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Empirical Research Article

Understanding the Acceptance of Mobile Food Ordering Applications: Role of Confidence in Food Safety Measures

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Abstract

This study examines the factors influencing the use of mobile food ordering applications and their impact on consumption behavior amidst recent societal changes. It re-evaluates the relevance of factors from the UTAUT2 theory in predicting customers' behavioral intentions. Additionally, the study explores the moderating effect of confidence in food safety measures (CFSM). Quantitative research methods are employed. A structured questionnaire that measures the psychological factors, behavioral intention, and actual usage of mobile food ordering applications was used to collect customer data. Regression and moderation analyses are conducted to test the hypotheses and examine the moderating role of CFSM. The findings reveal that performance expectation, effort expectation, and habit significantly predict customers' intention to use mobile food ordering applications. Moreover, for customers with high CFSM, social influence, facilitating conditions, and hedonic motivation add additional contributions to their behavioral intention. This study extends the UTAUT2 theory by applying it to mobile food ordering applications and examining the influence of CFSM. It identifies the specific factors that drive customers' intention to use these applications and highlights the importance of CFSM as a moderating factor. The findings offer theoretical insights and practical implications for researchers and practitioners in the mobile food ordering industry.

Keywords

mobile food ordering applications; food delivery applications; food safety measures; Unified Theory of Acceptance and Use of Technology

1. Introduction

The global economy has been profoundly impacted by the recent pandemic, with the hospitality industry, in particular, experiencing devastating effects. Many restaurants worldwide lost billions of dollars; some even faced business closures (Hass et al., 2020). It has been reported that the restaurant industry alone has lost about $240 billion by 2020 (Hass et al., 2020). While the pandemic's devastating impact is evident, there has also been a thriving wave of innovation in response to these challenging circumstances. Hospitality organizations have quickly adapted their services and embraced new technologies to survive this harsh business environment (Elkhwesky et al., 2022). One noteworthy example is the adoption of mobile food ordering applications (MFOAs).

Mobile food ordering applications (MFOAs) are the "mobile apps that smartphone users download and use as an innovative and convenient channel to access restaurants, view food menus, place food orders, and make payments without any physical interaction with restaurant staff" (Alalwan, 2020, p. 29). In recent years, a majority of restaurant patrons have used mobile order applications, resulting in an exponential increase in sales of MFOAs (Elkhwesky et al., 2022). Customers are ordering food using MFOAs more often than in the pre-pandemic era (Pymnts, 2022), which indicates that MFOAs are no longer a temporary strategy during the pandemic but a sustainable innovation for the hospitality business nowadays.

While MFOAs gained prominence during the pandemic, it is important to note that these technologies already existed and were utilized by customers. Previous theories, such as the unified theory of acceptance and use of technology (UTAUT) and its extended version (UTAUT2), offer insights into consumers' adoption of new technologies like MFOAs (Venkatesh et al., 2003; Venkatesh et al., 2012). However, there are critical knowledge gaps that need to be addressed.

First, the pandemic has brought about significant changes in public health and social behaviors, necessitating a reassessment of the psychological factors influencing the intention and actual use of MFOAs. While UTAUT2 has proposed six psychological factors that have been empirically supported (Venkatesh et al., 2012), the dramatic shifts in customer perception and behavior, along with the transformed business environment, require a fresh examination of whether customers are still inclined to use MFOAs based on prior theories' psychological factors.

Second, prior studies subscribing to MFOAs mainly treated such applications as a means of food *delivery*. Because the origin of most MFOAs (e.g., Grubhub) was more like the online ordering and delivery service, early studies regarding such technology

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focused on its *delivery* feature, calling such technology mobile food delivery applications (Belarmino et al., 2021). However, the rapid development of technology enables customers to order food more conveniently using cell phones. Thus, it is important to identify key drivers to use mobile applications, including both ordering and delivering.

Third, the pandemic has generated heightened concerns about food safety. People now have increased apprehensions about safety measures at restaurants and during food delivery. Despite its impact, the role of the concerns in food safety measures has not been addressed. Prior studies on food safety have mainly investigated customers' safety concerns during onsite food production and presentation (e.g., Arendt et al., 2013). However, it is plausible that people, after more than two years of COVID-19 safety protocols, develop increased concerns about food handling throughout the entire food ordering and delivery process. Some people may feel reluctant to use MFOAs even though they understand the convenience and benefits of MFOAs due to food safety concerns. Thus, customers' safety concerns using MFOAs must be considered when examining MFOA usage.

To fill these gaps, this research aims to re-examine the effectiveness and validity of the well-established theory in technology acceptance: UTAUT2, to identify factors influencing customers' use of MFOAs. Further, this study investigates the moderating role of customers' confidence in food safety measures (CFAM) on the relationship among key factors influencing customers' acceptance of MFOAs, behavioral intention, and actual behavior. Therefore, this study added value to the theoretical implications by exploring CFSM, which is more important and carefully considered after the COVID-19 pandemic. The findings of this study not only advance understanding of UTAUT2 among customers in the post-pandemic era but also assist hospitality practitioners such as the decision-makers who are enhancing new technologies, MFOA developers and management in the MFOA industry with suggestions on app development and marketing that will enable them to flourish in today's highly mobile business environment.

2. Literature Review and Hypotheses

2.1. Mobile Food Ordering Applications

MFOAs have experienced significant growth and popularity among customers and restaurants, emerging as a rapidly growing online-to-offline mobile technology (Roh and Park, 2019; Al Amin et al., 2020; Al Amin et al., 2021). There are two main types of MFOAs: those offered by specific restaurants, such as Domino's and Pizza Hut, and third-party intermediary platforms, like Uber Eats, DoorDash, and Meituan (Dirsehan and Cankat, 2021; Zhao and Bacao, 2020). These apps facilitate effective communication between customers and restaurants, reducing waiting times and improving food delivery efficiency (Tandon et al., 2021).

MFOAs share some similarities with online ordering websites. These similarities include enabling customers to access a variety of restaurants at the times and locations of customers convenience and get up-to-date information regarding the restaurants and their menus (Alalwan, 2020). MFOAs also possess unique, innovative features compared with traditional online ordering. For example, the GPS function empowers customers to locate restaurants nearby and track order progress throughout delivery. MFOAs also facilitate real-time communication between customers and restaurants throughout the entire food consumption process (Alalwan, 2020), including food preparation, delivery, and post-purchase services (e.g., eWOM and complaints).

Moreover, the innovative features of MFOAs make them even more appealing and one of the most prominent food ordering platforms during the global COVID-19 pandemic (Al Amin et al., 2021; Dirsehan and Cankat, 2021; Sharma, Dhir, Talwar, and Kaur, 2021). In an effort to reduce the risk of infection, people have been advised to avoid physical contact with others (WHO, 2020). MFOAs have enabled customers to order food without physically interacting with the restaurant's staff and other customers (Alalwan, 2020), aligning with the health and safety guidelines. In addition, restaurants have embraced the challenges posed by the pandemic by transitioning from offline to online operations (Shah, Yan, and Qayyum, 2021), aiming to survive and thrive in these times (Yang, Li, Lau, and Zhu, 2021). While the pandemic is no longer a global health emergency, MFOAs can still profoundly affect customers' food consumption behavior. Therefore, it is critical for hospitality academics and practitioners to understand the factors contributing to customers' actual usage behavior of MFOAs.

