

The new normal: the adoption of food delivery apps

The adoption
of food delivery
apps

175

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Abstract

Purpose – In the wake of lockdown regulations and limited mobility during the COVID-19 pandemic, dining habits shifted towards usage of food delivery apps to avoid physical interaction. Nonetheless, it is unknown whether the COVID-19 pandemic had an influence on the adoption of food delivery apps. Therefore, this study examined factors influencing the adoption of food delivery apps during the COVID-19 pandemic, as well as the moderating effects of education and age.

Design/methodology/approach – Data were collected from 282 food delivery application users in South Africa using a web-based survey. Partial least square structural equation modelling analysis was used to test the hypotheses, while partial least squares multigroup analysis was used to examine the moderating effect of education level and age.

Findings – The results indicated that perceived ease of use has a significant impact on perceived usefulness and attitudes, perceived usefulness has an impact on attitudes and continuous intention, attitude influences continuous intention and social pressure and convenience influence attitudes. The perceived COVID-19 threat had no impact on attitudes, and education and age had no significant impact on any relationships. The findings are imperative for restaurants and mobile application designers, as they enable more effective strategic management planning.

Originality/value – This study is the first paper to empirically employ technology acceptance model to analyse the adoption of food delivery applications during the COVID-19 pandemic. Its uniqueness is in examining situational influence associated with the pandemic such as social pressure, perceived COVID-19 threat and convenience.

Keywords Food delivery apps, COVID-19 threat, TAM, Social influence, Ease of use, Usefulness, Continuous intention

Paper type Research paper

1. Background

During the COVID-19 pandemic, the World Health Organization (WHO) strongly recommended social distancing and other self-protection measures to avoid direct human interaction to reduce the risk of COVID-19 transmission (Madinga *et al.*, 2022). The conventional catering industry suffered greatly as consumers tended to avoid public spaces during the COVID-19 pandemic (Zhao and Bacao, 2020). As a result, the South African economy was drastically affected by the pandemic and lockdown regulations. According to Stats-SA (2020), sales by restaurants and coffee shops decreased by 98% in May 2020 compared with May 2019. Despite the negative effects of COVID-19, FIFE (2020) found that approximately 40% of food retailers recorded an increase in food delivery requests. Changing consumer habits have accelerated the transformation of the restaurant industry from traditional in-store service to online services to survive the pandemic (Zhao and Bacao, 2020).

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The COVID-19 pandemic caused great pressure on the demand for products and services devoid of human contact. In the wake of lockdown regulations and limited mobility, dining habits have shifted towards usage of food delivery apps to avoid physical interaction between people (Shah *et al.*, 2021). Kaur *et al.* (2021) define food delivery apps as “mobile applications used to order from food-aggregator platforms, which include both restaurant-to-consumer delivery and aggregator-to-consumer delivery”. Food delivery apps are one of the most rapidly developing segments of the mobile application market (Shroff *et al.*, 2022) and they have lately gained popularity worldwide, helping both customers and businesses by facilitating hassle-free, efficient and timely online food ordering and offline food delivery services (Gani *et al.*, 2021). Globally, the online food delivery market was worth US\$323.30bn in 2022 and is predicted to grow to US\$466.20bn by 2027, at an annual growth rate (CAGR 2022–2017) of 7.60% (Statista, 2022). On the African continent, South Africa has the biggest online delivery market. According to Statista (2022), South Africa’s online food delivery market was worth US\$807.10m in 2022 and is projected to grow to US\$1.152m by 2027, at an annual growth rate (CAGR 2022–2027) of 7.38%.

The adoption rate of food delivery apps in South Africa has been growing in recent years, but remains relatively low, with only 7.3% of the population was using these services in 2022 (Statista, 2022). This is despite the widespread adoption of e-commerce for various products and services in developed countries, including clothing, electronics, and furniture, where the percentage of consumers ordering food through apps is also low (Bruwer *et al.*, 2021). Considering the shift in consumer behaviour and the rise of restaurants’ online presence during the pandemic, it is imperative to consider what factors influence the adoption of food delivery apps to understand the expectations and requirements of food delivery app users during the pandemic.

To date, a number of scholars have offered a fundamental understanding of food delivery services (Chai and Yat, 2019; Lee *et al.*, 2017), factors influencing the usage of food delivery services (Zhao and Bacao, 2020; Su *et al.*, 2022; Bruwer *et al.*, 2021), attitudes towards food delivery services (Chen *et al.*, 2020; Yeo *et al.*, 2017), risks associated with drone food delivery (Choe *et al.*, 2021; Hong *et al.*, 2021; Hwang and Kim, 2021), and decision process associated with adoption of food delivery services (Song *et al.*, 2021). Nonetheless, it is unknown whether the COVID-19 pandemic has an influence on customers’ intention to adopt food delivery apps. As the pandemic has had a great influence on changes in peoples’ behaviour (Hong *et al.*, 2021), it is important to include the COVID-19 pandemic as a contextual factor influencing the adoption of food delivery apps during the pandemic. In addition, a number of studies have demonstrated that individuals who perceive health threats alter their preventative behaviour (Hong *et al.*, 2021; Ali *et al.*, 2019). Therefore, individuals might adopt food delivery apps to avoid interacting with restaurant employees and other consumers during and post COVID-19 pandemic. However, no study has considered the impact of perceived COVID-19 threat on the adoption of food delivery apps. To fill this research gap, this study addresses the following research objectives:

- (1) Determine factors that influence the adoption of food delivery apps during the COVID-19 pandemic;
- (2) Determine if the relationships established in previous literature holds true for food delivery apps adoption during the COVID-19 pandemic.

