

Satisfaction with mobile food delivery app (MFDA) usage and the moderating role of perceived COVID 19 risk

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ABSTRACT

The purpose of this study was to determine the influence of MFDAs characteristics on satisfaction in a health emergence situation, as well as the interrelationships between satisfaction, trust, and continuance intention. Unlike other existing studies, this research examines the determinants of satisfaction classified into two groups based on the Expectation-Confirmation Model: on one hand, service-related factors (external - lifestyle compatibility and various food choices), and on the other hand, technical factors (internal - personalization, performance expectancy, and task technology fit) in the context of MFDA. Additionally, the moderating role of perceived COVID-19 risk was explored. The study provides a tool that app developers can use to test their proposed systems before commercialisation through measuring the relationship between MFDA system characteristics and user satisfaction.

1. Introduction

The increased penetration of smartphones, high-speed internet connectivity and improvement in interactive applications (apps) (Belanche et al., 2020) and the proliferation, portability, and accessibility of mobile devices (Yahya et al., 2023), have established a favourable climate for mobile app adoption. One of the fastest growing industries is the mobile food delivery app business due to the paradigm shift in consumers' purchasing behaviour in recent years (Chotigo and Kadono, 2021; Zhao & Bacao, 2020). Several scholars concur that the proliferation of the mobile food delivery apps came as a blessing for not only the consumer due to the advent of the coronavirus (COVID-19) pandemic to avoid transmission of the virus (Puriwat and Tripopsakul, 2021; Chotigo and Kadono, 2021; Al Amin et al., 2021; Liébana-Cabanillas et al., 2023a, 2023b), but businesses also saw an opportunity for growth and forging stronger relationships with both existing and new clients. In fact, the perceived ease of use, accuracy, and speed of online food delivery services have led to previous research confirming that the majority of people prefer to use food delivery apps (Izaitullina et al., 2022).

Although the food delivery business started a decade ago across the globe, the industry has been growing at a snail's pace of around 8 % since 2017 (Puriwat and Tripopsakul, 2021), but was accelerated by the

health emergence situation such as the COVID-19 pandemic (Al Amin et al., 2021). For instance, Yogiyo food delivery app in South Korea witnessed a weekly increase of 3–4 % amidst the pandemic during 2020 (Al Amin et al., 2021). Similarly, the Grab mobile food delivery app accounted for a 20 % increase in Singapore food delivery services during the same period (Choudhury, 2020). More than 20,000 eateries in Thailand commercialised online food delivery services in the first quarter of 2020 (Chotigo and Kadono, 2021). In South Africa, the revenue of mobile food delivery apps is now projected to grow at an annual rate of 8.33 % from 2022 to 2026 (Statista, 2022) due to increasing popularity of the mobile food delivery apps. European restaurants that used mobile food delivery services sporadically before COVID-19 were forced to massively jump into the fray (Francioni et al., 2022). Against this backdrop, it is evident that the mobile food delivery app services can play a key role in connecting restaurants with consumers amidst a health emergence. Therefore, it is crucial for relevant stakeholders to understand the needs and expectations of customers to appreciate what drives them to use MFDAs consistently.

Mobile food delivery applications (MFDAs) are mobile apps that consumers can download to their smartphones to access restaurants and view menus, order food and pay without any physical interaction with staff at the restaurant (Alalwan, 2020). With a single tap on their

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phones, customers can place orders from a range of restaurants, with various food choices to choose from. This enables customers to order and pay for food remotely and to have the food delivered to a specified address, all without having to meet the restaurant personnel (Al Amin et al., 2021; Alalwan, 2020).

The context of South Africa for this study is of particular interest because it also experienced an unprecedented health emergence caused by the COVID-19. For example, of the estimated 12 million COVID-19 infections on the continent to date, South Africa recorded the highest rate of infections totalling over four million and 102,568 deaths as of 11 January 2023. More recently, the National Institute of Communicable Diseases (NICD) confirmed the discovery of yet another highly transmissible XBB.1.5 variant (NICD, 2023), to suggest that the pandemic is still a reality. Having experienced the devastating effects of the health emergence such as the COVID-19 pandemic, it would seem plausible for South African users of MFDAs to continue using them to curtail the emergence situation. Second, about 12 % South Africans prefer to eat at a restaurant every week compared to the global average of 28 % (GWI, 2021). Despite these staggering statistics and growth in app usage, research on whether consumers who adopted MFDAs during the pandemic would continue to use them beyond the pandemic is sparse.

The study is envisaged to provide a tool that app developers can use to test their proposed systems before commercialisation through measuring the relationship between system characteristics and user satisfaction, which leads to not only trust in the system but also enhancing continuance intention. It is also envisaged that the framework of the current study will direct researchers, specialists, and policymakers in developing effective marketing plans for MFDAs. Thus, the present study examines the impact of essential variables on the satisfaction with MFDAs during a health emergence to provide recommendations to practitioners to tailor MFDA services to customers' safety needs and other preferences.

Recently, a few studies have examined the intention to continue to use mobile food delivery services during a health emergence. First, Chen McCain et al. (2022) examined consumer perceptions regarding the Uber Eats food delivery app (FDA) during the COVID-19 pandemic lockdown period, in which performance of the app emerged as the second most important determinant of user satisfaction. Second, scholars such as Zhao and Bacao (2020) and Maungmee et al. (2021) examined continuance intention to use online food delivery services by investigating several factors including task technology fit, performance expectancy, and satisfaction. On the other hand, factors such as lifestyle compatibility, various food choices, and personalisation have also been investigated in the mobile food delivery contexts in the past (Belanche et al., 2020; Aslam et al., 2021; Chotigo & Kadono; Al Amin et al., 2021). However, this study stands out for several reasons:

- 1) It focuses on food delivery applications, highlighting their rise during a health emergence and exploring less researched satisfaction factors.
- 2) Its uniqueness lies in the context of the research by focusing on South Africa, considering the impact of the recent COVID-19 health emergence's local infection rates and consumption preferences.
- 3) This study incorporates two theories to define the intention to continue using MFDA: the Expectation-Confirmation Theory and the Perceived Trust Theory. Based on the first of the proposed theories, satisfaction is defined by two groups of factors in line with the proposals of NG et al. (2023): service-related factors (external - lifestyle compatibility and various food choices) and technical factors (internal - personalization, performance expectancy, and task technology fit) in the context of MFDA.
- 4) It stands out by including the moderation of perceived COVID-19 risk in consumer intention to continue using these apps. This comprehensive approach contributes significantly from both a theoretical and practical standpoint, enriching the existing literature and

providing valuable information to developers and managers to improve user satisfaction and confidence.

