The rise of online food delivery culture during the COVID-19 pandemic: an analysis of intention and its associated risk

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Abstract

Purpose – This study aims to understand consumer behaviour in the context of online food delivery (OFD), especially given the mandatory lockdown imposed in some countries that have modified the behaviour of consumers. Using model goal-directed behaviour (MGB), this study was conducted to investigate consumer perceived risk on the use of OFD services.

Design/methodology/approach – Responses of food delivery services users were collected online throughout April 2020 to understand their risk profile and behaviour. A total of 339 responses were collected and subsequently analysed using partial least square (PLS). Both measurement and structural model were evaluated to ensure that the structural equation modelling (SEM) is valid.

Findings – The results revealed that attitude (ATT), subjective norm (SN), positive anticipated emotion (PAE) and negative anticipated emotion (NAE) and perceived behavioural control (PBC) significantly influenced users' desire. It was also found that PBC significantly influenced users' intention. The empirical result suggests that performance, privacy, financial, physical and the risk of contracting COVID-19 negatively influenced users' desire. In contrast, only physical and the risk of contracting COVID-19 negatively influenced users' intention to use OFD services.

Practical implications – These findings provide OFD service providers and scholars with significant insights into what compels urbanites to adopt OFD services amid a health pandemic. It also allows OFD companies to realign their operation in addressing these concerns and changes in consumer behaviour.

Originality/value – Against the backdrop of the pandemic, this study provides insights for OFD providers in developing new strategies and approaches for business development and consumer retention in a post-pandemic world.

Keywords Food delivery culture, Perceived risk, Consumer behaviour, COVID-19 pandemic

Paper type Research paper

1. Introduction

The rapid growth of the Internet and wireless technologies has substantially impacted online shopping. Cheaper smart devices, rapid improvement in telecommunication infrastructure, coupled with the increase in purchasing power, lack of time and convenience has forced the food and beverage (F&B) industry to adapt and provide new offerings to cater to the growing demands of consumers (Bezerra *et al.*, 2013). Consumers are attracted to shopping online since

it is much more convenient, comfortable and at their leisure (Jiang *et al.*, 2013). Online shopping has enabled consumers to reduce their decision-making efforts by offering more comprehensive options to choose from, screen information and compare products (Alba *et al.*, 1997). Das and Ghose (2019) observed these changes in consumer behaviour, noting that the working population has less time due to the work-life culture in big cities. This busy lifestyle contributes to the rise of online shopping as consumers are too busy to enter shopping malls physically. Similarly, on-demand food and grocery delivery services quickly flourish among the urban working community.

Over the past year, the popularity of online food delivery (OFD) has been on the rise worldwide. Cho *et al.* (2019) argues that OFD is an innovative way that allows consumers to purchase a wide range of food selection via platform(s). OFD platforms collect orders from consumer and pass on the information to restaurants and delivery personnel (Troise *et al.*, 2021). This opens up new opportunity for restaurants to reach new market while increasing their revenues and consumers the convenience of having food delivered to their home. In the past, researchers have mainly focused on traditional retail, e-commerce behaviours, characteristics of mobile application (Cho *et al.*, 2019), not much discussion around OFD consumers (Yeo *et al.*, 2017; Suhartanto *et al.*, 2019) and even lesser on the use of mobile application to order food from a restaurant (Rodríguez-López *et al.*, 2020).

