What factors determining customer continuingly using food delivery apps during 2019 novel coronavirus pandemic period?

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Contents

1. Introduction

Mobile devices have been widely adopted, and their use has sharply increased worldwide. According to a report from the Global Association of Mobile Operators, global mobile phone users exceeded 5.1 billion in 2020, among them, over 1.2 billion users are accounted for in China (GSMA, 2020). Meanwhile, various mobile services are significantly developed and implemented in different industries. Food delivery apps (FDAs) as online-to-offline mobile services have recently gained popularity offering two-way benefits for catering enterprises and customers by providing convenient and efficient online order and offline delivery services. Statista Reports (2019) illustrated that FDAs revenue in China (38.4 billion US dollar (USD)) generated more than one-third of global FDAs revenue (95.4 billion USD) in 2018. Moreover, global FDAs revenue increased to 107.4 billion USD in 2019 (Statista Reports, 2019), and are expected to exceed 164.5 billion USD by 2024, expanding at a CAGR of 11.4% during 2019-2024 (Imarc, 2020).

Meanwhile, the 2019 novel coronavirus (COVID-2019) erupted as a serious global pandemic from the end of 2019 and reached the whole of China in February 2020, then progressively expanded worldwide (Tang et al., 2020). According to a report from the World Health Organization (WHO), until 21 May 2020, there were a total of 4,904,413 globally confirmed cases of COVID-19 infections and 323,412 deaths (WHO, 2020a). During the COVID-19 crisis, wearing a mask in public, social distancing, self-isolating and other self-protection actions have been highly recommended by the WHO (2020b) to avoid direct and indirect contacts among people to reduce the risk of COVID-19 transmission (Wilder-Smith and Freedman, 2020; Tang *et al.,* 2020). Moreover, because fewer customers intend to use public services, the traditional catering industry has suffered dramatically during the COVID-19 pandemic. According to the data of iiMedia Research (2020), in China, the revenue of the catering industry was 419.4 billion yuan (59.2 billion USD) during January to February 2020, which decreased 43.1% year on year. 95.0% of the interviewed catering businesses' revenue of the stores decreased significantly during COVID-19 epidemic period (iiMedia Research, 2020).

On the other hand, despite the negative influence of COVID-19 significantly affecting the supply and demand of the catering industry, it has changed the consumption habits of residents and accelerated the transformation of

catering enterprises from traditional in-store service to online-to-offline service for surviving in the pandemic situation and maintaining sustainable development. According to a report from Meituan research institute (2020), there were 71.7% of 15263 participants using FDAs from the end of February to beginning of March 2020, and 41.6% residents preferred using online-to-offline delivery services to purchase daily supplies during the COVID-19 pandemic period in China. Likewise, iiMedia Research (2020) illustrated that 78% of responded Chinese traditional catering enterprises transferred their business to third-party FDAs (Ele.me, Meituan Waimai and Baidu Waimai). Compared to before the COVID-19 pandemic outbreak, the catering enterprises registered on FDAs have dramatically increased 63.1% in China, and 70% of the surveyed restaurants will continue to operate and increase investment in FDAs after the COVID-19 epidemic. Moreover, according to the business registration data from Tianyancha (2020), there were 106,000 new enterprise registrations related to food delivery services from January to May 2020, up 766% from the same period in 2019. The estimated scale of the Chinese online food delivery market will exceed 91.8 billion USD in 2020 (iiMedia Research, 2020). Therefore, during the COVID-19 pandemic, "internet + restaurant" mode of FDA not only met the requirements of catering enterprises but also satisfied customers' demands on convenient and efficient food supplies and personal safety concerns (Liu and Wang, 2016).

Accordingly, factors motivating users to use FDAs continuously under the COVID-19 pandemic situation are essential for relevant stakeholders to understand customers' requirements and expectations. In terms of FDA adoption, customers consider performance expectancy as the main determinator to adopt a relevant service (Yeo *et al.*, 2017; Roh and Park, 2019). Moreover, easiness and quality of service, convenience, social influence and satisfaction are also considerable antecedents of intention to adopt FDAs (Yeo *et al.*, 2017; Cho *et al.*, 2019; Correa *et al.*, 2019; Ray *et al.*, 2019; Roh and Park, 2019). Meanwhile, in terms of continuance usage of information technology, performance expectancy, effort expectance, social influence and satisfaction are important for formulating users' continuance usage intention (Gao *et al.*, 2015; Yuan *et al.*, 2016; Alghamdi *et al.*, 2018; Chopdar and Sivakumar, 2019; Marinković *et al.*, 2020). Furthermore, in order to evaluate factors affecting users' continuance intention of using information technology, Chong (2013) extended the Expectancy Confirmation Model (ECM), and Marinković *et al.* (2020) modified the Unified Theory of Use and Acceptance of Technology model (UTAUT), they

found that trust also has a significant impact on users' continuance usage intention.

Meanwhile, Yuan *et al.* (2016) combined ECM with the Technology Acceptance Model (TAM) and the Task-Technology Fit model to explain that users' continuance usage intention is determined by perceived task-technology fit and confirmation. However, few prior investigations have focused on factors affecting FDAs' continuance usage, especially under pandemic condition. Consequently, the purposes of this study are to fulfil the gap of factors determining users' intention to use FDAs during the COVID-19 period continuously and support FDA relevant stakeholders to understand customers' perceptions and behaviours for efficiently developing business strategies better. Therefore, this paper attempts to establish a comprehensive model integrating variables from ECM, UTAUT and the Task-Technology Fit model, including performance expectancy, effort expectancy, social influence, trust, perceived task-technology fit, confirmation and satisfaction, to investigate the factors affecting users' continuance usage intention of FDAs during the COVID-19 pandemic.

2. Theoretical background and hypotheses development

2.1. Food delivery apps (FDAs)

FDAs, as an emerging online-to-offline mobile technology, provide a channel between catering enterprises and customers by integrating online order and offline delivery services. FDAs can be categorised into two patterns (Ray *et al.*, 2019). First, the restaurants themselves, such as KFC, Domino's and Pizzahut etc. Second, the third-party intermediary platforms, such as, Uber Eats, Zomato, Ele.me Meituan Waimai and Baidu Waimai, which are more popular and have been widely adopted in China (Roh and Park, 2019). Moreover, in order to adapt and overcome the COVID-19 pandemic situation, the contactless delivery process is applied in China, which delivers food to the gates of customers without direct contact. Meanwhile, FDAs also involve daily supplies delivery service for customers. These additional services establish multi-way benefits in efficiently

maintaining social distancing during the COVID-19 pandemic, enriching service range and reducing the spatio-temporal interval of sales and consumptions processes (Liu and Wang, 2016). Therefore, the quality of FDA services significantly impacts on users' perceptions. Several previous studies have focused on various factors affecting users' intentions to adopt FDAs. Yeo *et al.* (2017) emphasised post-usage usefulness and perceived convenience motivation as significantly affecting customer's behavioural intentions to adopt online food delivery services. Moreover, Roh and Park (2019) modified TAM with the moral obligation moderator and found that usefulness, compatibility, subjective norm, are significant determiners in the intention of online food delivery service adoption. He *et al.* (2018) illustrated that satisfaction is associated with food quality and service efficiency, which significantly affects online food delivery service adoption. Meanwhile, Elvandari *et al.* (2018) found that order conformity, quality of delivery, food quality and costs are the most significant attributes affecting the intention of using online food delivery services. Furthermore, Ray *et al.* (2019) implemented the uses and gratifications theory and validated that customer experience, ease-of-use and technological characteristic had significant impacts on behavioural intention to use FDAs. Likewise, Cho *et al.* (2019) associated multi-dimensional perceived values with attitude to investigate continuance intention of FDAs. They presented that trustworthiness has the most significant positive effect on perceived value towards formulating users' attitudes to continue using FDAs.