Furthermore, previous studies (Alalwan, 2020; Al Amin et al., 2021; Aslam et al., 2021; Hakim et al., 2022) have predominantly focussed on perceptive factors and psychological characteristics to measure satisfaction, and not much attention has been paid to features of the system. These studies also focused on other regions such as the Middle East, Asia, Europe and South America, with limited empirical evidence of similar studies in the emerging economies such as South Africa that experienced the most COVID-19 deaths on the continent (Galal, 2023), and where 60 % of consumers are confident in using new technologies, compared to the global average of 43 % (GWI, 2021). Thus, investigating customer satisfaction from the system characteristics viewpoint could provide a new perspective that can broaden the understanding of the important determinants of user satisfaction with MFDAs for continued usage.

The purpose of this study is to investigate the influence of MFDAs' lifestyle compatibility, available food choices, personalisation, trust in the system, task technology fit (TTF), and performance expectancy on user satisfaction and the moderating role COVID-19 perceived risk. Further, the study explores how continuance intention is influenced by satisfaction and trust, and the relationship between satisfaction and trust is also explored. Considering the above, three research questions guide the study; (1) What are the important features of MFDA system that contribute to satisfaction with their use during a health emergence? (2) To what extent did the advent of the COVID-19 played a role in driving South African consumers' satisfaction with the use of MFDAs? (3) What can restaurants do to enhance satisfaction, and to strengthen the trust and intention to continue to use MFDAs during a health emergence?

To answer these questions, the study proposes a framework that incorporates dimensions related to the features of the MFDA to address the salient aspects that promote satisfaction with the apps. Addressing these questions is important to equip restaurant businesses with knowledge for developing mobile technologies that create business opportunities in similar future health emergence circumstances. The study's view is that users of MFDAs will be satisfied if the system characteristics of the app exceeds their expectations which can lead to the desire to continue to use the app. Similarly, customers are likely to be satisfied by their experience if they perceive the MFDA to fit their lifestyle and the task at hand, is fully functional, trustworthy, and personalised.

In summary, the study theoretically enriches the dearth of literature on MFDAs in a health emergence context from an emerging market perspective as supported by Francioni et al. (2022). By focusing on an emerging economy, this study would enrich the current mobile food delivery app literature as international scholars tend to neglect research in emerging markets, especially underdeveloped countries in the Sub-Saharan Africa (Humbani and Wiese, 2019).

A recent study that investigated several technological and behavioural factors that influence the use of innovative mobile technology found that indeed, a health emergence situation can have a significant impact on consumer expectations and ultimate behaviour (Bhatia et al., 2023). In fact, Bhatia et al. (2023) asserted that the COVID-19 health emergence worked in favour of digital services. Therefore, this study purports that perceived COVID-19 risk could have significant moderating effects on consumer intention to use MFDAs in the pandemic period.

The managerial contributions of the study are twofold. First, the study attempts to determine how restaurants can offer value through MFDAs and second, it provides insights to management on the most salient drivers of MFDA satisfaction during a health emergence to inform their marketing offerings and strategies in similar health crises in the future.

2. Literature review

2.1. MFDA in perspective

Although previous research states that consumer and transaction behaviours shifted away from traditional cash and in-store services toward online-to-offline services even before the pandemic (Muangmee et al., 2021), health emergence created by the COVID-19 hastened and doubled the adoption of mobile food delivery ordering making it a global market worth more than \$150 Billion (Ahuja et al., 2021). This shift has forced many restaurants and retail stores to suddenly adjust their business models in many ways to take advantage of the manifesting business opportunities.

South Africa has not been left behind. South Africans topped the smartphone users in the world in 2017 making them skilled at utilising them to access the applications and services that they provide (GeoPoll, 2022). More so, in South Africa mobile delivery apps are most popular among the 25–44 years age cohort accounting for 26 % of the total population and who prefer to eat out for the most part (Statista, 2022). The familiar MFDA that have gained traction over the years in South Africa are UberEATS, UCook, and Mr D (Business Insider, 2020). For example, Mr D garnered over two million users in 2019 with 700,000 active users to suggest a resounding South African technology success story. Popular supermarkets such as Checkers and Woolworths jumped into the bandwagon and started offering grocery delivery services through retail mobile payment apps, such as Checkers-Sixty60 and Woolies Dash apps respectively. These online mobile delivery apps experienced increased growth during the health emergence situation, servicing customers who were not able or unwilling to leave their homes to shop for groceries.

2.2. Theoretical framework

Recent research demonstrates the existence of multiple theories in the analysis of FDA (Shankar et al., 2022), confirming a fragmented perspective on the underlying theories used in this context (Singh et al., 2024). While several studies have employed classical theories such as the Technology Adoption Model (Kang and Namkung, 2019), the UTAUT2 model (Yang et al., 2024), or even the SOR model (Liébana-Cabanillas et al., 2023a, 2023b), the current research proposal encompasses a holistic framework that classifies the determinants of usage intention through two novel theories: the Expectation-Confirmation Model and the Trust Theory.

2.2.1. Expectation-confirmation model

Bhattacharjee (2001), drawing from the Theory of Planned Behavior (TPB), proposed the Expectation-Confirmation Model (ECM) to predict users' intention to continue using Information Systems (IS). While the TPB has been widely utilized in consumer behavior to examine user satisfaction, repurchase behavior, and service marketing, the ECM has become the basis of a post-acceptance model used in IS literature to investigate the impacts of user perceptions and expectations on technology continuity (Nguyen et al., 2024). The ECM has been employed in research to analyze the continued use of various technologies by users (Al Amin et al., 2023; Franque et al., 2023), including recent FDA (Zhao and Bacao, 2020; Teng et al., 2023), making it a suitable theoretical framework for defining the intention to use them.

In line with the proposals of Ng et al. (2023), two groups of antecedent factors of satisfaction are defined, classified into technical factors (internal - personalization, performance expectancy, and task technology fit), and service-related factors (external - lifestyle compatibility and various food choices) in the context of MFDA.

Regarding external factors associated with service provision, we propose lifestyle compatibility and various food choices. Lifestyle compatibility influences individuals' behavior and consumption choices of products, brands, and services (Belanche et al., 2020; Correia and

Tam, 2024), and offering diverse selections (various food choices) enhances customer attitudes (Cho et al., 2019), consequently affecting their level of satisfaction.