In 2020 and 2021, due to strict lockdown order, OFD had cemented itself as the most significant trend around the world (Durai, 2020), representing a significant shift from frequenting restaurant to ordering food online. According to Statista (2021), the estimated market size for OFD worldwide is around 107.44 billion U.S. dollars for 2019 and projected to be 154.34 billion U.S. dollars by 2023. Before the COVID-19 pandemic, majority of urban consumers are warming up to the concept of OFD. However, this trend had a major shift with multiple regions reporting a surge in OFD services, such as an increase 65% for Asia Pacific region, 21% for North America, 23% for Europe and 150% for Latin America region (Statista, 2021; Hussey, 2021). The new behaviour imposed upon due to the pandemic will most likely remain as long-term behaviours, altering consumer's behaviours permanently. The present study coin this new phenomenon as food delivery culture. Food delivery culture refers to the consumer shift of practices and attitude (ATT) from the traditional model (i.e. dine-in or take-away) to delivery services enabled by the rise of technology. Nevertheless, with the rise of food delivery culture, little is known regarding this new behaviour and decision-making process. These changes were more evident as COVID-19 causes significant economic disruptions often up-ending years of traditional practices among consumer and companies worldwide. Faced with major disruption, it is relevant to focus on behavioural change among existing and new OFD consumer in response to the uncertainty.

A significant increase in OFD services resulted in a huge number of first-time users, but they also have concerns about the adoption of a new technology because they perceive unforeseen negative outcome before, during or after use, which is also known as "perceived risk" (Hwang and Choe, 2019). The change in consumer behaviours shifted some risks traditionally that are not associated to dine-in to the consumers such as financial risk, privacy risk and performance risk. Business and consumers are expected to incur an additional cost when engaging in commission-based OFD services (e.g. signup fees, commission, packaging fees and delivery charges). In contrast, a patron is not subjected to additional fees while dining in the restaurant and businesses are not required to invest in new technology to cater for OFD. In this light, while pivoting to OFD may be the logical choice for the business's survival, the adoption of OFD is entirely dependent on the consumers due to the cost and risk posed by the adoption. More importantly, such risks are negatively associated with the adoption of a new technology. Even though studies related to perceived risk in e-commerce and hospitality industry is not uncommon (Lutz *et al.*, 2018; Yi *et al.*, 2020), studies related to perceived risk in the domain of mobile application for food deliveries is extremely limited.

OFD represents a significant innovation in food delivery that is changing consumers' habits (Troise *et al.*, 2021). Hence, the present study examines the consumer's intention to use OFD and its associated risks to address the research gap. More specifically, this study proposes evaluating consumer's desire and intention in engaging with OFD using the model goal-directed behaviour (MGB), which is an extension of the theory of planned behaviour (TPB). The application of MGB could elicit meaningful insight in examining consumers' behavioural intention and decision-making as MGB focuses on areas overlooked by TPB, which are desire, affect and habit in providing more accurate OFD user prediction of behaviour and decisions (Perugini and Bagozzi, 2001, 2004). Furthermore, this study incorporates the influence of perceived risk on desire and behavioural intention to use OFD. The investigation of perceived risk's role would reveal the hurdles preventing users from engaging with OFD and assisting OFD service provider in formulating relevant strategies to target their market and mitigate consumer risk profiles.

2. Theoretical framework and hypothesis development

According to the first lacuna, this study developed a conceptual model that revisited the intention theory – theory of planned behaviour (TPB) (see Figure 1). TPB was first proposed by Ajzen (1991), who claims that when behaviour is rational, the best predictor of that behaviour is intention. This theory postulates that intentions are a fundamental antecedent of actual behaviour. TPB posits the link between subjective norm (SN), ATT and perceived behavioural control (PBC) influencing intention and subsequent behaviour. Likewise, Fishbein and Ajzen (2010) also suggest that once intentions have been formed, individuals will be highly inclined to act on such intentions once the opportunity arises. TPB has been widely applied in numerous research such as health-related studies (Cooke *et al.*, 2016), marketing (Rehman *et al.*, 2019) and e-commerce (Dakduk *et al.*, 2017).

TPB has been criticised recently due to concerns over its validity and utility, with some arguing that the theory should be retired (Sniehotta *et al.*, 2014; Erasmus *et al.*, 2010). Esposito *et al.* (2016) argues that TPB fails to capture people really *want* to do something and the emotions after they have done it. Due to these shortcomings, researchers have sought to extend and improve upon TPB by establishing new constructs and new relationships (Sutton, 1998; Perugini and Bagozzi, 2001; Tommasetti *et al.*, 2018), such as MGB (see Figure 2). MGB accounts for significantly more variance, parsimonious and prediction in studies regarding intention and behaviour in comparison to the TPB (Perugini and Bagozzi, 2001).