Therefore, according to previous relevant researches and characteristics of FDAs associated with the current situation of the COVID-19 outbreak, this study focuses on technological and mental factors affecting customers' continuance intentions of using FDAs in China by integrating variables from UTAUT, ECM and the Task-Technology Fit model, including performance expectancy (Mun *et al.*, 2017; Yeo *et al.*, 2017; Roh and Park, 2019), effort expectancy (Ray *et al.*, 2019), social influence (Roh and Park, 2019) from UTAUT, satisfaction (He *et al.,* 2018) and confirmation (Yeo *et al.*, 2017) from ECM, perceived technology task fit (Elvandari *et al.*, 2018) from the Task-Technology Fit model and trust (Cho *et al.*, 2019). Furthermore, the following parts introduce the theoretical foundations that contribute to the conceptualisation of the research model.

2.2. Theoretical foundations

2.2.1. Unified Theory of Use and Acceptance of Technology (UTAUT)

UTAUT, as a reflection of social cognition theory, is an extension of the technology acceptance model developed by Venkatesh *et al.* (2003) for predicting users' behavioural intention to use new technology systems. Specifically, the UTAUT model has been modified with other variables and widely implemented on mobile technology adoption. For example, Khalilzadeh *et al.* (2017) modified UTAUT to verify that trust is associated with security and risk, and significantly affects customers' intentions to use mobile payment technology. Min *et al.* (2008) combined UTAUT with satisfaction to analyse mobile commerce adoption in China. Moreover, UTAUT has also been integrated with other models for investigating mobile technology adoption. For example, Zhou *et al.* (2010) integrated the Task-Technology Fit model with UTAUT and found that performance expectancy, task-technology fit, social influence, and facilitating conditions had significant effects on mobile banking adoption in China. Afterwards, Oliveira *et al.* (2014) integrated UTAUT with the Task-Technology Fit model and the Initial Trust Model (ITM) and validated that initial trust, performance expectancy, technology characteristics, and task-technology fit are important predictors to formulate users' intention to adopt mobile banking. Furthermore, several studies implemented UTAUT to investigate users' continuance intention of mobile technology (Chopdar and Sivakumar, 2019; Marinković *et al.*, 2020). Therefore, UTAUT as an advanced technology adoption model can be applied by associating additional variables or integrating with other models to explain the factors determining users' continuance intention of using FDAs during the COVID-19 pandemic efficiently.

2.2.2. Expectancy Confirmation Model (ECM)

ECM was proposed by Bhattacherjee (2001) and is rooted in the expectation–confirmation theory (ECT) (Oliver, 1980). It consists of three dimensions, including performance expectancy, confirmation and satisfaction for evaluating continuance usage intention of information systems. ECM has been widely implemented in various continuance

adoptions of mobile technology. Such as Hung *et al.* (2012) who modified ECM with the trust factor and proved that consumers' satisfaction and trust had a significant impact on continuance usage intention of mobile shopping. Chong (2013) extended ECM with perceived ease of use, perceived enjoyment, trust and perceived cost to analyse Chinese consumers' satisfaction and continuance usage intentions of m-commerce.

Moreover, ECM can also be integrated with other adoption models to investigate the continuance usage intention of a technology. Such as, ECM integrating with TAM explains consumers' continuance usage intentions of various mobile technologies, m-shopping (Shang and Wu, 2017). Mobile Learning System (Alshurideh *et al.,* 2020). Likewise, Yuan *et al.* (2016) integrated ECM, TAM and the Task-Technology Fit model to explain the significant effects of satisfaction, perceived usefulness, perceived task-technology fit and perceived risk on users' continuance usage intentions of mobile banking.

2.2.3. Task-Technology Fit model

Task-Technology Fit model was proposed by Goodhue and Thompson (1995) as the degree of fitness between tasks and technology to assist in the performance of individual daily tasks and the utilisation of technology. On the technology adoption aspect, technology characteristics and functions determine the performance of individual tasks and meet individual requirements (Goodhue and Thompson, 1995). Specifically, in this study, customers' continuance intention of using FDAs during the COVID-19 crisis period is determined on features of FDAs (fast, convenient and contactless food supply services), which fit users' efficient food supply requirements and maintain social distancing demand under the pandemic condition. Moreover, the Task-Technology Fit model has been implemented by various previous studies to analyse users' behavioural intentions of adopting mobile technology in different contexts, such as mobile commerce in the insurance industry (Lee *et al.*, 2007), mobile information systems (Junglas *et al.*, 2008). Meanwhile, the Task-Technology Fit model has also been integrated with other models to explain technology adoption better. For example, the Task-Technology Fit model combines with UTAUT to analyse mobile banking adoption (Zhou *et al.*, 2010); the Task-Technology Fit model integrates with the DeLone & McLean model to

explain mobile banking adoption (Tam and Oliveira, 2016). Moreover, Yuan *et al.* (2016) incorporated the Task-Technology Fit model with ECM and TAM to measure the factors affecting the continuance usage of mobile banking.

2.2.4. Discussion of theoretical frameworks

According to previous descriptions, the UTAUT model focuses on predicting users' initial adoption of a new information technology from users' technological expectations rather than mental expectations, which weakly explain users' mental perceptions determining continuance usage intention (Venkatesh, *et al.,* 2011). Accordingly, based on the summary of previous studies related to continuance intention of using information technology (shown in Table 1.), this study integrates the trust, confirmation and satisfaction variables as mental perceptions with technological perceptions to analyse users' continuance intention of using FDAs during the COVID-19 pandemic. Specifically, trust is considered as users' general belief of technology, measured against perceived risk and uncertainty, and positively reflects perceived security when adopting new technology (Khalilzadeh *et al.*, 2017; Shao *et al.*, 2018). Moreover, confirmation and satisfaction extracted from ECM can efficiently describe users' expectations on continuously using information technology (Yuan *et al.*, 2016; Almazroa and Gulliver, 2018). Moreover, compared to UTAUT, the Task-Technology Fit model focuses more on the relationships among task and technology characteristics, utilisation and performance impact (Yuan *et al.*, 2016). Particularly, the contactless feature and convenience of FDAs significantly contribute to users perceived technological and mental benefits of using FDAs under COVID-19 pandemic conditions. Therefore, UTAUT, ECM and the Task-Technology Fit model have good complementarities to evaluate the factors affecting users' continuance intention of using FDAs during the COVID-19 pandemic.

Relevant studies	Theoretical frameworks	Variables
Hung *et al.*, 2012	**ECM**	• Perceived usefulness • Confirmation • Satisfaction
Yuan *et al.*, 2016	**ECM**	• Perceived technology-task fit

	the Task-Technology Fit model **TAM**	• Perceived ease of use • Perceived usefulness • Confirmation • Perceived risk • Satisfaction
Alghamdi *et al.*, 2018	**UTT** **ECM**	• Performance expectancy • Effort expectancy • Social influence • Facilitating conditions • Satisfaction • Confirmation • Technology readiness • Uncertainty Avoidance
Liébana-Cabanillas *et al.,* 2018	**UTAUT** **DOI**	• Satisfaction • Service quality • Effort expectancy • Perceived risk • Convenience • Social value
Alshurideh *et al.*, 2020	**ECM** **TAM**	• Perceived ease of use • Perceived usefulness • Social influence • Confirmation • Satisfaction • Continuance intention
Marinković *et al.*, 2020	**UTAUT**	• Performance expectancy • Effort expectancy • Social influence • Satisfaction • Perceived trust • Perceived compatibility • Customer involvement • Epistemic value • Comparative value
Tam *et al.*, 2020	**ECM** **UTAUT2**	• Confirmation • Satisfaction • Performance expectancy • Effort expectancy • Social influence • Facilitating conditions • Hedonic motivation • Price value

