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Sustainable entrepreneurship through customer satisfaction and reuse intention of online food delivery applications: insights from China

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Abstract

Advancements in the online food delivery market in China have resulted from the rapid development and popularity of mobile communications and smartphones, which are currently applied by mobile and online application developers to restaurants and food delivery services for high sales revenue and fulfilment of Chinese consumers at home. The current work aims to thoroughly examine the four information quality dimensions (i.e. intrinsic quality, contextual quality, representational quality and accessibility quality), perceived ease of use, perceived usefulness, and perceived convenience and their subsequent implications on user satisfaction and reuse intention of online food delivery applications. By analysing the roles of these factors, we underscore how innovative technology and entrepreneurial strategies can drive customer engagement and satisfaction in the rapidly evolving online food delivery market. The theoretical model proposed in this study was tested through partial least square structural equation modelling (PLS-SEM). Resultantly, intrinsic quality, contextual quality, representational quality, accessibility quality, perceived usefulness, and perceived ease of use showed a positive and statistically significant effect on user satisfaction, whereas contextual, representational, and accessibility quality, perceived usefulness, perceived convenience, and customer satisfaction positively and significantly affected users' intention to reuse the online food delivery applications. The key determinant of reuse intention was customers' personal satisfaction. In order to improve the continuous usage intention of online food delivery applications, application developers and the food industry should therefore focus on providing accurate and up-to-date information, which is expected to boost user satisfaction and reuse intentions.

Keywords: Online food delivery applications, Technology acceptance model, Information quality, Reuse intention

Introduction

Smart technologies and mobile apps have become a widespread and segmented part of daily life given the shifting paradigms of e-commerce practices owing to economic progress, mobile Internet development, and the COVID-19 pandemic (Alalwan, 2020; Cho

et al., 2019; Choi et al., 2021; Lin et al., 2021). On a global scale, both online and offline e-commerce platforms have become more accessible for users of e-commerce, such as online food delivery (OFD) services (Li et al., 2020) following the growth of online business models. Although such changes have inevitably impacted the way most consumers interact with their food providers, including (restaurants, convenience stores, and supermarkets, the sustainability effects of OFD services on consumers and users remain underexplored (Choi et al., 2021; Li et al., 2020).

Online food delivery applications (OFDAs) are one of the most widely used apps in daily life, bridging the gap between consumers and a wide range of food and beverage providers (restaurants, hotels, and takeaway specialties) by providing fast and convenient online ordering and offline delivery services (Cho et al., 2019; Zhao & Bacao, 2020). These apps connect restaurants with consumers, allowing them to use their smartphones to order food from various food outlets and enjoy the convenience of home delivery. They also provide restaurants with third-party delivery services, reducing labour and food delivery costs (Alalwan, 2020; Bao & Zhu, 2022; Lin et al., 2021). Especially, the health crisis caused by the COVID-19 pandemic has accelerated the overall growth and development of the outsourced restaurant industry and changed the attitudes of the majority of consumers towards outsourced restaurant services, making these services a daily necessity for an increasing number of users. Globally, mobile control orders and blocking orders have made OFDAs become a necessity for many users, allowing restaurants to survive past pandemics and continue to serve customers while remaining profitable (Lin et al., 2021).

In recent years, rapid growth has been observed in the e-commerce industry in China, including both online and offline platforms. One of the most prominent segments of this landscape is online food delivery (OFD) services, which have established itself as a thriving and compelling area (Lin et al., 2021; Zhao & Bacao, 2020). China has been at the forefront of digital innovation as it has become the world's largest e-commerce takeaway market with the rapid expansion of digital business models, and the development of online business models has made it easier for Chinese consumers to access online food delivery services (Bao & Zhu, 2022; Xu & Huang, 2019). The online food delivery market in China is rapidly growing and possesses enormous potential. The food delivery industry chain is continuously improving, and the catering food delivery market is maturing gradually. According to iiMedia Research, a reliable source for information on China's online food ordering market, the market size grew by 55% between 2012 and 2018, with a total value of 240 billion yuan in 2018. In subsequent measurements, the growth rate has continued to rise, with an increase of 35.97% in 2019, 15.00% in 2020, and 18.20% in 2021. The most recent data indicate that China's online food delivery market size grew by 19.80% in 2022, with the number of users reaching 450 million (iiMedia Research, 2023).

Furthermore, an increasing number of consumers and users are beginning to understand, accept, and use online platforms to facilitate their daily lives (Shah et al., 2022). Thus, the consumer behaviour of user groups in China is gradually changing, particularly in rural areas, where users are now increasingly turning to online platforms to satisfy their food-related needs (Zhao et al., 2021). The reason for this shift is that restaurants have established partnerships with food delivery companies to ensure

sustainable profitability through the use of these services (Zhao & Bacao, 2020). It can be seen that these online food delivery apps not only meet the needs of consumers but also provide cost-effective delivery solutions for restaurants, thus optimising the experience for both users and businesses. Consumers' experiences using these platforms have an impact on their perceptions and opinions of food delivery services. However, how to increase user satisfaction with OFDAs and how to promote repeat use of OFDAs is a crucial challenge and issue for online food delivery platforms and the food industry. User satisfaction and intentions to reuse affect not only the revenue and profit of the platform and the industry, but also their reputation and competitiveness. Consequently, exploring the factors influencing user satisfaction and intentions to reuse and how to optimise these factors is imperative for the future sustainability of online food delivery markets and businesses.

The information provided in OFDAs plays a pivotal role in shaping users' sensory perceptions (Kim et al., 2021). Previous research has looked at how and why people buy things on OFDAs (Chen et al., 2020; Kaur et al., 2021; Zhao & Bacao, 2020). But new research on the Chinese online food delivery market is more focused on the size of the market (Zhao et al., 2021), the types of people who use it (Shah et al., 2022), and how satisfied those people are (Koay et al., 2022; Ray et al., 2019). It does not go into users' plans to use the service again (Ray et al., 2019). Therefore, this study explores the perspective on user satisfaction (SAT) and intention to reuse (ITR) of OFDAs. Furthermore, there is a need for a deeper understanding of the quality of information provided by these applications in China. In an environment where consumers can directly access and interact with visual and textual information, it is crucial to study the impact of information quality on user satisfaction (SAT) and intention to reuse (ITR). Thus, this study explores the following research questions: (RQ1) Do the dimensions of information quality (i.e. intrinsic quality, contextual quality, representational quality, and accessibility quality) on online food delivery applications influence users' satisfaction with and intention to reuse OFDAs? (RQ2) How do perceived ease of use, perceived usefulness, and perceived convenience affect users' satisfaction with the use of OFDAs and their intention to reuse OFDAs? (RQ3) What is the effect of user satisfaction on users' intention to reuse OFDAs?