Understanding these factors can help businesses to develop strategies that can increase the adoption of the food delivery apps in South Africa. According to Bruwer *et al.* (2021) “it is very useful for organizations to identify and examine such factors to frame appropriate strategic frameworks that lead to greater adoption of food delivery apps during and post COVID-19”. These trends are anticipated to persist in the post-COVID-19 context (Gani *et al.*, 2021).

This study thus examined the adoption of food delivery apps during the COVID-19 pandemic. This was achieved by utilising an extension of the technology acceptance model (TAM) to consider the factors which affect the adoption of food delivery apps. TAM has been found to accurately predict people's e-commerce acceptance behaviour (Jamshidi and Hussin, 2016). Previous studies have examined the adoption of food delivery apps using TAM (Song *et al.*, 2021; Su *et al.*, 2022), however, to the best of the authors' knowledge, there are no existing studies which have extended the model to include social pressure, perceived COVID-19 threat and convenience. This study contributes to the literature by examining the influence of situational influence (COVID-19 pandemic) on the intention to adopt food delivery apps. The findings of this study confirm the robustness of TAM in terms of its ability to predict adoption intentions of technology applications. Furthermore, this study examines the moderating effect of education level and age. This study provides insights for marketing practitioners, food delivery providers and restaurant managers, as the findings identify critical factors to consider when developing their strategies. The results of this study are important to current and future food delivery services, restaurants, developers of mobile apps and consumers. Based on the findings, restaurants will be able to improve current food delivery apps, as well as design and develop innovative mobile apps that provide consumers with value.

Following from this introduction is a review of literature on food delivery apps and TAM, subsequent to which hypotheses are formed. The methodology is then outlined, detailing data collection and analysis processes, and the results are reported. A discussion of the results and their managerial implications are then provided.

2. Literature review and hypothesis development

2.1 Food delivery apps

Delivering food and beverages to customers' homes has recently been a popular option for restaurants and coffee shops during the COVID-19 pandemic as they are finding new methods to stay afloat (Hong *et al.*, 2021). Online food delivery services involve the ordering and delivery of food from various grocery stores, restaurants or coffee shops through a website or mobile delivery application (Ray *et al.*, 2019; Kapoor and Vij, 2018). Food delivery apps have become a popular trend in e-commerce due to their ability to reach a larger number of customers at a lower cost (Shankar *et al.*, 2022). By implementing a food delivery service, restaurants can expand their customer base in an affordable manner while enabling customers to order the meal of their choosing with little hassle (Bruwer *et al.*, 2021). The swift infiltration of smartphones has driven the growth of food delivery apps (Kapoor and Vij, 2018). Some restaurants have their own food delivery service such as Dominos, KFC, Pizza Hut and many more (Yeo *et al.*, 2017). However, due to financial implications, not all restaurants use their own delivery channels for food delivery (Shankar *et al.*, 2022). They opt for third-party platforms, such as UberEats, Foodpanda, Bolt Food, Zamato, Swiggy, Mr. Delivery, to enable online food delivery. Third-party food delivery applications act as intermediaries for various restaurants and service multiple restaurants with different cuisines (Hong *et al.*, 2021; Yeo *et al.*, 2017).

Due to the increasing popularity of food delivery services over the past few years, the academic community has started paying more attention to these services (Gani *et al.*, 2021). According to Shankar *et al.* (2022), between 2014 and 2021, 56 articles on food delivery services were published in 21 journals. The adoption of food delivery services was studied from several theoretical perspectives. Scholars have made use of various theoretical frameworks to identify factors that influence the adoption of food delivery services, such as the unified theory of acceptance and use of technology (UTAUT1), theory of planned behaviour (TPB), TAM, pleasure arousal dominance (PAD), expectancy confirmation model

(ECM), innovation resistance theory (IRT), social influence theory (SIT), theory of reasoned action (TRA), regulatory focus theory (RFT), uses and gratifications (U&G) theory (Shankar *et al.*, 2022). These models and theories examine consumers' intentions and attitudes towards adoption of technology, particularly in the context of food delivery apps.

2.2 Extension of TAM

TAM has been used extensively in previous literature and thus, to present a substantial contribution to literature, the present study employed an extension of TAM; this involves considering the relationship between three added constructs (namely perceived COVID-19 threat, social pressure and convenience) and attitudes towards food delivery apps. The model consists of four key constructs: perceived ease of use, perceived usefulness, attitudes and behavioural intention. The model considers how the attributes and features of a new technology will affect consumers' perceptions and how the consumer will ultimately use the new technology. TAM's focal point is based on the idea that usefulness and perceived ease of use are closely associated with consumers' attitudes towards adopting a new technology (Choe *et al.*, 2021). This is important in analysing the acceptance of a new technology as consumers' attitudes towards a new technology have been seen as being critical in the continual use of new technology (Choe *et al.*, 2021). The TAM has been extended in past studies by adding external variables as a means of influencing consumers' attitude, behavioural intention and use of technology (Lee *et al.*, 2017). This study includes perceived COVID-19 threat, social pressure and convenience in order to analyse these external factors' relationship with attitude towards food delivery apps.