		• Habit
Wang *et al*., 2020	**UTAUT2** **TAM**	• Performance expectancy • Effort expectancy • Hedonic motivation • Social influence • Attitude

Table 1. Summary of studies related to continuance intention of using information technology

2.3. Development of hypotheses

2.3.1. Revisiting the UTAUT model

2.3.1.1. Performance expectancy (PE)

According to UTAUT, performance expectancy (PE) is defined as the degree to which the user believes that using a particular technology will facilitate his or her performance in a certain activity (Venkatesh *et al*., 2003). PE is a significant predictor to determine a user's intention to adopt new technology. Concretely related to this study, users perceived the higher utility from FDAs, and the greater intention to continue using them (Mun *et al*., 2017; Yeo *et al*., 2017; Roh and Park, 2019). Meanwhile, previous researches have validated that PE has a significantly positive effect on user's continuance usage of various mobile technologies, such as mobile internet (Zhou, 2011a), mobile instant messaging and social networking apps (Lai and Shi, 2015), mobile banking (Yuan *et al.,* 2016) and mobile shopping applications (Chopdar and Sivakumar, 2019). Moreover, PE also has a significant effect on consumers' satisfaction towards affecting the continuance intention of using mobile technology (Tam *et al*., 2018). In terms of UTAUT, studies by Marinković *et al.* (2020) and Chong (2013) verified that PE is a significant predictor affecting the satisfaction of users' continuance usage of mobile commerce. Furthermore, the ECM posits that PE significantly influences the satisfaction and continuance intention of using mobile technology (Yuan *et al*., 2016; Susanto *et al.,* 2016). Accordingly, PE is considered as a significant variable of UTAUT and ECM positively affecting users' continuance intention and satisfaction. Therefore, the following hypotheses are proposed:

H1: Performance expectancy (PE) positively affects continuance intention (CI) of using FDAs during the COVID-19 pandemic.

H2: Performance expectancy (PE) positively affects satisfaction (SA) towards continuously using FDAs during the COVID-19 pandemic.

2.3.1.2. Effort expectancy (EE)

Effort expectancy (EE) as a fundamental variable of UTAUT is defined as the degree of ease associated with users' utilisation of a certain technology (Venkatesh *et al.*, 2003). EE positively affects users' continuance usage intention of using mobile apps (Kang, 2014; Fang and Fang, 2016), and has also been proved on FDAs (Ray *et al.*, 2019). Specifically, in this study, EE refers to users' perceived easiness of using FDAs generating higher continuance intentions to use them during the COVID-19 pandemic. Moreover, EE has been involved in previous studies by applying UTAUT to explain the continuance usage of information technology (Venkatesh *et al.*, 2011). However, some studies found that EE has an insignificantly direct effect on continuance intention of mobile technologies, such as mobile banking (Yuan *et al.*, 2016) and mobile shopping applications (Chopdar and Sivakumar, 2019). Because of users becoming increasingly familiar with mobile technology after their initial adoption, EE will no longer determine their intention. On the other hand, EE is validated as a significant indirect effect on technology's continuance usage by affecting other variables, such as PE and satisfaction. Specifically, EE significantly affected the PE of users' continuance intention of using mobile technology by implementing an ECM-based model(Yuan *et al.*, 2016). Similar results have been verified by previous researches in various aspects, like, information systems (Kim and Malhotra, 2005), mobile Internet (Shin *et al.*, 2010). Meanwhile, Marinković *et al.* (2020) applied a UTAUT-based model and validated that EE had a significant impact on satisfaction towards continuance usage of mobile commerce. Similar results are supported by Yeh and Li (2009), Agrebi and Jallais (2015) and Shang and Wu (2017). Therefore, this study proposes the following hypotheses:

H3: Effort expectancy (EE) positively affects the continuance intention (CI) of using FDAs during the COVID-19 pandemic.

H4: Effort expectancy (EE) positively affects performance expectancy (PE) towards continuously using FDAs during the COVID-19 pandemic.

H5: Effort expectancy (EE) positively affects satisfaction (SA) towards continuously using FDAs during the COVID-19 pandemic.

2.3.1.3. Social Influence (SI)

According to UTAUT, social influence (SI) is defined as the degree that users gain willingness from others' (e.g. families, friends and colleagues) encouragement that they should use a certain technology (Venkatesh *et al.*, 2003). Related to this study, SI has been validated as significantly determining users' intention to use an online-to-offline delivery service (Roh and Park, 2019). Moreover, from the continuance intention of using a mobile technology aspect, SI as an important variable in UTAUT has a significant impact on users' intentions to continue using mobile technologies (Lai and Shi, 2015). This angle has been supported in various aspects, such as mobile social network sites (Zhou and Li, 2014), shopping apps (Chopdar and Sivakumar, 2019) and mobile payment systems (Zhu *et al.*, 2017). Furthermore, SI not only directly determines users' continuance intention, but also indirectly formulates users' intention to continuously use mobile technology by affecting their satisfaction (Hsiao *et al.*, 2016). Marinković *et al.* (2020) revised UTAUT to confirm that SI has a significant effect on users' satisfaction towards continuance intention of using mobile technology. Therefore, the following hypotheses are proposed in this study:

H6: Social influence (SI) positively affects continuance intention (CI) of using FDAs during the COVID-19 pandemic.

H7: Social influence (SI) positively affects satisfaction (SA) towards continuously using FDAs during the COVID-19 pandemic.

2.3.1.4. Trust (TR)

Trust (TR) is defined as a state of individual faith regarding intentions, and prospective actions will follow the appropriate behaviour of integrity and ability (Gefen, 2000; Grazioli and Jarvenpaa, 2000). According to this study which focuses on continuance intention of using FDAs during the COVID-19 pandemic, trustworthiness can significantly formulate users' mental expectation to believe FDAs can provide reliable service (Cho *et al.*, 2019), which means users perceived the higher accumulation of trustworthiness

from FDAs, and the higher willingness to continuingly use FDAs. Moreover, trust been validated as an additional UTAUT variable, which represents personal metal perception reflecting users' perceived security against uncertainty and risk, which has a significant influence in formulating users' behavioural intention (Khalilzadeh *et al.*, 2017; Shao *et al.*, 2018). Meanwhile, trust been confirmed as a crucial predictor determining users' continuance usage intention towards mobile technology (Hung *et al.,* 2012; Zhou, 2013; Gao *et al.*, 2015). Furthermore, trust was demonstrated as a significant positive antecedent of satisfaction of mobile technology adoption, such as mobile banking (Liébana-Cabanillas *et al.*, 2016), mobile websites (Zhou, 2011b) and mobile commerce platforms (Gefen *et al.*, 2000; Jarvenpaa *et al.,* 2003). Likewise, in continuance usage studies, trust is also positively associated with satisfaction towards formulating users' continuance intention of using mobile technology (Chen and Li, 2017). Moreover, the positive influence of trust is not only on continuance intention but also on satisfaction to explain users' behaviour in continuance usage of mobile technology (Dlodlo, 2014). Accordingly, this study involves trust as an extra UTAUT variable and proposes the following hypotheses:

H8: Trust (TR) positively affects continuance intention (CI) of using FDAs during the COVID-19 pandemic.

H9: Trust (TR) positively affects satisfaction (SA) towards continuously using FDAs during the COVID-19 pandemic.