2.2. The Extended Unified Theory of Acceptance and Use of Technology (UTAUT2)

This study examines customers' MFOA usage behavior based on the well-established extended unified theory of acceptance and use of technology (UTAUT2) (Venkatesh et al., 2012). UTAUT2 was extended from the seminal UTAUT, which was developed and utilized to explain technology acceptance and use in organizational contexts (Venkatesh et al., 2003). The original UTAUT presented four key drivers of people's behavioral intention to adopt a certain technology: *performance expectancy*, *effort expectancy*, *social influence*, and *facilitating conditions* (Venkatesh et al., 2003). Later, the UTAUT was adapted to explain people's technology use from the consumers' perspective and enriched with three new drivers relevant to the consumer context: *hedonic motivation*, *price value*, and *habit* (Venkatesh et al., 2012). With these newly incorporated constructs, the UTAUT2 was created and then applied and validated to the research of various new technologies across consumption settings (e.g., Martins, Oliveira, and Popovič, 2014; Morosan and DeFranco, 2016; Wang, Malthouse, and Krishnamurthi, 2015; Wang et al., 2022; Yeo, Goh, and Rezaei, 2017). The following section is devoted to explaining the constructs of UTAUT2 and how each construct would drive customers' behavioral intention and the actual behavior of using MFOAs.

Performance expectancy (PE) is defined as "the degree to which using a technology will provide benefits to consumers in performing certain activities" (Venkatesh et al., 2012, p. 159). The utility and efficacy of new technology make the particular technological innovation stand out and attract customers to adopt it (Okumus, Ali, Bilgihan, and Ozturk, 2018; Xu, Jeong, Baiomy, and Shao, 2020). As a useful innovation, MFOAs are especially beneficial and valuable to customers for their convenience (Shah et al., 2021), efficiency, diverse food choices (Cho, Bonn, and Li, 2019), and functionality (Halim et al., 2021; Yeo et al., 2017). MFOAs have various functions that appeal to customers throughout the entire food-ordering process (Roh and Park, 2019). These applications offer customers diverse food options (Shah et al., 2021), make it easier for customers to select restaurants based on the types of food they offer, and allow customers to compare restaurants using specific criteria such as rating, price, and distance. Besides, MFOAs should be time-saving (Yeo et al., 2017). More importantly, MFOAs save customers from physical efforts to visit restaurants (Alalwan, 2020). These features collectively contribute to MFOAs' performance expectancy. When customers perceive a higher level of performance expectancy of MFOAs, they are likely to have a stronger behavioral intention to use MFOAs (Alalwan, 2020). Thus, the following hypothesis is proposed:

H1: Performance expectancy positively influences customers' behavioral intention to use MFOAs.

Effort expectancy (EE) refers to the extent to which the adoption and usage of new technology will be easy and cost less effort (Venkatesh et al., 2003; Venkatesh et al., 2012), which was also conceptualized as ease of use in some studies (e.g., Davis, Bagozzi, and Warshaw, 1989; Ray, Dhir, Bala, and Kaur, 2019; Roh and Park, 2019; Sha et al., 2021). As a specific type of interactive self-service ordering technology, MFOAs require customers to

make food orders without assistance from the restaurant staff (Alalwan, 2020). Therefore, the simplicity of design becomes vital in determining customers' usage intention (Cho et al., 2019). Specifically, MFOAs should be easy to learn and use at the initial adoption stage (Okumus and Bilgihan, 2014). The applications should offer clear information with uncomplicated functions that are easy for customers to follow (Cho et al., 2019). In terms of software design, MFOAs should also have high system and information quality (Lee, Sung, and Jeon, 2019; Wang et al., 2019), enabling customers to smoothly search for information, make food choices, place, and track orders, and provide post-purchase feedback without technical problems (Sharma et al., 2021). When customers feel that using MFOAs to order food is effortless, they are more likely to adopt MFOAs. Thus, this study proposes the following hypothesis:

H2: Effort expectancy positively influences customers' behavioral intention to use MFOAs.

Social influence (SI) is the extent to which customers perceive members of their social circle consider they should use the new technology (Venkatesh et al., 2012). Social influence has been consistently recognized as a critical contributor to customers' technology usage behaviors (e.g., Lee et al., 2019; Okumus et al., 2018; Zhao and Bacao, 2020). New technological innovations are often adopted first by a group of novelty-seeking and tech-savvy customers and then spread to the market via personal recommendations from close social ties such as family and friends, as well as via eWOM (electronic Word-of-Mouth) from distant social ties such as fellow customers from the online community (Hu and Kim, 2018). In other words, social influence is a significant driver of customers' technology adoption behavior (Venkatesh et al., 2012). It could even become a social norm to utilize a certain technological innovation (e.g., Okumus and Bilgihan, 2014; Roh and Park, 2019). Previous studies have empirically confirmed that social influence facilitates customers' usage of various technologies, including food delivery applications (e.g., Alawan, 2020; Okumus et al., 2018; Zhao and Bacao, 2020). Thus, this study proposes the following hypothesis:

H3: Social influence positively influences customers' behavioral intention to use MFOAs.

Facilitating conditions (FC) refer to customers' perceptions of the resources and support available to assist in adopting new technology (Venkatesh et al., 2012). In the context of MFOAs, facilitating conditions include the technical infrastructure, customers' basic technical skills, and human support regarding using these mobile applications (Alalwan, 2020). As a particular type of mobile software, MFOAs have to be used on a smartphone with an Internet connection as the basic infrastructure. Besides, customers are expected to have the basic knowledge and skills to embrace MFOAs. Moreover, when technical issues or service failures occur, human support should be easily accessible to customers and help them deal with these problems efficiently (Alalwan, 2020). These facilitating conditions are key to removing the barriers to using new technology and promoting adoption (Lee et al., 2019; Okumus et al., 2018; Venkatesh et al., 2003). Therefore, this study suggests the next hypothesis:

H4: Facilitating conditions positively influences customers' behavioral intention to use MFOAs.