2.2.1 Perceived ease of use. Perceived ease of use has been defined in literature as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Davis (1989) claims that an application which consumers perceive to be easy to use is likely to be accepted by consumers and users. Perceived ease of use is related to food delivery apps as the easier a consumer perceives the food delivery app to be, the more frequently the consumer will use and accept the service into their lifestyle (Lee *et al.*, 2017). In a study presented by Jayasingh and Eze (2015) exploring consumers' adoption of mobile coupons, it was found that perceived usefulness and perceived ease of use influence consumers' attitude which in turn influences consumers' intention to use mobile coupons. Similarly, Yeo *et al.* (2017) found that perceived ease of use and perceived usefulness affect consumers' attitude towards technology adoption.

2.2.2 Perceived usefulness. Perceived usefulness has been defined in past literature as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). Gefen and Straub (2000) found that perceived ease of use has a direct relationship with perceived usefulness. Moreover, in a study carried out by Abdullah *et al.* (2016), it was found that the best predictor of perceived usefulness is perceived ease of use.

2.2.3 Attitudes towards food delivery apps. Attitudes can be defined as an individual's feeling of favour or disfavour towards a certain object or behaviour (Nkomo *et al.*, 2017). Past literature has confirmed that there is an existing relationship between attitudes and perceived usefulness as well as an existing relationship between attitudes and perceived ease of use (Kaur *et al.*, 2021; Lee *et al.*, 2017).

2.2.4 Continuous intention. Continuous intention can be defined as the degree to which a person has formulated a conscious plan to perform or not perform a specified behaviour in future (Brezavšček *et al.*, 2017; Colman *et al.*, 2021; Minnaar *et al.*, 2020; Madinga *et al.*, 2021, Tseng *et al.*, 2020). Bruwer *et al.* (2021) established that consumers' attitudes towards purchasing food online has a substantial positive impact on behavioural intentions. Additionally, Yeo *et al.* (2017) studied the correlation between attitude and behavioural intention through a study looking at online food delivery services and found that the positive correlation was supported as the results were significant (Yeo *et al.*, 2017).

2.2.5 Perceived COVID-19 threat. In this study, perceived COVID-19 threat refers to one's understanding of the health risks that one could face when eating at a restaurant or coffee shop during the COVID-19 pandemic (Ali *et al.*, 2020; Madinga *et al.*, 2022). A study conducted by Ali *et al.* (2020), argues that situational factors, such as the COVID-19 pandemic, positively influence consumers' attitude towards food delivery apps. However, Mehroliya *et al.* (2021) had contradictory results as respondents felt that the disease could be spread through delivery partners. However, there is overwhelming evidence that consumers believe that using food delivery apps is a safer way to order food during the COVID-19 pandemic (Hong *et al.*, 2021; Ali *et al.*, 2019; Gani *et al.*, 2021).

2.2.6 Social pressures. Social influence is defined as the degree to which users are willing to use a technology because of the influence of others including family, friends, peers and co-workers (Zhao and Bacao, 2020). A study conducted by Kulviwat *et al.* (2009) on the adoption of high-tech innovations, found that social influence has a positive significant relationship with high tech adoption intention. Lee *et al.* (2019) found that consumers' adoption of emerging technology has been shown to be positively influenced by social pressure. During the COVID-19 pandemic, there were prevalent social pressures to use food delivery services as people had to quarantine at home to stay safe (Li *et al.*, 2020).

2.2.7 Convenience. Evidence has shown that convenience plays a crucial role in the food choices made by consumers. 'Convenient' implies that something can be done with minimal effort (Nettle, 2019). Li *et al.* (2020) claim that food delivery apps provide convenience as it only requires a few touches on a smartphone device and food is delivered on a consumer's doorstep. As the world had to adapt to a lifestyle governed by COVID-19, food delivery apps provided a safe option for consumers to receive food on their doorstep with little effort and time.

2.3 Moderating effect of education-level and age

To achieve the aim of this study, the most important moderating effects that the literature has deemed relevant to the adoption of new technology were incorporated (Liébana-Cabanillas *et al.*, 2021). In this study, the moderating effect of level of education and age were examined. Education level refers to the knowledge and skills gained through the process of formal education (Chawla and Joshi, 2018). Abu-Shanab (2011) indicates that education level positively influences the perception of technology. Higher education levels result in more usage of technology (Abu-Shanab, 2011). Chawla and Joshi (2018) studied the relationship between perceived ease of use and the attitude towards mobile banking and found that there was no moderating effect of education (Chawla and Joshi, 2018). However, perceived usefulness and perceived ease of use were moderated by education levels in studies conducted by Binyamin *et al.* (2019) and Claar *et al.* (2014).