On the other hand, concerning internal factors, we identify three important attributes. Firstly, personalization, understood as the adaptation of products and services to the consumer (Montgomery and Smith, 2009). Secondly, performance expectancy, referring to the degree to which it is believed that an application's performance will improve using technology (Hong et al., 2023). And finally, task technology fit, which refers to the efficiency in performing a task when technology, task requirements, and individual capabilities are compatible (Foroughi et al., 2024).

Indeed, it is understood that both groups of factors are antecedents of satisfaction, in line with the proposals of other researchers.

2.2.2. Trust theory

In recent decades, research in the field of marketing has highlighted the importance of trust between parties as a facilitating instrument for the continuity of a relationship, which is a crucial aspect in the business sphere. Specifically, within the realm of MFDA, some studies have proposed its relevance and its direct relationship with continuance intention (Goyal et al., 2023).

Users' trust in MFDA is demonstrated by their continued use of the platform, indicating that when users feel confident and secure in the MFDA, their intention to continue using it increases (Hong et al., 2023). Considering the literature, perceived trust should be considered to further enhance MFDA research (Ray and Bala, 2021). This implies that the higher a user's trust in the new technological system, the greater their intention to continue using it (Teng et al., 2023).

2.2.3. Continuance intention to use MFDA

Continuance intention which represents a reinforced post-use (Kang and Namkung, 2019), is defined by Kumar and Shah (2021) as the degree to which an individual currently using a new information system (such as the MFDA), develops conscious plans to keep using it in the future. Liébana-Cabanillas et al. (2021) describe continuance intention as the degree to which consumers are satisfied with the benefits and features of a specific technology, which in this study, are the MFDA system characteristics being investigated. However, the challenge that service providers such as restaurant businesses face is to find ways to encourage customers to keep using the apps, especially given that the three-month average rate of retail apps abandonment is over 71 % across the globe (Mondal and Chakrabarti, 2021).

According to Chotigo and Kadono (2021), the food delivery market has become highly competitive due to a plethora of branded retail apps. Therefore, keeping customers delighted for continued usage is central to any restaurant business to improve their profitability levels. Susanto et al. (2016) posit that maximising the financial investment in mobile payment services requires assurance from service providers to promote continued use after the initial experience. It costs five times more to acquire new business than to retain existing ones (Susanto et al., 2016).

The conceptual framework depicted in Fig. 1 shows the moderating role of perceived COVID-19 risks between the antecedents of consumer satisfaction (ie., system characteristics) and customer satisfaction and the relationship between satisfaction on trust and continuance intention.

3. Research hypothesis

3.1. Antecedents of customer satisfaction with MFDA

3.1.1. Lifestyle compatibility

As the urban middle class has grown and people lead busier lives, online shopping has become more and more popular because it allows consumers to purchase conveniently from home and access a wide range of goods and services, more especially during a health emergence situation (Verma and Dixit, 2023). Cheng et al. (2019) describe lifestyle

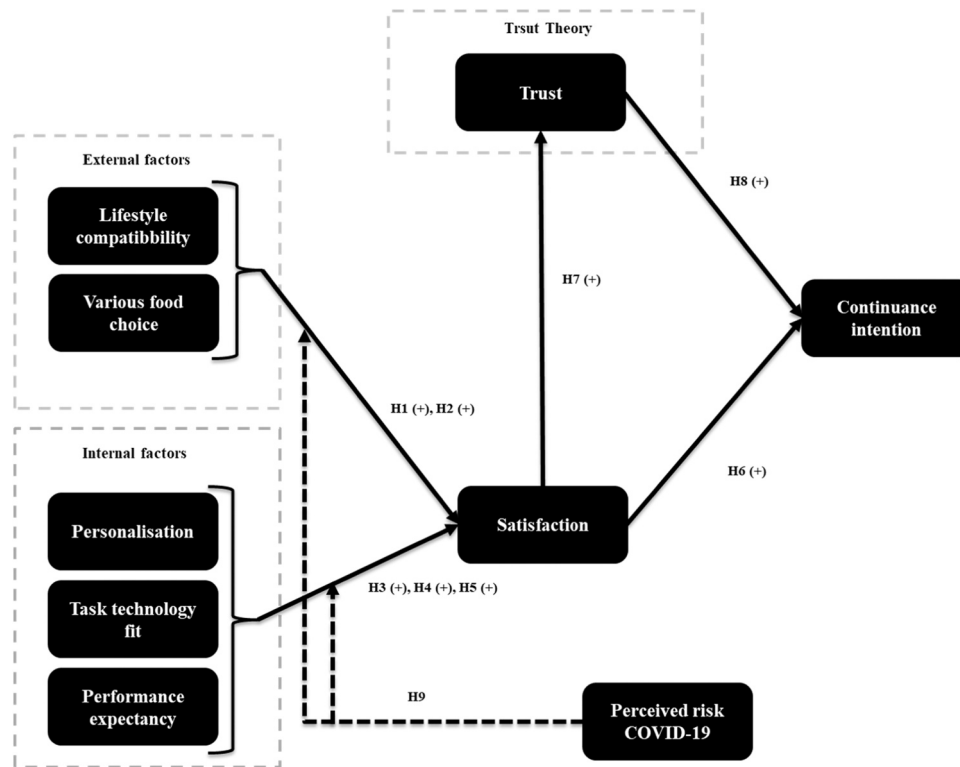


Fig. 1. Antecedents of satisfaction and continuance intention to use MFDAs.

compatibility as the degree to which potential adopters' existing values, current requirements, and present lifestyles are compatible with a technological innovation. Belanche et al. (2020) describes it as the way people go about their everyday tasks, how a person spends their time and money as well as their opinions, identity, and values. A study by Iziiatullina et al. (2022) reported that MFDAs should provide adequate information about food allergens to cater for consumers with allergies and information regarding calorie information such that lifestyle compatibility can be enhanced. As stated by Chotigo and Kadono (2021), MFDAs provides an important instrument for users with busy lifestyles and comes in handy for people who want to avoid traffic jams and long waiting times to allow more leisure time with their families. Therefore, MFDAs that offer consumers the convenience of browsing and ordering food from the comfort of their homes would be compatible with their busy lifestyles. For MFDAs to fit consumers' busy lifestyles, they should provide relevant and timely information on a click of a button, which leads to satisfaction (Pal et al., 2021). Based on the above, it stated that:

H1. : There is a significant relationship between lifestyle compatibility and satisfaction with using MFDAs.