Hedonic motivation (HM) refers to the intrinsic enjoyment, pleasure, and fun derived from using new technology (Brown and Venkatesh, 2005). When adopting new technology, the novelty and innovativeness of the new invention are among the key characteristics that attract customers (Venkatesh et al., 2012). Hedonic motivation can also relate to the esthetic and experiential enjoyment associated with the entire consumption process of using the new technology (Yeo et al., 2017). Interacting with new technology could also be entertaining (Hu, 2021). MFOA is considered an outstanding new technology that dramatically changes customers' consumption behaviors worldwide by being innovative and stylish (Alalwan, 2020; Wen, Pookulangara, and Josiam, 2022). Pursuing hedonic value is one of the main motivations driving customers to consume and interact with new technologies (Chiu, Wang, Fang, and Huang, 2014; To, Liao, and Lin, 2007). Thus, when customers feel that using a certain technology is pleasant and enjoyable, they are more likely to adopt it (Okumus and Bilgihan, 2014). We then propose the following hypothesis:

H5: Hedonic motivation positively influences customers' behavioral intention to use MFOAs.

Price value (PV) is a critical difference between UTAUT2 and UTAUT, where price value is only relevant in the consumer technology adoption setting. It refers to "consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them" (Venkatesh et al., 2012, p. 161). In the context of MFOAs, customers tend to take into account the cost of using mobile applications, such as the registration fee, member fee, and delivery fee. In addition, they are likely to compare if ordering food via MFOAs would be more cost-saving than ordering food from traditional channels (Yeo et al., 2017). For instance, customers often expect MFOAs to offer coupons, discounts, or reward points to increase the overall price value of the purchase (Alalwan, 2020). Despite cost-saving, when using MFOAs, customers also appreciate fair prices along with good food quality, having great value for money (Tandon et al., 2021; Yang et al., 2021). Therefore, if customers perceive that using MFOAs is going to bring a high level of price value, they are more likely to use them, introducing the next hypothesis:

H6: Price value positively influences customers' behavioral intention to use MFOAs.

Habit (HT) is customers' tendency to act automatically because of their accumulated learning experiences (Limayem, Hirt, and Cheung, 2007). If the experience of using a certain technology is satisfactory, customers will likely continue to use it and gain more experience (Alalwan, 2020). When previous experiences of using the technology accumulate, habitual behavior is likely to be formed and reinforced. Customers then tend to use the technology spontaneously out of habit (Venkatesh et al., 2012). Habit has been found to be a significant driver of customers' behavioral intention toward using MFOAs (Alalwan, 2020; Lee et al., 2019). Moreover, the effect of habit may become even more prominent post the pandemic. Because of the restrictions regarding mandatory closures of restaurants (Yost, Kizildag, and Ridderstaat, 2021), social distancing, and uncertainty risks of the pandemic, customers are more likely to use MFOAs repeatedly during the pandemic (Zhao and Bacao, 2020). Moreover, restaurants tend to embrace online delivery as a strategic reaction to the drop in demand due to the pandemic and further cultivate customers' habitual behavior of online ordering (Kim, Kim, and Wang, 2021; Yang et al., 2021; Yang, Liu, and Chen, 2020). Once customers get used to ordering food through MFOAs, they may carry over the spontaneous habitual behavior. Therefore, the following hypothesis is proposed:

H7: Habit positively influences customers' behavioral intention to use MFOAs.

Behavioral intention is individuals' subjective probability that they will engage in a certain behavior (Fishbein and Ajzen, 1975; Swar, Hameed, and Reychav, 2017). In the research of MFOAs, behavioral intention is often adopted as a proxy for actual usage behavior (e.g., Alalwan, 2020; Al Amin et al., 2020; Cho et al., 2019; Halim et al., 2021; Kaur et al., 2021). However, behavioral intention should not be considered a surrogate for actual behavior but rather an antecedent (Wu and Du, 2012). In the context of technology acceptance, the behavioral intention of using new technology has been consistently identified as a direct driver of actual behavior (Okumus and Bilgihan, 2014; Venkatesh et al., 2003; Venkatesh et al., 2012; Wu and Du, 2012). Thus, following the original UTAUT2 model, this study proposes that:

H8: Customers' behavioral intention to use MFOAs positively influences actual behavior.

2.3. The Moderating Role of Confidence in Food Safety Measures (CFSM)

Confidence in Food Safety Measures (CFSM) refers to customers' confidence in the safety of ordering food via MFOAs (Agrusa et al., 2021). It encompasses safety measures in food preparation, production, processing, handling, and delivery (Al Amin et al., 2021). There are multiple aspects to customers' CFSM in terms of using MFOAs. Customers must believe the restaurant and its employees comply with the food safety measures to prepare food and keep the premises hygienic (Hu, Yan, Casey, and Wu, 2021). In addition, customers are comfortable using MFOAs because they believe the MFOAs delivery staff would strictly follow the food safety measures (Hu et al., 2021). Moreover, customers should be assured that the food provided by MFOAs would be intact from any contamination throughout the food preparation and delivery process.

Food safety has always been one of the customers' top concerns regarding food consumption (e.g., De Jonge et al., 2004; Rimal et al., 2001), and the unprecedented global pandemic has made customers more hygiene-conscious and safety-conscious (Sharma et al., 2021). Food safety measures greatly concern customers and significantly determine customers' food-ordering behaviors during the pandemic (Shah et al., 2021; Wen et al., 2022) and may exert a long-lasting effect on customers' future food consumption behavior. Therefore, customers' confidence in food safety measures regarding using MFOAs turns into a critical factor affecting customers' food-consumption decisions (Agrusa et al., 2021; Sharma et al., 2021; Zhao and Bacao, 2020).

Accordingly, whether the UTAUT2 components would significantly affect customers' behavioral intention of using MFOAs depends on customers' CFSM. If customers have minimal CFSM in using MFOAs, they are unlikely to even consider MFOAs as an option. Only when customers have a high-level CFSM in using MFOAs, can they be comfortable and open to the idea of adopting such applications (Agrusa et al., 2021; Poon and Tung, 2024). Once customers are assured of safety, they will evaluate the design features of MFOAs (e.g., performance expectation, effort expectation, and facilitating conditions), their own intrinsic beliefs (e.g., hedonic motivation and price value), their previous habits regarding MFOAs, as well as the external influence (e.g., social influence) on using MFOAs. Subsequently, these UTAUT2 components drive customers to develop a usage intention (Zhao and Bacao, 2020). Thus, this study introduces the following hypotheses:

H9-15: CFSM moderates the effects of the UTAUT2 components (i.e., performance expectation (H9), effort expectation (H10), social influence (H11), facilitating conditions (H12), hedonic motivation (H13), price value (H14), and habit (H15)) on behavioral intention, such that each component of UTAUT2 has a stronger effect on behavioral intention as CFSM increases.

3. Method

3.1. Sample and Procedure

Survey participants were recruited from Qualtrics. After filtering out participants who failed to answer quality control questions (n = 43), 428 responses were used for the analysis. The mean age of participants was 40 years, and 51% (n = 219) were women. Over half of the participants (57.7%; n = 247) had an associate college degree (2-year) or higher education level. At first, the definition of MFOA and examples such as UberEats, Doordash, GrubHub, and Postmates were provided. Then, based on their experience, participants completed a questionnaire that assessed the factors influencing mobile services adoption, CFSM, behavioral intention, actual behavior, and demographic information such as age, gender, and education level.

