Statista, 2019). M-commerce applications have gained importance for services that are time-critical and directed toward people on the move (Laudon and Laudon, 2014). Thus, m-commerce applications have made m-commerce easy for people to use, and the reasons why people use online stores and mobile applications for activities such as shopping and education are notable concerns for companies (Fedorko et al., 2018). On the other hand, m-commerce has received more attention in recent years because the technology is an important pillar for countries to increase their global competitiveness (Vučković et al., 2020).

Because the number of users of smartphones or similar platforms such as tablets gradually has increased, the number of application downloads has risen proportionally. Globally, the number of mobile app downloads was about 178 billion in 2017. This is expected to rise to 258 billion in 2022 (Statista, 2019). In addition to the development of mobile apps, consumers have been dining out less due to social distancing and other precautions during the COVID-19 pandemic (Statista, 2020d). Thus, mobile food ordering apps (MFOAs) have gained popularity, and there are strong local competitors in the Turkish market. Due to strong competition in the market, Spain-based startup Glovo has announced its withdrawal from the Turkish market (Eyidilli, 2020).

Even though online delivery services such as MFOAs have attracted considerable interest in Turkey and other countries in the region, academics and researchers have not fully investigated the related issues of these apps, such as the aspects shaping customers' perceptions, intentions, and behavior toward them (Alalwan, 2020). Moreover, previous research mainly has focused on consumers' initial acceptance or adoption of the technology (Kapoor and Vij, 2018). For instance, researchers have often used the technology-acceptance model (TAM) as a framework (Davis, 1989) to identify the antecedents of the initial app acceptance (Peng et al., 2014; Taylor and Levin, 2014). Studies have focused on acceptance because it signifies a person's positive attitude

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toward using innovation or a particular system. Before developing a new system, decision-makers who are enhancing new technologies should determine why people use and accept the innovations, and then understand which factors affect the usage of a particular system. Therefore, various TAMs have been studied to determine users' behavior (Taherdoost, 2018).

This study focuses on MFOAs to understand their role in developing restaurants' brand satisfaction and loyalty. Even though food research has been conducted on various topics, including food trends, healthy eating, vegetarianism, food service, management, operations, food, and gastronomy tourism (Okumus et al., 2018), the outcomes of MFOA adoption must be examined. Notably, many of today's modern consumers have already adopted the mobile apps and use them in their daily life (Kapoor and Vij, 2018; Sanakulov and Karjaluoto, 2015; Taylor and Levin, 2014). In other words, TAMs have been developed for different areas, including autonomous vehicles (Dirsehan and Can, 2020), online learning (Farahat, 2012), e-commerce (Fayad and Paper, 2015), and the restaurant industry (Park et al., 2018). Nonetheless, the contribution of MFOAs to the food-service industry in terms of restaurants' brand satisfaction and loyalty development must be investigated. In fact, what MFOAs provide to food companies has not been defined. Thus, this study differs from previous studies by moving beyond drivers of the app adoption, which also was the focus of Kapoor and Vij (2018), who examined the association between mobile app attributes and final conversion. To fill the gap, the main purpose of this study is to extend the TAMs in the consequences direction by investigating the interrelations among MFOA usage, MFOA satisfaction, brand satisfaction, and brand loyalty.

2. Literature survey and hypothesis development

2.1. Background information on mobile food applications

People today are exposed to technological development in all fields, including work, leisure, and tourism (Buhalis and O'Connor, 2005). Profit-oriented companies try to increase their revenues and promote their products while reducing costs with these technological innovations. As a channel for interaction, the Internet enables sellers to monitor consumer behavior online closely (Öztürk et al., 2012). As a specific Internet access tool, mobile applications enable companies to meet users' needs by using location-based services and making customizations (Chhabra, 2015). Moreover, studies have shown that mobile applications play an important role in food-related industries, given that food and beverage is one of the most popular categories in online ordering. Mainly, food and beverage applications rank eighth on the list of the most popular app store applications in August 2020 (Statista, 2020a).

Based on Statista's (2020b) forecast, adjusted for the expected impacts of COVID-19, the revenue for Turkish online food delivery, an expanding industry in recent years, is projected to reach US$853m in 2020, of which US$716m represents restaurant-to-consumer delivery and US$173m represents platform-to-consumer sales. Mobile food applications in Turkey can be categorized by their business models. Even though all of them basically are food applications, they are parts of different business models and provide different services. However, some of them have a common structure. Hence, they can be separated into four groups based on their business model, as shown in Fig. 1.