3.1.2. Various food choices

According to Cho et al. (2019) and Aslam et al. (2021), delivery by means of MFDA occurs more frequently and factors such as variety of food vendors and alternative food choices allow users to explore multiple food options from different restaurants, which adds to the importance of various food choices on a customer's perceived value. Therefore, MFDAs (such as Uber Eats) that allow users to access various restaurants, browse menus, select food items, and to receive their orders without having to visit the restaurant have the potential to satisfy consumers during any health emergence situation (Puriwat and Tripopsakul, 2021). More so, MFDAs provide detailed and updated information that enables users to track their orders at various stages. Therefore, the study takes the view that various food choices is key to delivering satisfaction that enhances users' desire to continue to use the apps. A

recent study found that various food choices positively influence satisfaction with the system (Al Amin et al., 2021), hence it is hypothesised that:

H2. : There is a significant relationship between various food choices and satisfaction with using MFDAs.

3.1.3. Personalisation

According to Rodríguez-Torrico et al. (2019), personalisation is key to effective marketing as it creates a consumer-centric shopping experience through the provision of customised offers. In the context of this study, the success of an information system depends on the restaurant businesses' concise understanding of patron needs and preferences during a health emergence to provide personalised services as personalisation reduces search time (Piccoli et al., 2017). Kang and Namkung (2019) concurs that personalisation facilitates interactions between consumers and service providers, such as restaurants. Based on Iziiatullina et al. (2022)'s report, consumers prefer MFDAs that include information such as dietary restriction certificates for either medical or religious reasons, ingredients' origins, and nutritional information as people are becoming more health conscious, and more so in a health emergence situation. This kind of information adds to the MFDA's sense of personalisation. Accordingly, high quality service is experienced when users feel engaged while using the information system, such as the MFDA during a health emergence (Khasawneh et al., 2023). Several studies have confirmed that user satisfaction with a technology increase when they have positive experiences that include personalisation (Chotigo and Kadono, 2021; Rodríguez-Torrico et al., 2019). Thus, the following hypothesis is formulated:

H3. : There is a significant relationship between personalisation and satisfaction with using MFDAs.

3.1.4. Task technology fit

The task technology fit model (TTF) quantifies the efficacy of technology by evaluating the relation between the product and the tasks it

aims to support (Spies et al., 2020). Numerous studies have amplified the importance of TTF, obtaining advocacy for its predictive and expository properties (Spies et al., 2020; Muangmee et al., 2021). If a technology's functionality can help achieve a task at hand during a health emergence, the user will be satisfied and their propensity to use the system again in a future similar situation will be enhanced (Spies et al., 2020). Gupta et al. (2021) corroborates this assertion by stating that user evaluation of the TTF is a function of both task and system characteristics. Therefore, MFDAs that fits the desired task of visualising the menu options, showing prices, and providing the ability to order and pay for the food online that will be delivered at one's doorstep during a health emergence would be satisfactory to consumers. Based on the above, it is hypothesised that:

H4. : There is a significant relationship between task technology fit and satisfaction with using MFDAs.

3.1.5. Performance expectancy

Performance expectancy was conceptualised by Venkatesh et al. (2012, pp. 159) as "the degree to which an individual believes that applying the technology will help him or her to attain gains in job performance". Since the functionality of the app can be considered a technology-based factor (Xu et al., 2023), performance expectancy is therefore inherently captured in the system quality dimension of the new technology. In the context of this study, MFDAs gained traction because they allow consumers to "enjoy their preferred products, at the right time, at the right place, in the right quantity and in the right condition" (Belanche et al., 2020, pp. 20). Thus, the ability of the user to browse menus, order preferred food, complete the payment transaction, and receive the order without physical contact with restaurant personnel during a health emergence is a function of the system quality (performance expectancy) that could act as a precursor of MFDA user satisfaction. Several studies have verified that performance expectancy significantly predicts satisfaction of users' continued usage of mobile commerce (Zhao and Bacao, 2020; Venkatesh et al., 2012; Marinković et al., 2020). Therefore, it is hypothesised that:

H5. : There is a significant relationship between performance expectancy and continuance intention to use MFDAs.

3.2. Satisfaction

Satisfaction is described as "the reaction or feeling of a customer in relation to his/her experience with all aspects of an e-commerce system" (DeLone and McLean, 2004, p. 37). According to Yahya et al. (2023), the two most important elements in the successful creation of mobile apps (referred to MFDAs in this study) are user satisfaction and meeting or exceeding user demands. To enhance consumer satisfaction, service providers ought to leverage feedback from user reviews regarding app-related concerns, including usability, dependability, and performance (Yahya et al., 2023), especially during a health emergence. Satisfaction is also described as an emotion-based evaluation of an information system (Zhao and Bacao, 2020). Similarly, satisfaction can be described in this study as a cumulative feeling that culminates from multiple uses of the MFDA and interactions with the service providers (restaurants) during a health emergence. Al Amin et al. (2021) contend that the sustainability of the MFDAs depends on continued use rather than initial adoption.

The study takes the view that users of MFDAs will be satisfied if the system characteristics of the apps exceed their expectations, which can lead to the desire to continue to use the app during a health emergence. Also, the study opines that once a user is satisfied with the MFDA, their level of trust in the system will be enhanced, failure of which leads to switching behaviour as posited by Thaichon and Quach (2015). Based on Baki (2022)'s report, the quality of the product or service to meet or exceed customer expectations leads to satisfied customers. Therefore, in the context of this study, the quality of the MFDA in terms of its

compatibility to user lifestyle, ability to offer various food choices, extent of personalisation, its fitness to the task (TTF) and meeting performance expectancies during a health emergence are the application quality dimensions that are pertinent for the functioning of the MFDA. Several studies also concur that satisfaction is positively correlated with trust and continuance intention (Liébana-Cabanillas et al., 2021; Mondal and Chakrabarti, 2021; Rodríguez-Torrico et al., 2019), to suggest that satisfaction is pivotal in ensuring continued customer support. Hence, it is hypothesised that:

H6. : There is a significant relationship between satisfaction and continuance intention to use MFDAs.

H7. : There is a significant relationship between trust and satisfaction with using MFDAs.