In the MGB, the intention to perform a behaviour is primarily motivated by the desire to perform the behaviour, and this desire is assumed to reflect the effects of ATT, SN, PBC, anticipated emotions (AEs) and frequency of past behaviour and to mediate their influence on
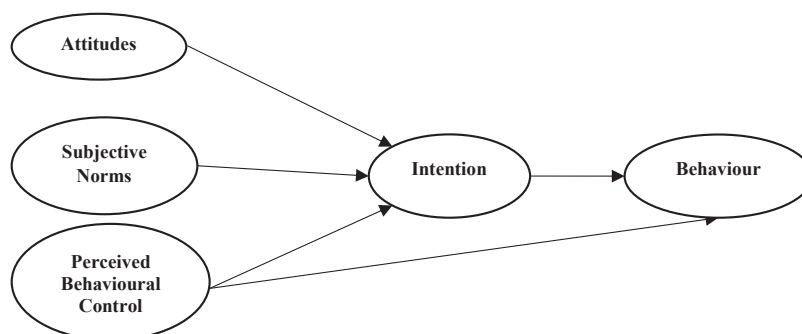
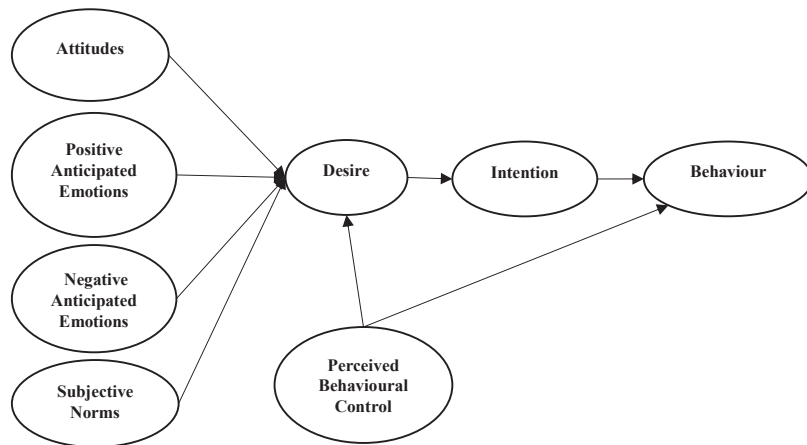Figure 1.
The theory of planned behaviour

Figure 2.
The model of goal-directed behaviour

intention (Perugini and Bagozzi, 2001). The concept of desire is defined as "a state of mind whereby an agent has a personal motivation to perform an action or achieve a goal" (Perugini and Bagozzi, 2004, p. 71). This desire represents a motivational state of mind where the reasons to act are translated into motivation. Desire is a state in which an individual is eager to take a particular action through internal stimulation (e.g. achievement, curiosity and shortage) (Perugini and Bagozzi, 2004). One of the crucial causes of desire formation is individuals' previous experiences (Leone *et al.*, 2004). Therefore, the construct of desire is to capture whether people want to do something, out of joy or a feeling of satisfaction, instead of out of obligation (Esposito *et al.*, 2016). Meanwhile, AE evaluates one's emotional state in the decision-making process (Perugini and Bagozzi, 2001). Desire is presumed to mediate the influence of ATT, SN and PBC on intention, while AE appear in the model as a factor influencing desire. Thus, the MGB explained significantly greater amount of variance in intention in comparison to the TPB (Esposito *et al.*, 2016).