3.2. Measurements

We adopted well-documented UTAUT2 scales to measure *performance expectation* (4 items, α = 0.94), *effort expectancy* (4 items, α = 0.95), *social influence* (3 items, α = 0.95), *facilitating condition* (4 items, α = 0.83), *hedonic motivation* (3 items, α = 0.93), *price value* (3 items, α = 0.96), *habit* (4 items, α = 0.93), and *behavioral intention* (3 items, α = 0.91) (Venkatesh et al., 2012). These scale items were assessed via Likert-type scales, ranging from 1 (strongly disagree) to 7 (strongly agree). Actual behavior was measured through a question asking how frequently the participants use MFOA with anchor points ranging from 1 to 7—1 (never), 2 (once a month), 3 (2-3 times a month), 4 (once a week), 5 (2-3 times a week), 6 (once a day), and 7 (more than once a day). Finally, a three-item measure (α = 0.94) to assess CFSM was adapted from a previous study of Agrusa and colleagues (2021) using a 7-point Likert-type scale (1 = strongly disagree, 7 = strongly agree).

4. Results

4.1. Descriptive Analysis and Correlations

The mean values indicate that customers overall have positive perceptions toward MFOA except for habit (M = 3.11, SD = 1.82) (see Table 1 for details). These findings indicate although customers perceive MFOA in a positive lense overall, they do not use MFOA habitually. In other words, hospitality organizations should devote efforts to entice customers to use this newly available technology.

Table 1. Means, standard deviations and correlations.

	M	SD	1	2	3	4	5	6	7	8
1. PE	4.45	1.62	1.00							
2. EE	5.37	1.43	0.64	1.00						
3. SI	4.03	1.74	0.70	0.46	1.00					
4. FC	5.57	1.14	0.45	0.69	0.34	1.00				
5. HM	4.74	1.41	0.72	0.58	0.64	0.51	1.00			
6. PV	4.57	1.50	0.61	0.51	0.55	0.49	0.64	1.00		
7. HT	3.11	1.80	0.73	0.48	0.64	0.36	0.67	0.57	1.00	
8. BI	3.90	1.82	0.79	0.60	0.62	0.43	0.71	0.62	0.85	1.00

Note: All correlations are significant at the $p < 0.01$ level.

The correlation analysis reveals several significant relationships among the studied variables. Strong positive correlations were observed between PE and EE (r = 0.64, p < 0.01), as well as between PE and HM (r = 0.72, p < 0.01), indicating that a positive performance expectancy tends to coincide with effort expectancy and hedonic motivation. Similarly, EE exhibited

significant positive correlations with HM (r = 0.59, p < 0.01) and PV (r = 0.51, p < 0.01), suggesting that when fewer efforts to learn MFOA are expected, customers find MFOA more enjoyable and cost-effective. Notably, BI showed strong positive correlations with all other variables, particularly with HT (r = 0.86, p < 0.01), underscoring the importance of habit in shaping behavioral intentions.

4.2. Measurement Model

We used structural equation modeling (SEM) to test our hypotheses. First, the measurement model was tested to see if the model fits well with the data. The results indicated a satisfactory model fit: $X^2(398) = 987.08$, $p < 0.05$; RMSEA = 0.06; CFI = 0.94; TLI = 0.93; and SRMR = 0.05. All standardized loadings exceed the criterion value 0.70 ($p < 0.01$). As shown in Table 2, each construct's average variance extracted (AVE) is greater than the threshold value of 0.50. The composite reliability (CR) values are greater than the threshold value of 0.70, ranging from 0.85 to 0.96. These results indicate satisfactory convergent validity and good internal consistency for all latent variables.

Table 2. Results of the measurement model.

	AVE	CR	Factor loadings
Performance expectancy	0.79	0.94	
1. I find mobile food ordering applications (MFOA) useful in my daily life.			0.85
2. Using MFOA increases my chances of achieving things that are important to me.			0.91
3. Using MFOA helps me accomplish things more quickly.			0.92
4. Using MFOA increases my productivity.			0.87
Effort expectancy	0.82	0.95	
1. Learning how to use MFOA is easy for me.			0.91
2. My interaction with MFOA is clear and understandable.			0.91
3. I find MFOA easy to use.			0.92
4. It is easy for me to become skillful at using MFOA.			0.89
Social influence	0.86	0.95	
1. People who are important to me think that I should use MFOA.			0.92
2. People who influence my behavior think that I should use MFOA.			0.93
3. People whose opinions I value prefer that I use MFOA.			0.93
Facilitating condition	0.60	0.85	
1. I have the resources necessary to use MFOA.			0.77
2. I have the knowledge necessary to use MFOA.			0.85
3. MFOA is compatible with other technologies I use.			0.81
4. I can get help from others when I have difficulties using MFOA.			0.60
Hedonic motivation	0.81	0.93	
1. Using MFOA is fun.			0.89
2. Using MFOA is enjoyable.			0.94
3. Using MFOA is very entertaining.			0.87
Price value	0.88	0.96	
1. MFOA is reasonably priced.			0.92
2. MFOA is a good value for the money.			0.95
3. At the current price, MFOA provides a good value.			0.94
Habit	0.76	0.93	
1. The use of MFOA has become a habit for me.			0.90
2. I am addicted to using MFOA.			0.84
3. I must use MFOA.			0.85
4. Using MFOA has become natural to me.			0.89
Behavioral intention	0.78	0.92	
1. I intend to continue using MFOA in the future.			0.84
2. I will always try to use MFOA in my daily life.			0.88
3. I plan to continue to use MFOA frequently.			0.93
Confidence in Food Safety Measures	0.80	0.94	
1. I feel confident that it is safe to order food using MFOA.			0.92
2. I feel comfortable eating the food served by MFOA.			0.92
3. I feel comfortable with the contactless food delivery provided by MFOA.			0.86