This research emphasised users' SAT and ITR towards OFDAs given the paucity of empirical works focusing on information quality. As the introduction of information quality-oriented aspects could provide a holistic understanding of OFD users' perspectives and knowledge in the Chinese market, this work extended the technology acceptance model (TAM) model by incorporating information quality-based factors from the information system success model (ISSM) to encompass both the OFDAs function dimensions and subsequent implications on SAT from Chinese users' perception. The four dimensions of information quality, i.e. intrinsic quality (INQ), contextual quality (CNQ), representational quality (REQ) and accessibility quality (ACQ) and three user perception factors including, perceived ease of use (PEU), perceived usefulness (PUF), and perceived convenience (PCN) were incorporated into this work to thoroughly examine and internalise the factors impacting users' SAT and ITR. Notably, the Chinese context was utilised for model assessment given the advancements in the Chinese e-commerce market and the rise of OFDA app users.

The next section describes the theoretical basis of the current study and the development of hypotheses. The methodology used in this study is also described in the following section. The findings are then discussed in light of previous literature. The implications and limitations of this study are described at the end of the paper.

Literature review

Theoretical foundation

Associated dimensions entailing system, information, and service quality, user SAT, and personal and organisational impact denote crucial indicators that forecast successful information systems (DeLone & McLean, 2003; Wang & Liao, 2008). As demonstrated in past ISSM studies, this model justifies consumers' information system behaviours, such as online learning (Aldholay et al., 2018), cross-border e-commerce (Cui et al., 2019), and e-commerce usage (Dirgantari et al., 2020). Information quality denotes one of the key factors impacting consumers' SAT and intention to use technology and information systems following Delone and McLean's (2003) ISSM model. As such, this research applied the information quality derived from ISSM to assess users' SAT and ITR through OFD apps for a holistic understanding of users' associated perceptions and opinions as a class of electronic products and technologies.

This study considered Davis's (1989), TAM as users' OFD app acceptance and use is inextricably linked to e-commerce and information systems. Extensively used in past research to assess the determinants of technology use with PUF and PEU, TAM significantly impacts users' behavioural intentions and actual behavioural execution (Choi, 2020; Kang & Namkung, 2019). Most researchers utilised TAM to empirically assess the intention to use and adoption of technologies in e-commerce domains, including online shopping (Aggarwal & Rahul, 2017; Chi, 2018), blockchain (Liu & Ye, 2021), and mobile banking (Aldammagh et al., 2021; Obaid, 2021).

TAM possesses superior predictive and explanatory abilities regarding the practical use of information systems (Aldammagh et al., 2021; Choi, 2020). Compared to the Innovation Resistance Perspective, which aims to comprehend user resistance to new innovations, the Technology Acceptance Model (TAM) provides more accurate predictions and explanations for user acceptance of new technologies and their use. This is in line with the objectives of our research and the current dynamics in the fields of e-commerce and mobile technology (Choi, 2020; Kang & Namkung, 2019; Chi, 2018). Although the TAM has certain predictive advantages regarding user behaviour, its practical utility for enhancing information system quality and promoting usage is limited, while the Information System Success Model (ISSM) can more effectively analyse the interrelationships among elements, leading to a superior, multilevel, and recursive structural model. For a satisfactory user experience with OFDAs, it is vital to consider not only the perception of the system as useful and easy to use, but also the perception of the system as a source of high-quality information and services. Thus, given the inadequacy of TAM to thoroughly evaluate users' intention and acceptance behaviour towards new systems following past works, this research better justifies their acceptance of, SAT towards, and ITR of OFD apps by integrating both TAM and ISSM models.

Hypotheses development

Information quality is a key determinant in DeLone and McLean's (2003) ISSM model that impacts and justifies consumers' information system behaviour (DeLone & McLean, 2003; Wang & Liao, 2008). On digital grounds, information quality implies users' information quality-oriented perspectives on online platforms (websites, social media, and mobile apps) and their subjective judgement of whether information attributes fulfil their requirements (Jiang et al., 2021). High-quality information potentially elevates consumer SAT and trust in online shopping platforms, which subsequently leads to repeat consumption (Ghasemaghaei et al., 2015; Lim et al., 2009). The effectiveness of social media messages on user engagement, which was moderated by the context of the content, implied that high-quality messages could easily appeal to consumers (Shahbaznezhad et al., 2021). Recent information quality research has examined information quality effects using different dimensions. The multi-dimensional information quality variables are inextricably linked to particular study scenarios with various key determinants of information quality utilised across multiple studies. Based on Lee et al. (1998), information quality could be characterised by four distinctive dimensions (i.e. INQ, CNQ, REQ, and ACQ). This study adopted Lee et al.'s (1998) four dimensions to represent information quality following the practicalities of OFD apps and examined the dimension effects on users' SAT and ITR.

Intrinsic quality

Intrinsic information quality denotes the quality dimensions and intrinsic characteristics stemming from the information itself, which is independent of users' perspective and context in terms of information accuracy, objectivity, integrity, and credibility (Kang & Namkung, 2019). Parallel to early works, intrinsic information quality was primarily examined to ascertain the information accuracy effects and interference with customers' perceptions, intentions, and behaviours (Kang & Namkung, 2019; Kim et al., 2021). Intrinsic information quality in online shopping-related studies could affect the functionality of online websites and online shopping apps, which subsequently influences customers' SAT and loyalty (Kim et al., 2021; Michnik & Lo, 2009). In Wang et al. (2016), online shopping sites that offer users beneficial, timely, and comprehensible information could positively impact users' SAT. Regardless, Ahn and Sura's (2020) work explained that information completeness (rather than accuracy or timeliness) on social media platforms highly influenced users' SAT, thus implying that the inherent quality of information influences users' SAT differently across various circumstances. The following hypothesis on the relationship between INQ and user SAT in OFD apps was proposed with an emphasis on digital food delivery apps in China.

H_{1a}: The INQ positively influences SAT.

Contextual quality

As a key determinant that impacts information quality, CNQ includes time or task contexts (Herrera-Viedma et al., 2006). The CNQ, which assesses the type, level of detail, and variety of information, is a key information quality determinant that impacts the

users' acceptance of online app types (Kim et al., 2021) and characterises information and content usefulness in OFD apps, such as product and service descriptions, transaction details (payment processes and shipping options), and other content that substantially influences customers' consumption decisions (reviews and consumer recommendations) (Bao & Huang, 2018). Consumers in different regions with varying needs and choices would utilise contextual information for food selection and purchase owing to the geographically vast nature of the Chinese market. Hence, the current work employed contextual information quality to internalise the information quality impacts on users. Past studies on information systems and online app usage, such as mobile shopping apps (Kim et al., 2021), online learning apps (Wang et al., 2019a, 2019b), and enterprise content management systems (Laumer et al., 2017) have demonstrated the capacity of information quality to positively influence users' SAT. As the CNQ of online shopping platforms could positively impact information quality following Kim et al. (2021), the following hypothesis proposed that the CNQ in information quality could positively impact users' SAT:

H_{1b}: The CNQ positively influences SAT.