3.3. Trust

According to Triyuni et al. (2021, p.698), 'trust refers to the confidence of customers in the services' quality and reliability'. Therefore, trust influences consumer behaviours such as purchase intentions, continuance intentions and adoption. Consumers are willing to transact with a mobile app if they believe that their data are shared only with trusted parties (Kang and Namkung, 2019).

Nelloh et al. (2019) also posit that privacy, security, infrastructure, and technical aspects of trust shape the literature of trust. In the same vein, Liébana-Cabanillas et al. (2022) describe trust in the system as the integrity of using mobile services, particularly the security of the system, the confidentiality of personal data, and the accuracy of the results of mobile payment transactions. Against this backdrop, this study assumes that improved confidence would influence consumer intention towards continued use of the MFDA payment system, especially during a health emergence. Thus, trust in the MFDA can be defined as system's reliability, effectiveness, and security in fulfilling the performance expectation of ordering food conveniently and safely during a health emergence. A recent study by Triyuni et al. (2021) reiterated that user trust is crucial in online transactions, particularly during a health emergence, as health risks are the main reason why people choose not to eat out.

Thus, it can be hypothesised that:

H8. : There is a significant relationship between trust and continuance intention to use MFDAs.

3.4. Perceived COVID-19 risk and its moderating effects

Perceived COVID-19 risk can be described as a person's understanding and evaluation of possible negative consequences of their decision-making process regarding contagion through food, cash, packaging or contact with delivery personnel (Aji et al., 2020; Ramos, 2022). The onset of the COVID-19 pandemic resulted in an increase in consumers making their food purchases online to prioritise health and hygiene (Moon et al., 2021; Muangmee, et. al., 2021). In their study, Choi and Jang (2022) confirmed the moderating effect of the perceived COVID-19 risk between health concerns and psychological well-being of senior citizens in Korea. Yilidirim and Güler (2022) investigated the relationship between perceived risk and pain and happiness regarding COVID-19 risk, and reported that indeed, perceived risk of COVID-19 negatively affected happiness and positivity in life. Thus, there is consensus among scholars that the perceived risk of COVID-19 caused undue influence on individual feelings, attitudes, and behaviours. Consequently, this study infers that the perceived risk of contracting COVID-19 would equally influence consumer behaviour regarding intention to continue to use MFDAs.

Thus, it is plausible to suggest that the perceived COVID-19 risk would have a moderating effect on the relationships between the system functionality aspects of lifestyle compatibility, various food choices,

personalisation, task technology fit, performance expectancy and satisfaction with MFDAs. To increase user satisfaction with the MFDA, it is anticipated that the perceived COVID-19 risk will enhance users' perception of the afore-mentioned app features. Further, a study by [Aji et al. \(2020\)](#) also indicated that the perceived COVID-19 risk had a great influence on consumers' willingness to purchase via MFDAs during the pandemic. Hence, the study assumes that the fear of contracting COVID-19 and the fear of eating out during a health emergence will have a significant influence on the various MFDA system characteristics in determining satisfaction, trust, and intention to continue to use the apps.

Thus, it can be hypothesised that:

H9. a-e: Perceived COVID-19 moderates the relationship between antecedents (lifestyle compatibility, various food choices, personalisation, task technology fit, performance expectancy) and user satisfaction with MFDAs.

4. Methodology

4.1. Data collection

The study adopted a quantitative approach using an online survey to test the hypotheses depicted in the research framework ([Fig. 1](#)). Data was collected using a sample from the online community of a leading marketing research agency in South Africa. The research agency has a database of 80 000 South African consumers of all demographics, providing a representative sample chosen through precise recruiting methods. The study targeted South African smartphone users who had previously downloaded any MFDA and used the app to facilitate remote payments for food ordered online during the pandemic period. A self-administered questionnaire was distributed to the online community using a non-probability purposive sampling method. Purposive sampling technique is better suited when the researcher is clear on what needs to be known and sets out to find people who are willing to provide the required information based on their knowledge and experience ([Etikan et al., 2016](#)). This study targeted consumers who had previously made use of a mobile food delivery app during the COVID-19 pandemic, therefore, were considered well-informed to articulate their experiences reflectively. [Baki \(2022\)](#) also used purposive sampling to select participants who were in the position of decision making to determine the criteria to be used in a green supplier selection process.

As reported by [Rodríguez-Ardura and Meseguer-Artola \(2020\)](#), one major issue with self-administered data is Common Method Bias (CMB). To mitigate the risk of CMB, three approaches were utilised. First, the questionnaire was pre-tested on a sample of 30 participants among the study population to ensure that participants understood the instructions and terms used in the survey ([Babin and Zikmund, 2016](#)). Second, participants were assured that the study was strictly for academic purposes and that their confidentiality and anonymity would be preserved. Third, the items were arranged randomly and the relationships between the constructs were also not apparent ([Rodríguez-Ardura and Meseguer-Artola, 2020](#)).

4.2. Research instrument

The constructs investigated in the study were measured using validated scales from previous studies, utilising a seven-point Likert response format that ranges from 1 (strongly disagree) to 7 (strongly agree). Items of performance expectancy, task-technology fit, trust, satisfaction and continuance intention were adopted from [Zhao and Bacao \(2020\)](#); personalisation items were taken from [Cheng et al. \(2020\)](#), various food choices items from [Cho et al. \(2019\)](#), and lifestyle compatibility from [Belanche et al. \(2020\)](#). Items to measure perceived COVID-19 risk were drawn from [Aji et al. \(2020\)](#).

5. Results

Data were captured, cleaned, and edited using Statistical Package for Social Scientists (SPSS) V28. Covariance-based structural equation modelling (SEM) was used to test the model using AMOS V28. SEM was appropriate because it can measure several dependent variables simultaneously by analysing the fit among the observed variables ([Hair et al., 2019](#)).

A total of 411 responses were finally realised. Among these respondents, 161 (39 %) were men, and 250 (60.7 %) were women. Most of the participants were between 41 and 56 years old (45.1 %) followed by the 18–40 age group (35.4 %). In terms of race, Whites constituted most of the respondents (47.3 %). Of the total participants, 73.5 % indicated that they had used MFDAs directly because of COVID-19 pandemic. At the time of the survey, 80 % of the participants had downloaded up to three distinct MFDAs onto their mobile devices, while 66.2 % had more than a year experience in using MFDAs.

