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## Over-ordering and food waste: The use of food delivery apps during a pandemic

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## ABSTRACT

There is a paucity of research on the role of food delivery apps (FDAs) in food waste generation. This gap needs to be addressed since FDAs represent a fast-growing segment of the hospitality sector, which is already considered to be a key food waste generator globally. Even more critically, FDAs have become a prominent source of ordering food during the COVID-19 pandemic. In addition, the growing usage of FDAs warrants an improved understanding of the complexities of consumer behavior toward them, particularly during a health crisis. The present study addresses this need by examining the antecedents of FDA users' food ordering behavior during the pandemic that can lead to food waste. The study theorizes that hygiene consciousness impacts the enablers and barriers to FDA usage, which, in turn, shape the attitude toward FDAs and the tendency to order more food than required, i.e., shopping routine. The conceptual model, based on behavioral reasoning theory, was tested using data collected from 440 users of FDAs during the pandemic. The results support a positive association of trust and price advantage with attitude, but only of trust with shopping routine. Perceived severity and moral norms did not moderate any associations.

## 1. Introduction

Food delivery applications (FDAs) serve as aggregator platforms that enable users to order food from multiple restaurants for direct consumption (Ray et al., 2019). The revenue of this segment is anticipated to grow at a compounded annual rate of 8.2% from 2020 to 2024 globally, with user penetration expected to increase from 9.5% in 2020–12.5% by 2024 (Statista, 2020). This expanding user base offers immense growth opportunities to FDA service providers worldwide. Furthermore, the growing media conversation around FDAs and their popularity among consumers has attracted scholarly interest as well. Prior research on FDAs, however, has largely focused on the theoretical lens of technology acceptance theories (e.g., Roh and Park, 2019; Alalwan, 2020; Lee et al., 2017; Kang and Namkung, 2019). These studies have examined different factors, such as information quality (Kang and Namkung, 2019), design and convenience (Cho et al., 2019), online purchase experience (Yeo et al., 2017), attitude and intentions (Yeo

et al., 2017), ease of ordering food from users' favorite restaurants (Cho et al., 2019), and reduction in waiting time (Ray et al., 2019).

The accumulated findings are comprehensive and offer deep insights into various aspects of FDA usage and adoption. However, a review of this literature reveals that certain research gaps persist. First, empirical studies in the area have completely ignored the possibility of linkage between FDA usage and food waste, which is a rising concern in the hospitality industry. This vacuum in the research is quite concerning since food waste issues are rising in this sector by the day. In fact, hospitality scholars have observed that food waste is a threat to society at large (Kasavan et al., 2019; Dhir et al., 2020), with this sector being the third-largest contributor to global food waste (Filimonau et al., 2019). Given the linkage of food waste with food insecurity in both developing and developed economies (Filimonau et al., 2019; Goh and Jie, 2019), the paucity of food waste research in the context of FDAs is a gap that must be bridged immediately, as argued by some recent studies in the area (e.g., Dhir et al., 2020).

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Second, there are no studies on consumer behavior toward FDAs in the backdrop of a health crisis like the ongoing COVID-19 pandemic, which has significantly impacted consumers by causing them to hoard essentials and engage in panic buying (Miri et al., 2020; Laato et al., 2020a). We posit that the unusual consumer behavior of panic buying may have manifested in the FDA-context as well, driving users' attitude and behavior toward ordering excessive food per order. We contend that the usage of FDAs has increased with the implementation of the pandemic control measures of lockdown and social distancing, which have all but eliminated out-of-home dining. In addition, various factors associated with health and safety concerns during the pandemic could also have impacted the attitude of consumers toward FDAs; these need to be diagnosed to help service providers ensure continued usage of their apps for the delivery of food.

Third, there is an over-emphasis on technology acceptance theories, with limited consumer behavior insights. Accordingly, the available findings are skewed toward the positivist agenda of adoption, thus remaining deficient in the resistance perspective. As recent consumer behavior literature has underscored the importance of examining behavioral reasoning (Sahu et al., 2020), which considers the valence of consumer behavior as driven by both enablers and barriers (Talwar et al., 2020c, 2020d; Tandon et al., 2020), this gap should be addressed to provide a multi-dimensional perspective on consumers' behavior toward using FDAs.

We address these three gaps in the literature by examining the enablers and barriers impacting users' attitude toward FDA use and their actual food ordering behavior, considering variables related to the COVID-19 pandemic and food waste concerns, and using behavioral reasoning theory (BRT; Westaby, 2005) as the theoretical lens. BRT allows us to: (a) theorize the full spectrum of FDA usage behavior, ranging from values/beliefs and attitude to actual ordering behavior during the COVID-19 pandemic; (b) examine the complexities of consumer behavior associated with the use of FDAs during the COVID-19 pandemic; and (c) examine the net effect of the enablers (reasons for) and barriers (reasons against) on attitude toward FDA use, which influences consumers' ordering behavior and can, in turn, lead to consumers over-ordering and wasting food as a result.

With regard to food waste concerns, recent literature has suggested that food waste is generated at the point of consumption in both out-of-home and at-home dining (Dhir et al., 2020). On the one hand, the literature on out-of-home hospitality has focused on both the organizational (e.g., Okumus, 2020) and consumer behavior aspects related to food waste, such as attitude toward food waste, taking away leftovers, and demographic factors (e.g., Liao et al., 2018; Hamerman et al., 2018; Sebbane and Costa, 2018). On the other hand, the literature on at-home dining has focused on leftovers reuse intentions, moral norms, and the tendency to buy more food than required (e.g., Stefan et al., 2013; Stancu et al., 2016; Qi and Roe, 2016). FDAs thus represent a unique context that brings hospitality services for consumption in a household location. Accordingly, we have built upon the extant findings on food waste in the hospitality sector as well as in household-level consumption to address the gap related to the drivers of food waste generated by FDA use. We have thus modeled factors, such as shopping routine and moral norms, to reflect the food waste aspect of FDAs. Shopping routine captures the food ordering behavior of consumers (e.g., Stefan et al., 2013; Stancu et al., 2016) by measuring their tendency to order more food than required, thereby creating the possibility of food waste. Moral norms represent the dilemma that may reduce consumers' tendency to over-order food since such excesses can contribute to food waste. Finally, to reflect the COVID-19 related concerns, we have modeled the impact of factors, such as hygiene consciousness and the perceived severity of the pandemic, on consumers' perception of why they should or should not use FDAs.

We specifically address four research questions: **RQ1**. Are consumers' attitudes toward FDAs during the COVID-19 pandemic associated with their food ordering behavior? **RQ2**. What are the enablers and

barriers associated with consumers' attitudes to using FDAs as well as their actual food ordering behavior during the COVID-19 pandemic? **RQ3**. How is hygiene consciousness associated with consumers' enablers, barriers, and attitudes toward FDAs during the COVID-19 pandemic? **RQ4**. (a) How does the perceived severity of the pandemic moderate the association of hygiene consciousness with consumers' enablers and barriers toward FDA usage during the COVID-19 pandemic? (b) How do moral norms moderate the association of attitude with the food ordering behavior of FDA consumers during the COVID-19 pandemic?

The current study significantly contributes to both theory and practice in the hospitality sector in four ways. First, it is the first empirical study to extend BRT to examine consumer behavior related to the use of FDAs, which are rapidly growing in both revenue and users worldwide. Second, the present study encapsulates both the enablers and barriers to using FDAs in the same framework, thus providing insights into the valence of consumer behavior toward FDAs. Third, the present study uses a newer set of contextual variables, such as moral norms and shopping routines, which are rooted in the contemporary food waste literature. Finally, the choice of antecedents (hygiene consciousness) and moderator (perceived pandemic severity) provide COVID-19-related insights, which can serve as the basis for many future studies.