Representational quality

As one of the key measures of information quality, REQ denotes information interpretability and comprehensibility (Zhang & Du, 2020; Kang & Namkung, 2019; Michnik & Lo, 2009). The REQ emphasises the characteristics of the information itself, such as concise and comprehensible presentation and consistent representation (Azemi et al., 2018; Laumer et al., 2017). Based on Laumer et al. (2017), information system provides lower REQ, which then reduces users' SAT with the information system. Gao and Park (2017) implied that representative information quality in virtual travel communities could positively influence users' and participants' SAT, while simple and comprehensible travel information potentially impacts their travel-oriented decisions and SAT with the aforementioned societies. The REQ for digital (OFD) apps mainly denotes how well the platform presents its product information, including product appearance and display images. Parallel to past research, consumers' product and service-related evaluations and perceptions may be influenced by the visual appeal of the product, during online purchases, which subsequently influences users' SAT with online shopping sites (Bao & Huang, 2018). This study, which assumed a relationship between representational information quality and users' SAT, developed the following hypotheses:

H_{1c}: The REQ positively influences SAT.

Accessibility quality

This quality indicates the ease of access to information together with its availability and security (Azemi et al., 2018). Notably, ACQ emphasises the significance underpinning the role of data and systems, information and data accessibility, and the comprehensibility of digital information (Rasool & Warraich, 2018). In line with past works, information quality is a prerequisite for users' SAT measurement. Shahzad et al. (2021) affirmed that easily accessible and reliable information positively impacted consumers' electronic

systems usage during e-learning, which then positively influenced users' SAT. As such, information accessibility positively impacted users' SAT in line with the following hypothesis:

H_{1d}: The ACQ positively influences SAT.

Information quality and intention to reuse

Empirically, information quality is a prerequisite to and key determinant of users' ITR involving electronic products and digital apps. For example, Wang et al., (2019a, 2019b) study on the ITR entailing mobile catering apps revealed the positive impact of information quality on users' ITR. Lee et al. (2019) examined the reuse intention of food delivery apps while Cheng et al. (2019) investigated smartphone users' continued intention and reuse behaviour. Meanwhile, Hussein et al. (2020) explored the continued intention of an online teaching platform (Google classroom). Lee et al., (2019) empirical work on the TAM-derived model UTAUT2 discovered that customers' continued shopping intentions and behaviours in online shopping platforms were influenced by the information quality derived from the digital site. Assumably, information quality positively influenced consumers' ITR involving OFD apps. This study, which categorised information quality into INQ, CNQ, REQ, and ACQ investigated the information quality effect on users' ITR in line with the following hypotheses:

H_{2a-d}: The INQ, CNQ, REQ and ACQ positively influence ITR.

Perceived usefulness

The PUF, a key measure in TAM and crucial predictor of behavioural intention to use electronics and technology (Bao & Zhu, 2022), positively influenced users' SAT and intention to use, such as consumers' SAT in mobile commerce apps (Ngubelanga & Duffett, 2021), users' SAT on social networking platforms (Ahn & Sura, 2020), acceptance of online education (Han & Sa, 2021), and continued intention for online teaching sites (Hussein et al., 2020) based on much TAM research. Based on relevant research, PUF implicitly and explicitly influenced users' SAT in using online meeting apps (Talantis et al., 2020). Ladkoom and Thanasopon (2020) asserted that users who found e-wallet apps useful were highly satisfied with and consistently utilised them. Bao and Zhu's (2022) study disclosed the indirect impact of PUF on the intention to consistently use OFD apps through users' SAT. Based on the following hypotheses, PUF could positively affect SAT and ITR:

H_{1e}: The PUF positively influences SAT.

H_{2e}: The PUF positively influences ITR.

Perceived ease of use

The PEU, another key TAM measure, evaluates the effect on users' SAT and ITR. Consumers' sense of use varies based on different mobile app types. For example, Kim and Kim (2020) affirmed that users who perceive a service as easy to use tend to develop a sense of trust, which leads to the intention to continuously use and reuse. Customers' perspectives of mobile apps potentially influence their acceptance of these platforms and

users' SAT when utilising online services (Han & Sa, 2021). With regard to the OFD apps in this study, a comprehensible platform that facilitates customers to order food more seamlessly would induce users' SAT and ITR. In this vein, the following hypothesis was developed:

H_{1f}: The PEU positively influences SAT.

H_{2f}: The PEU positively influences ITR.

Perceived convenience

As convenience is one of the most common reasons underpinning people's use of mobile apps, this study examined the implications of this factor on SAT and ITR (Bao & Zhu, 2022) following the advent of multiple mobile app categories. Park et al.'s (2019) study revealed that users' PCN of mobile apps could positively influence their own attitudes, intention to use, and usage behaviour. Mobile apps could prove convenient to consumers in terms of design and functionality. Users who experience convenience are possibly satisfied and reuse the service (Bao & Zhu, 2022; Cho et al., 2019). Pham et al. (2018) asserted that although PCN could impact users' ITR, the implications of different PCN dimensions on repurchase intention differ. For example, search convenience, transaction convenience, and access convenience could positively affect users' ITR, whereas the effect of evaluation convenience on ITR relies on the mobile app type and nature. As such, this study did not consider the dimensional factors of PCN and solely emphasised users' perspectives and cognitions of convenience. The two following hypotheses were developed to characterise the correlation among PCN, SAT, and ITR.

H_{1g}: The PCN positively influences SAT.

H_{2g}: The PCN positively influences ITR.

Satisfaction and intention to reuse

Users' SAT, a fundamental measure of ISSM that is closely associated with usage intentions and behaviours, could be considered as a proxy measure to determine the effectiveness of online app systems towards information systems (DeLone & McLean, 2003). The experiences gained by consumers inevitably impact their SAT levels and increase the intention to continue using and reuse a product. Particularly, users who are satisfied with their experience during product use would engage in reuse if the actual outcomes of using OFD apps meet or exceed their expectations (Wang et al., 2019a, 2019b). Internet service-related research on the SAT-intention to use correlation revealed a positive SAT impact on users' continuous use and reuse intention. For example, Bao and Zhu (2022) examined users' SAT and ITR towards food delivery apps, Zhao and Bacao (2020) explored online delivery app users' SAT and intention to continue using the app, Wang et al. (2019a, 2019b) assessed users' SAT and ITR in mobile restaurant ordering apps, and Cho (2017) measured e-commerce users' SAT and intention to continue purchasing and re-purchasing. As such, users' SAT could positively affect their ITR based on the following hypothesis:

H₃: The SAT positively influences ITR.

All hypothesised associations are shown in Fig. 1 below.