2.3.2. Revisiting the Task-Technology Fit model

2.3.2.1 Perceived task-technology fit (TTF)

Perceived task-technology fit (TTF) is a crucial factor summarised from the task-technology fit model, which affects users' adoption of technology. Goodhue and Thompson (1995) argued that the higher fitness between the performance of a technology and users' tasks and requirements, the higher the probability of adopting the technology. In the ongoing COVID-19 pandemic context, TTF represents the characteristics and advantages of FDAs that users can conveniently order food or daily supplies anytime at any self-isolation location via FDAs; meanwhile, contactless offline delivery is monitored and managed by FDA platforms to ensure the quality and efficiency of the service. Therefore, TTF significantly formulates users'

technological and mental expectations towards continuously using FDAs during the COVID-19 pandemic. TTF associated with ECM has a significantly positive effect on continuance intention towards the usage of mobile banking (Yuan *et al.*, 2016). This result is per previous studies in information systems (Larsen *et al.*, 2009) and Web learning systems (Lin, 2012). In addition, TTF has also been confirmed to have a significant impact on PE in technology adoption. Zhou *et al.* (2010) and Oliveira *et al.* (2014) integrated TTF with UTAUT and observed that TTF was a significant predictor in determining PE of mobile banking adoption. TTF has been verified to have a significantly positive effect on PE determining users' continuance usage intention of mobile technology (Yuan *et al.*, 2016). Thus, this study assumes the following hypotheses:

H10: Perceived task-technology fit (TTF) positively affects continuance intention (CI) of using FDAs during the COVID-19 pandemic.

H11: Perceived task-technology fit (TTF) positively affects Performance expectancy (PE) towards continuously using FDAs during the COVID-19 pandemic.

2.3.3. Revisiting the ECM model

2.3.3.1. Confirmation (COF)

Confirmation (COF) is defined as the degree of users' perceptions of an information system is congruent with their prior expectations and actual performances (Bhattacherjee, 2001). In terms of ECM, Bhattacherjee (2001) illustrated that COF as an important factor predicts PE and satisfaction determining user's continuance intention of using the information system. This study refers to COF as the degree of users' confirmations of their initial expectations of FDAs, which affect PE and satisfaction towards continuance usage of FDAs during the COVID-19 pandemic. Lee and Kwon (2011) validated that COF had a significant positive effect on PE and satisfaction towards users' continuance intention of using web-based services. Similar results have been verified by applying ECM in various mobile technologies' continuance usage contexts as well, like, mobile banking (Yuan *et al.*, 2016), and mobile learning systems (Alshurideh *et al.*, 2020). Therefore, the following hypotheses are proposed in this study:

H12: Confirmation (COF) positively affects satisfaction (SA) towards continuously using FDAs during the COVID-19 pandemic.

H13: Confirmation (COF) positively affects Performance expectancy (PE) towards continuously using FDAs during the COVID-19 pandemic.

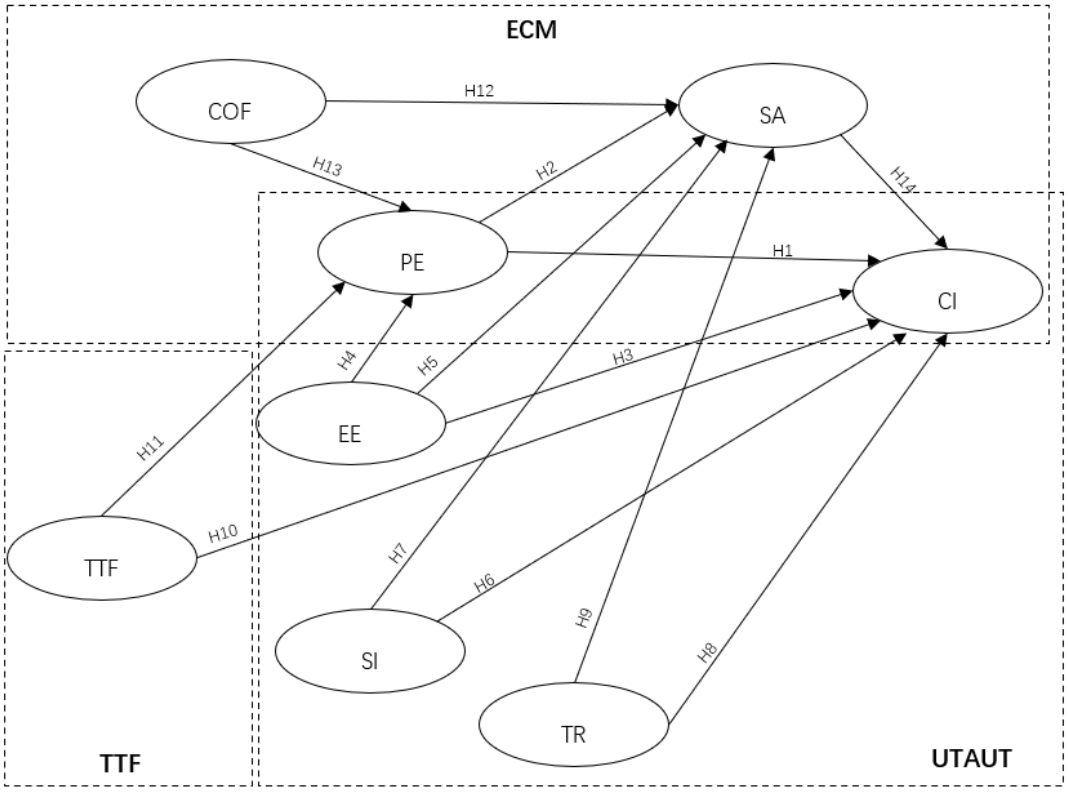
2.3.3.2 Satisfaction (SA)

Satisfaction (SA) is defined as cumulative feelings when individual prior emotion is coupled with surrounding disconfirmed expectations (Oliver 1980). According to ECM, satisfaction refers to an overall emotion-based evaluation of an IS (Yuan *et al.*, 2016). Users will be satisfied if perceived service performance exceeded their expectations, which leads to positive action towards continuance usage of FDAs. For example, Gao *et al.* (2015) found the significant influence of satisfaction towards users' continuance usage intention of mobile purchases. Moreover, satisfaction as an extra variable of UTAUT positively formulated users' continuance intentions of using information technology (Alghamdi *et al.* 2018). Similar findings are supported by other studies of different mobile technologies' continuance usage intention, such as mobile banking (Liébana-Cabanillas et al., 2017; Susanto *et al.,* 2016; Yuan *et al.*, 2016), mobile apps (Hsiao, Chang, and Tang 2016; Tam, Santos, and Oliveira 2018), mobile payment (Cao et al., 2018; Dlodlo, 2014) and mobile commerce (Marinković *et al.*, 2020). Therefore, satisfaction as a complementary variable of UTAUT and ECM has been proposed in the following hypothesis:

H14: Satisfaction (SA) positively affects continuance intention (CI) of using mobile payment during the COVID-19 pandemic.

2.4. Research model

According to previous literature and the proposed hypotheses, the research model integrates variables from UTAUT, ECM and the Task-Technology Fit model and presents the hypotheses paths in Figure 1.



(COF=Confirmation; SA=Satisfaction; PE=Performance Expectancy; EE=Effort Expectancy; SI=Social Influence; TR=Trust; CI=Continuance Intention; TTF=Perceived Task-technology fit.)

Figure 1. Research model and hypotheses

3. Methodology

3.1. Questionnaire development

A questionnaire survey was applied to collect data to validate the conceptual model and examine the research hypotheses. The questionnaire consisted of two parts. The first part concentrated on the demographic information of respondents using close-ended questions, including, gender, age, education, occupation and frequency of using FDAs during the COVID-19 pandemic. The second part comprised of constructs and items referred from pre-validated literature, consisting of 32 measurement items as indicators of variables, including performance expectancy (PE), effort expectancy (EE), social influence (SI), trust (TR), perceived task-technology fit (TTF), confirmation (COF), satisfaction (SA) and continuance intention (CI) of using FDAs, and the scale items and their references are listed in the Appendix table. According to the large number of measurement items, a five-point scale appears to be less confusing and less time consuming for participants to increase the response rate (Babakus and Mangold, 1992; Bouranta, 2009). Thus, all indicators corresponding to the constructs in the survey were measured by using a five-point Likert scale, which ranges from strongly disagree = "1" to strongly agree = "5".