The first distinction between the mobile food applications is whether they focus on delivery (such as MFOAs) or information. Moreover, the MFOAs can fall into two categories. First, the mobile applications of companies such as Getir Yemek, Glovo, and Yemeksepeti focus on ordering and delivering food, rather than on its preparation. Thus, they are merely intermediaries for food-producing companies such as restaurants. Therefore, they can be categorized as delivery-oriented third-party applications. Notably, with over 10 million downloads, Yemeksepeti is the most widely used app in Turkey (Deggin, 2020).

The second category is delivery-oriented and firm-owned applications. Companies such as CarrefourSa and Migros are grocery store chains. To extend their businesses, they have developed their own applications to provide online delivery services for their customers' convenience. Therefore, these applications can be classified as delivery oriented and firm owned. Importantly, however, consumers use these applications for ordering not only food but also other groceries.

Besides MFOAs, companies such as Foursquare and Zomato provide information-oriented mobile applications that introduce users to restaurants. Foursquare and Zomato promote food and beverage companies and inform users about the companies' menus, locations, etc., as third parties. Thus, they can be categorized as information-oriented third-party applications.

The last category is information-oriented and firm-owned mobile

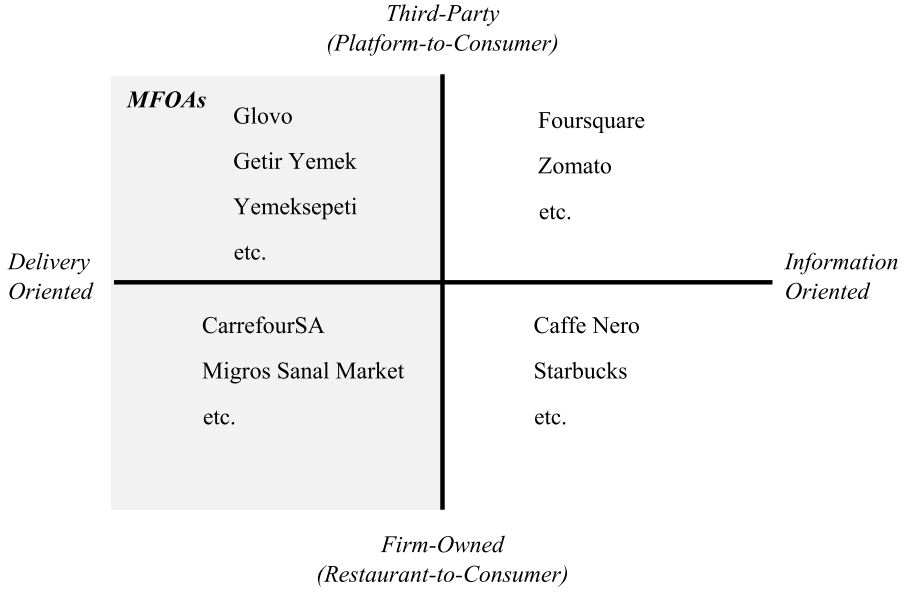

Fig. 1. Mobile Food Applications Matrix.
Source: Developed by the authors.

applications, such as those developed by Caffe Nero and Starbucks. Caffe Nero and Starbucks mainly provide coffee for their customers. In addition to their primary service, they have developed their own mobile applications for their customers, to whom the companies offer incentives and supply complementary products by using the applications. Consequently, they are firm-owned and information-oriented applications.

This study considers the MFOAs in the first category, called "delivery-oriented third parties," comprising apps used only for ordering food and not also other groceries. Therefore, the consequences of the TAM were investigated in this category.

2.2. Overview of models for technology acceptance

The theory of reasoned action (TRA) was developed in 1975 by Fishbein and Ajzen (1975) for their sociological and psychological research in understanding individuals' behaviors. It has become a basis with which to understand people's behaviors regarding information technology (IT) (Taherdoost, 2018). According to the TRA, an individual's actual behavior is affected by his or her attitudes, beliefs, and intentions (Ul-Haque et al., 2014). The theory of planned behavior (TPB) developed by Ajzen (1991) was built upon the TRA and is used to explain human behavior in general. According to the TPB, behavior can be predicted by grasping dimensions, including attitudes toward the behavior, subjective norms, perceived behavioral control, intention, and the relationships among these dimensions (Ajzen, 1991).