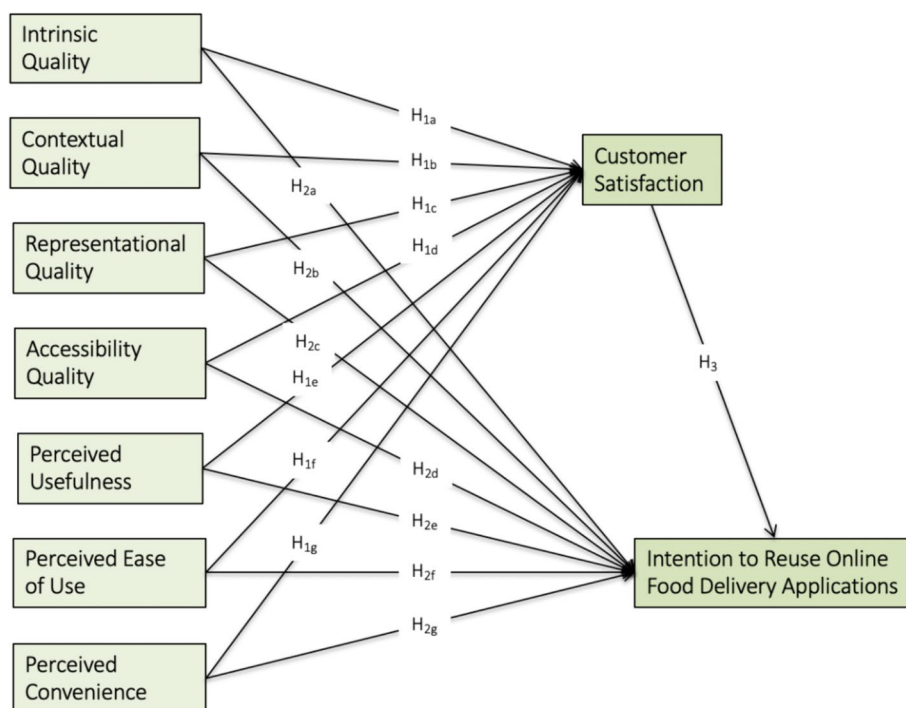


Fig. 1 Research framework

Research methodology

Data collection method

This quantitative cross-sectional research performed data collection using an independent questionnaire for a sound comprehension of Chinese consumers’ SAT and ITR of OFD apps. The primary study sample encompassed Chinese OFD app users with prior experience using the platforms. A pre-test was performed to assess the reliability and validity of the Chinese version of the questionnaire pre-data collection. The study questionnaires were gathered through Chinese online questionnaire websites and social media (WeChat and Wenjuanxing) instead of conventional paper-based counterparts following the specificity of the research orientation and pandemic-related limitations. All the study respondents were briefed on the survey objective before their involvement and assured of their anonymity, confidentiality, and rights to withdraw from the study during the research process.

This three-part questionnaire encompassed the (i) questionnaire instructions, (ii) demographic details, and (iii) scale questions. The first section of the survey highlights the research connotations and justifications for respondents to internalise the survey content. The second section contains demographic questions regarding age, gender, education, average monthly income, and place of residence. The third section encompassed a 7-point Likert scale to measure respondents’ perceptions of information quality, PEU, SAT, and ITR in OFD apps. Specifically, the individuals were required to answer all the questionnaire items based on their experience and perspective of utilising the aforementioned platforms. Judgmental sampling with the screening item, “Do you have a smartphone?” was used in this study to ensure that all the respondents possessed the

necessary devices and capacity to use OFD apps and subsequently eliminate counterparts without a smartphone. Essentially, 911 valid responses were gathered in this study.

Instrument

All the items measuring the study variables were adapted from past works to ensure content validity and usability. The wording was revised based on the contextual study requirements and applicability. Notably, all the questionnaire items were rated on a seven-point Likert scale ranging between ‘strongly disagree’ to ‘strongly agree’. Each scale contained approximately five to six items for variable assessment. For example, the information quality items constituting INQ, CNQ, REQ, and ACQ were adapted from Wang and Namkung (2019), PUF items from Yang et al. (2022), PEU items from Tan and Ooi (2018), PCN items from Shaw and Sergueeva (2016), SAT items from Choi (2020), and ITR from Kim et al. (2019) and Kang and Namkung (2019). The final scale (questionnaire) version was evaluated by Chinese language experts pre-utilisation, as the original items were structured in English, to ensure questionnaire item accuracy and validity and obtain appropriate, reasonable, and meaningful responses from future respondents (Sekaran & Bougie, 2016). The complete questionnaire is presented in Supporting Material.

Common method bias (CMB)

Kock’s (2015) full collinearity test was utilised in this study for CMB assessment. All the variance inflation factor (VIF) values, which were under 3.3 (see Table 1), implied no CMB from single source data used in this study.

Multivariate normality

Multivariate normality was tested in this study using the web power online tool to facilitate the selection of appropriate data analysis. Mardia’s multivariate *p*-value of under 0.05 denoted non-normal data (Yang et al., 2022).

Data analysis method

The current work employed partial least squares structural equation modelling (PLS-SEM), this approach is commonly used in the predictive analysis as it could be applied in more complex construct, non-normality data, which is widely used in both marketing and management field (Hair et al., 2021a, 2021b). The PLS-SEM applied in this study for evaluating the measurement model included average variance extraction, internal consistency reliability, discriminant validity, loadings and cross-loadings, and also for assessed the structural model about the predictive correlations, and multi-group analysis (Becker et al., 2022). Furthermore, this study adopted a group analysis by categorising

Table 1 Full collinearity test

Variables	INQ	CNQ	REQ	ACQ	PUF	PEU	PCN	SAT	ITR
VIF	2.652	2.652	2.574	2.589	2.596	2.614	2.768	2.563	2.451

INQ intrinsic quality, *CNQ* contextual quality, *REQ* representational quality, *ACQ* accessibility quality, *PUF* perceived usefulness, *PEU* perceived ease of use, *PCN* perceived convenience, *SAT* satisfaction, *ITR* intention to reuse

Source: Author’s data analysis

the respondents based on their gender, frequency of using delivery services platforms per month, and frequency of eating out per month to thoroughly examine the respondents' situation.

Results

Demographic characteristics

Valid data were gathered from the 911 study respondents with judgmental sampling. Table 2 presents the respondents' demographics. Age-wise, most respondents were under 20 years old (44.2%), followed by individuals from 20 to 30 years old (44.2%), and those over 41 years old (41–50 years old, 3.6%; 51 years old and above, 2.4%). In terms of marital status, a substantial number of the respondents were unmarried (88.5%). With regard to education level, 65% of the respondents held a Bachelor's degree, followed by individuals with college diploma (16.8%). Most of the respondents were school students (88.5%) with a low monthly income, with most of them earning under RMB 1500 (46.1%)