## 2. Theoretical framework and hypotheses

### 2.1. Extending BRT to the present context

BRT theorizes beliefs or values as antecedents of reasons (for and against) and global motives, which, in turn, are associated with an individual's actual behavior. With regard to the *values/beliefs* component of BRT, scholars have employed several variables, such as consumer values (Ryan and Casidy, 2018), extrinsic personal and social beliefs (Arlin and Lasmono, 2015), security (Claudy and Peterson, 2014), and openness to change (Claudy et al., 2015), to measure it. Interestingly, Sahu et al. (2020) argued that values/beliefs in the BRT framework are contextual in nature and thus offer the freedom to be measured in different contexts, including health and wellbeing. We use hygiene consciousness to represent values/beliefs to suitably capture the context of the COVID-19 pandemic. This choice is based on the premise that individuals manifest behaviors related to mitigating health risks during outbreaks (La Torre et al., 2009) and that the more novel the situation is, the greater the pursuit of safety will be (Brug et al., 2009). The COVID-19 virus has particularly triggered safety concerns due to its morbidity rate and speed of spread (Xu et al., 2020; Liu et al., 2020). Hygiene consciousness has also been described as a key concern in the tourism and hospitality sectors, especially regarding concerns over cleanliness (Pizam and Tasci, 2019; Talwar et al., 2020b). As such, we utilize hygiene consciousness to represent consumers' concerns related to cleanliness and other hygiene practices followed by FDAs and restaurants during the COVID-19 pandemic.

*Reasons for and against* are similarly context-specific in the BRT framework. Scholars have suggested that these are not simply opposite of each other but accommodate different perspectives associated with attitude and behavior (Sahu et al., 2020). Since these reasons are contextual in nature, we draw upon the existing FDA literature to identify their related enablers and barriers. Thus, we use trust and price advantage as 'reasons for' using FDAs as these are influential predictors of positive consumer behavior toward such services (e.g., Kang and Namkung, 2019; Cho et al., 2019; Alalwan, 2020). Trust and price are also key consumer considerations in other hospitality contexts, such as online travel agencies, as well (e.g., Talwar et al., 2020a, 2020b; Lien et al., 2015; Agag and El-Masry, 2016). Reasons acting as barriers to adoption, however, have only been explored by one recent study, which suggested that quality and interface issues are key barriers that consumers may have toward FDAs (Kaur et al., 2020a). Thus, barriers to

FDA use could be related to the technology-related features of the app as well as the physical experience related to the quality of food and service delivered. Specifically, FDAs are technology-based services/interfaces that enable consumers to order food physically for consumption, potentially creating barriers at different points during and after the transaction. This is in consonance with recent studies suggesting that, for mobile app services with online-to-offline contexts, such as FDAs, both the app-related features and the consumption at the offline location are important considerations (Kaur et al., 2020b). Accordingly, we examine the role of interface issues and quality issues related to the food and service ordered as reasons against using FDAs.

Regarding *global motives*, attitude is the most frequently used measure (e.g., Peterson and Simkins, 2019; Claudy et al., 2015). Scholars have used various measures of consumer attitude, such as attitude for and against (Chatzidakis et al., 2016), consumer attitude (Ryan and Casidy, 2018), and so on. In the present context, we thus use attitude toward ordering food via FDAs during the COVID-19 pandemic as the measure of the global motives component of BRT.

The next component of BRT in our study is the users' behavior while ordering food via FDAs. Prior studies have measured this actual behavior through measures, such as car-sharing behavior (Peterson and Simkins, 2019) and commuting by bike (Claudy and Peterson, 2014), thus implying that the measure of behavior in BRT is also context-specific. Accordingly, we have measured behavior through consumers' shopping routines to bring together the context of FDAs and food waste during the COVID-19 pandemic. Shopping routine is a construct that explains the consumers' tendency to buy more food than needed, which creates the possibility of food waste (Stefan et al., 2013). Due to the COVID-19 restrictions on out-of-home dining, consumers ordering food on FDAs may indulge in panic buying and, thus, may over-order. While shopping routine has been examined in the food waste literature, it has not, to the best of our knowledge, been examined in the context of FDAs.

In addition to the above-mentioned direct paths, we have tested (a) the mediating role of trust, quality issues, and attitude, and (b) the moderating role of perceived severity and moral norms in consonance

with the suggestion of the prior literature (e.g., Sahu et al., 2020). The use of trust and quality issues as mediators between hygiene consciousness and attitude reflects the COVID-19-related concerns in our study. Similarly, the use of perceived severity as a moderating variable has been highlighted as a COVID-19-related measure in recent studies (Laato et al., 2020a; Li et al., 2020). Finally, the use of moral norms as a moderator is also rooted in the prior food waste literature (Stefan et al., 2013; Stancu et al., 2016).

2.2. Research model and hypotheses

Our research model proposes the following associations: (a) shopping routine as the dependent variable associated with attitude toward FDAs (H1), reasons for (trust and price advantage (H2a and H3a)), and reasons against (interface issues and quality issues (H4a and H5a)); (b) attitude as the dependent variable associated with reasons for (trust and price advantage (H2b and H3b)), reasons against (interface issues and quality issues (H4b and H5b)), and hygiene consciousness (H6a); (c) trust (H6b) and quality issues (H6c) as dependent variables associated with hygiene consciousness; (d) attitude as a mediating variable between reasons for and reasons against and shopping routine (H7a-d); (e) trust and quality issues as mediating variables between hygiene consciousness and attitude (H8a-b); (f) the moderating effect of perceived severity on the association of hygiene consciousness with trust and quality issues (H9a-b) and that of moral norms on the association of shopping routine with attitude (H10). All the hypothesized associations are presented in Fig. 1.

2.2.1. Attitude and shopping routine

Past research in the hospitality sector has suggested that the consumer attitudes formed during the process of considering a behavioral action can affect the user's actual behavior. Some of the associations explored include attitude toward mobile payment-based hotel reservations (Sun et al., 2020), how attitude toward local food affects the choice of destination (Choe and Kim, 2018), and attitude toward menu information's effect on consumer behavior in a restaurant (Fakih et al.,

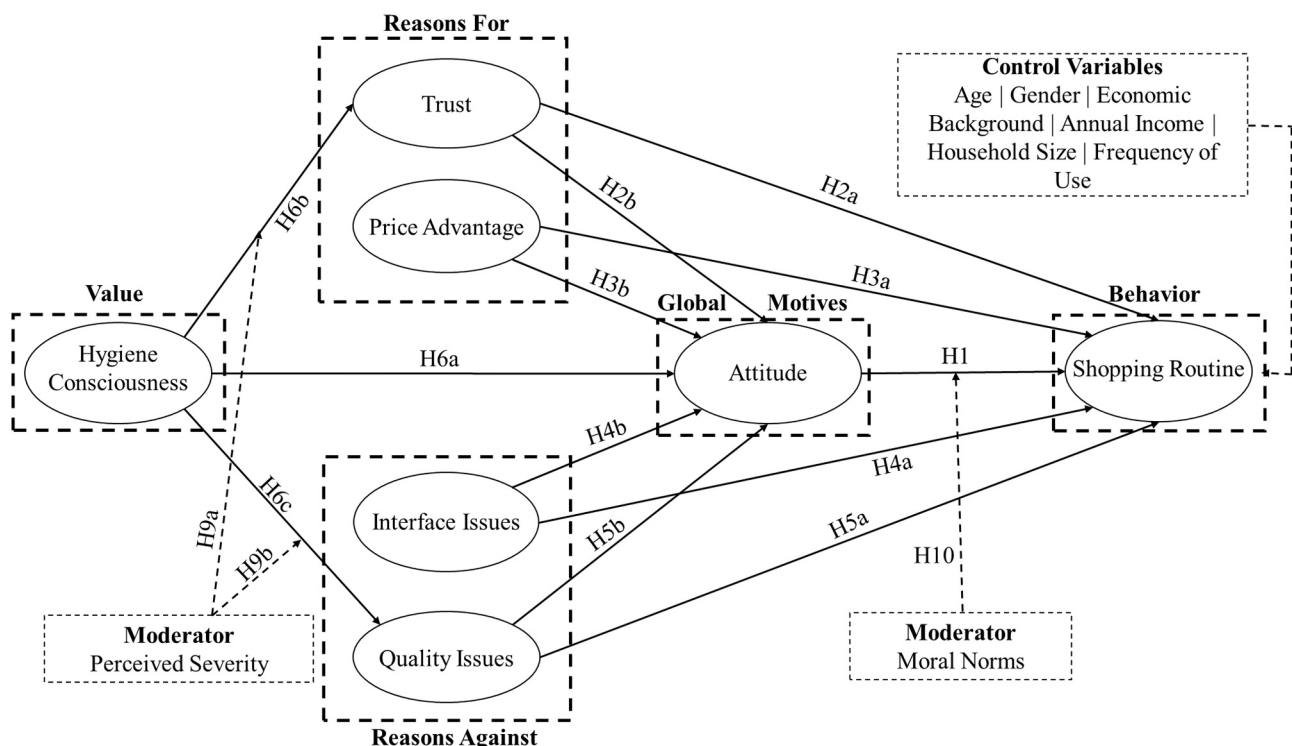


Fig. 1. Proposed conceptual model.