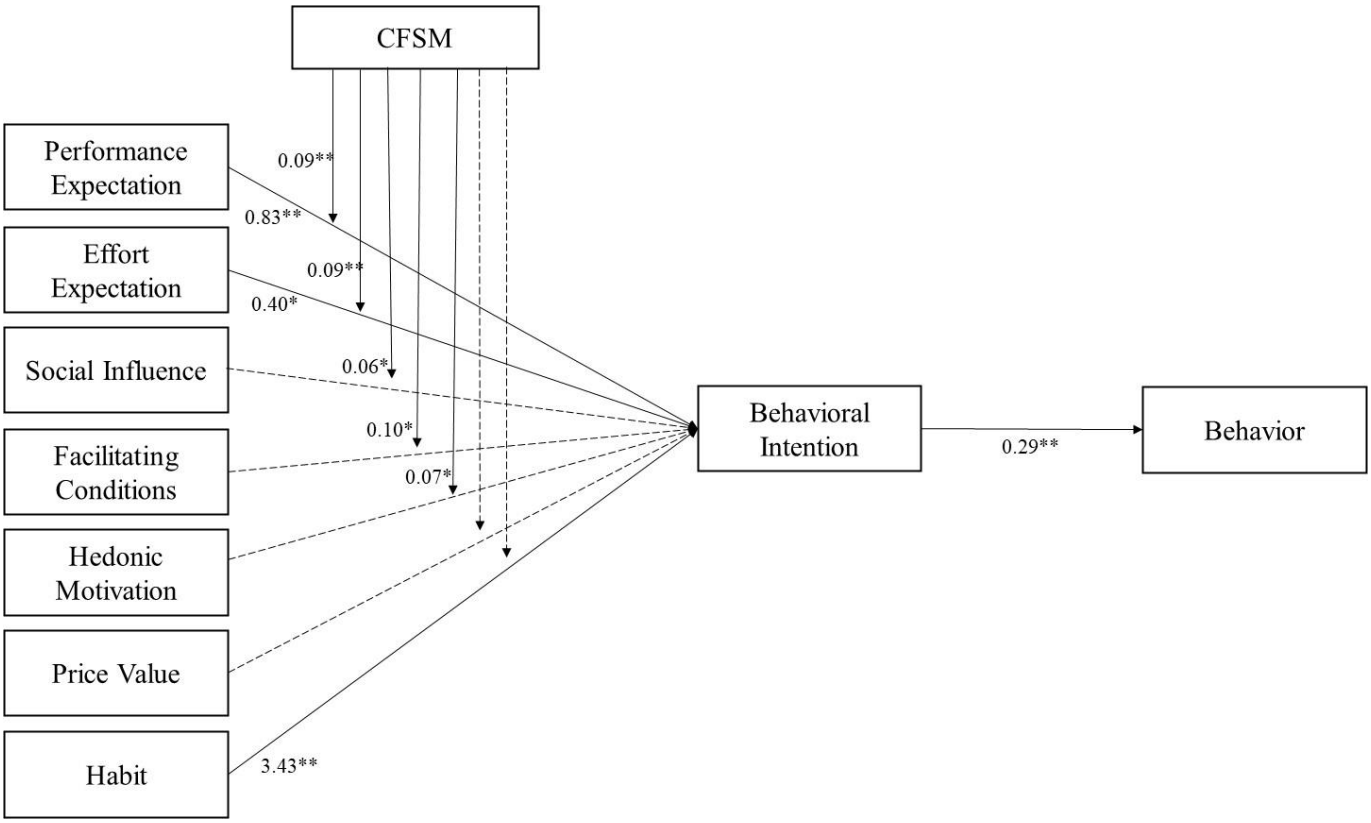
4.3. Hypotheses Testing

To test H1 ~ H8, we assessed the overall structural model. The results indicated a good model fit: χ^2 (349) = 932.28, $p < 0.01$; CFI = 0.94; TLI = 0.93; RMSEA = 0.06; SRMR = 0.05. The parameter estimates (Figure 1) displayed that behavioral intention is significantly predicted by performance expectation ($t = 3.27$, $b = 0.83$, $p < 0.01$), effort expectation ($t = 2.14$, $b = 0.40$, $p < 0.05$), and habit ($t = 18.16$, $b = 3.43$, $p < 0.01$). Thus, H1, H2, and H7 are supported. However, against the hypotheses, social influence ($t = -1.98$, $b = -0.35$, $p > 0.05$), facilitating conditions ($t = -0.50$, $b = -0.10$, $p > 0.05$), hedonic motivation ($t = 0.54$, $b = 0.12$, $p > 0.05$), and price value ($t = 1.01$, $b = 0.17$, $p > 0.05$) were not significantly associated with behavioral intention. Thus, the results fail to support H3, H4, H5, and H6. Finally, behavioral intention revealed a positive relationship with actual behavior ($t = 39.55$, $b = 0.28$, $p < 0.01$), supporting H8. Although not hypothesized, the mediation effect of behavioral intention on the relationship between the factors influencing mobile services adoption and actual behavior was tested. The results show three significant indirect effects: (1) performance expectation → behavioral intention → behavior ($t = 3.23$, $b = 0.24$, $p < 0.01$), (2) effort expectation → behavioral intention → behavior ($t = 2.15$, $b = 0.11$, $p < 0.05$), and (3) habit → behavioral intention → behavior ($t = 13.32$, $b = 0.97$, $p < 0.01$).

We used Hayes' Process to test the moderating effects of CFSM (H9 ~ H15). As shown in Figure 2, CFSM significantly moderates the relationship between performance expectation and behavioral intention ($t = 4.55$, $b = 0.09$, $p < 0.01$) and between effort expectation and behavioral intention ($t = 3.76$, $b = 0.09$, $p < 0.01$), supporting H9 and H10. The results also suggested that CFSM moderates the insignificant effects of social influence ($t = 2.71$, $b = 0.06$, $p < 0.05$), facilitating condition ($t = 3.09$, $b = 0.10$, $p < 0.05$), and hedonic motivation ($t = 2.94$, $b = 0.07$, $p < 0.05$) on behavioral intention. These results lend support for H11, H12, and

H13. Against our anticipation, CFSM does not moderate the effect of price value (t = 1.71, b = 0.03, p > 0.05), and habit (t = 0.68, b = 0.00, p > 0.05), on behavioral intention. Therefore, H14 and H15 are not supported.

Figure 1. Results of the structural model and Hayes' process.

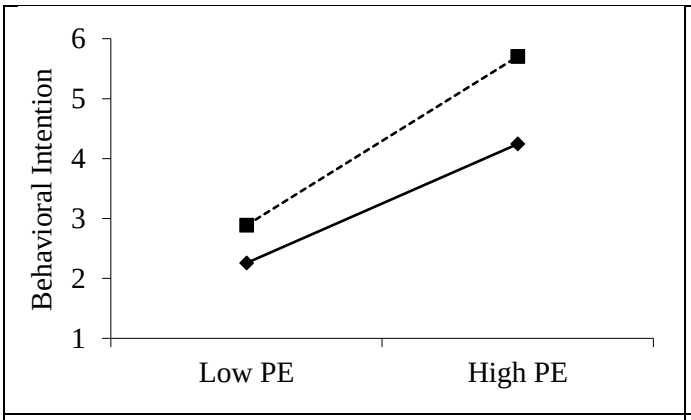


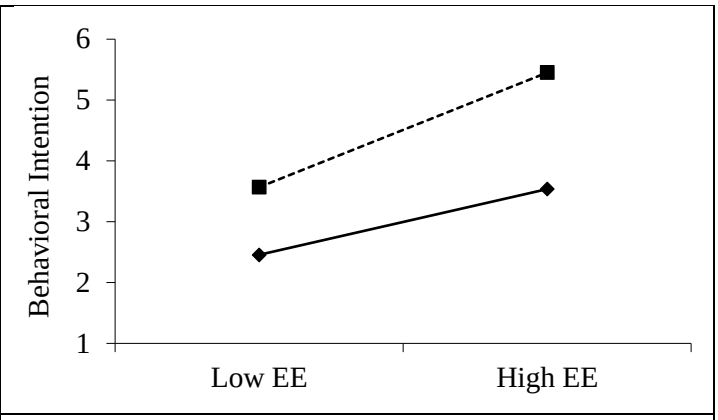
Notes: The above figure was created by the authors. Values are unstandardized coefficients. * p < 0.05, ** p < 0.01, ----- $p \geq 0.05$.