Ample of evidence in the literature that supports the significant relationship rooted in TPB. TPB argues that an individual's beliefs about their ability to perform the behaviour in question influence whether or not they engage in the behaviours. ATT represents the degree to which a person has a favourable or unfavourable evaluation of the behaviour. At the same time, SN refers to the belief that whether the majority of people approve or disapprove of the behaviour while, PBC reflects a persons' perception of the ease or difficulty of performing a given behaviour (Ajzen, 1991). An individual with a positive evaluation of the behaviour will increase the likelihood that the behaviour will be performed. Consumer's ATTs toward buying food online have a significant positive effect on their behavioural intentions (Chen *et al.*, 2020). Mosunmola *et al.* (2018) argued that ATT has a significant positive effect on engaging in online purchases. Behavioural intentions are also influenced by important people in the consumers' lives, such as their family and friends (Bhattacherjee, 2000). Bui and Kemp (2013) argued that consumers' ATTs, emotion regulation, SN and PBC influence repeat purchase intentions. In the field of marketing, a recent study has applied MGB to the purchase of sporting goods online (Chiu *et al.*, 2018), and Yi *et al.* (2020) applied MGB in the field of tourism.

In this light, one's intention to perform the behaviour is strongly weighted by available resources and opportunity (Ajzen, 1991). An individual will be subjectively affected by external factors, such as past experiences or expectations which may hinder or encourage them, individual acknowledgement of self-competence (ability), awareness of critical needs

(resources) and the awareness of convenience (opportunity) (Chen *et al.*, 2020). Consumers' past experiences will significantly influence their behavioural intention toward online food services (Liang and Lim, 2011). Hence, PBCs are essential factors influencing online purchases (Yang *et al.*, 2018). MGB assumes that PBC bolsters an individual's desire and intention of a specific behaviour (Perugini and Bagozzi, 2001). Drawing similarities from consumer online purchase intention, ATT, SN and PBC would, therefore, have similar influence on OFD users. When consumers have favourable views towards OFD services, they substantially improve a person's motivation that would result in lesser resistance in ordering food online, triggering a higher level of desire to use OFD services. Therefore, the present study posited that individuals' behavioural, normative and control belief are key factors influencing their desire and intention towards OFD services. Based on these discussions, the following hypotheses have been developed.

H1. ATT positively influences the desire to use OFD services

H2. SN positively influences the desire to use OFD services

H3. PBC positively influences the desire to use OFD services

H4. PBC positively influences behavioural intention to use OFD services

A long-held belief is that individuals tend to avoid discomfort or pain while seeking pleasure or happiness. Many, if not all, of our decisions are bias towards pursuing happiness or avoiding unhappiness. Emotions play a significant role in persuading consumer's intention. External stimuli such as restaurant ambience, customer-employee relationship, virtual reality simulation, aromas and service failures influence their satisfaction and intention (Rodríguez-López *et al.*, 2020). Additionally, emotions were found to be a significant predictor of online shopping behaviours in numerous studies (Szymkowiak *et al.*, 2020; Poon and Mohamad, 2020b; Cinar, 2020). Emotions are dynamic and heavily influenced by our surroundings, current happenings and other people who affect our decision-making, resulting in impulsive buying. Affirming the importance of emotions in affecting an individual's online shopping behaviours, the underlying assumption of AE is that individuals anticipate that the emotional consequences of their action or inaction post decision-making (Bagozzi *et al.*, 2016). Positive anticipated emotions (PAEs) are related to emotions felt when the individual succeeds in accomplishing the behaviour. These emotions, such as pleasure or arousal post–purchase, are important as they positively affect users' behaviour to use a particular online service (Kim *et al.*, 2007; Menon and Khan, 2002). Meanwhile, negative anticipated emotions (NAEs) constitute regret, angry or guilt related to action or inaction after the purchase (Bagozzi and Dholakia, 2002). These emotions relate to emotions one fell when failing to achieve the desired behaviour. Wang *et al.* (2011) found both PAE and NAE affect intention depending on customers' reasons for engaging in the process. A recent study by Chiu *et al.* (2018) found that both PAE and NAE significantly influence consumers' purchase intention. Bagozzi and Dholakia (2002) argued that the effect of AEs is based upon an individual's argument when deciding to act or not in goal-directed situations, taking into account emotional consequences or both action and inaction. As such, AEs play a role in shaping an individual's behaviour towards the use of OFD services. With the rise of technology enabled services such as OFD, external stimuli such as ambience, aroma or meaningful relationship with customer that are traditionally used to stimulate consumer emotions are no longer effective. Consumer instead draws upon experience of past purchases to shape their emotions. In summary, consumers will intend to order food from mobile application if the emotions they anticipate from doing so are positive, which in turn will drive their desire. Hence, based on the discussion, the following hypotheses have been developed.