2016). Accordingly, we anticipate that the shopping routine (i.e., an actual behavior) will also be affected by the attitude of users. We contend that a positive attitude toward FDAs is likely to result in users placing orders for more food than they need. This expectation aligns with earlier literature, suggesting that one reason for consumers' shopping habits is their positive attitude toward shopping (Stefan et al., 2013). We expect this behavior to be even more pronounced under the influence of the COVID-19 pandemic, which has witnessed panic buying on a global scale (Laato et al., 2020a; Miri et al., 2020). We further contend that the pandemic control measures may cause consumers with a positive attitude toward FDAs to order more due to the monotony that might set in from consuming home-cooked meals. Hence, we hypothesize:

**H1.** Consumers' attitude toward FDAs during the COVID-19 pandemic has a positive association with their shopping routine.

### 2.2.2. Reasons for the use of FDAs, attitude, and shopping routine

Prior FDA research has exclusively identified 'trust' as the main reason for the adoption of such services (Kang and Namkung, 2019). For example, Kang and Namkung (2019) identified a positive relationship between trust and continuation intentions toward FDAs. Ponte et al. (2015), meanwhile, suggested that trust facilitated the purchasing of hospitality products online. Therefore, the current study considers trust to be one reason for FDA use, given the infectious nature of the COVID-19 pandemic (Xu et al., 2020), which may cause consumers to worry about how much they can rely on FDAs to adhere to the highest standards of hygiene. Furthermore, price is a key product characteristic impacting consumers' perceived value of FDAs (Cho et al., 2019; Alalwan, 2020). Consumer evaluation of FDAs' price-quality is one of the most important determinants of their positive perceived value (Cho et al., 2019). Alalwan (2020), meanwhile, found the price value of FDAs affected consumers' e-satisfaction and continued use intentions. Similarly, the current study considers price and trust as important reasons influencing a positive attitude toward FDA adoption. Moreover, price and user experience have also been identified as major factors that create a push effect on consumers to engage in shopping routines (Stefan et al., 2013) and food waste behavior (Di Talia et al., 2019). Di Talia et al. (2019) considered price an exogenous variable affecting consumers' food purchase amounts. We propose that price is also an important consideration during the COVID-19 pandemic, which has caused a severe economic fallout and widespread job loss (Leduc and Liu, 2020); thus, the price advantage offered by FDAs could motivate consumers to use them more. Therefore, positive reasons for using FDAs could impact the shopping routine of consumers, leading us to hypothesize that:

**H2a.** Trust as 'reasons for' using FDAs during the COVID-19 pandemic has a positive association with consumers' shopping routine.

**H2b.** Trust as 'reasons for' using FDAs during the COVID-19 pandemic has a positive association with consumers' attitude.

**H3a.** Price advantage as 'reasons for' using FDAs during the COVID-19 pandemic has a positive association with consumers' shopping routine.

**H3b.** Price advantage as 'reasons for' using FDAs during the COVID-19 pandemic has a positive association with consumers' attitude.

### 2.2.3. Reasons against use of FDAs, attitude, and shopping routine

FDA users may face problems related to the complexity of the food delivery app, processing speed of the orders, and the quality of information available (Lee et al., 2017; Kaur et al., 2020a). Xu and Li (2016), for example, argued that a complex usage experience in the hospitality sector might lead to the emergence of barriers. Similarly, the complexity of performing a particular task decreases the willingness of consumers to do so if the interface is not convenient or fair (Yeo et al., 2017). Additionally, poor information quality provided by FDAs is considered the

main driver of consumers' negative attitude toward adopting such services (Lee et al., 2019). These aspects all pertain to the app interface, leading us to categorize them as interface issues, as suggested by Kaur et al. (2020a). Based on the preceding discussion, we contend that interface issues may cause consumers to develop a heightened negative response toward FDAs during the COVID-19 pandemic. Although there are no previous findings in this regard, it is rational to expect that these types of issues could be especially frustrating to consumers during such a stressful time, causing them to develop barriers against FDAs.

Prior studies have also discussed the packaging and quality of food as an important consideration in the case of food delivery (Elvandari et al., 2018). For instance, consumer behavior is impacted by the cleanliness of the packaging (Elvandari et al., 2018), while their loyalty toward service providers is enhanced by the quality of the food (Suhartanto et al., 2019). Food quality similarly increases consumers' satisfaction and value perception (Sjahroeddin, 2018). At the same time, issues with the quality of food and packaging could cause consumers to consider FDAs in a negative light. We argue that this concern may be further aggravated during the COVID-19 pandemic due to two main reasons, (a) consumers may worry more about receiving tampered food packages that could expose them to the COVID-19 virus, and (b) they may also worry about the quality of food, since consuming healthy food may be a priority during the pandemic.

A negative association between reasons acting as barriers and consumer attitude has already been established in the literature (Claudy et al., 2015). Since FDAs are also services impacted by consumers' disposition toward them, we contend that the barriers identified above (interface and quality issues) will also negatively affect the users' attitude. The existing evidence thus leads us to speculate that issues with processing orders, the lack of quality information, and the poor quality of food and service will act as barriers, thereby negatively influencing the attitude of FDA users. Moreover, these issues will reduce consumers' seamless shopping routine of ordering more food than needed. Hence, we hypothesize:

**H4a.** Interface issues as 'reasons against' using FDAs during the COVID-19 pandemic will negatively influence consumers' shopping routine.

**H4b.** Interface issues as 'reasons against' using FDAs during the COVID-19 pandemic will negatively influence consumers' attitude.

**H5a.** Quality issues as 'reasons against' using FDAs during the COVID-19 pandemic will negatively influence consumers' shopping routine.

**H5b.** Quality issues as 'reasons against' using FDAs during the COVID-19 pandemic will negatively influence consumers' attitude.

### 2.2.4. Hygiene consciousness, attitude, and reasons

During the ongoing COVID-19 pandemic, the concern for avoiding exposure to this infectious disease may cause consumers to be worried about the hygiene practices followed by restaurants and FDAs while preparing the ordered food for delivery. Given that out-of-home dining has come to a near halt due to the movement restrictions imposed by governments to control the virus' spread (Anderson et al., 2020), consumers may be compelled to use FDAs to order food either due to their inability to cook, fear of exposure when leaving the house (such as for grocery shopping) or boredom from consuming home-cooked meals. Recent studies have noted that COVID-19 has distinctly altered how individuals think and act (Polizzi et al., 2020). For instance, consumers ordering food through online channels during the pandemic have shown a preference for fresh food for health reasons and hygienic packaging (Yang et al., 2021). In fact, a qualitative study revealed that users preferred the online food delivery service of luxury restaurants as they were appreciative of factors, such as hygienic, safe, and clean food delivery with high sanitation standards (Yang et al., 2021). Given that food safety concerns have always been discussed in the context of FDAs, including foodborne illnesses and food-package tampering (e.g., Kaur

et al., 2020b; Wasserstrom, 2018), it is plausible to expect that hygiene consciousness might make consumers wary of using FDAs during the pandemic when hygiene consciousness is their key priority. Based on the preceding discussion, we speculate that such consciousness will negatively impact their attitude toward ordering food from FDAs, erode their trust in these services, and cause them to worry about the quality of food, packaging, and other related aspects of the food delivered. Thus, we propose the following hypotheses:

**H6a.** Hygiene consciousness during the COVID-19 pandemic will negatively influence attitude toward FDAs.

**H6b.** Hygiene consciousness during the COVID-19 pandemic will negatively influence trust in FDAs.

**H6c.** Hygiene consciousness during the COVID-19 pandemic will positively influence quality issues related to FDAs.

#### 2.2.5. The mediating role of attitude and reasons

Based on prior studies, we presuppose that, along with the hypothesized direct associations, indirect effects also influence the key relationships underlying the conceptual model. For instance, attitude was found to mediate the relationship between reasons for and against consuming organic food and the resultant purchase intentions of consumers (Ryan and Casidy, 2018). Scholars have further confirmed the existence of the mediation effect of attitude in various online contexts as well. For example, Torres and Augusto (2019) revealed the mediating role of attitude in the relationship of online brand experience and brand personality with purchase intentions in the digital environment. We similarly anticipate that attitude will mediate the association of shopping routine with reasons for and against the use of FDAs during the COVID-19 pandemic, respectively. Hence, we propose:

**H7a.** Attitude mediates the association of trust and shopping routine.

**H7b.** Attitude mediates the association of price advantage and shopping routine.

**H7c.** Attitude mediates the association of interface issues and shopping routine.

**H7d.** Attitude mediates the association of quality issues and shopping routine.

We have hypothesized that trust will positively influence consumers' attitudes and that hygiene consciousness will negatively influence trust in FDAs during the pandemic. Similarly, we hypothesized that quality issues would negatively influence consumers' attitudes, and hygiene consciousness will positively influence quality issues related to FDAs during the COVID-19 pandemic as well. Furthermore, we proposed that hygiene consciousness will negatively influence attitude toward FDAs during the COVID-19 pandemic. These expected direct associations raise the question of whether trust and quality issues mediate the effect of moral norms on attitude. This would be in consonance with consumer behavior studies that have examined the mediational effect of reasons in the association of value with intentions and attitude (e.g., Ryan and Casidy, 2018). Although there are no prior findings in this regard, such mediation seems plausible since reasons for and against are context-specific and can be expected to play a role in the value-attitude dynamics. Hence, we propose:

**H8a.** Trust mediates the association of hygiene consciousness and attitude.

**H8b.** Quality issues mediate the association of hygiene consciousness and attitude.

#### 2.2.6. Moderating variables

Moderating influences play an important role in capturing individual differences in the association of antecedents with outcome variables. Prior studies on FDAs and other hospitality contexts have suggested that

age and gender moderate the effect of attitude toward food delivery using drones (Hwang et al., 2019) and that ratings moderate the association between e-satisfaction and online customers' continuance intentions to use online ratings (Tran et al., 2019). Since we wanted to capture two novel contexts, the COVID-19 pandemic and food waste due to ordering food via FDAs, we identified the moderating constructs that reflect the nature of our chosen contexts. Accordingly, we examined perceived severity and moral norms as moderating variables, as discussed previously. The operational description and measurement items used to measure the two moderators are presented in Table 1.

Perceived severity may be described as an individual's perception of the threat of a situation (Laato, 2020a) as well as its actual seriousness (Floyd et al., 2000). In the case of the COVID-19 pandemic, perceived severity may reflect individuals' appraisal of how serious their threat of exposure may be. Accordingly, perceived severity drives the adoption of prevention measures (Gamma et al., 2017; Laato et al., 2020b), particularly during a health crisis. It may thus motivate individuals to undertake protective measures (Rogers, 1975). Since the threat of the COVID-19 virus is well-accepted (Xu et al., 2020), we contend that the perceived severity of the pandemic may influence the association of hygiene consciousness with the factors driving or hindering the use of FDAs. This is in consonance with previous studies that have revealed its influence on use intentions in the case of health issues and pandemics (Ruthig, 2016; Bults et al., 2015). Since we hypothesized that hygiene consciousness would be negatively associated with trust in FDAs during the COVID-19 pandemic, it is plausible to expect that the pandemic's perceived severity will influence the strength of this association. Similarly, given our hypothesis that hygiene consciousness will be positively associated with quality issues related to FDAs during the COVID-19 pandemic, it is also plausible to expect that the perceived severity of the pandemic will influence the strength of this association. Hence, we posit:

**H9a.** The negative association of hygiene consciousness and trust will be enhanced by the perceived severity of the COVID-19 pandemic.

**H9b.** The positive association of hygiene consciousness and quality issues will be enhanced by the perceived severity of the COVID-19 pandemic.

We proposed that a positive attitude toward FDAs increases routine shopping behavior. This leads us to connect shopping routines with food waste since the prior literature has noted that ordering more food than needed results in such waste (Stefan et al., 2013). However, there is a possibility that the feeling of guilt associated with wasting food may reduce the strength of the positive association of attitude with shopping routine, implying that if consumers feel that food waste is against their moral norms, they may exhibit a lower tendency to indulge in shopping routine on FDAs. This supposition is in consonance with previous studies that have examined the association of moral norms with the intention to not waste food and the feeling of guilt among consumers when this waste occurs (e.g., Stefan et al., 2013). Along the same lines, prior studies have found that consumers exhibit a certain amount of morality related to food consumption and try to avoid food waste (Richter and Bokelmann, 2018). Accordingly, we argue that moral norms associated with food waste will have an important moderating influence on the food ordering behavior of FDA users. Hence, we propose:

**H10.** The positive association of attitude and shopping routine will be diminished by the moral norms associated with food waste.

#### 2.2.7. Control variables

The use of control variables is well-entrenched in the literature, with demographic variables used extensively in different hospitality and online contexts. For instance, Su and Mattila (2019) revealed gender bias in consumer booking intention on Airbnb, while Yoon and Occena (2015) suggested the need to control age in consumer behavior studies related to e-commerce. Hwang et al. (2019) further argued that

**Table 1**  
Operational description and measurement items of the moderating variables.

Variables	Operational description	Measurement items	Reference
<b>Moral norms</b>	Moral norms represent the feeling of guilt that FDA users have if the food they order is not consumed and goes to waste. Such guilt is driven by environmental concerns, food insecurity concerns, and an individual's own value system.	<ol style="list-style-type: none"> <li>1. Wasting food would make me feel guilty about people who do not have enough food</li> <li>2. Wasting food would make me feel guilty about the environment</li> <li>3. Wasting food would give me a bad conscience</li> <li>4. Wasting food is against my morals</li> <li>5. Wasting food is against my principles</li> <li>6. I feel ashamed if I waste food, even if nobody is aware of my actions</li> </ol>	Olsen et al. (2010); Yuan et al. (2016); Wan et al. (2017)
<b>Perceived severity</b>	Perceived severity represents FDA users' perception of the threat of the virus to themselves and others. This feeling of severity is driven by the fear that the virus is highly infectious, severe, and potentially fatal.	<ol style="list-style-type: none"> <li>1. The negative effects of COVID-19 infection are high</li> <li>2. COVID-19 infection can be dangerous for me</li> <li>3. Infection caused by the COVID-19 virus can be life-threatening for several people</li> <li>4. The COVID-19 infection is a serious illness for someone like me</li> <li>5. The infectious nature of the COVID-19 virus is severe</li> <li>6. The morbidity of the COVID-19 virus is severe</li> </ol>	Ling et al. (2019); Li et al. (2020)

controlling age is important for controlling the differences in the effect of product innovativeness on attitude and intentions toward drone food delivery services. Moreover, Di Talia et al. (2019) identified differences among consumers while studying the impact of household income on food shopping and consumers' food waste behavior. Scholars have also noted the effect of differences in household size on food-related behaviors, such as consumption patterns (Cho et al., 2019; Kim et al., 2018). Similarly, we argue that it is likely that the differences in FDA usage frequency may also have a significant moderating impact. Hence, the study considers age, gender, and economic background as control variables. In addition, household size and frequency of FDA usage are also controlled for their possible confounding effect.

### 3. Data and method

#### 3.1. Data collection and measurement

The study utilized an online cross-sectional survey to collect data from FDA users in India. The data was collected over a two-week period, with the survey link being shared on different social media platforms (e.g., Facebook and WhatsApp). Furthermore, the target population of FDA users was directly approached through acquaintances and social circles (e.g., peers, friends, colleagues). Due to COVID-19 restrictions and related safety measures (e.g., social distancing), it was not possible to collect data in-person through mall intervention or other face-to-face contact methods.