Simple slope analyses was used to further investigate the pattern of moderating effects. Figure 2 shows the patterns of interactions between CFSM and (a) performance expectancy, (b) effort expectancy, (c) social influence, (d) facilitating conditions, and (e) hedonic motivation on behavioral intention. The level of CFSM was grouped based on its standard deviation where -1 SD represented low CFSM and +1 SD represented high CFSM. The positive effects of performance expectation and effort expectation on behavioral intention are stronger for those high in CFSM (t = 19.24, b = 0.85, p < 0.01 for performance expectancy; t = 7.96, b = 0.64, p < 0.01 for effort expectation) compared to those low in CFSM (t = 13.23, b = 0.62, p < 0.01 for performance expectancy; t = 6.37, b = 0.40, p < 0.01 for effort expectation). Social influence positively influenced behavioral intention among people in both low (t = 7.30, b = 0.38, p < 0.01) and high (t = 11.90, b = 0.54, p < 0.01) CFSM. However, people with a high level of CFSM tend to have a higher level of behavioral intention, and the strength of the positive effect was significantly greater among those high in CFSM compared to people low in CFSM. In terms of facilitating conditions, those high in CFSM revealed increased behavioral intention as the perception of facilitating conditions increased (t = 4.01, b = 0.44, p < 0.01). However, a positive relationship did not exist among those low in CFSM (t = 1.93, b = 0.14, p > 0.05). Finally, positive relationship between hedonic motivation and behavioral intention for both people with high and low CFSM, but the strength of the relationship was much greater for those high in CFSM (t = 13.33, b = 0.77, p < 0.01) compared to those low in CFSM (t = 9.42, b = 0.58, p < 0.01). Also, even when the level of hedonic motivation is high, people low in CFSM tend to have a level of behavioral intention lower than the mid-point.

Figure 2. Patterns of the interaction effects of CFSM with PE, EE, SI FC, and HM.

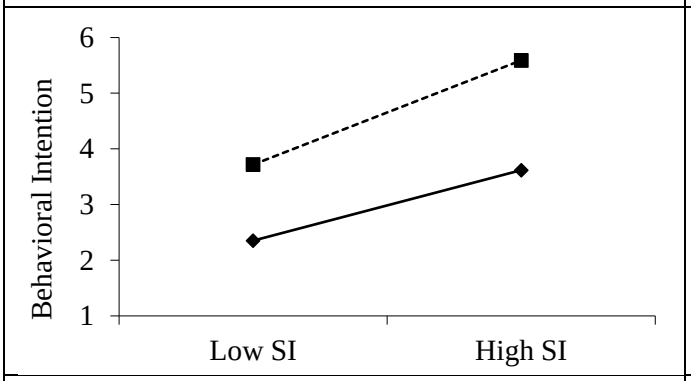
(a) Interaction between PE and CFSM	(b) Interaction between EE and CFSM

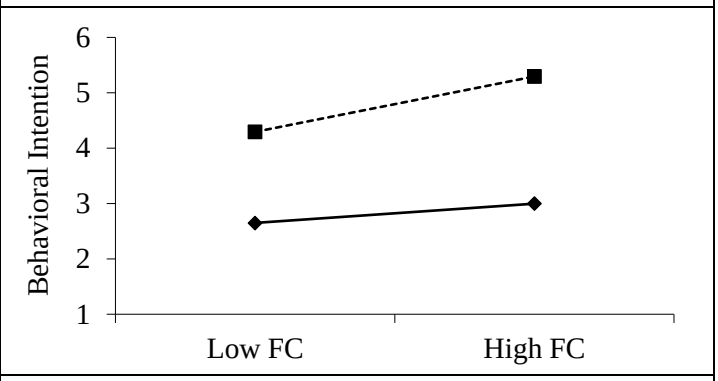




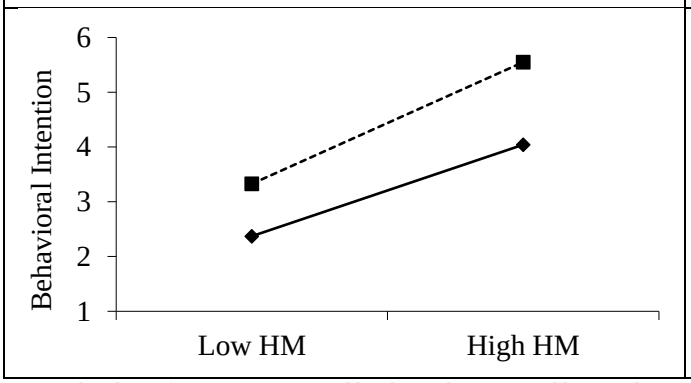
(c) Interaction between SI and CFSM

(d) Interaction between FC and CFSM





(e) Interaction between HM and CFSM



Notes: The above figures were created by the authors. Dotted lines indicate High CFSM; Solid lines indicate Low CFSM; PE = performance expectancy; EE = effort expectancy; SI = social influence; FC = facilitating condition; HM = hedonic motivation.

5. Discussion

5.1. Theoretical Implications

This study adds important insights to the literature in several aspects. First, it enhances our understanding of food-related mobile applications. Unlike prior studies, which predominantly concentrated on the 'delivery' aspect of MFOAs (e.g., Belarmino et al., 2021; Wen et al., 2022), this research expands the conceptualization of MFOA by encompassing and highlighting the ordering features. It also emphasizes the entire food preparation, production, processing, handling, and delivery process (Al Amin et al., 2021), thus refining our understanding of MFOAs.

Furthermore, this research validates the relevance and applicability of the UTAUT2 theory (Venkatesh et al., 2012) in the context of MFOAs by empirically testing the theoretical model using post-pandemic data. The study confirms that the UTAUT2 theory remains valid in explaining customers' acceptance of MFOAs. Specifically, three key factors - habit, performance expectations, and effort expectations - significantly contribute to customers' intention to use MFOAs and subsequent actual usage.

Additionally, this study extends the UTAUT2 theory by uncovering a critical boundary condition specific to the food and beverage industry: customers' confidence in the food safety measures of MFOAs. The research highlights that when customers have low confidence in the food safety practices of MFOAs, their behavioral intention and usage behavior are primarily influenced by habit, performance expectations, and effort expectations. However, when customers have high confidence in the food safety measures, additional factors such as social influence, facilitating conditions, and hedonic motivation significantly contribute to their intention to use MFOAs and subsequent behavior. This finding emphasizes the importance of customers' confidence in food safety within the context of mobile food ordering and delivery (Agrusa et al., 2021; De Jonge et al., 2004).