H5. PAE positively influences the desire to use OFD services

H6. NAE positively influences the desire to use OFD services

Desire functions as a motivator. Desires are thought to be very important in the first step of human actions and argued to lead to intentions to perform a behaviour (Perugini and Bagozzi, 2001, 2004). Perugini and Bagozzi (2004) argue that desire is the motivational state of mind in which internal assessment to carry out a particular behaviour are transformed into a motivation to do so. Desires act as a stimulus of decisions when individual consider their desires and endorse them as motivators to act (Bagozzi and Dholakia, 2002). Since humans naturally want to satisfy their desires for a gratifying self-image, they tend to believe, intuit and act in certain ways to achieve their goals (Perugini and Bagozzi, 2001). Han *et al.* (2018) investigate the effect of desire to engage in pro-environmental action on green loyalty. The results suggest that desire to engage in such action was an integral factor affecting green loyalty. Therefore, the desire to engage in OFD services will be a vital determining factor in an individual's intention to engage in OFD services. Based on previous studies on desire as a strong motivator for intention, the following hypothesis has been developed.

H7. Desire positively influences behavioural intention to use OFD services

2.1 Perceived risk

Consumers are notably more anxious when using new technology-based services (e.g. OFD applications), especially in providing personal information, such as their full name, identification number and credit card details. The uncertainty of unpleasant consequences can result in perceived risk (Yang *et al.*, 2015). Suppose the intention and desire to make a certain purchase goal are not met. Consumer will experience negative consequences such as negative view toward the service, financial losses, violation of privacy, product or service delivery failure, anxiety, discomfort or wasted time. The higher the perception of negative consequences among consumers, the more it would deter consumers' purchasing intention. Hence, building consumer confidence and the mitigation of such risk influences consumers' purchasing intentions.

Since the 1960s, perceived risk theory has been used to explain consumers' behaviour. Perceived risk is a kind of expected loss (Schierz *et al.*, 2010) to pursue the desired outcome, which plays a significant role in dictating consumer purchase intention. Consumers' perceived risk is higher in online purchases compared to traditional in-store purchases. As such, perceived higher risk behaviours would hinder the individual's motivation to act a certain way. Zhao *et al.* (2017) and Kim and Lennon (2013) posit that if a consumer perceived that it is risky to purchase from online retailers, it is less likely for the consumer to purchase from the online retailer. The majority of scholars agreed that consumers' perceived risk is a multi-dimensional construct and may vary according to its product, service, industry or situation. Five constructs or component of perceived risks have been identified that could influence online purchasing habits: performance risk, financial risk, time risk, physical risk and privacy risk (Featherman and Pavlou, 2003; Han and Kim, 2017). Furthermore, the pandemic's abrupt behavioural change causes' anxiety and stress among the OFD users. Hence, the present research investigated five types of risk: performance risk, privacy risk, financial risk, physical risk and COVID-19 risk and its influence on the desire and intention to use OFD services.