Multi-item scales were used to measure each construct in our research model. All items were measured on a five-point Likert scale (strongly disagree to strongly agree). Validated scales from the existing literature were utilized for data collection after being modified to suit the FDA context (see Table 1). Moreover, an expert group comprising three academic researchers and two practitioners specializing in hospitality and FDAs reviewed the initial study instrument. They were asked to evaluate the validity and suitability of the survey measures in the context of the COVID-19 pandemic. The expert group provided various suggestions for improvement, which were then incorporated. Afterward, an online pilot study with 10 FDA users was conducted, resulting in a

minor revision of the survey instrument to address ambiguity, odd wordings, or distorted meanings.

At the beginning of the actual survey, the respondents were briefed about the study's objectives, with no incentive offered for responding. The final dataset of 440 respondents (48.4% female,  $n = 213$ ) was taken forward for further data analysis after removing 89 incomplete/irrelevant responses. Regarding participants' ages, 35% ( $n = 154$ ) were between 26 and 35 years of age, followed by 34.3% ( $n = 151$ ) between 36 and 45 years old, 26.8% ( $n = 118$ ) who were either 25 years or younger, and 3.9% ( $n = 17$ ) who were 46 years of age or older.

#### 3.2. Data analysis methods

Confirmatory factor analysis (CFA) was performed to determine the reliability and validity of the measures. We then tested the conceptual model, hypothesizing the associations among the latent variables, for direct and indirect effects using structural equation modeling (SEM) in SPSS. The output was assessed to determine the overall goodness of fit, the significance of the path coefficients, and the variance explained. Common method bias (CMB) was tested using the Harman one-factor test, following Podsakoff et al.'s (2012) suggestion that such spurious covariance among variables may exist due to the common method used in data collection.

### 4. Results

#### 4.1. Common method bias (CMB)

Harman's one-factor test confirmed that a single latent factor accounted for only 40.38% of the total variance, which is less than the recommended cut-off of 50% (Podsakoff et al., 2012). This suggested that CMB did not pose a problem in the present study.

#### 4.2. Validity and reliability

The measurement model returned a good fit ( $\chi^2/df = 1.56$ ,  $CFI = 0.99$ ,  $TLI = 0.98$ ;  $RMSEA = 0.04$ ) (Hair et al., 2010). Factor loadings,

given in Table 2, were above 0.7, thus exceeding the recommended cut-off of 0.40. The items used were thus good measures of each construct and possessed sufficient convergent validity (Hair et al., 2010).

The composite reliability (CR) and the average variance extracted (AVE) values of the construct were found to be above the recommended threshold of 0.7 and 0.5, respectively (Hair et al., 2010) (Table 3). This confirmed the internal reliability and convergent validity of the study constructs. Discriminant validity was also confirmed as the square roots of the AVEs were greater than the correlation coefficients of the pairs of constructs (Hair et al., 2010).

### 4.3. Structural model

The path analysis returned a model with acceptable goodness of fit criteria ( $\chi^2/df = 2.35$ ,  $CFI = 0.95$ ,  $TLI = 0.94$ ;  $RMSEA = 0.06$ ) (Hair et al., 2010). The regression weights for the proposed hypotheses, along with the probability values, assisted in the hypothesis testing. The results of this testing are as follows: H1: ( $\beta = 0.19$ ,  $p < .001$ ), H2a: ( $\beta = 0.26$ ,  $p < .001$ ), H2b: ( $\beta = 0.09$ ,  $p < .05$ ), H3a: ( $\beta = 0.11$ ,  $p > .05$ ), H3b: ( $\beta = 0.19$ ,  $p < .001$ ), H4a: ( $\beta = 0.17$ ,  $p < .01$ ), H4b: ( $\beta = 0.30$ ,  $p < .001$ ), H5a: ( $\beta = 0.31$ ,  $p < .001$ ), H5b: ( $\beta = 0.34$ ,  $p < .001$ ), H6a: ( $\beta = -0.10$ ,  $p > .05$ ), H6b: ( $\beta = -0.13$ ,  $p < .05$ ), and H6c: ( $\beta = -0.25$ ,  $p < .001$ ). Furthermore, the proposed research model explained 39.6% of the variance in attitude and 43.2% of the variance in shopping routine (Fig. 2).

### 4.4. Mediation analysis

Mediation analysis was carried out using Model 4 in the PROCESS macro in SPSS. The parallel mediating effect of trust and quality issues was analyzed for the association of hygiene consciousness and attitude. The results showed that trust does not mediate this relationship while quality issues partially do. Furthermore, attitude was found to partially

mediate the associations of trust, price advantage, interface issues, and quality issues with the users' shopping routine (Tables 4 and 5). Thus, hypotheses H7a-7d and H8b were supported, while H8a was rejected.

### 4.5. Moderation analysis

The analysis was conducted using Model 1 in the PROCESS macro in SPSS. Herein, the conditional effect of the moderator perceived severity at three values: high (1 SD above average), medium (average), and low (1 SD below average) was calculated with hygiene consciousness as an independent variable and trust and quality issues as dependent variables. The results, presented in Table 6, revealed that perceived security does not moderate the association of hygiene consciousness with trust and quality issues. Similarly, the conditional effect of the moderator moral norms at three values: high (1 SD above average), medium (average), and low (1 SD below average) was calculated with attitude as an independent variable and shopping routine as the dependent variable. The results, presented in Table 6, revealed that moral norms do not moderate the association of attitude with shopping routine. The approach used to analyze and report moderation effects is in consonance with prior studies (Zhang and Hanks, 2018; Zou et al., 2015; Wang et al., 2021). Thus, H9a, H9b, and H10 were not supported by the present study.

### 4.6. Control variables

The present study considered age, gender, annual income, educational background, household size, and usage frequency as possible control variables. The considered variables had no controlling influence on attitude and shopping routine, with the only exception of usage frequency on shopping routine. Thus, as usage frequency increases, the users' shopping routine is positively influenced.

**Table 2**  
Study measures and factor loadings.

Study Measures (Reference)	Measurement Items	Mean	SD	CFA loadings	SEM loadings
<b>Hygiene Consciousness (HC)</b> (Talwar et al., 2020b)	I'm alert to changes in hygiene practices introduced by FDAs due to COVID-19 fears	2.80	1.27	.72	0.70
	I'm aware of the hygiene practices of restaurants and FDAs due to the COVID-19 pandemic	2.73	1.23	.74	0.72
<b>Trust (TR)</b> (Kaur et al., 2020a; Cho et al., 2019)	I trust FDAs while ordering food during the COVID-19 pandemic	3.15	1.26	.93	0.94
	I feel secure while ordering food via FDAs during the COVID-19 pandemic	3.20	1.34	.92	0.92
	I perceive I can rely on FDAs for ordering food during the COVID-19 pandemic	3.20	1.30	.91	0.91
	I feel the information provided by the FDAs is reliable	3.17	1.30	.90	0.90
<b>Price Advantage (PRA)</b> (Talwar et al., 2020b)	FDAs charge a reasonable price for the food ordered	3.12	1.19	.85	0.85
	Food ordered via FDAs is economical	2.97	1.14	.78	0.79
	FDAs offer good value for my money	3.00	1.13	.82	0.81
<b>Interface Issues (II)</b> (Kaur et al., 2020a)	The search bars on FDAs often fail to function properly	3.35	1.16	.85	0.85
	The interfaces of FDAs often lag or hang	3.55	1.14	.86	0.86
	FDAs often take a long time to process my order	3.43	1.16	.86	0.86
	FDAs do not regularly update the opening and closing time of a restaurant	3.35	1.09	.81	0.81
	Orders placed via FDAs frequently get canceled after being accepted	3.46	1.15	.84	0.84
<b>Quality Issues (QI)</b> (Kaur et al., 2020a)	Food containers are often not sealed properly, raising doubt as to whether the food ordered via FDAs has been tampered with	3.22	1.22	.87	0.87
	Restaurants often send a lesser quantity of food when ordered via FDAs during the COVID-19 pandemic	3.29	1.34	.91	0.92
	Restaurants often send lower quality food when ordered via FDAs during the COVID-19 pandemic	3.32	1.28	.88	0.88
<b>Attitude (ATT)</b> (Armitage & Conner, 1999; Juschten et al., 2019)	Ordering food via FDAs during the COVID-19 pandemic is satisfying	3.32	1.17	.93	0.91
	Ordering food via FDAs during the COVID-19 pandemic is good	3.24	1.10	.87	0.84
	Ordering food via FDAs during the COVID-19 pandemic is gratifying	3.42	1.27	.89	0.87
<b>Shopping Routine (SR)</b> (Stancu et al., 2016)	I often order unintended food items when ordering via FDAs during the COVID-19 pandemic	3.25	1.34	.94	0.92
	I often order too much food when ordering via FDAs during the COVID-19 pandemic	3.37	1.36	.92	0.90
	I usually buy more food than required if the FDA offers good value for money	3.22	1.34	.90	0.87
	I order more perishable food items (e.g., salads) via FDAs as part of healthier eating patterns during the COVID-19 pandemic	3.17	1.30	.82	0.78