As another adaptation of the TRA, Davis et al. (1989) introduced the technology-acceptance model (TAM). The TPB was developed to explain human behavior in general, whereas the TAM was developed to explain technology acceptance—in other words, to understand the determinants that play roles in users' acceptance of technologies (Alzubi et al., 2018). These determinants are perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) to use.

Studies conducted about the TAM indicate that PU is one of the essential antecedents for technology adoption (Ashraf et al., 2014). Previous research has stated that PU is related to the influence of job performance. Indeed, PU has been defined as the prospective user's perception that using the technological system or application will enhance his/her job performance (Davis et al., 1989; Doherty et al., 2006).

PEOU is about how easy the system/application is to use. Indeed, the prospective user should consider that using the app is free of effort (Venkatesh and Davis, 2000). As Davis et al. (1989) and Gillenson and Sherrell (2002) have stated, PEOU includes both physical and mental concentration efforts. When a user can use the new application without any psychological and physical energy, the user can perceive the application as being easy to use. Furthermore, Selamat et al. (2009) implied that the complexity of a technology affects its acceptance rate. In other terms, if a prospective user perceives the use of a technology as effortless, then the user's acceptance will be more likely.

PU and PEOU have been suggested as the main antecedents of BI (Panagiotopoulos and Dimitrakopoulos, 2018). BI is a person's intention to decide to use a system (Davis et al., 1989; Kanchanatanee et al., 2014).

Later, the TAM was modified to cover broader usage behaviors for computers in 1989 (Lai, 2017). Therefore, different models for technology acceptance have been developed within the literature. For instance, TAM 2 includes additional key determinants to the basic model that affect the perceived usefulness and usage intention. These key determinants are separated into two theoretical constructs: social influence and cognitive instrumental forces. Moreover, TAM 2 involves attempting to understand the effects of these determinants on user experience over time. Notably, the results of another study have demonstrated that the influences of social influence and cognitive instrumental processes are consistent with TAM 2 (Venkatesh and Davis, 2000). Furthermore, Venkatesh (2000) developed a model with the determinants of perceived ease of use and proposed TAM 3. Later, Venkatesh et al. (2003) developed the unified theory of acceptance and use of technology (UTAUT) with four predictors of users' behavioral intention: performance expectancy, effort expectancy, social influence, and facilitating conditions. Venkatesh et al. (2012) extended the UTAUT with three additional constructs that explain the consumer's behavior regarding technology use: hedonic motivation (intrinsic motivation), price, and habit. This new model was called UTAUT2. Recently, Pelegrin-Borondo et al. (2017) proposed a model, namely the Cognitive-Affective-Normative (CAN) model, for assessing the acceptance of new types of technological products. The model included the following affective variables: positive emotions, negative emotions, and anxiety.

2.3. Outcomes of MFOA usage

Studies have often used TAMs to identify the determinants of technology acceptance for specific topics such as e-learning, online shopping, e-commerce, and online banking (Surendran, 2012). These studies mainly have investigated the antecedents of the TAM. However, the quality of mobile applications is important because users evaluate a service based on their satisfaction after they use the app. Furthermore, users may react positively based upon their satisfaction levels (Özer et al., 2013; Zhao et al., 2012). Satisfaction can be defined as a person's pleasure or disappointment when he or she compares the derived service with his or her expectations (Chang et al., 2009; Kotler and Armstrong, 2010). Therefore, the following statement is hypothesized:

H1. MFOA usage leads to MFOA satisfaction.

2.4. Restaurant–MFOA collaboration in the pandemic period

Many cities worldwide faced partial or full lockdowns due to the COVID-19 pandemic in 2020. The first positive test for COVID-19 in Turkey was confirmed on March 11, 2020, when the WHO declared COVID-19 a pandemic. One day later, on March 12, the Turkish government implemented its first measures against COVID-19, such as vacationing of schools and playing sports matches without spectators. Cafes and restaurants were closed on March 16 (BBC, 2020). After this date, delivery services became vital for restaurants to keep their business running. In particular, mobile devices, including location-based applications, have spurred retailers to find new channels with which to reach customers (Brynjolfsson et al., 2013). In a competitive market, companies should extend their channels with new ones (Geng et al., 2003). Nysveen et al. (2005) demonstrated the positive effect of adding mobile channels on brand satisfaction. Thus, the consumers may value channels that offer them flexibility in terms of time and location (Balasubraman et al., 2002). Therefore, we argue that a positive relationship exists between MFOA satisfaction and brand satisfaction.