Age is a significant moderating element with two opposing perspectives. The first viewpoint asserts that older consumers are less inclined to adopt new technology (AlHadid *et al.*, 2022). This may be because older people are less flexible to technological change whereas younger people are more flexible to changing technology (Liebana-Cabanillas and Alonso-Dos-Santos, 2017). The second view is that age matters but does not determine technology adoption (Tan and Ooi, 2018). Paul and Spuru (2021) argue that demographic factors do not influence the adoption and usage of new technology. They further argue that psychological and social factors influence adoption of technology. However, there is overwhelming empirical evidence in recent studies showing that age has an influence on technology adoption (AlHadid *et al.*, 2022; Owusu Kwateng *et al.*, 2021; Kasilingam and Krishna, 2022).

2.4 Hypotheses

Based on the preliminary literature provided in this study, a hypothetical model and hypotheses were developed. The hypotheses are discussed below, and Figure 1 depicts a

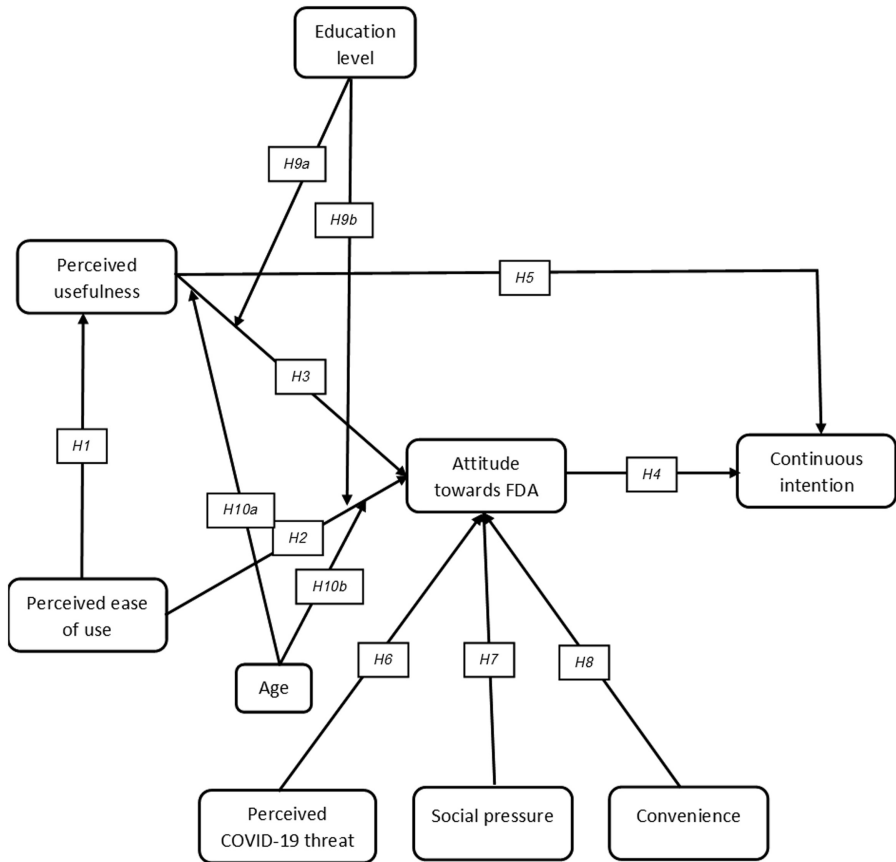


Figure 1.
Hypothetical model

Source(s): Figure 1 by authors

visual representation of the conceptual model that the present study employs, illustrating the extension of the TAM.

- H1.* Perceived ease of use is positively related to perceived usefulness.
- H2.* Perceived ease of use is positively related to attitude towards food delivery apps.
- H3.* Perceived usefulness is positively related to attitude towards food delivery apps.
- H4.* Attitude towards food delivery apps is positively related to the continuous intention to use food delivery apps.
- H5.* Perceived usefulness positively influences continuous intention to use food delivery apps.
- H6.* Perceived COVID-19 threat is positively related to attitude towards food delivery apps.
- H7.* Social pressure is positively related to attitude towards food delivery apps.
- H8.* Convenience is positively related to attitude towards food delivery apps.

- H9a.* The relationship between perceived usefulness and attitude towards food delivery apps is moderated by education level.
- H9b.* The relationship between perceived ease of use and attitude towards food delivery apps is moderated by education level.
- H10a.* The relationship between perceived usefulness and attitude towards food delivery apps is moderated by age.
- H10b.* The relationship between perceived ease of use and attitude towards food delivery apps is moderated by age.

3. Research methodology

3.1 Data collection

All items in the questionnaire were adapted from existing research. The first section of the questionnaire included demographic questions pertaining to respondents' age, gender, education level and food delivery app usage. All the items were measured using a five-point Likert scale, ranging from "strongly disagree" 1 to "strongly agree" 5. A web-based, self-administered questionnaire was used to collect data. The web-based survey was created using Qualtrics. Of the 300 questionnaires that were collected, 282 were included for analysis.