Note. CFA = Confirmatory factor analysis (measurement model testing), SEM = Structural Equation Modeling

**Table 3**  
Validity & Reliability.

	CR	AVE	MSV	ASV	TR	ATT	PRA	QI	HC	SR	II
TR	0.95	0.84	0.26	0.14	<b>0.92</b>						
ATT	0.92	0.80	0.38	0.25	0.38	<b>0.89</b>					
PRA	0.86	0.67	0.24	0.16	0.23	0.48	<b>0.82</b>				
QI	0.92	0.79	0.43	0.28	0.50	0.62	0.49	<b>0.89</b>			
HC	0.70	0.53	0.04	0.02	-0.04	-0.20	-0.09	-0.15	<b>0.73</b>		
SR	0.94	0.80	0.43	0.26	0.52	0.59	0.45	0.66	-0.06	<b>0.89</b>	
II	0.93	0.71	0.36	0.23	0.36	0.59	0.47	0.60	-0.17	0.56	<b>0.84</b>

Note: Composite reliability = CR, Average variance extracted = AVE, Maximum shared variance = MSV, Average shared variance = ASV, Trust = TR, Attitude = ATT, Price advantage = PRA, Quality issues = QI, Hygiene consciousness = HC, Shopping routine = SR, Interface issues = II

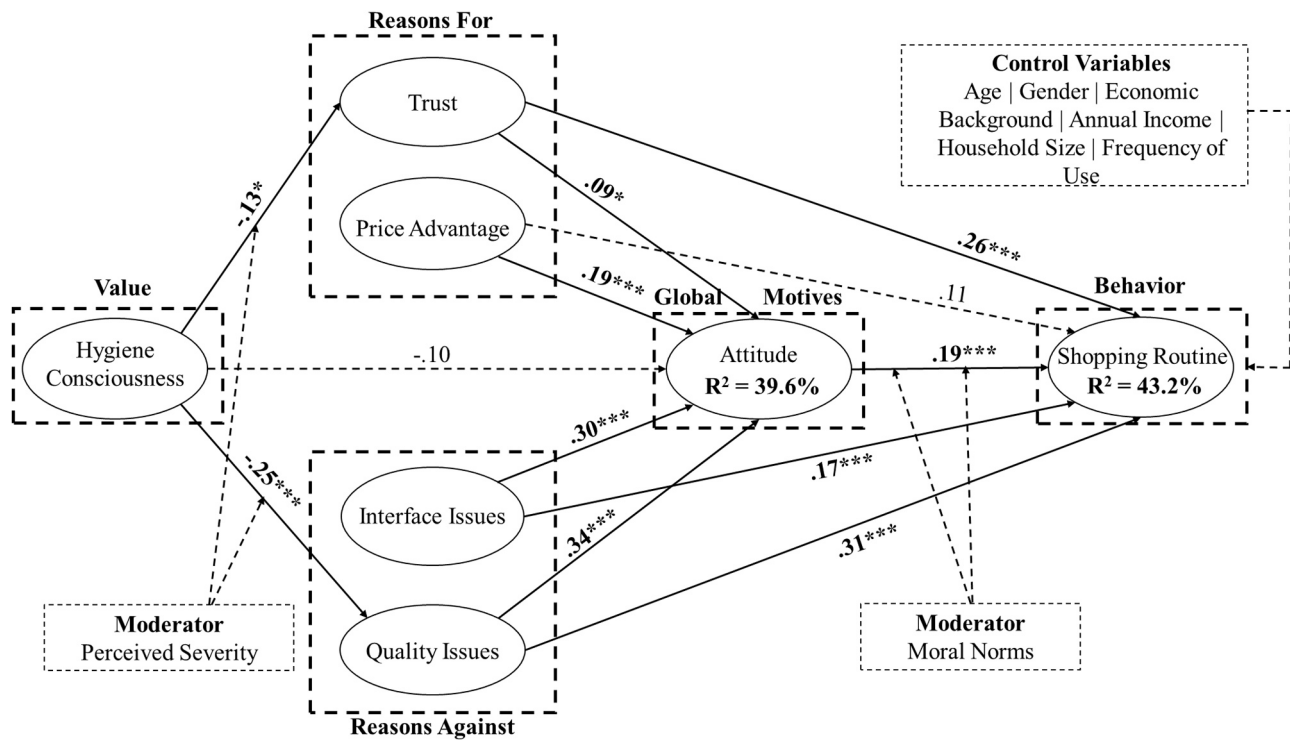


Fig. 2. Results of hypotheses testing.

**5. Discussion of results**

The conceptual model of the study is based on BRT, a theoretical framework that begins with values/beliefs and ends with actual behavior. Along with the proposed direct associations, multiple mediating and moderating relationships have been explored. The results of our hypothesis testing (H1 to H10) were varied. For ease of interpretation, we thus discuss the results under four categories:

*5.1. Anticipated outcomes and the implications thereof*

As hypothesized, the study results confirmed that the positive attitude of consumers toward FDAs during the COVID-19 pandemic increases shopping routine. This finding is in tandem with the earlier literature on the association of attitude with actual behavior (e.g., Sun et al., 2020; Choe and Kim, 2018), implying that consumers who find ordering food via FDAs during the COVID-19 pandemic to be satisfying and gratifying would inadvertently, yet frequently, order unintendedly large quantities of food items. In fact, they would order more food than required for the satiation of their hunger, particularly healthy foods, such as salads, in their bid to eat better during the ongoing health crisis.

As expected, trust, as an enabler of FDA usage, positively influenced both shopping routine and attitude. Consistent with prior findings (e.g.,

Kang and Namkung, 2019; Ponte et al., 2015), this outcome suggests that users' feeling of security and belief in the reliability of the information provided by FDAs causes them to order unplanned, excessive food, especially healthy food, during the COVID-19 pandemic. Furthermore, such trust, along with the price advantage offered by reasonable and value-for-money pricing, also enhances a positive attitude toward FDAs.

Another supported association directly captures the COVID-19 context. Hygiene consciousness was found to reduce trust in FDAs, which is plausible considering the prior findings on general hygiene consciousness as well as hygiene consciousness during health crises (e.g., Pizam and Tasci, 2019; Talwar et al., 2020a, 2020b; La Torre et al., 2009). The finding indicates that fears related to the COVID-19 pandemic raise concerns about changes in the hygiene practices of FDAs and listed restaurants, thus reducing trust in FDAs and the information they provide.