H2. MFOA satisfaction leads to brand satisfaction.

Moreover, satisfaction is a key antecedent to loyalty (Picón et al., 2014). In terms of mobile applications, users tend to use applications if they are satisfied with the app (Xu et al., 2015). When customers become loyal, they will be willing to re-purchase products or services (Lambin et al., 2007). In other terms, loyalty is a person's commitment to a certain product or service, resulting in repeat purchasing and positive word-of-mouth in the future (Chang et al., 2009). Thus, the following hypotheses are also proposed:

H3. MFOA satisfaction leads to brand loyalty.

H4. Brand satisfaction leads to brand loyalty.

3. Research methodology

This quantitative research study was designed to achieve the research purpose. A survey was conducted that consisted of three parts.

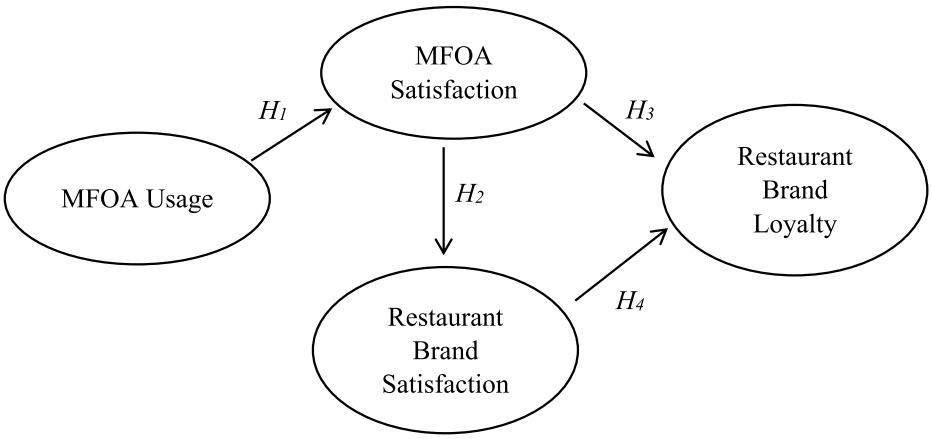

Fig. 2. Research Model.
Source: Developed by the authors.

The first part included the filtering questions (whether the participants owned a smartphone and whether they had ever used a MFOA). The second part was about the participants' attitudes toward MFOAs (to test the model), and the third part identified the participants' behavioral (how often the participants ordered food, which MFOAs they preferred), demographic (age and gender), and socioeconomic (occupation, monthly expenditures, education level, and city of residence) characteristics.

3.1. Developed research model

Three constructs were used to analyze the outcome of MFOA acceptance: MFOA satisfaction, brand satisfaction, and brand loyalty. Together with the MFOA usage, in total, the research model used four variables, and four hypotheses are proposed based on the literature survey, as illustrated in Fig. 2.

3.2. Measurement development

Multiple items were adapted from the extant literature to measure each construct in the model and improve the study's content validity. MFOA usage was measured through the widely used scales of Davis et al. (1989) and Venkatesh and Davis (1996). The scale items of Kuo et al. (2009) and Özer et al. (2013) were used to measure MFOA satisfaction and brand satisfaction. Lastly, items from the scale used by Chang et al. (2009) and Özer et al. (2013) were considered to measure brand loyalty. The items were tested for their understandability using a pretest including 15 students, and they were slightly reworded afterward. All of the items were measured through Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree) (see Table 1).

3.3. Data collection and sample characteristics

We gathered data from an online survey of MFOA users to test the hypotheses and address the research purpose. Despite the advantages of online data collection, such as the removal of geographical constraints, some limitations exist, such as the respondents' computer skills (Malhotra, 2007). However, this limitation was not applicable in this study because the research purpose was about MFOAs, and the respondents were selected based on their MFOA usage. Thus, it was assumed that the participants had enough computer skills to complete the survey online.