4. Results

4.1 Respondents' profile

Table 1 provides an overview of the study sample's demographics. In terms of gender, there were 82 male respondents (representing 29% of the total), while there were 197 female respondents (representing 70% of the total). In addition, 07% respondents identified as other, while 0.3% of the respondents preferred not to reveal their gender. The age of respondents

Variable	Category	Frequency	Percentage
Gender	Male	82	29
	Female	197	70
	Other	2	0.7
	Prefer not to say	1	0.3
Age	18–22	137	49
	23–27	71	25
	28–32	15	5
	33–37	14	5
	38–42	10	4
	43–47	3	1
	48–52	6	2
	53–57	14	5
	58–62	9	3
	63–67	2	0.7
Education	68 and above	1	0.3
	High school	89	32
	Undergrad qualification	80	28
	Postgrad qualification	108	38
	Prefer not to say	5	2

Note(s): Respondents (n) = 282

Source(s): Table by authors

Table 1.
Respondents profile

ranged from 18 to 68 years old with the majority of participants between 18 and 27 years old (74%). There was an equitable distribution of the respondents by level of education, with 32% holding a high school diploma, 28% an undergraduate qualification and 38% a postgraduate qualification. Lastly, 2% of the respondents preferred not to disclose their education level.

Table 2 presents the food delivery app user behaviour, indicating that the majority of the respondents (80.5%) have more than one food delivery app and 78.8% make use of the food delivery apps more than once a month. In addition, only 15.6% makes use of UberEats while 74.8% make use of other food delivery apps.

4.2 Research model analysis

This study employed partial least squares structural equation modelling (PLS-SEM) to analyse measurement and structural models. PLS-SEM stands out when studying complex research models with small samples and nonnormalized data (Gefen and Straub, 2000). Anderson and Gerbing's (1988) two stage analytical protocol was followed in this study. In the first stage, the measurement model was evaluated to assess the convergent validity and discriminant validity. Next, the structural model was evaluated to test the hypotheses. To test the significance of outer loadings and path coefficients, a bootstrapping approach (5000 resamples) was used (Sarstedt et al., 2014).

4.2.1 Measurement model assessment. Outer loadings, composite reliability (CR) and average variance extracted (AVE) were used to evaluate convergent validity. Outer loading values indicating reliability should be greater than 0.70 (Leguina, 2015). Outer loadings in this study ranged from 0.745 to 0.903, and thus were above the threshold recommended by Hair et al. (2020). The Cronbach alpha values ranged from 0.750 to 0.884, and thus were above the threshold of 0.7 threshold as suggested by Field (2018). The following factors: CI2, CI5, PCT5, C4 and C5 were removed as they did not have an acceptable factor loading above the 0.7 minimal cut-off score (Hair et al., 2017). The CR values were between 0.857 and 0.916, showing a high degree of internal consistency of the constructs. Furthermore, all the AVE values were greater than 0.50, ranging between 0.590 and 0.740 (see Table 3), confirming convergence validity. As a result, the measurement validity was deemed sufficient and satisfactory.

The discriminant validity was tested using the heterotrait-monotrait (HTMT) criterion (Henseler et al., 2015). All the HTMT values are below the cut off value of 0.90, confirming discriminant validity. The HTMT results are presented in Table 4.

	Categories	Frequency	Percentage
FDAs	UberEats	44	15.6
	Bolt Food	2	0.7
	Mr. D Food	11	3.9
	Checkers60six	14	5
	others	211	74.8
No of FDAs	1	55	19.5
	2	99	35.1
	3	67	23.8
	4 and above	61	21.6
FDAs use per month	Once	57	20.2
	Twice	55	19.5
	Three times	55	19.5
	More than 3 times	115	40.8

Table 2.
Food delivery app user
behaviour

Note(s): FDAs = food delivery apps
Source(s): Table by authors

Research construct	Factor loadings	Cronbach's alpha	CR	AVE
Attitude towards FDA (A)		0.869	0.910	0.717
A2	0.823			
A3	0.855			
A4	0.867			
A5	0.842			
Convenience (C)		0.824	0.895	0.740
C1	0.829			
C2	0.888			
C3	0.863			
Continuous intention (CI)		0.750	0.857	0.667
CI1	0.802			
CI3	0.777			
CI4	0.869			
Perceived COVID-19 threat (PCT)		0.867	0.901	0.696
PCT1	0.802			
PCT2	0.878			
PCT3	0.859			
PCT4	0.794			
Perceived ease of use (PEU)		0.877	0.910	0.671
PEU1	0.813			
PEU2	0.804			
PEU3	0.890			
PEU4	0.760			
PEU5	0.823			
Perceived usefulness (PU)		0.884	0.916	0.686
PU1	0.745			
PU2	0.818			
PU3	0.903			
PU4	0.867			
PU5	0.799			
Social influence (SI)		0.850	0.877	0.590
SI1	0.729			
SI2	0.752			
SI3	0.732			
SI4	0.764			
SI5	0.856			

Source(s): Table by authors

Table 3. Measurement statistics of constructs

	A	C	CI	PCT	PEOU	SI
A	0.714					
C	0.626	0.572				
CI	0.165	0.167	0.099			
PCT	0.508	0.556	0.418	0.112		
PEOU	0.549	0.570	0.465	0.153	0.613	
SI	0.214	0.210	0.267	0.197	0.116	0.122