The main survey target of this research focuses on smartphone users who adopted FDAs during the ongoing COVID-19 virus period in China. The questionnaire was translated into the Chinese language by a professional translator to avoid the impact of culture and language differences. The questionnaire was then reversely translated into English to confirm the translation equivalence. The questionnaire data were collected through an online survey and inquiry through Wechat (Chinese social media platform) over a 3-week period, from 23 March 2020 to 12 April 2020.

3.2. Data collection and demographic distribution

During the data collection period, a total of 900 questionnaires were distributed, and 713 data were collected on 13 April 2020. After scrutinising the questionnaire and removing answers with missing values, a total

number of 532 valid responses were accepted, achieving a final response rate of 59.1%. The valid data were mainly collected from the Henan province, which is the third-largest population province, consisting of 6.9% of the total population in China. The sample distribution of the male and female respondent groups was compared by using the Kolmogorov–Smirnov (K–S) test and no statistical difference between them was verified (Ryans, 1974), which indicates a sample with no existing non-response bias. The demographic distribution of the sample consists of 49.62% male and 50.38% female respondents; the largest proportion of age range is between 21 to 30 with 53.57%, which in line with a report from Chyxx (2019) that the proportion of FDAs users' age between 19 to 35 was 73.9%; there are 71.80% participants with bachelor's or college degrees because this group is more active on social media and achieve a high response rate. Meanwhile, their working and study pressures accelerate their experience of ordering food through FDAs (DCCI, 2016); employee and student are the two main groups of respondents with the percentages of 43.05% and 31.58% respectively; there are 45.68% of total responses using FDAs at least once every three days. The specific demographic distribution is listed in Table 2.

Measure	Item	N	%
Gender	Male	264	49.62%
	Female	268	50.38%
Age	<21	158	29.70%
	21-30	285	53.57%
	31-40	62	11.65%
	41-50	12	2.26%
	>50	15	2.82%
Education	High school and lower	32	6.02%
	Bachelor's or college	382	71.80%
	Master's	107	20.11%
	PhD and above	9	1.69%
	other	2	0.38%
Occupation	Student	168	31.58%
	Employee	229	43.05%
	Public Servant	30	5.64%
	Retiree	10	1.88%
	Unemployed	5	0.94%
	Freelancer	38	7.14%

	Other	52	9.77%
Frequency	At least 1 time every 3 days	243	45.68%
	At least 1 time per 1 week	208	39.10%
	At least 1 time every 2 weeks	66	12.41%
	At least 1 time per 1 month	11	2.07%
	Never used during the pandemic	4	0.75%

Table 2. Demographic distribution of participates

4. Data analysis

The data analysis followed the two-step approach by Anderson and Gerbing (1988) by using SPSS 19 and AMOS 22 software. The first step assessed the reliability and validity of the measurement model. It was followed by examining the structural model and testing the research hypotheses. The maximum likelihood approach was implemented as the model estimation method in this study.

4.1. Measurement model

The reliability and validity of the measurement model were assessed by exploratory factor analysis (EFA) via SPSS and confirmatory factor analysis (CFA) through AMOS. Construct reliability represents the internal consistency of survey items and was measured by Cronbach's alpha (CA). The results in Table 3 reveal that all CAs are in the range of 0.848 to 0.888 and all exceed 0.70 (Nunnally and Bernstein, 1994), which demonstrate eligible construct reliability. Furthermore, CFA is employed to evaluate the convergent and discriminant validity of each dimension. Specifically, convergent validity refers to the high theoretical correlations of the items of a scale where a factor's loadings exceed 0.7 (Henseler *et al.,* 2014). Table 3 confirms that all the loadings are qualified. Moreover, the complemented convergent validity is assessed by Composite Reliability (CR) and Average Variance Extracted (AVE) criteria. The CR value of 0.70 or above is deemed acceptable, and an AVE value suggested higher than the threshold of 0.5 (Fornell and Larcker, 1981). As shown in Table 3, the CR values of all variables range from 0.838 to 0.889. All constructs have AVE values in the

range of 0.582 to 0.666. Thus, the convergent validity of the measurement model has been confirmed.

In addition, discriminant validity is defined as the extent to which the indicator is not a reflection of other variables (Lee *et al.*, 2007). The square root of AVE of each latent construct should be higher than any two pairs of its inter-construct correlation to confirm the discriminant validity. Meanwhile, the values of the average variance extracted (AVE) of each variable should greater than its maximum shared squared variance (MSV) (Hair *et al.*, 2010). The results of the variables' MSV and square roots of AVE and correlations shown in Table 4, confirm qualified convergent validity and discriminant validity of the measurement model.

Moreover, the model-fit was examined by the following measures: the ratio of chi-square to degrees-of-freedom (X^2/df), comparative fit index (CFI), the goodness of fit index (GFI), adjusted goodness-of-fit index (AGFI), normalized fit index (NFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR). All the model-fit indices of measurement model (X^2/df=1.207, CFI=0.992, GFI=0.942, AGFI=0.929 NFI=0.953, TLI=0.990, RMSEA=0.020, SRMR=0.240) respectively exceed the common acceptance levels (shown in Table 5), which demonstrates a reasonable fitness of the measurement model.

Further, this study implemented two tests to examine the potential common method bias. First, Harman's one-factor test (Podsakoff *et al.*, 2003) was conducted by implementing EFA in SPSS. The results present that the largest variance explained by individual factor is 44% (< 50%). Therefore, the result confirms that none of the factors can individually explain the majority of the variance. Second, a CFA was applied to assess the fitness of a single-factor model (all items as the indicators of one factor) (Malhotra et al., 2006). The results of model-fit present a poor fitness (v^2/df = 6.449(>3), CFI = 0.764 (<0.9), GFI = 0.668 (<0.9), AGFI = 0.622 (<0.9), NFI = 0733 (<0.9), TLI = 0.765 (<0.9), RMSEA = 0.101 (>0.08), SRMS=0.0713 (>0.05)). Therefore, both tests confirm that no common method bias appeared in this study.

Variables	Items	Loading	CA	CR	AVE
Performance expectancy (PE)	PE1	0.84	0.881	0.838	0.634
	PE2	0.832			
	PE3	0.784			

	PE4	0.771			
Effort expectance (EE)	EE1	0.845	0.883	0.883	0.654
	EE2	0.845			
	EE3	0.771			
	EE4	0.77			
Social influence (SI)	SI1	0.807	0.860	0.862	0.609
	SI2	0.77			
	SI3	0.732			
	SI4	0.81			
Trust (TR)	TR1	0.737	0.852	0.852	0.591
	TR2	0.788			
	TR3	0.762			
	TR4	0.787			
Perceived task-technology fit (TTF)	TTF1	0.824	0.880	0.880	0.647
	TTF2	0.801			
	TTF3	0.796			
	TTF4	0.797			
Confirmation (COF)	COF1	0.78	0.848	0.848	0.582
	COF3	0.769			
	COF2	0.76			
	COF4	0.741			
Satisfaction (SA)	SA1	0.808	0.848	0.850	0.586
	SA2	0.777			
	SA3	0.719			
	SA4	0.755			
Continuance intention (CI)	CI1	0.842	0.888	0.889	0.666
	CI2	0.82			
	CI3	0.814			
	CI4	0.788			

Table 3. The factor loadings, Cronbach's alphas (CA), Composite Reliability (CR) and Average Variance Extracted (AVE)

	MSV	CI	PE	EE	SI	TR	TTF	COF	SA
CI	0.610	**0.816**							
PE	0.612	0.781	**0.796**						
EE	0.429	0.421	0.544	**0.809**					
SI	0.551	0.697	0.666	0.622	**0.780**				
TR	0.575	0.758	0.700	0.549	0.742	**0.769**			
TTF	0.612	0.781	0.782	0.530	0.642	0.699	**0.805**		
COF	0.575	0.625	0.709	0.655	0.677	0.671	0.658	**0.921**	
SA	0.581	0.762	0.726	0.587	0.699	0.714	0.659	0.758	**0.765**

Table 4. Descriptive statistics and correlation among constructs.