Table 2 Demographic profile of respondents

	<i>n</i>	%		<i>n</i>	%
Gender			Average monthly income		
Male	475	52.1	Below RMB1500	420	46.1
Female	436	47.9	RMB1501-3000	386	42.4
Total	911	100.0	RMB3001-4500	32	3.5
Age group			RMB4501-6000	25	2.7
Under 20 years	403	44.2	RMB6001-7500	25	2.7
20–30 years	403	44.2	Above RMB7500	23	2.5
31–40 years	50	5.5	Total	911	100
41–50 years	33	3.6	Region		
51 years and above	22	2.4	East China	165	18.1
Total	911	100	South China	217	23.8
Marital status			Central China	123	13.5
Unmarried	806	88.5	North China	125	13.7
Married	93	10.2	Northwest China	70	7.7
Divorced	11	1.2	Southwest China	104	11.4
Widowed	1	0.1	Northeast China	107	11.7
Total	911	100	Total	911	100
Occupation			Frequency of eat out per month		
Unemployed	1	0.1	0–5 Times	198	21.7
Self-employed	7	0.8	6–10 Times	268	29.4
Student	806	88.5	11–15 Times	198	21.7
Private sector	41	4.5	16–20 Times	174	19.1
Civil servant	39	4.3	More than 20 Times	73	8
Other occupations	17	1.9	Total	911	100
Total	911	100	Frequency of the usage of OFD apps		
Education level			1–5 Times	254	27.9
High school level and below	18	2	6–10 Times	239	26.2
College level or equivalent	153	16.8	11–15 Times	283	31.1
Undergraduate level	596	65.4	More than 15 Times	135	14.8
Postgraduate level and above	144	15.8	Total	911	100
Total	911	100			

and between RMB 1501 and RMB 3000 (42.4%). Based on the frequency of eating out per month, 29.4% of the respondents ate out from six to 10 times, 21.7% from 0 to five times, 21.7% from 11 to 15 times, and 8% dined out over 20 times. Additionally, all the respondents had experienced using OFD apps, 31.1% utilised it from 11 to 15 times a month, 26.2% employed it from six to 10 times a month, and 27.9% used it from one to five times a month.

Validity and reliability

All the recorded average variance extracted (AVE) values in Table 3 exceeded 0.5, thus implying convergent validity in all the measurement items (Hair et al., 2021a, 2021b). Meanwhile, discriminant validity was determined based on the Fornell–Larcker Criterion and the Heterotrait–Monotrait Ratio (HTMT). The square root value of AVE of each latent variable exceeded the square root of other items following the Fornell–Larcker criterion data outcomes in Table 4 (Fornell & Larcker, 1981). Additionally, all the HTMT values were under 0.9 (see Table 4), which is well below the proposed threshold of 0.85. In other words, the HTMT between dimensions, which is within the significant range, proved unique while the discriminant validity between the constructs performed well (Avkiran & Ringle, 2018). As depicted in Fig. 2 and Supplementary Material, the loading exceeded 0.5: higher than the respective cross-loading values.

Hypothesis testing

This section assesses the structural model of this study through the values of r^2 obtained in Table 5 in analysing the model’s predictive power. Following Hair et al., (2021a, 2021b), an r^2 value exceeding 0.75 implied the model’s explanatory power to be significant while an r^2 value of approximately 0.5 denoted the model’s explanatory power to be moderate. In this study, the r^2 values of SAT (0.592) and ITR (0.592) were deemed moderate and slightly significant. Meanwhile, Cohen’s (2013) and Hair et al., (2021a, 2021b) research threshold interpretation of f^2 was employed to measure the predictor variables’ effect sizes: using f^2 values of 0.005, 0.01, and 0.025 reflected small, medium, and large effect sizes. Resultantly, this research demonstrated (i) relatively large effect sizes

Table 3 Reliability and validity

Variables	Items	Cronbach’s alpha	Dillon–Goldstein’s rho	Composite reliability	Average variance extracted	VIF (SAT)	VIF (ITR)
INQ	5	0.912	0.912	0.934	0.740	2.578	2.639
CNQ	5	0.909	0.909	0.932	0.734	2.549	2.632
REQ	5	0.911	0.912	0.934	0.738	2.449	2.526
ACQ	5	0.909	0.909	0.932	0.733	2.554	2.574
PUF	5	0.905	0.905	0.930	0.725	2.541	2.563
PEU	5	0.914	0.915	0.936	0.745	2.568	2.613
PCN	5	0.910	0.910	0.933	0.736	2.710	2.722
SAT	5	0.911	0.911	0.934	0.738	–	2.448
ITR	5	0.912	0.912	0.934	0.740	–	–

INQ intrinsic quality, CNQ contextual quality, REQ representational quality, ACQ accessibility quality, PUF perceived usefulness, PEU perceived ease of use, PCN perceived convenience, SAT satisfaction, ITR intention to reuse

Table 4 Discriminant validity

	INQ	CNQ	REQ	ACQ	PUF	PEU	PCN	SAT	ITR
Fornell–Larcker criterion									
INQ	0.860								
CNQ	0.673	0.857							
REQ	0.627	0.637	0.859						
ACQ	0.672	0.675	0.624	0.856					
PUF	0.662	0.641	0.649	0.653	0.852				
PEU	0.667	0.649	0.656	0.647	0.676	0.863			
PCN	0.654	0.668	0.690	0.671	0.663	0.660	0.858		
SAT	0.655	0.662	0.651	0.630	0.632	0.648	0.634	0.859	
ITR	0.626	0.634	0.648	0.625	0.638	0.611	0.654	0.669	0.860
Heterotrait–monotrait ratio (HTMT)									
INQ	–								
CNQ	0.739	–							
REQ	0.688	0.699	–						
ACQ	0.737	0.743	0.685	–					
PUF	0.728	0.706	0.714	0.719	–				
PEU	0.730	0.712	0.718	0.709	0.743	–			
PCN	0.718	0.734	0.757	0.738	0.730	0.724	–		
SAT	0.718	0.727	0.713	0.691	0.695	0.710	0.695	–	
ITR	0.686	0.696	0.710	0.686	0.702	0.669	0.718	0.733	–

INQ intrinsic quality, CNQ contextual quality, REQ representational quality, ACQ accessibility quality, PUF perceived usefulness, PEU perceived ease of use, PCN perceived convenience, SAT satisfaction, ITR intention to reuse

Source: Author’s data analysis

for INQ (0.024), CNQ (0.032), REQ (0.032), and SAT (0.049); (ii) medium effect size for PEU (0.018); and (iii) small effect sizes for ACQ (0.008), PUF (0.009), and PCN (0.004).

Table 5 presents the *p*-values and *t*-values generated by the path coefficient analysis and detailed research data outcomes. Specifically, INQ ($\beta=0.159, p<0.001$), CNQ ($\beta=0.184, p<0.001$), REQ ($\beta=0.178, p<0.001$), ACQ ($\beta=0.090, p<0.05$), PUF ($\beta=0.096, p<0.05$), and PEU ($\beta=0.137, p<0.001$) were significantly and positively related to users’ SAT as opposed to PCN ($\beta=0.070, p>0.06$), which had no effect on users’ SAT. The CNQ ($\beta=0.091, p<0.05$), REQ ($\beta=0.146, p<0.001$), ACQ ($\beta=0.087, p<0.05$), PUF ($\beta=0.125, p<0.01$), and PCN ($\beta=0.145, p<0.001$) significantly and positively affected ITR. Nevertheless, INQ ($\beta=0.074, p>0.06$) and PEU ($\beta=0.027, p>0.06$) demonstrated no effect on ITR. Furthermore, SAT ($\beta=0.222, p<0.001$) positively and significantly impacted users’ ITR OFD apps.