We used structural equation modeling to test the hypotheses, for which Hoelter (1983) suggests a minimum sample size of 200. On the other hand, the most widely used method for estimating the minimum sample size in PLS-SEM is the "10-times rule" method (Hair et al., 2011). According to this rule, the maximum number of model links pointing at any variable in the model is 2, which, when multiplied by 10, yields 20, regardless of the strengths of the path coefficients. As this method can lead to inaccurate estimations, Hair et al. (2014b) proposed an alternative called the minimum R-squared method, based on Cohen's (1988) power tables for least squares regression. With a maximum of 2 arrows pointing at a latent variable, and with the minimum R^2 as 0.5, the model shows a minimum sample size of 33.

In order to meet the minimum sample size suggestions by Hoelter

Table 1
List of constructs and their items.

Construct	Items	References
MFOA Usage	*MFOA_usage_1.* I typically use food-ordering applications. *MFOA_usage_2.* I prefer to make my food orders with mobile applications. *MFOA_usage_3.* I use mobile applications for my food orders.	adapted from Davis et al. (1989) and Venkatesh and Davis (1996)
MFOA Satisfaction	*MFOA_satisfaction_1.* The MFOA I used last time fulfilled my needs. *MFOA_satisfaction_2.* The MFOA I used last time fulfilled my expectations. *MFOA_satisfaction_3.* I liked the MFOA I used last time. *MFOA_satisfaction_4.* The MFOA I used last time is of high quality. *MFOA_satisfaction_5.* Overall, I am satisfied with the MFOA I used last time.	adapted from Kuo et al. (2009) and Özer et al. (2013)
Restaurant Brand Satisfaction	*Brand_satisfaction_1.* The last restaurant I ordered from fulfilled my needs. *Brand_satisfaction_2.* The last restaurant I ordered from fulfilled my expectations. *Brand_satisfaction_3.* The last restaurant I ordered from is of high quality. *Brand_satisfaction_4.* I liked the last restaurant from which I ordered. *Brand_satisfaction_5.* Overall, I am satisfied with the last restaurant from which I ordered.	adapted from Kuo et al. (2009) and Özer et al. (2013)
Restaurant Brand Loyalty	*Brand_loyalty_1.* I intend to continue to make orders from the last restaurant from which I ordered. *Brand_loyalty_2.* I think I will order from the last restaurant I ordered from in the future. *Brand_loyalty_3.* I recommend the last restaurant I ordered from to others.	adapted from Chang et al. (2009) and Özer et al. (2013)

(1983), Hair et al. (2011), and Hair et al. (2014b), this study included 217 participants who had already have adopted MFOAs. It was assumed that MFOA users would manage to answer the questions online. On the other hand, online data collection enables researchers to track information about the participants in real time, to avoid double responses from the same respondent and to exclude respondents who did not complete the whole questionnaire. A Web-based survey was preferred because it is more convenient and cost-efficient, participants can be reached faster, and responses can be collected more quickly and stored electronically (Boyer et al., 2002).

The data were collected online using a snowball sampling technique, which is widely used in social science research (Biernacki and Waldorf, 1981). The technique is also called referral sampling, in which the researcher identifies an initial group of respondents who can help the researcher to identify additional people to be included in the research sample (Joseph et al., 2009). This technique helps to provide in-depth results relatively quickly. In this fieldwork, the respondents referred other participants who had adopted MFOAs.

The participants' gender distribution was almost equal, with 112 women and 105 men. A majority of the participants were aged 26–35 years old, at 56% of the sample, and the second largest group was aged 18–25 years old, at 34% of the total, followed by the group aged 36–45 years old, at 10%. With respect to education levels, 22% of the respondents had at least a bachelor's degree, and 19% were bachelor's students. Regarding location, 76% of the participants lived in Istanbul, and the rest lived in major cities such as Ankara and Izmir. Moreover, 54% of them lived with their parents.

Most of the participants (30%) indicated that they had ordered food in the last day, and 23% had ordered food in the last one week. In addition, the respondents were asked where they made food orders. More than half of the respondents (83%) made food orders when they were at home, while 11% of them ordered food at their workplace, and 5% of them did so at a friend's home. Most of the sample (78%) preferred the MFOA Yemeksepeti. GetirYemek was the second most preferred application, at 12%.