5.1. Assessment of the measurement model

A two-step approach was used to test the model. First, the measurement model was run to test reliability, convergent validity, and discriminant validity. Second, a structural model was used to test the hypothesised paths. Based on [Pallant \(2016\)](#) criteria, Cronbach's Alpha coefficients of 0.7 or greater show adequate internal consistency reliability. For convergent validity, the composite reliability (CR) should be 0.7 or greater, while the average variance extracted (AVE) and factor loadings should be 0.5 or greater ([Fornell and Larcker, 1981](#)). The results indicated that all criteria for internal consistency reliability and convergent validity were met for the constructs, and factor loadings for all items ranged between 0.741 and 0.962; CAs ranged between 0.887 and 0.960; CRs between 0.883 and 0.962; and AVEs between 0.695 and 0.868.

Confirmatory factor analysis (CFA) was utilised to determine model fit, reliability, and validity of the constructs in the measurement model ([Hair et al., 2019](#)). [Hair et al. \(2019\)](#) recommends the following thresholds: Chi-Square of difference (χ^2/df) of ≤ 5.00 , fit indices including comparative fit index (CFI), normed fit index (NFI) and incremental fit index of ≤ 0.90 , root mean square error of approximation (RMSEA) and standard root mean square residual (SRMS) of 0.08). The measurement model's results ($\chi^2/df = 2.163$, RMSEA = 0.053, NFI = 0.930, TLI = 0.956, CFI = 0.961, IFI = 0.961, SRMR = 0.048) satisfied the model fit criteria ([Hair et al., 2019](#)).

Discriminant validity was tested using the heterotrait-monotrait (HTMT) criterion. The HTMT is defined as "the mean value of item correlations across constructs as a percentage of the (geometric) mean of average correlations for items measuring the same construct" ([Hair et al., 2019](#)). Although the [Fornell and Larcker \(1981\)](#) criterion is commonly used to test discriminant validity, there are some criticisms that have been levelled against the criterion relating to its potential failure to detect discriminant validity ([Henseler et al., 2015](#)). [Henseler et al. \(2015\)](#) used the Monte Carlo Simulation study and found that the HTMT can achieve higher specificity and sensitivity rates of between 97 % and 99 % compared to [Fornell and Larcker \(1981\)](#) criterion with specificity and sensitivity rates of 20.82 %. Therefore, the HTMT criterion is recommended to test discriminant validity than the commonly used [Fornell and Larcker \(1981\)](#) criterion.

According to [Hair et al. \(2019\)](#), HTMT scores larger than 0.90 for conceptually identical constructs and greater than 0.85 for conceptually distinct ideas, suggest insufficient discriminant validity. Based on the results depicted in [Table 1](#), discriminant validity was achieved for the independent variables, with HTMT values ranging from 0.575 to 0.869.

5.2. Assessment of the structural model

After validating the measurement model, the structural model was

Table 1

Results of the HTMT analysis.

	LifeC	VFC	Pers	TTF	Perf	Trust	Sat	CI
LifeC								
VFC	0,618							
Pers	0,615	0,667						
TTF	0,7	0,737	0,707					
Perf	0,633	0,608	0,575	0,788				
Trust	0,651	0,701	0,738	0,829	0,757			
Sat	0,637	0,693	0,751	0,84	0,8	0,869		
CI	0,772	0,578	0,641	0,727	0,82	0,736	0,775	

Note: Thresholds are 0.850 for strict and 0.900 for liberal discriminant validity.

Table 2

The results of the hypotheses testing.

Hypotheses	SRW	P value	Result
H1: Lifestyle compatibility → Satisfaction	0.004	0.896	Not supported
H2: Various food choices → Satisfaction	0.085	0.190	Not supported
H3: Personalisation → Satisfaction	0.310**	0.000	Supported
H4: Task technology fit → Satisfaction	0.388**	0.000	Supported
H5: Performance expectancy → Satisfaction	0.371**	0.000	Supported
H6: Satisfaction → Continuance intention	0.826**	0.000	Supported
H7: Satisfaction → Trust	0.836**	0.000	Supported
H8: Trust → Continuance intention	0.029	0.828	Not supported

Notes: H, Hypothesis; SRW, standardised regression weight; **Significant at $p < 0.05$.

tested. Table 2 shows the results of the hypothesised paths.

Specifically, personalisation ($\beta = 0.310$, $p < 0.05$), task technology fit ($\beta = 0.388$, $p < 0.05$) and performance expectancy ($\beta = 0.371$, $p < 0.05$) positively influence satisfaction with MFDAs, thereby validating H3-H5 with a minimum confidence level of 95 %. Lifestyle compatibility ($\beta = 0.004$, $p > 0.005$), and various food choices ($\beta = 0.085$, $p > 0.05$), emerged as insignificant predictors to refute H1 and H2.

Satisfaction with using MFDAs significantly influences intention to continue to use these apps ($\beta = 0.826$, $p < 0.05$), to support H6. Also, satisfaction leads to trust in the system ($\beta = 0.836$, $p < 0.05$) to support H7. Surprisingly, trust in the system ($\beta = 0.029$, $p > 0.05$) emerged as an insignificant predictor of continuance intention to use MFDAs during the pandemic, hence H8 was not supported.

5.3. Moderation analysis

To analyse the moderation effects of perceived COVID-19 risks on the satisfaction with MFDAs, multi-group analysis through SEM was employed. Two categories of perceived COVID-19 risk groups were formed comprising of low and high-risk groups. Those who feared the risk of COVID the least were included in the "Low risk of COVID-19" (group 1, $n = 189$), while those who feared it the most were grouped in the "High risk of COVID-19" category (group 2, $n = 222$). First, it conducted an invariance assessment by comparing the Chi-square (χ^2) values (along with degrees of freedom) between the overall model and the constrained model, revealing notable variances, (see Table 3).

After that, it tested the moderating effect of the proposed variables. It applied a test comparing the regression coefficients between structural models considered in pairs, using a modified Student's t test for independent samples (Goodman and Blum, 1996). The multi-group moderation between respondents with low and high COVID-19 risk

Table 3

Invariance analysis.

	χ^2	gl	p-value	Invariant
Unconstrained	1371,211	416		
Fully constrained	2101,342	832		
Difference	730,131	2	0.000	No

perceptions showed that hypotheses H9a, H9b, (the moderating effect of perceived COVID-19 on lifestyle compatibility and various food choices) were supported (see Table 4). Therefore, for the low-risk group, lifestyle compatibility and various food choices do not significantly impact satisfaction. Whereas, for the high-risk group to COVID-19, these variables have a significant and positive influence.