Multi-group analysis

As the assessment through PLS-SEM always uses complete set of data, it defaults that all data come from a single homogeneous population, which is usually unrealistic in the real research. And ignore this may lead to unreliable findings (Hair et al., 2021a, 2021b). Therefore, multi-group analysis is recommended by Hair et al., (2021a, 2021b) to address this issue. For conduct multi-group analysis, the importance is to ensure the measurement invariance, the MICOM protocol was used to evaluate the measurement invariance of the two study groupings: (i) Group 1: female respondents; (ii)

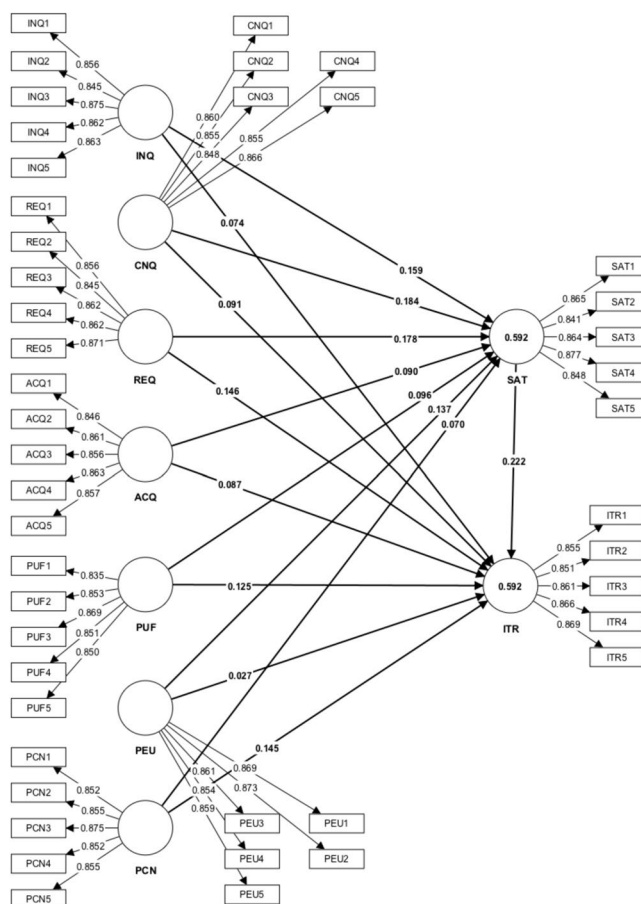


Fig. 2 Measurement model with findings

Group 2: male respondents. This research compared the path coefficients of the two aforementioned subgroups with PLS-MGA as the reciprocal p -values for most study constructs exceeded 0.05 (see Table 6). A difference was observed in all the hypothesised relationships through the INQ effect on SAT ($\beta = 0.155, p < 0.05$), thus implying a gender-based variance between both groups. A significant difference in the degree to which male and female respondents were affected by INQ on SAT was identified, with male respondents ($\beta = 0.230, p < 0.001$) being more affected.

The measurement invariance between groups was assessed through the MICOM procedure by grouping mainly based on the frequency of using the courier service platform per month: (i) Group 1: up to 5 times; (ii) group 2: over 6 times. The PCN effect on ITR in all the hypothesised relationships (see Table 6) was significantly different between the two groups ($\beta = 0.246, p < 0.005$) with a more significant influence in the subgroup with a frequency of use of up to 5 times ($\beta = 0.320, p < 0.001$). Finally, the measurement invariance between the following two groups was assessed in this study through the MICOM procedure and grouped based on the frequency of eating out per month: (i) Group 1: up to 10 times and (ii) Group 2: over 11 times. Resultantly, a difference between INQ and SAT ($\beta = 0.164, p < 0.05$) was ascertained among all hypothesised relationships, thus implying a difference between both groups based

Table 5 Hypothesis testing

Hypothesis	Beta	Mean	Confidence intervals	t-value	r ²	f ²	Sig	Decision
Factors affecting satisfaction								
H1a INQ → SAT	0.159	0.047	(0.081, 0.237)	3.349		0.024	0.000	Supported
H1b CNQ → SAT	0.184	0.041	(0.115, 0.251)	4.434		0.032	0.000	Supported
H1c REQ → SAT	0.178	0.044	(0.105, 0.249)	4.075		0.032	0.000	Supported
H1d ACQ → SAT	0.090	0.043	(0.018, 0.159)	2.093	0.592	0.008	0.018	Supported
H1e PUF → SAT	0.096	0.043	(0.026, 0.168)	2.214		0.009	0.013	Supported
H1f PEU → SAT	0.137	0.042	(0.066, 0.203)	3.255		0.018	0.001	Supported
H1g PCN → SAT	0.070	0.047	(− 0.007, 0.147)	1.513		0.004	0.065	Rejected
Factors affecting intention to reuse								
H2a INQ → ITR	0.074	0.049	(− 0.008, 0.153)	1.518		0.005	0.065	Rejected
H2b CNQ → ITR	0.091	0.047	(0.015, 0.168)	1.935		0.008	0.027	Supported
H2c REQ → ITR	0.146	0.041	(0.078, 0.215)	3.557		0.021	0.000	Supported
H2d ACQ → ITR	0.087	0.046	(0.012, 0.162)	1.880	0.592	0.007	0.030	Supported
H2e PUF → ITR	0.125	0.049	(0.043, 0.206)	2.531		0.015	0.006	Supported
H2f PEU → ITR	0.027	0.046	(− 0.048, 0.102)	0.589		0.001	0.278	Rejected
H2g PCN → ITR	0.145	0.041	(0.077, 0.214)	3.512		0.019	0.000	Supported
H3 SAT → ITR	0.222	0.038	(0.158, 0.283)	5.816		0.049	0.000	Supported

INQ intrinsic quality, CNQ contextual quality, REQ representational quality, ACQ accessibility quality, PUF perceived usefulness, PEU perceived ease of use, PCN perceived convenience, SAT satisfaction, ITR intention to reuse

Source: Author’s data analysis

on the frequency of eating out per month. Notably, the subgroup with a frequency of 10 meals out or less ($\beta = 0.246, p < 0.001$) was more affected.

Discussion

The current work aimed to validate specific elements involving information quality and user perception to forecast their impacts on consumers’ SAT and ITR of OFD apps. For example, INQ, CNQ, REQ, ACQ, PUF, PEU and PCN, were determined from multiple TAM and ISSM literature. Most of the relationships proved positive and significant based on the corresponding model associations, with some correlations elaborated below.

First, information quality substantially influenced both users’ SAT and intention to continue using. The four dimensions underpinning information quality, INQ, CNQ, REQ, and ACQ, positively and significantly affected users’ SAT, thus implying INQ, CNQ, and REQ as strong SAT predictors. This finding corresponded to that of Kim et al. (2021) and Bao and Huang (2018), where information quality in online apps significantly and positively affected users’ SAT. High-quality information facilitates knowledge acquisition of a specific topic, consumers’ experience, and the service provider of the information. The positive impact of CNQ, REQ, and ACQ on ITR indicated users’ SAT with the high information quality presented in OFD apps. Contrarily, INQ reflected no effect on ITR owing to the nature of intrinsic information quality (Kim et al., 2021), which is independent of users’ opinions and contexts and emphasises accuracy, objectivity, completeness, and credibility (Kang & Namkung, 2019). Perceivably, OFD app users who select and purchase food items based on their needs may not focus on intrinsic app information, thus resulting in this outcome.