	X^2/DF	CFI	GFI	AGFI	NFI	TLI	RMSEA	SRMR
RECOMMEND VALUE	<3	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08	<0.05
MEASUREMENT MODEL	1.207	0.992	0.942	0.0.929	0.953	0.990	0.020	0.0240
STRUCTURAL MODEL	1.235	0.990	0.940	0.9228	0.952	0.989	0.021	0.0265

Table 5. Models fit indices of the measurement model and structural model

4.2. Structural model

According to the previous hypotheses, the structural equation model was developed, and the maximum likelihood estimation method and bootstrapping technique (500 samples, and 95% significance level) were applied based on the absence of normality of the variables in this study. The overall goodness of fit of the structural model was comparably assessed as was the previous CFA of the measurement model. The model-fit results are shown in Table 5, which demonstrates the adequate fitness between the hypothesised structural model and the observed data. Furthermore, in order to evaluate the explanatory power and predictive accuracy of the structural model, the R^2 (also known as squared multiple correlations or coefficient of determination) of endogenous variables were calculated to show that the degree of their portion of the variance is explained by related exogenous variables (Hair *et al.*, 2010). As shown in Table 6 and Figure 2, the explained variances of performance expectancy, satisfaction and continuance intention are R^2=0.70, R^2=0.69 and R^2=0.78, respectively, which confirm the structural model substantially explains the dependent variable. Moreover, the hypotheses' testing shows that the continuance intention of using FDAs during the ongoing COVID-19 pandemic is positively determined by performance expectancy (ß=0.228, p<0.001), social influence (ß=0.163, p=0.011), trust (ß=0.271, <0.001), perceived task-technology fit (ß=0.309, p<0.001) and satisfaction (ß=0.341, p<0.001) directly. Thus, hypotheses H1, H6, H8, H10 and H14 are respectively validated. Moreover, the results illustrate that satisfaction is significantly influenced by performance expectancy (ß=0.210, p<0.001), social influence (ß=0.141, p=0.023), trust (ß=0.223, P=0.003), confirmation (ß=0.339, p<0.001) respectively. Therefore, hypotheses H2, H7, H9 and H12

are confirmed. Moreover, perceived task-technology fit (ß=0.536, p<0.001) and confirmation (ß=0.389, p<0.001) are verified and have significant effects on performance expectancy, which support H11 and H13. However, effort expectancy was found to have a negative influence on continuance intention (ß=-0.267, p<0.001), and an insignificant impact on performance expectancy (ß=0.038, p=0.466) and satisfaction (ß=0.041, p=0.399). Therefore, the results reject hypotheses H3, H4 and H5.

Hypotheses	Relations	Estimate	S.E.	T-values	P-values	Decisions
H1	PE→CI	0.228	0.066	3.444	***	Supported
H2	PE→SA	0.210	0.052	4.027	***	Supported
H3	EE→CI	-0.267	0.048	-5.57	***	Rejected
H4	EE→PE	0.038	0.052	0.729	0.466	Rejected
H5	EE→SA	0.041	0.049	0.844	0.399	Rejected
H6	SI→CI	0.163	0.064	2.55	0.011	Supported
H7	SI→SA	0.141	0.062	2.278	0.023	Supported
H8	TR→CI	0.271	0.081	3.333	***	Supported
H9	TR→SA	0.223	0.074	3.022	0.003	Supported
H10	TTF→CI	0.309	0.063	4.907	***	Supported
H11	TTF→PE	0.536	0.051	10.564	***	Supported
H12	COF→SA	0.339	0.073	4.61	***	Supported
H13	COF→PE	0.389	0.071	5.442	***	Supported
H14	SA→CI	0.341	0.070	4.836	***	Supported

Table 6. Summary of hypotheses testing.

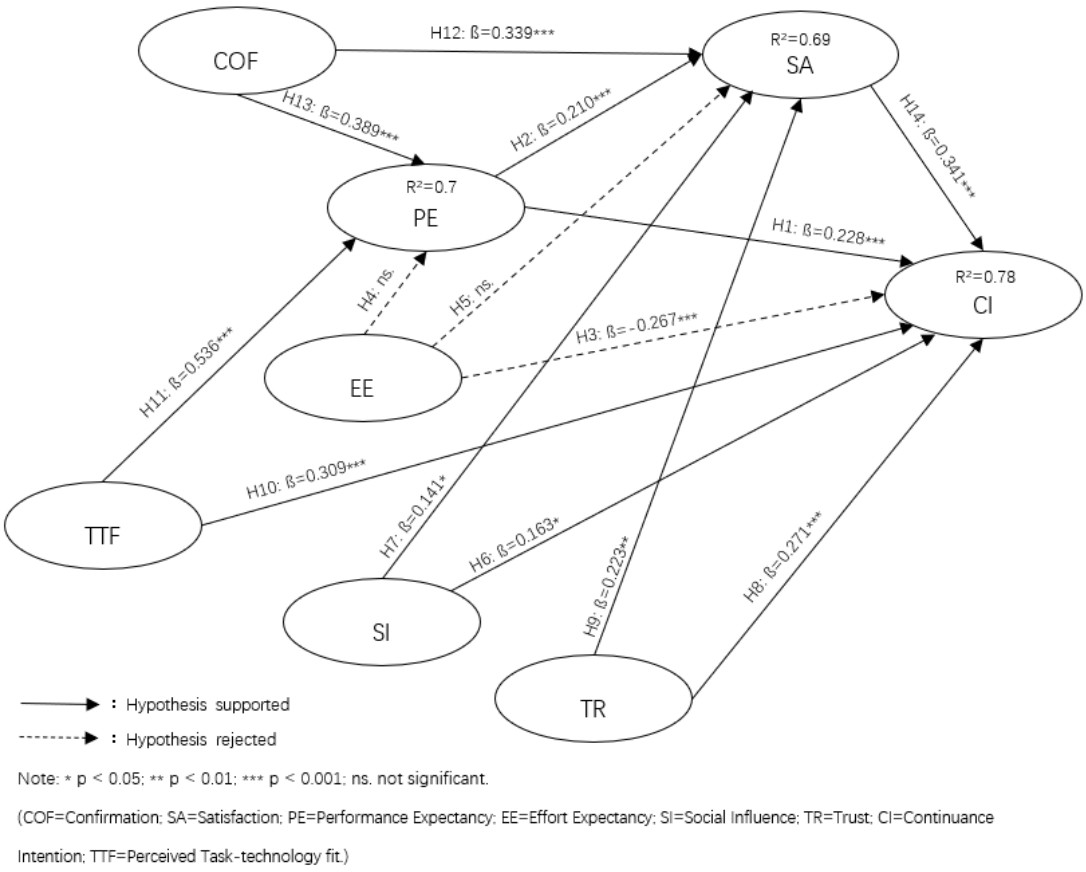


Figure 2. Hypotheses testing results

5. Discussion

According to the path analysis, it can be concluded that four of the five variables (PE, SI, TR, TTF and SA) emerged as statistically significant antecedents of continuance usage intention of FDAs during the COVID-19 pandemic. Wherein satisfaction has the most substantial influence on continuance intention. This result confirms previous studies related to continuance adoption of mobile technologies and services (Dlodlo, 2014; Gao *et al.*, 2015; Yuan *et al.*, 2016; Cao and Niu, 2019; Marinković *et al.*, 2020). Furthermore, it has reconfirmed that satisfaction is an important determinant for users' re-purchase intentions in an FDA service context (Elvandari *et al.*, 2018). Therefore, monitoring and improving users' satisfaction by providing a high quality of service to meet customers' requirements are essential and appropriate approaches for FDAs providers to retain customers during the COVID-19 pandemic, as well as sustainably

maintaining future development of FDAs by satisfying customers' technological and mental expectations.