5.2. Practical Implications

This study holds significant practical implications for the hospitality and mobile food ordering industries, emphasizing the importance of food safety measures for both platforms and restaurants offering services through mobile food ordering

applications (MFOAs). It suggests that while complying with legal requirements and industry regulations is essential, instilling customers' confidence in food safety measures is paramount.

Even though the COVID-19 pandemic doubled the use of MFOAs, the lack of regulation for the mobile food ordering industry poses an increased risk of food safety such as food poisoning due to unsafe food temperatures, food handling practices, and packaging. As MFOA businesses continue to operate while federal regulations catch up, MFOA management should put in place a number of operating policies and traceability capabilities to ensure consumer's safety.

MFOA platforms should establish stringent entry criteria for restaurants, ensuring that only those meeting the criteria can offer services on the platform. This approach enhances overall food safety standards and provides customers with a sense of assurance. For example, the U.S. Food and Drug Administration (FDA) published the "Food Code" which gives retail food establishments and restaurants a set of guidelines to follow in order to keep food safe. MFOA companies can adapt the information and require the restaurants to use these same standards as a guideline to ensure food safety. Transparency is also crucial, and MFOA platforms are encouraged to display restaurants' food safety levels to enable informed decision-making. Restaurants can further strengthen customers' confidence by providing evidence of their compliance, such as sharing visuals of their kitchens and food preparation processes.

Once customers have confidence in the food safety of MFOAs, both platforms and restaurants can leverage this trust to promote their businesses. Differentiating themselves by prioritizing and effectively communicating their commitment to food safety sets them apart from competitors. Based on the study's findings, MFOA platforms can employ strategies to promote their businesses while ensuring food safety measures. Cultivating customer loyalty through habitual usage is key, and offering incentives like discounts or loyalty benefits to repeat customers fosters loyalty and benefits customers simultaneously.

MFOAs should prioritize enhancing their application's performance and user experience, focusing on functionality, user-friendliness, convenience, and time-saving features. Meeting and exceeding customers' performance and effort expectations attract and retain customers. Incorporating social influence, facilitating conditions, and hedonic motivation into marketing strategies can also be effective. Leveraging customers' social referrals through targeted marketing campaigns attracts more customers and ensures accessible customer service provides assistance and support. Making the applications enjoyable to use adds hedonic value; it's about what makes the customer's heart beat faster. To add hedonic values to the MFOA, marketers and management can use several marketing strategies. Those include an emotional storytelling strategy by sharing genuine testimonials that highlight personal product experiences, offering samples, testers, or trial experiences that allow consumers to feel, smell, or taste the product for sensory engagement, launching exclusive clubs or reward programs that offer members early access or limited editions and actively using social media platforms to showcase visually stunning product showcases.

By implementing these strategies, MFOAs can effectively promote their businesses while ensuring food safety measures. This approach attracts more customers and fosters long-term success in the mobile food ordering industry.

5.3. Limitations and Future Research

While providing valuable insights, this study has certain limitations that present opportunities for future research. Firstly, while the study highlights the importance of customers' confidence in food safety measures as a crucial boundary condition for using MFOAs, it does not empirically investigate the factors influencing customers' confidence in these measures. Future research endeavors should focus on identifying and understanding the contributors to customers' confidence in food safety measures within the context of MFOAs.

Secondly, this study extends the UTAUT2 theory in the specific context of mobile food ordering applications and validates the impacts of its six factors. However, other relevant influential features, contextual factors, and customers' individual characteristics may further enrich the UTAUT2 theory within the MFOA domain. Future studies can explore and incorporate these additional factors to better understand customers' acceptance and usage behavior in the mobile food ordering context.

Declaration of competing interests

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

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References

Agrusa, J., Linnes, C., Lema, J., Min, J. E., Henthorne, T., Itoga, H., & Lee, H. (2021). Tourism well-being and transitioning island destinations for sustainable development. *Journal of Risk and Financial Management*, *14*(1), 32.

Alalwan, A. A. (2020). Mobile food ordering apps: An empirical study of the factors affecting customer e-satisfaction and continued intention to reuse. *International Journal of Information Management*, *50*, 28-44.

Al Amin, M., Arefin, M. S., Alam, M. R., Ahammad, T., & Hoque, M. R. (2021). Using mobile food delivery applications during COVID-19 pandemic: An extended model of planned behavior. *Journal of Food Products Marketing*, *27*(2), 105-126.

Al Amin, M., Arefin, M. S., Sultana, N., Islam, M. R., Jahan, I., & Akhtar, A. (2020). Evaluating the customers' dining attitudes, e-satisfaction and continuance intention toward mobile food ordering apps (MFOAs): evidence from Bangladesh. *European Journal of Management and Business Economics*.

Arendt, S. W., Paez, P., & Strohbehn, C. (2013). Food safety practices and managers' perceptions: A qualitative study in hospitality. *International Journal of Contemporary Hospitality Management*, *25*(1), 124-139.

Belarmino, A., Raab, C., Tang, J., & Han, W. (2021). Exploring the motivations to use online meal delivery platforms: Before and during quarantine. *International Journal of Hospitality Management*, *96*, 102983.

Brown, S. A., & Venkatesh, V. (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *MIS Quarterly*, 399-426.

Chiu, C. M., Wang, E. T., Fang, Y. H., & Huang, H. Y. (2014). Understanding customers' repeat purchase intentions in B2C e-commerce: the roles of utilitarian value, hedonic value and perceived risk. *Information Systems Journal*, *24*(1), 85-114.

Cho, M., Bonn, M. A., & Li, J. J. (2019). Differences in perceptions about food delivery apps between single-person and multi-person households. *International Journal of Hospitality Management*, *77*, 108-116.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982-1003.

De Jonge, J., Frewer, L., Van Trijp, H., Jan Renes, R., De Wit, W., & Timmers, J. (2004). Monitoring consumer confidence in food safety: an exploratory study. *British Food Journal*, *106*(10/11), 837-849.