4. Research findings

4.1. Non-response bias test

Before analyzing the data, a non-response bias test was performed to avoid non-response bias. For this purpose, the extrapolation method was used to detect differences in variables by comparing early and late respondents, as suggested by Armstrong and Overton (1977). Thus, an independent sample *t*-test was conducted to compare the first 30 and the last 30 respondents. The result has indicated no significant differences between the two groups at a 0.05 level. Therefore, no problems involving non-response bias occurred in this research.

4.2. Construct reliability and validity

Before testing the structural model, its internal consistency, convergent validity, and discriminant validity were assessed. First, the Cronbach's alpha coefficients were used to evaluate internal consistency. A value higher than 0.6 is suggested for satisfactory consistency (Malhotra, 2007). Secondly, convergent validity was tested based on two criteria suggested by Fornell and Larcker (1981): (1) all of the factor loadings should be significant and exceed the value of 0.70, and (2) the average variance extracted (AVE) for each factor should exceed the variance due to measurement error for that construct (i.e., it should exceed 0.50). Moreover, a heterotrait-monotrait (HTMT) ratio of 0.85 was used as the cutoff value for assessing discriminant validity, as suggested by Henseler et al. (2015) and Voorhees et al. (2016).

Table 2 shows that the composite reliability scores and Cronbach's alpha coefficients for all constructs exceeded 0.9, indicating high reliability and high internal consistency of the measurement. The items' factor loadings were higher than 0.8 on their respective constructs, meaning acceptable item convergence. On the other hand, AVE ranged from 0.793 to 0.887, which exceeded the critical value of 0.50 suggested by Hair et al. (2014b). Hence, it has been concluded that the criteria for convergent validity were met.

To assess the discriminant validity, the square root of the AVE from a factor should be greater than the correlations among the factors (Fornell and Larcker, 1981). However, Henseler et al. (2015) showed that the

Table 2
Evaluation of scales for reliability and convergent validity.

Construct	Items	M (SD)	Loading (λ)	Cronbach's α	CR	AVE
MFOA Usage	MFOA_usage_1	4.27 (1.11)	0.922	0.948	0.948	0.858
	MFOA_usage_2	4.30 (1.06)	0.949			
	MFOA_usage_3	4.33 (1.07)	0.907			
MFOA Satisfaction	MFOA_satisfaction_1	4.24 (0.96)	0.940	0.959	0.959	0.825
	MFOA_satisfaction_2	4.20 (0.96)	0.917			
	MFOA_satisfaction_3	4.24 (0.97)	0.928			
	MFOA_satisfaction_4	4.17 (1.02)	0.884			
	MFOA_satisfaction_5	4.21 (1.05)	0.872			
Restaurant Brand Satisfaction[a]	Brand_satisfaction_1	4.01 (1.05)	0.934[a]	0.954[a]	0.955[a]	0.808[a]
			0.938[b]			
	Brand_satisfaction_2	4.01 (1.07)	0.836[a]			
			0.805[b]			
	Brand_satisfaction_3	3.81 (1.08)	0.944[a]			
			0.954[b]			
	Brand_satisfaction_4	4.04 (1.04)	0.935[a]			
			0.932[b]			
	Brand_satisfaction_5	3.99 (1.08)	0.839[a]			
			0.874[b]			
Restaurant Brand Loyalty[a]	Brand_loyalty_1	3.99 (1.08)	0.873[a]	0.920[a]	0.920[a]	0.793[a]
			0.856[b]			
	Brand_loyalty_2	4.09 (1.09)	0.895[a]			
			0.918[b]			
	Brand_loyalty_3	3.92 (1.14)	0.904[a]			
			0.874[b]			
Restaurant Brand Satisfaction & Loyalty[b]				0.969[b]	0.969[b]	0.798[b]

[a] *Before merging the constructs.*
[b] *After merging the constructs.*

Fornell–Larcker criterion may not reliably detect a lack of discriminant validity. Thus, the HTMT ratio was proposed to assess discriminant validity. As the HTMT ratio between brand satisfaction and loyalty (0.992) was considerably higher than the cutoff value (0.85), these two variables were merged and replaced with a new (merged) construct, as suggested by Henseler et al. (2015).

A strong correlation between satisfaction and loyalty is observed frequently in the literature, with correlation values greater than 0.6 (Bennett and Rundle-Thiele, 2004; Cronin et al., 2000), strong beta values greater than 0.6 (Eriksson and Vaghult, 2000; Mattila, 2001; Oliver and Linda, 1981), and r^2 statistics greater than 0.7 (Gronholdt et al., 2000). Because the main purpose of this study is to examine the role of MFOAs in developing brand satisfaction and loyalty for restaurants, the model was modified and tested with three constructs: MFOA usage, MFOA satisfaction, and restaurant brand satisfaction and loyalty.