TTF is the second most crucial indicator affecting CI. This study initially integrates the Task-Technology Fit model with UTAUT and ECM to verify the TTF plays an essential role not only on determining users' premier behaviour intention of adopting technology (Zhou *et al.*, 2010), but on explaining users' continuance intention (Larsen *et al.,* 2009; Lin, 2012; Yuan *et al.*, 2016). Moreover, previous literature related to FDAs adoption has focused on users' perceptions or technologies' characteristics (Cho et al., 2019; Ray et al., 2019; Roh and Park, 2019), which is insufficient on analysing the fitness between users' perception and technology characteristics. TTF is significantly determined by technological characteristics (Oliveira et al., 2014). Specifically, based on the FDAs' features, strict monitoring of the service processes and additional functions, such as daily necessities delivery. Contactless delivery, significantly formulates customers' intention to use FDAs under the COVID-19 pandemic situation. Compared to the results from Oliveira et al. (2014) that TTF has no significant effect on behavioural intention, this study proves that when technology's characteristic is beneficial to a particular situation, the customers will take advantage of relevant features to acquire higher usage intention. Thus, the stakeholders of FDAs, as well as other new technologies, should analyse how technology's specific characteristic can meet users' requirements in particular contexts to increase customers' usage intention. Meanwhile, TTF also significantly determine PE (Zhou et al., 2010; Oliveira et al., 2014; Yuan et al., 2016). It indicates that when FDAs' specific characteristics or functions meet customers' requirements of accessing food supplies or daily necessities under a safe environment during the pandemic period, customers will feel FDAs are useful and compatible. This study replenishes findings from Roh and Park (2019) that TTF is another antecedent of PE towards using FDAs. Therefore, the stakeholders of FDAs should insist on user-centred principle to improve the services or functions to optimize users' perceived usefulness and better meet the requirements of users, thereby maintaining users' continuance usage.

Moreover, not only TTF but also COF significantly impact PE, synchronously COF significantly determines SA. Similar results have been supported in previous studies (Lee and Kwon, 2011; Yuan *et al.*, 2016; Alshurideh *et al.*, 2020). COF reflects users' expectations formulated by their previous experience. Ray et al. (2019) illustrated experience directly affects customers' intention of using FDAs. This study supplements their findings

with mediating variables PE and SA, which explains the technological and mental effects of COF on customers' continuance intention of using FDAs. Thus, FDA providers should comprehend users' expectations to improve the efficiency and reliability of online order and delivery services based on users' requirements and particular situations (e.g. the COVID-19 pandemic) to preferably meet customers' technological and practical expectations for formulating a useful inspiration of technology and improving users' experience to maintain customers' continuance usage intention.

Furthermore, PE is determined by TTF and COF and simultaneously plays a vital predictor role in influencing SA and CI positively. Yuan *et al.* (2016) supported similar results. Moreover, these findings have been validated in various contexts by other researches respectively (Zhou, 2011b; Lai and Shi, 2015; Chopdar and Sivakumar, 2019; Susanto *et al.,* 2016; Marinković *et al.*; 2020). These findings indicate that the quality and serviceability of FDAs affect users' perceived satisfaction and continuance intention of FDAs' usage during the COVID-19 pandemic. Therefore, FDA providers should guarantee the performance and usability of FDAs appropriate to users' expectancy in pandemic conditions, providing accurate and opportune stability ordering and delivery services with safety and quality assurance.

Additionally, this study proposes TR, as the additional variable of UTAUT, has a significant influence on CI, which is consistent with previous findings (Dlodlo, 2014; Shao et al., 2018). Meanwhile, this study originally integrates TR with the ECM model. The results confirm that TR significantly formulates SA on users' continuance intention (Zhou, 2013; Dlodlo, 2014; Zhou, 2011b; Liébana-Cabanillas et al., 2016). These results confirm that TR significantly impacts users' behaviour on adopting FDAs (Cho et al., 2019). It can be concluded that the reliability, promptness and personalisation of FDA service determine customers' trust of using FDAs during the COVID-19 pandemic. Thus, FDA providers should improve personalised services and monitor online ordering, production and delivery processes to ensure service quality and reliability to increase customer's trust.

Similarly, SI has also been validated to be the determinant of SA and CI, which efficiently combines UTAUT with ECM to explain users' continuance usage intention of FDAs, which is supported by previous studies in various contexts of technology adoption respectively (Roh and Park, 2019; Zhou and Li, 2014; Lai and Shi; 2015; Hsiao *et al.*, 2016; Zhu, Lan and Chang; 2017; Chopdar and Sivakumar; 2019; Marinković *et al.*, 2020). Regarding the significant role of SI, FDA providers and catering enterprises need to create

appropriate marketing through social networks. Social marketing should be applied to promote the benefits of FDAs related to the pandemic situation to establish a reliable reputation of FDAs for increasing customers' satisfaction and continuance usage intention.

However, the influence of EE does not have a strong influence on PE, SI and CI. These results are against previous findings (Fang and Fang, 2016; Kim and Malhotra, 2005; Marinković et al., 2020), but consistent with results from Yuan et al. (2016) and Chopdar and Sivakumar (2019). Because users gained enough experience from their previous usage of FDAs, the recognition and familiarity of FDAs will increase by their usage experience. Therefore, the ease of a user will no longer determine users' satisfaction and continuance intention after their initial adoption of FDAs. Meanwhile, during the COVID-19 pandemic, other FDA features, such as, safety, reliability and efficiency, as more important determinants can provide more benefits for users, which more directly influence their satisfaction and continuance usage intention.

6. Theoretical and practical implications

This study contributes with various theoretical implications. First, this study applied an empirical study and examined the factors affecting users' continuance usage intention of FDAs during the COIVD-19 pandemic. Consequently, the study dramatically enriched the literature of technology continuance usage in an emergency situation, especially during a pandemic. Second, UTAUT, ECM and the Task-Technology Fit model are initially integrated to form a comprehensive model in this study, simultaneously, the proposed model highly explains technological and mental factors affecting users' continuance intention of using FDAs during the COVID-19 pandemic. Specifically, TTF as the extension of the boundary of the UTAUT, efficiently explains the technology characteristic significantly formulates users' perceptions and behaviours. Meanwhile, the proposed variables of the revised UTAUT model, as the extension of boundaries of the ECM model complementarily explain users' technological perceptions not only determining users' continuance usage intention, but also affecting on users'

satisfaction. Moreover, ECM analyses users' continuance intention mainly from mental aspects, which is complementary with UTAUT and the Task-Technology Fit model. Thus, the proposed comprehensive model can significantly contribute to the emerging literature on information technology's continuance usage. Third, this study not only focuses on perspectives of users' perceptions but also emphasizes the effect of specific technology's characteristic can appropriately optimize users' technological and mental expectations in a particular situation (e.g. contactless function of FDAs increases users' perceived fitness between technology and their requirements, thereby optimizes users' perceptions towards determining their continuance usage intention of FDAs under COVID-19 pandemic). Therefore, future researches may pay more attention on the specific feature or function of technology, which can adapt a particular situation, as an antecedent of users' perceptions and behaviours. Meanwhile, integrating users' technological and mental perceptions is an efficient pattern to explain users' continuance usage intentions of technologies in various contexts.