*5.2. Statistically insignificant results and their potential reasons*

We had expected a positive association between price advantage and shopping routine based on the extended findings (e.g., Stefan et al., 2013). However, the results indicated that the perception of FDAs' reasonable, economical, and value-for-money pricing of food items does



**Table 4**  
Results of mediation analysis.

HC → TR/QI → ATT						
	$\beta$	se	t	p	LLCI	ULCI
HC → TR	-0.04	0.05	-0.72	0.47	-0.1424	.0662
HC → QI	-0.13	0.05	-2.44	0.02	-0.2263	-0.0243
HC → ATT	-0.09	0.04	-2.37	0.02	-0.1705	-0.0159
TR → ATT	0.11	0.04	2.83	0.00	0.0343	0.1908
QI → ATT	0.46	0.04	11.26	0.00	0.3824	0.5440
Total effect	-0.16	0.05	-3.28	0.00	-0.2488	-0.0622
TR → ATT → SR						
	$\beta$	se	t	p	LLCI	ULCI
TR → ATT	0.33	0.04	8.13	0.00	0.2484	0.4068
TR → SR	0.33	0.04	8.19	0.00	0.2524	0.4117
ATT → SR	0.47	0.04	10.49	0.00	0.3817	0.5577
Total effect	0.49	0.04	11.51	0.00	0.4029	0.5688
PRA → ATT → SR						
	$\beta$	se	t	p	LLCI	ULCI
PRA → ATT	0.45	0.05	9.70	0.00	0.3622	0.5462
PRA → SR	0.26	0.05	4.91	0.00	0.1530	0.3572
ATT → SR	0.50	0.05	10.46	0.00	0.4086	0.5978
Total effect	0.48	0.05	9.19	0.00	0.3802	0.5871
II → ATT → SR						
	$\beta$	se	t	p	LLCI	ULCI
II → ATT	0.60	0.04	13.74	0.00	0.5174	0.6900
II → SR	0.39	0.06	7.02	0.00	0.2828	0.5026
ATT → SR	0.41	0.05	7.99	0.00	0.3066	0.5065
Total effect	0.64	0.05	12.76	0.00	0.5399	0.7364
QI → ATT → SR						
	$\beta$	se	t	p	LLCI	ULCI
QI → ATT	0.53	0.04	14.44	0.00	0.4557	0.5993
QI → SR	0.47	0.05	10.29	0.00	0.3778	0.5563
ATT → SR	0.32	0.05	6.48	0.00	0.2209	0.4130
Total effect	0.63	0.04	16.23	0.00	0.5575	0.7111

**Table 5**  
Indirect effects.

	$\beta$	BootSE	BootLLCI	BootULCI
HC → TR → ATT	-0.00	0.01	-0.0193	0.0077
HC → QI → ATT	-0.06	0.02	-0.1073	-0.0116
TR → ATT → SR	0.15	0.03	0.1053	0.2079
PRA → ATT → SR	0.23	0.03	0.1655	0.2982
II → ATT → SR	0.25	0.04	0.1619	0.3316
QI → ATT → SR	0.17	0.03	0.1005	0.2379

**Table 6**  
Results of moderation analysis.

Moral norms						
	$\beta$	t	p	LLCI	ULCI	Moderation?
ATT → SR	-0.02	-0.42	0.68	-0.1273	0.0826	No
Perceived severity						
	$\beta$	t	p	LLCI	ULCI	Moderation?
HC → TR	-0.07	-1.20	0.23	-0.1727	0.0414	No
HC → QI	0.001	0.01	0.99	-0.1033	0.1045	No

not induce users to order unintended items and excess quantities while ordering food through such platforms. A possible reason behind this outcome could be that the price advantage offered by FDAs is considered a routine feature by users and not something that would cause them to indulge in binge ordering. Another explanation could be that the COVID-19 pandemic has changed the priorities of consumers, leading them to over-order in the interest of their health or for consuming the food over multiple meals.

Similarly, our anticipation that COVID-19-related hygiene consciousness would diminish the positive attitude of consumers toward FDAs was not supported. Although the prior literature had not investigated this association, we had been motivated to expect such a negative

relationship given the concern of hygiene in the hospitality industry and the immense scope of the pandemic (e.g., Talwar et al., 2020a, 2020b; Xu et al., 2020; Liu et al., 2020). A possible reason behind this lack of support could be that hygiene consciousness is a habit and could have been present in consumers even before the COVID-19 pandemic, thus suggesting that concern for hygiene is already factored in by consumers, and they do not think much about it in terms of attitude toward FDAs (i.e., gratification and satisfaction). However, we feel that this lack of relationship between values/beliefs and global motives in the FDA context needs to be explored with a larger sample and consideration for the possible moderating influence of various demographic factors that have been controlled for in this study.

**5.3. Statistically significant results with confounding direction**

The results of the data analysis yielded confounding findings for all hypothesized direct associations in the case of reasons against, i.e., interface and quality issues. Based on the extant literature, we had anticipated a negative association of the reasons against with both attitude and shopping routine (e.g., Claudy et al., 2015; Lee et al., 2019; Suhartanto et al., 2019). In addition, we expected that heightened hygiene consciousness in the wake of the COVID-19 pandemic would cause consumers to be more concerned about quality issues. However, in each proposed association, we found a significant positive relationship. There could be many reasons for such an outcome. One possibility is that FDAs have a good service recovery strategy in terms of apology, compensation, and so on, which can cause consumers to forgive the service providers in the event of service failures, as discussed by previous scholars (e.g., Harrison-Walker, 2019; Chong and Ahmed, 2018). By resolving interface or quality issues whenever consumers encounter them, the FDAs could engage positively with their users, thus leading them to form a positive attitude and shopping routine despite these barriers. Another explanation for this unexpected but statistically significant association can be found in the prior literature on barriers, which have revealed that consumers may exhibit a paradoxical behavior, wherein they may have positive intentions despite the existence of barriers (e.g., Talwar et al., 2020a). These possibilities notwithstanding, we recommend that these relationships be tested with a larger sample to comment upon them more conclusively.

**5.4. Results of moderation and mediation**

The results show that attitude partially mediated the association of reasons for (trust and price advantage) with shopping routine, implying that users who have positive reasons for ordering food via FDAs will be even more motivated to indulge in a shopping routine, with a positive attitude playing a further role in this decision. Similarly, attitude partially mediated the association of reasons against (interface and quality issues) with shopping routine, implying that users who have barriers toward ordering food via FDAs will be paradoxically more motivated to indulge in a shopping routine, with a positive attitude again playing a further role in the decision. Such paradoxical behavior may be explained based on effective service recovery strategies by FDAs or the manifested tendency of consumers to have positive intentions despite the barriers.

Next, quality issues partially mediated the association of hygiene consciousness and attitude, implying that hygiene-conscious consumers' attitudes toward FDAs will be further affected by their perception of quality issues related to the food delivered by the FDAs. In comparison, trust did not mediate the association of hygiene consciousness with attitude, which implies that the existence or absence of trust will neither enhance nor diminish the attitude of FDA users with heightened hygiene consciousness during the COVID-19 pandemic.

Regarding the moderation analysis, we found that all three proposed hypotheses were not supported, indicating that perceived severity does not increase the strength of the negative association between hygiene

consciousness and trust or the positive association between hygiene consciousness and quality issues, despite the severe and ongoing threat of the COVID-19 pandemic (Miri et al., 2020; Xu et al., 2020). A possible reason behind such a result could be that the study participants were existing FDA users who have used FDAs to order food during the pandemic and, therefore, have likely discounted the seriousness and threat of infection. In a similarly confounding outcome, moral norms had no diminishing effect on the positive association between attitude and shopping routine. This is against what one would expect, given the prior findings (e.g., Richter and Bokelmann, 2018; Stefan et al., 2013), suggesting that ordering more food than required does not make consumers feel guilty about food waste. A possible reason could be that during the COVID-19 pandemic, ordering food for health and for driving away the monotony of home-cooked meals could be a bigger priority. Furthermore, consumers may have no worries about food going to waste during the COVID-19 pandemic because they are all largely confined to home, making it easier to consume leftovers by simply warming them or by transforming them into new dishes. Thus, rather than interpreting this result conclusively, we contend that moral norms should be tested in tandem with users' leftover reuse routine to provide a more complete picture.

## 6. Conclusion, implications, limitation, and future work

The present study brings together multiple contexts of FDA usage, the COVID-19 pandemic, and food waste to provide deep insight into complex consumer behavior in an online environment. Our study is intended to develop consumer behavior insights to help managers at FDAs better navigate the challenging situation posed by extrinsic stressors, such as the ongoing COVID-19 pandemic. Toward this end, we utilized BRT to propose and answer four research questions pertaining to (a) the effect of attitude on shopping routine (actual food ordering behavior); (b) the enablers (reasons for: trust and price advantage) and the barriers (reasons against: interface issues and quality) associated with consumers' attitude and shopping routine during the COVID-19 pandemic; (c) the antecedents of attitude, enablers, and barriers toward FDA use and their effects on attitude and shopping routine via FDAs; and (d) possible moderating influences.