6. Discussion

The present study aims to determine the influence of MFDA payment system characteristics on user satisfaction, the extent to which satisfied users would continue to use the apps and assessing the moderating effect of risk perceptions of the COVID-19. The extent to which satisfied users of the MFDAs would trust the system and continue to use the apps is also explored in the study.

Examining the first hypothesis involves investigating the positive correlation between lifestyle compatibility and satisfaction with MFDAs. The finding of this study suggests no significant association, thus contradicting findings of Belanche et al. (2020). A plausible explanation could be that during the health emergence such as COVID-19, consumers became sceptical of the possible contaminated food or delivery personnel and paid more attention to social distancing rules, so much that it was hard for them to adjust their lifestyles accordingly.

The second hypothesis investigated the positive relationship between various food choices and satisfaction with MFDAs. Like the above result, various food choices were not a factor in influencing satisfaction with MFDAs in this study during a health emergence. The result is inconsistent with prior studies (Aslam et al., 2021; Cho et al., 2019). One possible explanation could point to the problem of lack of interoperability of mobile apps in the context of South Africa, where many of the apps are specific to a particular outlet (e.g., Checkers Sixty60), and cannot be used in other restaurants. To be able to buy from many restaurants, one will be forced to download different apps which increases the risk of financial and information loss. Hence, the ability to offer various food choices was not a significant factor.

The third hypothesis tested the relationship between personalisation and satisfaction with MFDAs. The results show that personalisation significantly influences satisfaction with MFDAs, thus corroborating findings of Rodríguez-Torrico et al. (2019) and Kang and Namkung (2017). This suggests that users seemed satisfied with restaurants that matched their preferences to specific offerings. Thus, restaurants that processed personalised orders and delivered them timeously using hassle-free payment processing were at the forefront of satisfying users during the health emergence.

Hypothesis four examined the relationship between task technology fit and satisfaction with MFDAs. The result supports this hypothesis and is consistent with Zhao and Bacao's (2020)'s finding who reported that when MFDA characteristics or functions meet customer tasks or desires of accessing restaurant meals timeously under safe conditions during a health emergence, users feel satisfied with the app's functionality. Users seemed to obtain satisfaction based on the characteristics of MFDAs such as their ability to track orders, easy payment options, and even social media integration for sharing images of their favourite dishes.

The fifth hypothesis investigated the positive relationship between performance expectancy and satisfaction, a result that was confirmed in this study to concur with findings of Lee et al. (2019) and Zhao and Bacao (2020). The finding suggests that if the MFDAs functions optimally in enabling users to attain what they want (restaurant meals) in a more convenient and safe manner, with easy processing of orders, and efficiency of ordering and receiving food, it leads to satisfaction with the app.

The sixth hypothesis tested the positive relationship between satisfaction with the MFDAs and the intention to continue to use the apps. Satisfaction emerged as a strong predictor of continuance intention in support of recent studies (Francioni et al., 2022; Al Almin et al., 2022). The result suggests the enduring satisfaction that users experience with

Table 4
Multigroup analysis.

	Low risk		High risk		t-test	Result
	Estimate	p-value	Estimate	p-value		
H1: Lifestyle compatibility → Satisfaction	-0.047	0.303	0.112	0.034	-2,27	Supported
H2: Various food choices → Satisfaction	-0.047	0.597	0.222	0.000	-2,44	Supported
H3: Personalisation → Satisfaction	0.292	0.000	0.288	0.000	0,05	Not supported
H4: Task technology fit → Satisfaction	0.484	0.013	0.159	0.111	1,48	Not supported
H5: Performance expectancy → Satisfaction	0.302	0.005	0.183	0.007	0,94	Not supported
H6: Satisfaction → Continuance intention	0.731	0.000	0.861	0.000	-0,54	Not supported
H7: Satisfaction → Trust	0.824	0.000	0.869	0.000	-0,60	Not supported
H8: Trust → Continuance intention	0.168	0.403	0.004	0.980	0,63	Not supported

MFDA promotes the use of the apps continuously. This suggests that restaurants that increasingly delighted the users by ensuring that the systems worked with minimum hiccups in initiating and completing transactions during the health emergence promoted continuance intentions to use those apps.

The hypothesis that investigated the positive relationship between satisfaction and trust in the system was supported in accordance with previous research (Neloh et al., 2019; Zhao & Baco, 2020). Therefore, satisfaction plays a crucial role in building relationships with users and trusting the MFDA in the context of a health emergence, such as the COVID-19 pandemic. This finding tallies with that of Triyuni et al. (2021) who also reported that perceived risk levels are higher in online transactions compared to traditional forms of payment such that consumers would prefer to make online transactions with providers and systems that they trust.

However, trust in the system was not a significant precursor of continuance intention, thus contradicting a recent study (Triyuni et al., 2021). Thus, the eighth hypothesis was not supported. A plausible explanation for this anomaly could be that trust was not important to consumers regarding forging continuance intentions perhaps because the COVID-19 pandemic health emergence did not give people many options to enjoy their favourite restaurant meals during the lockdown periods. For instance, despite restaurant businesses enforcing the sanitation protocols in food handling and delivery, COVID-19 infections and deaths were on the rise during the lockdown period (Chotigo and Kadono, 2021), to suggest that getting their favourite meals when needed took precedence.

The study tested the moderating effect of perceived COVID-19 risk on the relationship between the predictors and satisfaction with use of MFDA. The results confirmed two relationships (H9a, H9b). Therefore, the health emergence facilitated the use of MFDA as users took precautionary measures to mitigate the spread of the virus. It follows to say that satisfaction with the MFDA system characteristics of lifestyle compatibility and various food choices was enhanced by the perceived COVID-19 risks. Put differently, the higher the perceived risk of COVID-19 infection, the more significantly and positively these variables influence satisfaction with using MFDA.

7. Conclusion

7.1. Theoretical and managerial implications

The study offers several key theoretical contributions to literature. First, this research contributes by expanding the literature on the impact of using new technologies during a pandemic period through the assessment of MFDA system characteristics and their influence on user satisfaction. Thus, the research identified salient system characteristics that drive satisfaction with MFDA in a health emergence environment to add to existing body of academic knowledge. Previous studies on MFDA have mostly overlooked the influence of system characteristics on user satisfaction. Secondly, the findings of this study could be deemed theoretically innovative as they contribute to understanding system characteristics relevant to users' satisfaction with MFDA through the

framework that classifies the determinants of usage intention via two novel theories (Expectation-confirmation model and the Trust Theory). Thus, the validated theoretical framework of this study can be applied in future related studies in health emergence situations of a similar nature in a way that advances the theoretical knowledge. Furthermore, the study was conducted in South Africa that can be considered a prime market for MFDA as the economy recorded the highest revenue of \$732 million from food deliveries on the continent during 2020 (Statista, 2023).