Dirsehan, T., & Cankat, E. (2021). Role of mobile food-ordering applications in developing restaurants' brand satisfaction and loyalty

in the pandemic period. *Journal of Retailing and Consumer Services*, *62*, 102608.
Elkhwesky, Z., El Manzani, Y., & Elbayoumi Salem, I. (2022). Driving hospitality and tourism to foster sustainable innovation: A systematic review of COVID-19-related studies and practical implications in the digital era. *Tourism and Hospitality Research*, 14673584221126792.
Fishbein, M., & Ajzen, I. (1977). Belief, attitude, intention, and behavior: An introduction to theory and research. *Philosophy and Rhetoric*, *10*(2).
Haas, S., Kuehl, E., Moran, J. R., & Venkataraman, K. (2020). How restaurants can thrive in the next normal. *McKinsey & Company, May*, 1-8.
Halim, E., Destiano, R., Salim, J., Margarita, V., Hartono, H., & Hebrard, M. (2021, August). Understanding Mobile Payment Continuance Intention on Mobile Food Ordering Apps (MFOAs) during COVID-19 Pandemic. In *2021 International Conference on Information Management and Technology (ICIMTech)* (Vol. 1, pp. 667-672). IEEE.
Hu, X., Yan, H., Casey, T., & Wu, C. H. (2021). Creating a safe haven during the crisis: How organizations can achieve deep compliance with COVID-19 safety measures in the hospitality industry. *International Journal of Hospitality Management*, *92*, 102662.
Hu, Y. (2021). An improvement or a gimmick? The importance of user perceived values, previous experience, and industry context in human–robot service interaction. *Journal of Destination Marketing & Management*, *21*, 100645.
Hu, Y., & Kim, H. J. (2018). Positive and negative eWOM motivations and hotel customers' eWOM behavior: Does personality matter? *International Journal of Hospitality Management*, *75*, 27-37.
Kaur, P., Dhir, A., Talwar, S., & Ghuman, K. (2021). The value proposition of food delivery apps from the perspective of theory of consumption value. *International Journal of Contemporary Hospitality Management.*
Kim, J., Kim, J., & Wang, Y. (2021). Uncertainty risks and strategic reaction of restaurant firms amid COVID-19: Evidence from China. *International Journal of Hospitality Management*, *92*, 102752.
Lee, S. W., Sung, H. J., & Jeon, H. M. (2019). Determinants of continuous intention on food delivery apps: extending UTAUT2 with information quality. *Sustainability*, *11*(11), 3141.
Limayem, M., Hirt, S. G., & Cheung, C. M. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly*, 705-737.
Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, *34*(1), 1-13.
Morosan, C., & DeFranco, A. (2016). It's about time: Revisiting UTAUT2 to examine consumers' intentions to use NFC mobile payments in hotels. *International Journal of Hospitality Management*, *53*, 17-29.
Okumus, B., & Bilgihan, A. (2014). Proposing a model to test smartphone users' intention to use smart applications when ordering food in restaurants. *Journal of Hospitality and Tourism Technology*.
Okumus, B., Ali, F., Bilgihan, A., & Ozturk, A. B. (2018). Psychological factors influencing customers' acceptance of smartphone diet apps when ordering food at restaurants. *International Journal of Hospitality Management*, *72*, 67-77.
Poon, W. C., & Tung, S. E. H. (2024). The rise of online food delivery culture during the COVID-19 pandemic: an analysis of intention and its associated risk. *European Journal of Management and Business Economics*, *33*(1), 54-73.
Ray, A., Dhir, A., Bala, P. K., & Kaur, P. (2019). Why do people use food delivery apps (FDA)? A uses and gratification theory perspective. *Journal of Retailing and Consumer Services*, *51*, 221-230.
Rimal, A., Fletcher, S. M., McWatters, K. H., Misra, S. K., & Deodhar, S. (2001). Perception of food safety and changes in food consumption habits: a consumer analysis. *International Journal of Consumer Studies*, *25*(1), 43-52.
Roh, M., & Park, K. (2019). Adoption of O2O food delivery services in South Korea: The moderating role of moral obligation in meal preparation. *International Journal of Information Management*, *47*, 262-273.
Shah, A. M., Yan, X., & Qayyum, A. (2021). Adoption of mobile food ordering apps for O2O food delivery services during the COVID-19 outbreak. *British Food Journal*.
Sharma, R., Dhir, A., Talwar, S., & Kaur, P. (2021). Over-ordering and food waste: The use of food delivery apps during a pandemic. *International Journal of Hospitality Management*, *96*, 102977.
Swar, B., Hameed, T., & Reychav, I. (2017). Information overload, psychological ill-being, and behavioral intention to continue online healthcare information search. *Computers in Human Behavior*, *70*, 416-425.
Tandon, A., Kaur, P., Bhatt, Y., Mäntymäki, M., & Dhir, A. (2021). Why do people purchase from food delivery apps? A consumer value perspective. *Journal of Retailing and Consumer Services*, *63*, 102667.
To, P. L., Liao, C., & Lin, T. H. (2007). Shopping motivations on Internet: A study based on utilitarian and hedonic value. *Technovation*, *27*(12), 774-787.
Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 157-178.
Wang, R. J. H., Malthouse, E. C., & Krishnamurthi, L. (2015). On the go: How mobile shopping affects customer purchase behavior. *Journal of Retailing*, *91*(2), 217-234.
Wang, Y. S., Tseng, T. H., Wang, W. T., Shih, Y. W., & Chan, P. Y. (2019). Developing and validating a mobile catering app success model. *International Journal of Hospitality Management*, *77*, 19-30.
Wang, X., Zhang, W., Zhang, T., Wang, Y., & Na, S. (2022). A study of Chinese consumers' consistent use of mobile food ordering apps. *Sustainability*, *14*(19), 12589.
Wen, H., Pookulangara, S., & Josiam, B. M. (2022). A comprehensive examination of consumers' intentions to use food delivery apps. *British Food Journal*, *124*(5), 1737-1754.
WHO. (2020). WHO, Coronavirus Disease (COVID-19) Advice for the Public: Coronavirus disease (COVID-19). https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public.
Wu, J., & Du, H. (2012). Toward a better understanding of behavioral intention and system usage constructs. *European Journal of Information Systems*, *21*(6), 680-698.
Xu, Y., Jeong, E., Baiomy, A. E., & Shao, X. (2020). Investigating onsite restaurant interactive self-service technology (ORISST) use: Customer expectations and intentions. *International Journal of Contemporary Hospitality Management*.
Yang, F. X., Li, X., Lau, V. M. C., & Zhu, V. Z. (2021). To survive or to thrive? China's luxury hotel restaurants entering O2O food delivery platforms amid the COVID-19 crisis. *International Journal of Hospitality Management*, *94*, 102855.
Yang, Y., Liu, H., & Chen, X. (2020). COVID-19 and restaurant demand: early effects of the pandemic and stay-at-home orders. *International Journal of Contemporary Hospitality Management*.
Yeo, V. C. S., Goh, S. K., & Rezaei, S. (2017). Consumer experiences, attitude and behavioral intention toward online food delivery (OFD) services. *Journal of Retailing and Consumer Services*, *35*, 150-162.
Yost, E., Kizildag, M., & Ridderstaat, J. (2021). Financial recovery strategies for restaurants during COVID-19: Evidence from the US restaurant industry. *Journal of Hospitality and Tourism Management*, *47*, 408-412.
Zhao, Y., & Bacao, F. (2020). What factors determining customer continuingly using food delivery apps during 2019 novel coronavirus pandemic period? *International Journal of Hospitality Management*, *91*, 102683.

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