Regarding the discriminant validity, the square root of the AVE from a factor should be greater than the correlations between the factors (Fornell and Larcker, 1981). The diagonal values shown in Table 3 exceeded the inter-factor correlations. Thus, the conditions for discriminant validity were also met.

4.3. Model's goodness of fit

The structural model was tested using consistent partial least squares path modeling (PLSc-PM) to estimate the structural equation models and to test the hypotheses (Wold, 1982). PLS-PM was used because it is based on regression, which minimizes the residual variances of the variables (Hair et al., 2011; Merli et al., 2019). Moreover, as a structural-equation-modeling technique, PLS enables researchers to analyze complex relationships between variables while also examining their direct, indirect, and moderating relationships (Nitzl et al., 2016). On the other hand, PLS-PM tends to skew factor loadings upward and underestimate regression coefficients (Gefen et al., 2011). Moreover, it tends to produce Type I and Type II errors (Dijkstra and Henseler, 2015). To avoid these problems, Dijkstra and Henseler (2015) suggested using an extension of PLS—consistent PLS-PM (PLSc-PM)—because it provides a correction for estimates when PLS is applied to reflective constructs.

In order to assess the model fit in PLSc-PM, a standardized root mean square residual (SRMR) and discrepancy values should be estimated. The model can be acceptable if the SRMR value is less than 0.080 and the discrepancy values are less than 0.95 (Benitez et al., 2020). The SRMR of 0.032 and the discrepancy value, which was non-significant ($p > 0.05$), give evidence of the model's fit. In addition, Lohnoller (1989) provides information about the NFI (normed fit index) computation of PLS path models. The model's NFI value of 0.908 is higher than 0.9, which represents an acceptable fit.

We also assessed the structural model's capability to predict. This measurement was based on Stone-Geisser's Q^2 (Geisser, 1974; Stone, 1974), using blindfolding procedures (Tenenhaus et al., 2005). The Q^2 values, which were above zero (0.463 and 0.546), give evidence that the model has predictive relevance (Henseler et al., 2009) (see Table 3).

Because different researchers suggest different fit measures, another approach is to assess goodness of fit (GoF) differently in PLS-PM than fit measures are in covariance-based SEM (Hair et al., 2014a). The measurement tool suggested by Tenenhaus et al. (2005) was used to assess the model fit in this study. This tool uses the geometric mean value of the average communality score (AVE values) and the average R^2 values (for endogenous constructs). The results then were assessed using the following cut-off values proposed by Wetzels et al. (2009): $GoF_{small} = 0.1$; $GoF_{medium} = 0.25$; $GoF_{large} = 0.36$. The calculated GoF was 0.839, which shows a very good model fit. Therefore, it can be concluded that the model proposed in this study has significant predictive relevance and explanatory power.

Table 3
Correlation matrix and discriminant validity.

Construct	1.	2.	3.	R^2	Q^2
1. MFOA Usage	*0.926*				
2. MFOA Satisfaction	0.777[a]	*0.908*		0.604	0.463
3. Restaurant Brand Satisfaction and Loyalty	0.686[a]	0.848[a]	*0.893*	0.720	0.546

Note. The scores in italics on the diagonal represent the square root of the average variance extracted for the construct.

[a] Correlation scores and HTMT ratios. All of the correlations were significant at the 0.01 level (2-tailed).

4.4. Path analysis and hypotheses testing

Table 4 summarizes the findings of the structural model. Since partial least squares regression, as a distribution-free technique, relies on the bootstrapping resampling technique to determine path significance (Henseler et al., 2009), 500 resamples were taken to perform the bootstrapping. According to the results, the R^2 values—the explanatory power—of MFOA satisfaction and brand satisfaction and loyalty were 0.604 and 0.72, respectively (see Table 3). R^2 values higher than 0.10 are recommended for a latent construct to be decided as adequate (Falk and Miller, 1992). Moreover, values between 0.33 and 0.67 indicate a moderated effect (Chin, 1998).