Note(s): A = attitude towards FDA, C = convenience, CI = continuous intention, PCT = Perceived COVID-19 threat, PEOU = perceived ease of use, PU = perceived usefulness, SI = social influence

Source(s): Table by authors

Table 4. Discriminant validity (HTMT results)

Variance of inflation factor (VIF) was also used in this analysis to identify the degree of multicollinearity. The PLS collinearity statistics show that the inner VIF values range from 1.459 to 3.244, which are below the cut-off threshold of 3.3. Finally, the overall model fit was evaluated using the standardised root mean square residual (SRMR), Chi-Square and NFI. SRMR was 0.077, Chi-square was 1,314.517 and NFI was 0.725, which is considered a good fit. The explanatory capacity of the structural model was examined using R^2 (Hair *et al.*, 2019). The R^2 value was 0.446 for attitudes towards food delivery apps, 0.283 for continuous intention and 0.295 for perceived usefulness. According to Falk and Miller (1992), R^2 should be greater than 0.10 (10%). The structural model is illustrated in Figure 2.

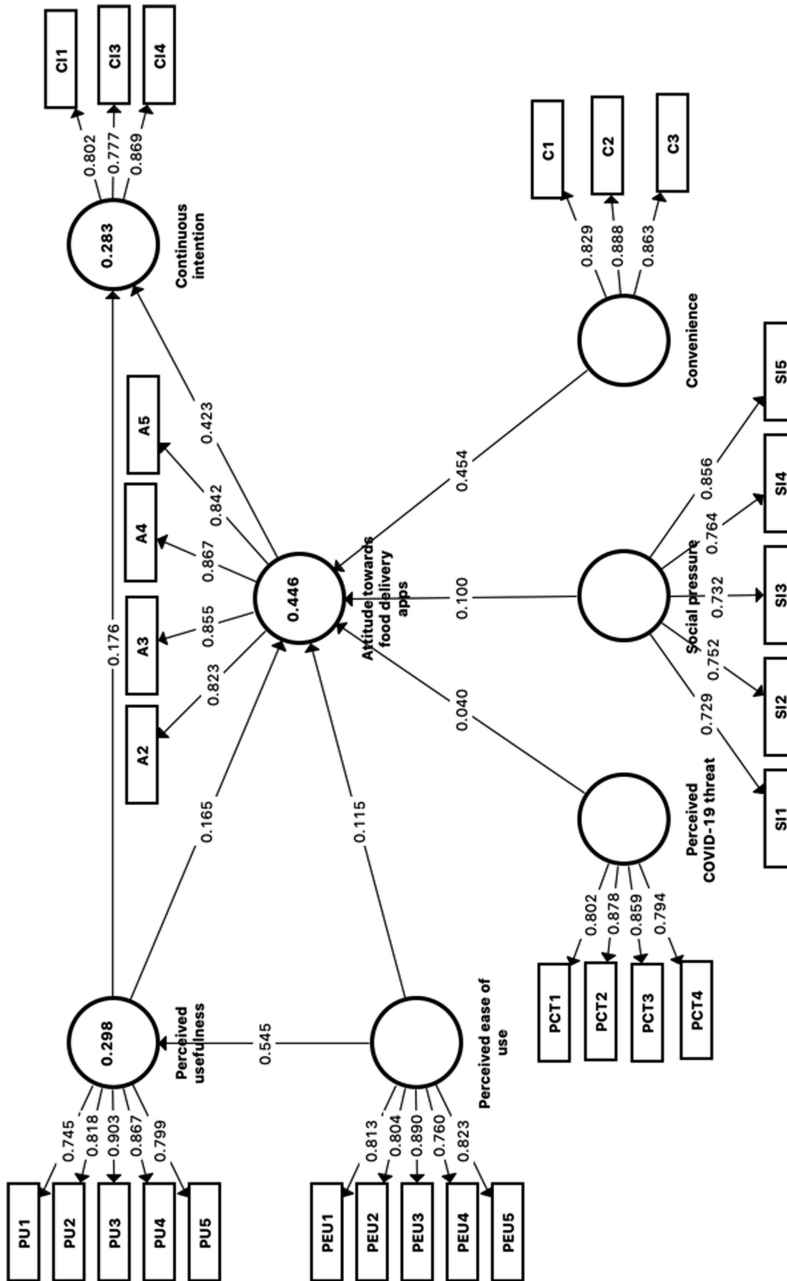
4.2.2 Hypotheses testing. Perceived ease of use had a positive influence on consumers' perceived usefulness ($\beta = 0.545, p = 0.000$) and attitude towards food delivery apps ($\beta = 0.115, p = 0.019$), thus supporting H1 and H2. Perceived usefulness positively influenced consumers' attitudes towards food delivery apps ($\beta = 0.165, p = 0.003$), thus H3 is supported. Attitude towards food delivery apps is positively related to consumers' intention of continuous use ($\beta = 0.423, p = 0.000$) and thus H4 is supported. Perceived usefulness is also positively related to continuous intention to use food delivery apps ($\beta = 0.176, p = 0.007$) and thus H5 is supported. Perceived COVID-19 threat does not significantly influence consumers' attitudes towards food delivery apps ($\beta = 0.040, p = 0.343$ and thus H6 is not supported in this study. Social pressures ($\beta = 0.100, p = 0.020$) and convenience ($\beta = 0.454, p = 0.000$) positively influence consumers' attitude towards food delivery apps and thus, H7 and H8 are supported. The results of PLS-SEM are presented in Table 5.