The results generated by the path analysis of data collected from 440 FDA users during the COVID-19 pandemic revealed support for the positive association of both reasons for with attitude but only of trust with shopping routine. In contrast, a paradoxical positive association was found in the case of both reasons against with attitude and shopping routine. In the case of our research question related to hygiene consciousness during the COVID-19 pandemic and trust and quality issues, only the proposed association of hygiene consciousness with trust was supported. Our fourth research question pertained to the moderating effect of the perceived severity of the COVID-19 pandemic and moral norms. However, none of the proposed hypotheses were supported. In addition, drawing upon the suggestions of scholars (Sahu et al., 2020), we examined the mediating role of trust, quality issues, and attitude, finding a partial mediation in all cases but one, that of the mediating effect of trust on the association of hygiene consciousness and attitude. Finally, we controlled the study for the confounding effect of age, gender, economic background, household size, and frequency of FDA usage. Only usage frequency was found to have a controlling influence on shopping routine. The study results thus offer several interesting theoretical and practical implications, as discussed below.

### 6.1. Theoretical implications

The study offers four key implications from a theoretical perspective: first, the study spotlights the key concern of food waste in the hospitality sector (Dhir et al., 2020). In this context, the study identified and investigated unique variables, such as shopping routine and moral norms for food waste, which have not previously been used in the FDA

literature. Identifying novel and hitherto unexplored contemporary variables and associations in a given context has been recognized as a remarkable contribution by scholars (Whetten, 1989). Thus, by investigating shopping routine and the role of moral norms related to food waste in making food ordering decisions via FDAs, the study lays the basis for future scholars to consider the opposite pull of the hedonic tendency to order excessive food, on the one hand, and the moral dilemma to mitigate food waste on the other.

Second, the conceptual model and findings of the present study shift their focus to a new and evolving area of consumer behavior in the face of a severe health crisis, such as the ongoing COVID-19 pandemic. By examining consumer behavior toward FDAs under the threat of a health crisis with a high morbidity and infection rate (Xu et al., 2020; Liu et al., 2020), we contribute to the recently growing literature on COVID-19. These insights are quite valuable since scholars have noted that the extant literature on health crises and outbreaks is largely focused on health-related responses and, as such, lacks insights into these crises' impact on consumer behavior (Laato et al., 2020). This is underscored by recent studies published in the hospitality context. For instance, Luo and Xu (2021) utilized deep learning algorithms to analyze online reviews posted about a restaurant during the pandemic and discovered the algorithms best suited for different text mining tasks. Similarly, Yang et al. (2021) examined consumer response to luxury hotel restaurants' entry into online-to-offline (O2O) food delivery platforms during the pandemic, while Zhao and Bacao (2020) examined the intentions of users to continue using FDAs during the pandemic outbreak.

Third, our study enhances the understanding of the factors motivating and hindering consumers' positive attitude toward FDA usage and their actual food ordering behavior. The study thus addresses the gap in the prior literature regarding the overemphasis on technology-related positive factors that may promote the adoption and usage of FDAs. This is a key contribution as the valence of antecedents affecting usage and adoption behavior has been underscored by recent studies (e.g., Talwar et al., 2020c). Thus, the study opens new avenues for research in this area.

Finally, the present study is the first to apply BRT to develop and empirically test a theoretical framework in the context of FDAs. The study thus extends the theoretical explanation of the relationships in the existing literature on FDAs. Furthermore, by introducing hygiene consciousness and shopping routine, along with reasons for and against FDA usage, the present study paves the way for scholars to extend BRT to diverse food waste research in the hospitality domain.

### 6.2. Practical implications

The study offers three practical implications. First, our findings have confirmed that the positive attitude toward FDAs enhances the tendency of consumers to order more (i.e., indulge in a shopping routine), thus creating the possibility of food waste. Such an attitude is driven by price advantage, among other reasons, indicating that consumers expect FDAs to offer good value for money. Other scholars have noted that consumers prefer FDAs that offer lucrative discounts and tend to order more to avail themselves of such offers (Gupta et al., 2019). Thus, to attract consumers, FDAs offer various incentives. For example, UberEATS makes free deliveries for orders above a certain monetary value (Forbes, 2020). This may, in turn, lure consumers into ordering more food than they need. Although the food waste debate has not yet entered the context of FDAs, its imminent threat cannot be ignored. Furthermore, since such waste impacts the global community (Kasavan et al., 2019; Dhir et al., 2020), food waste, irrespective of the underlying cause, cannot be taken lightly. As such, FDAs face an unenviable dilemma in such a situation. On the one hand, withdrawing the price advantage may cause a reduction in revenue and loss of customers. On the other hand, by continuing to encourage ordering unnecessarily large quantities, FDAs may seem socially irresponsible, thus harming their reputation. FDA service providers thus need to preempt such issues by devising strategies

to protect their revenue without appearing to be socially insensitive. Drawing upon the extended food waste literature, which has paid special attention to leftover reuse (e.g., Stancu et al., 2016), we suggest that a possible way forward is for FDA service providers to start creating awareness about leftover reuse and mention on each package a “use by” date to indicate how long the food packed within is fit for safe consumption. By doing so, they can continue offering discounts, per their revenue model, and appear to be socially concerned at the same time.

Second, FDA marketers and service providers can use these findings to better understand the factors that motivate or hinder the usage of FDAs and that influence users to order more food than required, especially in the presence of stressors, such as the COVID-19 pandemic. Service providers can take cues from our study and make strategic decisions to drive consumer attitudes toward FDA use. For example, service providers can highlight their reasonable and economic pricing and underscore trust-related factors, such as reliability and safety, in their marketing and communication campaigns. This will also increase these services’ visibility, which has been emphasized as an important way to influence consumers (e.g., Talwar 2020a). These initiatives will also help consumers develop a feeling of trust toward FDAs during and even after the pandemic.

Finally, our results uncovered a paradoxical consumer behavior in which FDA users continue to have a positive attitude and shopping routine despite the existence of barriers related to interface and quality issues. Such a response could be attributed to the FDAs’ use of effective service recovery strategies when service failure events occur; these recovery strategies, in turn, can cause users to exonerate the FDAs for any service lapses, as discussed by prior studies (e.g., Harrison-Walker, 2019; Chong and Ahmed, 2018). As such, we suggest that FDA service providers should focus on designing and articulating effective recovery strategies for a comprehensive list of possible service failure events and then disseminating them to the customer service team at the grass-roots level for successful implementation.

### 6.3. Limitations and future work

This study has some limitations that can facilitate future research in this domain. First, the current study may lack generalizability due to its research context as it focused exclusively on understanding the behavior of Indian consumers. Future research could validate our findings with consumers from diverse cultural contexts. In addition, India is witnessing an important change in household demographics, which could be driving the increasing popularity of FDAs. Although our study provides crucial insights into consumer perspectives from a country with a high number of FDAs operating in the industry, our research can be extended to countries where FDAs are less popular and where the current findings may not be applicable.

Second, the current research used BRT, which future scholars can use to understand the adoption of other services in the hospitality sector. Researchers can also conduct comparisons of BRT with different theories on technology acceptance and consumption values to understand the differences and gaps that each theory addresses. This would further enrich the understanding of future scholars and practitioners operating in the domain of FDAs. Furthermore, we included only two reasons for and two reasons against in our model. This was done to avoid making the model too complex or testing too many hypotheses. However, there are multiple enablers, such as convenience, compatibility, ease of use, and service quality, that have been identified by prior studies (e.g., Kang and Namkung, 2019; Cho et al., 2019; Yeo et al., 2017; Ray et al., 2019). Similarly, scholars have examined barriers, such as poor delivery experience and poor customer service, as reasons against the use of FDAs (Kaur et al., 2020b). Researchers can thus expand our model by including other variables in their study as reasons for and against, including the effect of delivery fee on usage intentions.

Finally, the study used cross-sectional, self-reported data to test the hypotheses. This was particularly useful in capturing the behavior of a

representative subset of the population quickly, especially during a health crisis like the ongoing COVID-19 pandemic. However, there could be some biases in the data. Therefore, future research can further explore the relationships between variables using longitudinal or experimental studies.

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