Based on *t*-tests, which were conducted to test the significance of the path coefficients based on a significance level of 0.05, all of the proposed hypotheses were supported, as predicted in the literature survey. Accordingly, MFOA usage leads to MFOA satisfaction. Moreover, MFOA satisfaction exhibits significant direct effects on brand satisfaction and loyalty.

5. Discussion

The study was conducted to examine the role of MFOAs for restaurant brands in terms of brand satisfaction and loyalty. The TAM was used as a starting point because it was developed to understand user intentions toward information technologies (Bigné et al., 2007; Davis, 1989). Although previous studies have showed the roles of TAM variables including perceived usefulness, perceived ease of use, behavioral intention, and usage, this research goes beyond the TAM and adds consequent variables. In other words, the TAM indicates why people accept use of the technologies, whereas this study demonstrates the results after people accepted the use of a technology and actually used it, by focusing on MFOAs.

Before people use mobile applications, they have certain expectations. Accordingly, mobile app satisfaction depends on these expectations. Users compare their expectations to the perceived value based on what they really obtained (Chang et al., 2009; Kotler and Armstrong, 2010). In parallel with previous studies, the results show that MFOA usage leads to MFOA satisfaction. In other terms, restaurant customers order via MFOAs, and their satisfaction level depends on the MFOAs' performance.

As shown in the Fig. 1, MFOAs are the intermediaries between restaurant brands and their customers because these applications (e.g. Yemeksepeti, Getiryemek, and Glovo) have multiple restaurant brands

Table 4
Path coefficients and total effects.

	Path Coefficients	*t* Statistic	*p* Value
MFOA Satisfaction - > Restaurant Brand Satisfaction and Loyalty	0.848	23.240	0.000
MFOA Usage - > MFOA Satisfaction	0.777	14.552	0.000
MFOA Usage - > Restaurant Brand Satisfaction and Loyalty	0.659	10.539	0.000

on their systems. The customers have expectations of both MFOA usage and the restaurant brands. They evaluate the service they receive based on their use of MFOAs and the quality of the food sent by the restaurants (Chang et al., 2009; Zhao et al., 2012). The results of the study also confirm that as long as users are satisfied with the MFOA, they can be satisfied with and loyal to restaurant brands.

When customers are highly satisfied, they become loyal to the restaurant and tend to repurchase from it (Lambin et al., 2007). The findings confirm the strong relationship between restaurant satisfaction and loyalty, in parallel with the extant literature (Bennett and Rundle-Thiele, 2004; Cronin et al., 2000; Eriksson and Vaghult, 2000). The present study also revealed this strong relationship, so that these two variables cannot be separated in customer minds. Moreover, the main contribution of this study is in showing the positive effect of MFOA satisfaction on restaurant brand satisfaction and loyalty.

6. Conclusion

Technology has blurred the difference between online and physical channels. Thus, retailers and their supply-chain partners must rethink their competitive advantages (Brynjolfsson et al., 2013). Mobile technologies are popular within retail. Mobile devices have been empowered with mobile applications that offer different services, flexibility, mobility, and efficiency for the users (Rao and Troshani, 2007).

This study differs from previous studies by moving beyond drivers of the app adoption. The main purpose of this study was to investigate the outcomes of MFOA acceptance by considering MFOA satisfaction, brand satisfaction, and brand loyalty. All of the hypothesized relationships between these variables in the model were supported. Thus, this study implies that the food-service industry can take advantages of MFOAs because their usage can create brand satisfaction and brand loyalty for the restaurants. If consumers are satisfied with the MFOAs, they can also be satisfied with and exhibit loyalty toward the restaurant brands from which they have made previous food orders. Thus, restaurants should cooperate with MFOA creators, especially during the pandemic, to develop their brand equity.

Restaurants are integrating new technologies, often including MFOAs, into their businesses. Because satisfaction with an MFOA is important for both a restaurant's brand satisfaction and loyalty, restaurants ought to make the right decisions when selecting MFOAs with which to partner.

Besides its contributions, this study has also several limitations. The age groups of 18–25 and 26–35 years old comprised the majority (90%) of the sample. Thus, these results could be biased toward these young groups' opinions. In addition, all of the MFOAs were developed by local companies. Thus, different cultures and markets may reveal different mediator or moderator effects, which can be subject to further research. Moreover, studies directed to other groups on the mobile application matrix are needed to validate, expand, and generalize the findings of this research.

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