In order to test for moderation, partial least squares multigroup analysis (PLS-MGA) was used to examine the differences in group results. SmartPLS' parametric testing and bootstrapping using 1,000 iterations were used to conduct the multi-group analysis. Education was used as a moderating variable in the present study and to complete PLS-MGA, two groups were formed: poorly educated (those who hold a primary and high school certificate) and highly educated (those who hold an undergraduate or post-graduate qualification). Five respondents chose not to disclose their level of education. The findings indicate that the relationships between perceived ease of use and perceived usefulness with attitude towards food delivery apps are not moderated by education level, therefore H9a and H9b were rejected. The results of the PLS-MGA are presented in Tables 6 and 7.

Age was a second moderating variable used in the present study and in order to complete PLS-MGA, age was categorised into two groups: young respondents (individuals aged 18–25) and old respondents (individuals aged 26–68). The findings indicate that the relationships between perceived ease of use and perceived usefulness with attitude towards food delivery apps are not moderated by age, therefore H10a and H10b were rejected (see Table 7).

5. Discussion

The findings revealed that the intention to continue to use food delivery apps is influenced by perceived usefulness and attitudes towards food delivery apps. This finding confirms that of Lee *et al.* (2017) as well as Lee *et al.* (2019). It was found that perceived ease of use is a significant predictor of perceived usefulness, thus indicating that when consumers find a food delivery app easy to use, they also find it more useful. This finding is consistent with previous studies, such as the studies conducted by Ghazali *et al.* (2018) and Driediger and Bhatiasevi (2019), who found that perceived ease of use has a significant influence on attitudes towards food delivery apps. According to Chawla and Joshi (2018) and (Indarsin and Ali, 2017), consumers' attitudes are improved when the technology is perceived to be user-friendly. This confirms the notion that applications that are easy to use are preferred by consumers and are thus more likely to be adopted.



Source(s): Figure 2 by authors

Figure 2. Structural model

Table 5.
Results of PLS-SEM

Hypotheses	Relationships	Path co-efficient	<i>p</i> -value	Decision
H1	PEU → PU	0.545	0.000	Supported
H2	PEU → A	0.115	0.019	Supported
H3	PU → A	0.165	0.003	Supported
H4	A → CI	0.423	0.000	Supported
H5	PU → CI	0.176	0.007	Supported
H6	PCT → A	0.040	0.343	Not supported
H7	SI → A	0.100	0.020	Supported
H8	C → A	0.454	0.000	Supported

Note(s): A = attitude towards FDA, C = convenience, CI = continuous intention, PCT = Perceived COVID-19 threat, PEU = perceived ease of use, PU = perceived usefulness, SI = social influence

Source(s): Table by authors

Table 6.
Results of PLS-MGA
with education as a
moderator variable

Hypotheses	Relationships	Path coefficient-diff (poorly – highly educated)	<i>p</i> -value	Decision
H9a	PU-A	-0.068	0.534	Not supported
H9b	PEOU-A	-0.136	0.277	Not supported

Note(s): A = attitude towards FDA, PEOU = perceived ease of use, PU = perceived usefulness

Source(s): Table by authors

Table 7.
Results of PLS-MGA
with age as a
moderator variable

Hypotheses	Relationships	Path coefficient-diff (young – old respondents)	<i>p</i> -value	Decision
H10a	PU-A	0.084	0.489	Not supported
H10b	PEOU-A	0.023	0.825	Not supported

Note(s): A = attitude towards FDA, PEOU = perceived ease of use, PU = perceived usefulness

Source(s): Table by authors

Perceived usefulness was found to be a significant predictor of attitudes towards food delivery apps. This indicates to retailers that a positive attitude towards their food delivery app will result in the consumer intending to continuously utilise the app. This result supports previous research on the relationship between perceived usefulness and continuous intention (Prabowo and Nugroho, 2019; Hong *et al.*, 2021; Chawla and Joshi, 2018).

Perceived COVID-19 threat was found to have no significant influence on attitude towards food delivery apps. This finding is like that of Hong *et al.* (2021) who found that the COVID-19 pandemic did not moderate the relationship between predictors and the continuous intention to use apps and thus, COVID-19 did not induce behavioural changes. This contradicts previous research which found that the COVID-19 pandemic resulted in a significant shift in consumer behaviour (Goswami and Chouhan, 2021; Eger *et al.*, 2021). It was found that social influence had a significant influence on attitude towards food delivery apps. This finding confirms the findings of Hwang and Kim (2021), who discovered that social influence enhances consumers' attitudes towards food delivery apps. It was revealed that convenience was found to be a significant predictor of attitude towards food delivery apps, which is consistent with previous research findings (Prabowo and Nugroho, 2019; Gupta and Duggal, 2020). This finding is crucial for retailers as it suggests that when consumers find the app to be convenient, they will have a more positive attitude towards the app.