Table 6 Multi-group analysis

Associations		Female (N = 436)		Male (N = 475)		Difference		Decision
		Beta	p-value	Beta	p-value	Beta	p-value	
H1a	INQ → SAT	0.075	0.154	0.230	0.000	0.155	0.046	Difference
H1b	CNQ → SAT	0.226	0.000	0.156	0.003	-0.070	0.194	No difference
H1c	REQ → SAT	0.109	0.038	0.233	0.000	0.125	0.074	No difference
H1d	ACQ → SAT	0.077	0.111	0.105	0.040	0.027	0.376	No difference
H1e	PUF → SAT	0.163	0.006	0.042	0.226	-0.121	0.078	No difference
H1f	PEU → SAT	0.143	0.006	0.120	0.022	-0.022	0.393	No difference
H1g	PCN → SAT	0.129	0.019	0.017	0.405	-0.112	0.117	No difference
H2a	INQ → ITR	0.049	0.251	0.099	0.066	0.051	0.302	No difference
H2b	CNQ → ITR	0.123	0.053	0.069	0.120	-0.054	0.283	No difference
H2c	REQ → ITR	0.176	0.001	0.112	0.028	-0.064	0.218	No difference
H2d	ACQ → ITR	0.101	0.087	0.080	0.090	-0.021	0.412	No difference
H2e	PUF → ITR	0.074	0.143	0.169	0.006	0.095	0.161	No difference
H2f	PEU → ITR	0.052	0.224	0.006	0.463	-0.046	0.308	No difference
H2g	PCN → ITR	0.163	0.003	0.127	0.016	-0.036	0.333	No difference
H3	SAT → ITR	0.187	0.001	0.253	0.000	0.066	0.195	No difference
		(OFD) 5 times or less (N = 254)		(OFD) 6 times or more (N = 657)		Difference		
		Beta	p-value	Beta	p-value	Beta	p-value	
H1a	INQ → SAT	0.211	0.009	0.135	0.007	0.076	0.235	No difference
H1b	CNQ → SAT	0.233	0.002	0.176	0.000	0.057	0.266	No difference
H1c	REQ → SAT	0.228	0.002	0.154	0.001	0.074	0.221	No difference
H1d	ACQ → SAT	-0.008	0.454	0.126	0.013	-0.133	0.090	No difference
H1e	PUF → SAT	0.110	0.084	0.085	0.052	0.025	0.399	No difference
H1f	PEU → SAT	0.170	0.012	0.125	0.007	0.045	0.316	No difference
H1g	PCN → SAT	-0.030	0.358	0.110	0.027	-0.140	0.092	No difference
H2a	INQ → ITR	0.183	0.024	0.044	0.208	0.139	0.091	No difference
H2b	CNQ → ITR	-0.011	0.458	0.121	0.010	-0.131	0.103	No difference
H2c	REQ → ITR	0.118	0.103	0.163	0.000	-0.045	0.313	No difference
H2d	ACQ → ITR	0.038	0.318	0.113	0.019	-0.076	0.226	No difference
H2e	PUF → ITR	0.053	0.291	0.138	0.009	-0.085	0.222	No difference
H2f	PEU → ITR	0.018	0.427	0.030	0.261	-0.012	0.453	No difference
H2g	PCN → ITR	0.320	0.000	0.074	0.053	0.246	0.002	difference
H3	SAT → ITR	0.176	0.012	0.243	0.000	-0.067	0.223	No difference
		(EO) 10 times or less (N = 466)		(EO) 11 times or more (N = 445)		Difference		
		Beta	p-value	Beta	p-value	Beta	p-value	
H1a	INQ → SAT	0.246	0.000	0.082	0.111	0.164	0.042	Difference
H1b	CNQ → SAT	0.138	0.009	0.227	0.000	-0.089	0.140	No difference
H1c	REQ → SAT	0.188	0.001	0.157	0.005	0.031	0.358	No difference
H1d	ACQ → SAT	0.098	0.046	0.076	0.125	0.022	0.402	No difference
H1e	PUF → SAT	0.107	0.047	0.099	0.043	0.007	0.467	No difference
H1f	PEU → SAT	0.088	0.049	0.174	0.002	-0.086	0.143	No difference
H1g	PCN → SAT	0.078	0.110	0.068	0.162	0.010	0.457	No difference
H2a	INQ → ITR	0.039	0.305	0.123	0.019	-0.084	0.195	No difference
H2b	CNQ → ITR	0.051	0.219	0.131	0.022	-0.080	0.195	No difference
H2c	REQ → ITR	0.183	0.001	0.115	0.021	0.068	0.206	No difference
H2d	ACQ → ITR	0.040	0.259	0.132	0.028	-0.092	0.161	No difference

Table 6 (continued)

		(EO) 10 times or less (N = 466)		(EO) 11 times or more (N = 445)		Difference		
		Beta	p-value	Beta	p-value	Beta	p-value	
H2e	PUF → ITR	0.187	0.005	0.056	0.180	0.131	0.084	No difference
H2f	PEU → ITR	0.018	0.398	0.041	0.238	- 0.023	0.401	No difference
H2g	PCN → ITR	0.166	0.002	0.114	0.023	0.052	0.263	No difference
H3	SAT → ITR	0.200	0.000	0.244	0.000	- 0.043	0.290	No difference

INQ intrinsic quality, *CNQ* contextual quality, *REQ* representational quality, *ACQ* accessibility quality, *PUF* perceived usefulness, *PEU* perceived ease of use, *PCN* perceived convenience, *SAT* satisfaction, *ITR* intention to reuse, *Use FDS* frequency of using delivery services platforms per month, *EO* frequency of eating out per month

In line with past outcomes on continuous intention and ITR of online learning and e-wallets, both PUF and PEU positively and significantly affected users’ SAT (Han & Sa, 2021; Hussein et al., 2020; Ladkoom & Thanasopon, 2020). Hence, high PEU and PUF led to high users’ SAT with OFD apps. Although the current study outcomes demonstrated no PCN impact on SAT, the PCN-SAT link examined in past literature affirmed the positive effect of PCN on users’ SAT. Bao and Zhu’s (2022) research on the ITR of food delivery apps proved that service providers who continuously optimise their apps to offer user convenience and save time and effort would induce customer SAT and ITR. Summarily, users demonstrate a high level of SAT with the simplicity and information quality rather than the convenience of online apps.