Moreover, four main practical implications have been demonstrated in this study. First, the current research enhances the existing knowledge and benefits of FDAs, especially in the emergency COVID-19 pandemic context. The results indicate that the benefits of the contactless delivery function of FDAs formulate users' perceptions and behaviour, which together with technological and mental factors jointly affecting users' intention to use FDAs in China continuingly under the COVID-19 pandemic condition. Second, this study supports FDAs providers and catering business owners with a fundamental understanding of customer's continuance intention as driven by satisfaction, perceived task-technology fit, trust, performance expectancy, confirmation and social influence. Notably, satisfaction, as the most significant determinant of customers' continuance usage intention, has significantly been determined by their mental and technological perception. Meanwhile, the sense of the fitness between technology's feature and users' requirements also play an essential role to formulate customers' perceptions and behaviour. Consequently, relevant stakeholders should focus on taking advantages of the technology's particular characteristic or function, and maintain service quality, reliability and efficiency to optimize users' experience and achieve higher customers' satisfaction, thereby, increasing the continuance acceptance among their target population in a particular situation and future development. Third, this study could be valuable for start-up companies, policymakers,

government bodies, and private service providers who are interested in the catering industry. FDAs have become increasingly popular and gradually useful platforms for the survival of the foodservice industry in a particular emergency (COVID-19 pandemic), as well as continuously developing after crises. This popularity is determined by customers' increasing willingness to enjoy food at home as well as self-protection during the pandemic period, which has also formulated new consumption habits for continuance usage. Finally, the findings of this study could be applied as references for other online-to-offline service industries, such as, online real estate services and online hospitality industry. Relevant businesses could utilise the findings from this study to develop appropriate strategies by integrating specific technology features with customers' technological and mental perceptions for expanding their market and build a better sustainable customer base not only in crises situations but also for future development.

7. Limitations and future research

This section summarises three main limitations of the current study and provides relevant recommendations for future research. First, this study mainly focuses on users of FDAs in China, and the results of this study may not be generalisable to different cultures, regions and countries. Therefore, future research is recommended to pay attention to different regions or countries. Moreover, comparisons across cultures are also highly encouraged. Second, this study only conducts a short-term reflection of users' perception towards continuance usage intention of FDAs, especially, in a particular situation (COVID-19 pandemic context). According to the spatio-temporal dynamic of individual's behaviour and intention, future research can apply longitudinal and experimental methods to explore users' perceptions in different situations and investigate causality over time and make comparisons, to more comprehensively explain users' continuance usage intentions of technology. Third, the current study does not distinguish the different FDA platforms such as Ele.me, Meituan waimai, Baidu Waimai, and Uber eats. Meanwhile, the study focuses on the customers' perspectives towards FDAs only. Consequently, the research model can be generalised to apply on distinguishing the different FDA platforms, different stakeholders, e.g. business owners, service providers,

and other contexts of the online-to-offline service industry, such as online real estate platforms and online-to-offline hospitality services.

8. Conclusion

In conclusion, at the nascent stage of FDA development, an increasing number of scholars have attracted their attention in the related field. This study applies an empirical study with a high explanatory power of examining factors affecting users' continuance usage intention of FDAs during the COVID-19 pandemic, which significantly contributes to the literature of continuance adoption of information technology. Furthermore, the current study proposed a comprehensive model integrating UTAUT, ECM and the Task-Technology Fit model and investigated 532 FDA users in China by a quantitative research method. The research model consists of seven factors, performance expectancy, effort expectancy, social influence, trust, perceived task-technology fit confirmation and satisfaction, to explore the determinators of users' continuance intention of using FDAs during the COVID-19 pandemic. The measurement model demonstrates good construct reliability and sufficient convergent and divergent validity. The results of this study conclude that customers' continuance intention of using FDAs during the COVID-19 pandemic is not only significantly determined by satisfaction, but also dramatically influenced by perceived task-technology fit, trust, performance expectancy and social influence. Moreover, it is necessary to emphasize that user perceived task-technology fit plays a crucial role to formulate users' technological and mental perceptions when the technology' characteristic is beneficial to a specific situation. However, this study does not find strong associations between effort expectancy with other variables (performance expectancy, satisfaction and continuance intention). In addition, this study contributes with various theoretical and practical implications. The perceived task-technology fit is an essential antecedent of UTAUT, which associates ECM can complementarily explain users' technological and mental perceptions determining on their continuance usage intention. Relevant researches and stakeholders should combine particular technology features with users' technological and mental perceptions to analyse and understand users' behaviour and continuance intention in a specific situation integrally.

Appendix

Table of questionnaire with constructs, items and references.

Constructs	Items	References
Performance expectancy (PE)	PE1-I feel that food delivery apps (FDAs) are useful for ordering and receiving delivery food during the COVID-19 pandemic. PE2-I feel FDAs are convenient to order and receive delivery food during the COVID-19 pandemic. PE3-Using FDAs improves the process of ordering and receiving delivery food. PE4-Using FDAs improves the efficiency of ordering and receiving delivery food during the COVID-19 pandemic.	Bhattacherjee (2001); Venkatesh *et al.* (2003); Roh and Park (2019)
Effort expectancy (EE)	EE1-Learning how to use FDAs is easy. EE2-It is easy to follow all the steps of FDAs. EE3-It is easy to become skilful at using FDAs. EE4-Interaction with FDAs is clear and comprehensible.	Venkatesh *et al.* (2003); Yuan *et al.* (2016)
Social influence (SI)	SI1-People who are important to me (e.g., family members, close friends, and colleagues) recommend I use FDAs during the COVID-19 pandemic. SI2-People who are important to me think FDAs are beneficial during the COVID-19 pandemic. SI3-People who are important to me think it is a good idea to use FDAs during the COVID-19 pandemic. SI4-People who are important to me support me to use FDAs.	Venkatesh *et al.* (2003);
Trust (TR)	TR1- I believe FDAs are trustworthy. TR2- I believe FDAs keep customers' interests in mind. TR3- I felt secure in ordering and receiving delivery food through the FDAs. TR4- The information provided by the FDAs is reliable.	Zhu *et al. (*2017); Shao *et al.* (2018); Cho *et al.* (2019)
Perceived task-technology fit (TTF)	TTF1-The functions of FDAs are enough for me to order and receive the delivery food. TTF2-The functions of FDAs are appropriate to help manage the ordering and receiving the delivery of food during the COVID-19 pandemic. TTF3-The functions of FDAs fully meet my requirements of ordering and receiving the delivery of food during the COVID-19 pandemic. TTF4-The functions of FDAs support me to maintain my personal safety during the COVID-19 pandemic.	Goodhue and Thompson (1995); Zhou *et al.* (2010); Yuan *et al.* (2016);
Confirmation (COF)	COF1-My experience with using FDAs is better than what I expected. COF2-The functions of FDAs are more than what I expected. COF3- The service provided by FDAs is better than what I expected during the COVID-19 pandemic. COF4- Overall, most of my expectations from using FDAs were confirmed.	Bhattacherjee (2001); Hung *et al.* (2012)

Satisfaction (SA)	SA1- I am very satisfied that FDAs meet my requirements during the COVID-19 pandemic. SA2-I am satisfied with FDAs efficiency during the COVID-19 pandemic. SA3- My interaction with the FDAs is very satisfying. SA4-I think I did the right thing by using FDAs during the COVID-19 pandemic.	Bhattacherjee (2001); Hung *et al.* (2012)
Continuance intention (CI)	CI1-I intend to use FDAs during the COVID-19 pandemic continuingly. CI2- If I have an opportunity, I will continuingly order food through FDAs. CI3- I have an open attitude to use FDAs continuingly. CI4- I am willing to use FDAs in the future continuingly.	Bhattacherjee (2001); Shao *et al.* (2018); Cho *et al.* (2019);

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