Education was found to have no significant moderating effect over the relationship between perceived usefulness and attitudes, as well as the relationship between perceived ease of use

and attitudes. This finding contradicts that of previous research, although this outcome is likely a result of a large majority of the respondents being highly educated thus skewing the results. Finally, age was found to have no significant moderating effect over the relationship between perceived usefulness and attitudes, as well as the relationship between perceived ease of use and attitudes. This finding, too, contradicts that of previous research; however, a large majority of survey respondents were young and thus the results indicate a conclusion which does not accurately consider the viewpoint of consumers in an older age bracket.

6. Managerial implications

The results of this study are important to current and future food delivery services, restaurants, developers of mobile apps and consumers. Based on the findings, retailers will be able to improve current food delivery apps as well as design and develop innovative mobile applications that provide consumers with value and encourage continuous use of the food delivery apps. Since PEOU and PU had a significant influence on consumers' attitude towards food delivery apps, food delivery services such as UberEats and entrepreneurs wanting to start a food delivery app should emphasise user friendly features and ensure that their apps have been tested before launch to guarantee that the apps are easy to use. Attitude towards food delivery apps significantly influenced consumers' intention to continue to use the app, thus it is important for food delivery apps to ensure that consumers have a positive experience when using their apps as it results in positive attitudes towards the brands, service and app. The study has highlighted that perceived ease of use has a significant influence on the perceived usefulness and attitude towards food delivery apps. Therefore, it is important for food delivery companies to focus on improving the user experience of their app to make it easier for users to navigate and use. This can include simplifying the ordering process, providing clear instructions, and offering multiple payment options.

The study has also shown that the perceived usefulness of food delivery apps has an influence on attitudes towards food delivery apps and continuous intention to use food delivery apps. Therefore, food delivery companies should emphasise the health and safety measures they have in place to ensure that their customers feel safe while ordering food through their app. Perceived usefulness also had a significant influence on consumers' intention to use thus it is important for food delivery apps to provide a service free of errors such as late delivery, incorrect orders or overall inefficient consumer experience to encourage consumers to continue using their food delivery apps.

Perceived threat of COVID-19 did not have a significant influence on the attitude towards food delivery apps in South Africa. This is positive for retailers and restaurants in South Africa as the results mean that consumers are willing to go out and make purchases physically. However, social influence had a significant positive influence on the attitude towards food delivery apps, implying that marketing efforts of food delivery apps can be utilised to encourage the usage of food delivery apps as consumers are heavily influenced by their peers, friends, family, role models or influencers. Marketing campaigns that make use of influential people and opinion leaders should be used to successfully attract consumers. Food delivery companies can leverage social media to promote their apps and encourage users to try them out. This can include running social media campaigns, collaborating with influencers, and offering discounts and promotions to encourage users to try their app.

The attitude of food delivery app users is also influenced by convenience. This is useful for retailers as it indicates that consumers are influenced by the convenience factor that food delivery apps offer. Convenience can be improved by food delivery app developers by making the user interface simpler for older consumers who were reluctant to participate in this study. Food delivery companies should offer a wide range of menu options to make it easier for users to find something they like. This can include offering a variety of cuisines, dietary options,

and special deals. Lastly, food delivery companies should continuously monitor and evaluate the effectiveness of their strategies to improve the adoption of their apps. This can include gathering feedback from customers, tracking usage data, and conducting surveys to understand customer preferences and behaviours. Based on this information, companies can adjust their strategies to improve the user experience and increase adoption rates.

7. Theoretical implications

The adoption of food delivery apps has significant theoretical implications for the Technology Acceptance Model (TAM). The TAM proposes that individuals' acceptance of a technology is determined by two main factors: perceived usefulness and perceived ease of use. However, the TAM does not explicitly consider external factors that can influence an individual's decision to adopt a technology, such as social influence, convenience and COVID-19 threat. The adoption of food delivery apps has been driven by a combination of external factors, such as social influence, convenience and COVID-19 threat. For example, the COVID-19 pandemic has led to a significant increase in the adoption of food delivery apps, as individuals have sought to reduce their exposure to public spaces and minimise the risk of infection. This trend has been driven by social influence, as individuals have adopted food delivery apps based on recommendations from friends and family, as well as by accessibility, as food delivery apps have become more widely available and convenient. The adoption of food delivery apps has also influenced the Technology Acceptance Model (TAM), as it has highlighted the importance of external factors in shaping an individual's decision to adopt a technology. Overall, the adoption of food delivery apps has significant theoretical implications for the Technology Acceptance Model (TAM), as it has highlighted the importance of external factors in shaping an individual's decision to adopt a technology. By considering external factors such as social influence, convenience and situational factors such as COVID-19 threat, researchers can develop more accurate models.

8. Conclusion

In conclusion, the COVID-19 pandemic has accelerated the adoption of food delivery apps, and the factors influencing the adoption of food delivery apps during this period are not well understood. This study extends the TAM by including social influence, perceived COVID-19 threat, and convenience as additional factors that may influence the adoption of food delivery apps. The findings of this study will have implications for food delivery companies and restaurants seeking to promote the adoption and sustainability of food delivery apps during and beyond the pandemic. The results of this study provide insights into the factors that influence the adoption of food delivery apps during the pandemic and inform the development of strategies to promote the adoption of food delivery apps.

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