A significant and positive correlation was identified between users’ PUE, PCN, and intention to use following Han and Sa’s (2021) research on the ITR of digital learning apps. Likewise, Bao and Zhu’s (2022) work on the ITR of food delivery apps concurred on the positive impact of PUF and PCN on users’ ITR of food delivery apps. Nevertheless, the ITR prediction by PEU proved contradictory as the relationship between both elements was insignificant in the proposed theoretical model. This outcome did not correspond to most past studies that validated PEU as a predictor of technology and information system acceptance (Han & Sa, 2021; Hussein et al., 2020; Kim & Kim, 2020). This work did not complement conventional TAM and past studies on the PEU effect on the ITR of digital food delivery apps. Overall, users’ relative disregard of PEU implied that customers’ current resistance to novel technologies may not stem from operational difficulty. The rejection of H2f may suggest a paradigm shift in the mindset of most skilled and digitally savvy users, who no longer regarded PEU as a determinant factor in app usage. Additionally, SAT could positively and significantly affect users’ ITR of OFD apps.

Implications

Theoretical implications

Technology adoption heavily relies on technology attributes and users’ technological perceptions and acceptance. Theoretically, this study expanded the current body of knowledge on the OFD market in China by integrating TAM and ISSM. In studies involving different online app types, TAM influenced customers’ acceptance and awareness of digital apps together with their intention and technology usage behaviour. Thus, the current work expanded the TAM model by incorporating ISSM to gauge the

information quality effect on OFD app users' SAT and ITR and the influence of their perception factors (PEU and PUF) on SAT. In introducing ISSM, only one factor (information quality) and its four associated dimensions (INQ, CNQ, REQ, and ACQ) were incorporated to internalise the information quality effect on users' SAT and ITR. Summarily, this integrated study model could serve as a reference to promote the continuous use of information technology and digital app technologies.

Practical implications

On practical grounds, the current work emphasised Chinese OFD app users' SAT and ITR to offer pivotal insights into and directions for the app suppliers and designers and restaurant owners. As this study also provided the foundation for app sustainability in the market, OFD app providers should optimise and regulate information validity and accuracy and continuously promote timely information updates. Based on the research outcomes, information quality, PEU, and PUF proved pivotal to enhance customers' SAT for high ITR. For example, OFD app service providers and designers should continue emphasising the creation and development of more built-in systems and features to provide users with reliable and up-to-date information. Consequently, users could conveniently obtain their desired food information with OFD apps regardless of time and space.

This study provided OFD app providers and restaurant owners with a holistic understanding of customers' ITR. As the most essential determinant of ITR, users' SAT primarily depends on their psychological and technological perceptions. From users' perspective, OFD apps have rapidly become one of the most useful apps following the global impact of COVID-19. A significant number of consumers have developed novel consumption habits to continue and reuse OFD apps daily. The study outcomes, which served as a reference for other Chinese works in online app-related areas (digital shopping and e-commerce sectors), could facilitate digital app companies to comprehend consumer needs and the factors stimulating their use (consumer motivation). Such organisations could integrate technical app features with consumer requirements to provide users with useful and easy-to-use apps.

Conclusions

This study empirically analyses the influence factors of both user satisfaction and reuse intention towards online food delivery applications through the extension of TAM model. In the final findings, four information quality dimensions (i.e. intrinsic quality, contextual quality, representational quality and accessibility quality), perceived usefulness, and perceived ease of use were proved have positive effect on satisfaction, and at the same time, the four information quality dimensions (i.e. intrinsic quality, contextual quality, representational quality and accessibility quality), perceived usefulness, perceived convenience, and customer satisfaction was found as the key determinations of customer's intention to reuse. It further proves the effectiveness of TAM model after the incorporating of information quality. The findings of this study demonstrate that a strategic focus on innovative platform features and entrepreneurial approaches in online food delivery applications can significantly impact customer satisfaction and usage intention. This insight offers valuable guidance for entrepreneurs and innovators seeking to enhance user experience and drive business growth in the digital food delivery sector.

Limitations

This research, which emphasised users' OFD apps in China, encountered several limitations. For example, the data collection period and study sample size proved limited although relevant information was derived from multiple Chinese provinces and cities. Furthermore, the 911 valid research samples insufficiently represented the whole OFD market and consumers in China. In this vein, the empirical outcomes could not be generalised across the Chinese population as the findings were restricted to the current study samples. Future works could narrow down the geographic scope to accurately reflect the demographic attributes of the population within the region.

Furthermore, considering that the culture, values, and consumer behaviours in the Chinese region are distinctive, the results of this study may not be directly applicable to other environments around the globe. In particular, Chinese consumers are often influenced by cultural and social factors and exhibit unique online behaviours and preferences, which factors would influence how they interact with OFD applications. Meanwhile, the dynamics, players, and competitive forces in the Chinese OFD market are different from those in other countries. China's digital ecosystem is unlike any other in the world, characterised by its sheer size and innovation. China has its own tech giants, including platforms such as Alibaba, Tencent, and Meituan, which have a significant impact on the OFD market. Thus, the insights of this study may not apply to other countries and regions with different market structures.

The measurement scales employed by past scholars were refined and incorporated into this study. Specific items were extracted from studies on other mobile apps (e-doctor apps and digital shopping) rather than OFD app-oriented works. The differences between users' OFD app experiences and perceptions and those of other apps implied an inadequate measurement scale as OFD apps indicated more frequent usage and higher customer demands. Hence, potential researchers could optimise the measurement scales and thoroughly examine relevant factors to examine the correlations between restaurants, consumers, and app service providers.

Lastly, this study solely regarded information quality as a factor in ISSM adoption and disregarded the impact of other ISSM elements (system and service quality) on users' SAT and ITR. Further research could investigate the influence of technologies and apps on consumers' behaviour- and intent-oriented aspects using other ISSM dimensions to determine the existence of other quality attributes. From users' and technology service providers' standpoint, the resolution of numerous quality issues and enhancements could optimise user experience, elevate the number of customers, and increase the sales revenue for the service providers.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13731-024-00399-z>.

Additional file 1.

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Author contributions

Gao Jingzu, Long Siyu, Wu Mengling and Naeem Hayat: conceptualisation, investigation, methodology, writing—original draft preparation. Qing Yang, Abdullah Al Mamun: conceptualisation, methodology, formal analysis, writing—review & editing.

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Availability of data and materials

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author/s.

Declarations**Ethics approval and consent to participate**

According to the “Ethical Review of Biomedical Research Involving Human Beings”, (http://www.gd.gov.cn/zwgk/wjk/zcfgk/content/post_2530813.html), China, business research and management are not part of life science and medical research activities involving human beings and only require clear and explicit informed consent prior to data collection. No formal ethics approval was therefore required in this particular case because (a) the data are completely anonymous with no personal information being collected; (b) the data are not considered to be sensitive or confidential in nature; (c) the issues being researched are not likely to upset or disturb participants; (d) vulnerable or dependent groups are not included; and (e) there is no risk of possible disclosures or reporting obligations. This study has been performed in accordance with the Declaration of Helsinki. Written informed consent for participation was obtained from respondents who participated in the survey. For the respondents who participated in the survey were asked to read the ethical statement posted at the top of the form and proceed only if they agree. No data was collected from anyone under 18 years old.

Competing interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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