Third, there are knowledge gaps in the literature supporting the moderation effect of perceived COVID-19 risk on several predictors of satisfaction with a new information system during a health crisis period, such as that posed by the COVID-19 pandemic. The research validated the moderating effect of perceived COVID-19 risk on the relationship between several features of the MFDA and satisfaction. This implies that in a health emergence where business activities are conducted primarily through the Internet, this business should leverage their technologies to function with optimum efficiency to enhance customer satisfaction, and this holds true for the MFDA. Therefore, the findings add to the existing body of knowledge about the moderating role of perceived COVID-19 risk on the relationship between MFDA characteristics and satisfaction during a health emergence.

According to the best knowledge of the authors, this research appears to be the first of its kind in South Africa to investigate characteristics of the MFDA, especially when is regarded as a potential market for MFDA. Therefore, it is essential for service providers to promote their operations by guaranteeing clients that they adhere to the relevant safety and hygienic standards when processing, handling, and delivering food during health emergence such as the COVID-19 pandemic. This is particularly important as food hygiene and safety issues are not guaranteed in the food delivery app (FDA) context particularly in developing countries that still lack proper hygiene practices.

From a managerial perspective, the study makes some practical contributions which can provide invaluable insights to restaurant businesses in strengthening the formed habits of using MFDA. Although the study was done within the confines of a health emergence such as the COVID-19 pandemic, it demonstrates the innovative initiatives that restaurants could forge to remain competitive and relevant in a time of a crisis like the COVID-19 pandemic. The results indicate that restaurants need to prioritise MFDA system functionalities for improving their relevance and performance in a bespoke manner by prioritising system characteristics of personalisation, task technology fit and performance expectancy. For instance, restaurants could endeavour to personalise services based on consumer information. To enable personalisation, restaurant businesses should invest in technology that provides accurate user information so that customised messages that speak to user needs and preferences can be crafted. As asserted by Piccoli et al. (2017), restaurants that can effectively match customer preferences to specific offerings will gain a competitive edge. However, the personalisation strategy requires consumers to give away personal information, for which trust in the system becomes of paramount importance. Consumers perceive some inherent risks associated with disclosing personal information (Morosan and DeFranco, 2015). Therefore, restaurants should

highlight the benefits of app utilisation for personalisation, and providing information that put users at ease regarding how their personal information will be used and the procedures for dealing with potential misuse of user information.

Several recommendations can be made to restaurant businesses regarding TTF and performance expectancy. First, MFDAs should allow users to compare food prices from different restaurants on the system which helps consumers to save search time. It should be easy for users to filter through available restaurant offerings in the MFDA platform to get to their desired choice, thus, enabling them to make informed decisions with ease. Second, MFDAs that allow consumers to schedule delivery appointments, circulate photos of their favourite dishes across social media sites, and posting reviews and ratings, can lead to satisfaction with using the system. As reported by Pal et al. (2022), when consumers post reviews with pictures of food items, it creates a feeling of authenticity that can greatly shape consumer satisfaction. Third, the use of MFDAs can be incentivised through coupons, cash back, discounts, loyalty programs and earning of referral points. As posited by Pal et al. (2022), restaurant businesses that can craft well thought out loyalty programmes will greatly encourage platform use. For example, consumers can earn rewards and redeem them as and when they wish. Fourth, the possibility of free delivery and the ability of the consumer to know the estimated time of delivery (tracking orders) could enhance user satisfaction with the MFDA.

Although the construct of various food choices emerged insignificant in this study, extant literature indicates that it should be given due consideration in the designing of MFDAs. As stated by Cho et al. (2019), MFDAs that provide suitable selection menus from various restaurants enhances perceived value and satisfaction. Thus, MFDAs should continuously be updated in terms of menu items, prices and ordering fees, failure of which could result in discontinuance of the app.

By the same token, lifestyle compatibility should also not be disregarded as previous studies have supported its influence on satisfaction (Cheng et al., 2019; Pal et al., 2022). Based on this previous research, it is important for restaurants to continuously gather customer data so as to upgrade their MFDAs to align them with consumer changing lifestyles.

It is also surprising to note that trust in the system was insignificant in the continuance intention to use MFDAs as prior studies have emphasised its influence on the use of MFDAs (Cho et al., 2019; Belanche et al., 2020). Therefore, managers should be aware that customers prioritise information security when using MFDAs so that they invest in information security through data protection and creating effective barriers against malware, in a way that promotes continuance intention to use MFDAs. As asserted by Belanche et al. (2020), app developers should meet the highest standards of security regarding MFDAs to ensure trust in the system, thereby encouraging continuance intention. Based on the above, trust I the system should be given due consideration in the design and implementation of MFDAs.

As alluded to in a recent study by Pal et al. (2022), customer satisfaction on its own is not enough to ensure business survival, but having consumers who continuously use the services will ensure business success in a highly competitive restaurant industry. The use of MFDAs involve several steps that include interacting with the app, online processing, and delivery of the orders. The extent to which all these processes are synchronised and managed can satisfy users, leading to continuance intention to use the MFDAs. More importantly, if restaurants are responsive to customer queries, users will develop trust in the system which will increase their propensity to use the system again in future.

7.2. Limitations and future research scope

Despite the contributions, the study has some limitations worth noting. First, it was confined to South African consumers with conclusions drawn in the context of South Africa where COVID-19 was most

prevalent on the continent. Thus, the results cannot be generalised to other countries. Future studies could use comparable results of other similar countries in the region to have a broader view of the predictors of satisfaction with new system characteristics in a health emergence period. Second, MFDAs are still developing as new apps are being launched with new functionalities (Izziatullina et al., 2022). To that end, a longitudinal study could adequately capture consumer views of MFDAs over an extended period in tandem with technological advancements. Third, this study dwelled on system characteristics only. Future studies could include perceptive variables too to fully get the picture of the salient factors that drive user satisfaction with new mobile technology during a health emergence period or new methodologies (Baki, 2022; Yahya et al., 2023).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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