The first concern of OFD is performance risk. Performance risk refers to the potential loss incurred when the service does not perform as expected (Kushwaha and Shankar, 2013). Compared to an established traditional in-dining service restaurant or take-away option, OFD services are more likely to be managed by an amateur delivery person resulting in sub-par or failed delivery service. On top of that, purchasing a product or service online without touching, smelling, seeing or feeling the product may increase the level of perceived

performance risk (Forsythe and Shi, 2003). Previous studies have commonly suggested that OFD consumers are more likely to have a negative experience. Unable to make correct decision, order prepared wrongly by the restaurant, delayed in delivery or stolen food would significantly impact the performance of OFD services resulting in higher performance risk for the consumer. Privacy risks are concerned with the possibility of a consumer's personal information, such as name, email address, phone number, credit card information, leaked or misused by an unscrupulous individual (Forsythe and Shi, 2003). OFD companies might store sensitive information through their mobile applications, making them likely target of hackers. Fortes and Rita (2016) found that the privacy concern negatively impacts trust, behaviours and online purchase intention. As all OFD transactions are conducted online, OFD users are more likely to be concerned about any unauthorised access of information that could cause harm to the owner. Thus, privacy risk could hinder consumer's intention and desire to engage in OFD services.

The financial aspect also poses a risk to the consumer. Financial risk refers to the possibility of consumer's loss of money due to inappropriate purchases of product and services online (Forsythe and Shi, 2003). If consumer's perception of value towards the online product or service is low, they are more likely to perceive that it is financially risky for them to engage in OFDs (Kim *et al.*, 2005). Such risk is more significant for first-time OFD users, where consumer expectations are not met in reality (Hwang and Choe, 2019). In short, OFD users could suffer from potential financial losses when using OFD services. Lastly, the physical risk is directly related to physical safety, while COVID-19 risk is concerned with an individual's perception of contracting COVID-19. Consumer engaging in OFD services is exposed to some form of physical risk. Consumer's physical location must be shared in real-time via a mobile application; with this, they are more likely to be concerned about their safety. Additionally, contacts with delivery persons might increase the likelihood of contracting COVID-19 if the recommended safety measures are not being adhered to. It was found that more than sixty percent of food delivery workers in Hanoi, Vietnam display mildly ill or presymptomatic while working (Nguyen and Vu, 2020). This raises the concern that food delivery workers may infect other riders and their customers as more and more people are adhering to shelter-in-place order. Altogether, consumers that decides to use OFD services are directly or indirectly exposing themselves to potential physical harm and risk of contracting unwanted illnesses from the delivery person. Hence, the following hypotheses have been developed based on the literature.

H8. Performance risk negatively influences the desire to use OFD services.

H9. Performance risk negatively influences behavioural intention to use OFD services.

H10. Privacy risk negatively influences the desire to use OFD services.

H11. Privacy risk negatively influences behavioural intention to use OFD services.

H12. Financial risk negatively influences the desire to use OFD services.

H13. Financial risk negatively influences behavioural intention to use OFD services.

H14. Physical risk negatively influences the desire to use OFD services.

H15. Physical risk negatively influences behavioural intention to use OFD services.

H16. COVID-19 risk negatively influences the desire to use OFD services.

H17. COVID-19 risk negatively influences behavioural intention to use OFD services.

3. Research method

3.1 Data collection and sample

The study's respondents are customers with OFD experience. The non-probability convenience sampling method was applied to examine the proposed framework (Figure 1) due to the unknown total population and the absence of a sampling frame for the customer of OFD. This study adopted Kline's (2015) recommendation to estimate the minimum samples size using the G*Power 3.1 program (Faul *et al.*, 2009). This program is designed to analyse the statistical power commonly used in social behavioural studies. It provides power analysis options for frequently used analysis, including correlation and regression. In terms of sampling, this study adopted the sample size calculation by Poon *et al.* (2018). The minimum estimated sample size is 208 respondents with the power at 95%, with an alpha set at 0.05 and a medium effect size of 0.15. The convenience sampling method was used in this study. Potential respondents were contacted online (messaging application) enclosed with an online survey link. In a bid to encourage respondents to complete the survey, important information such as the study's introduction and purpose guarantee data confidentiality, option to decline and progress bar. A total of 355 respondents recruited for the study; 349 responses were gathered from OFD customer residing in Selangor and Kuala Lumpur over two weeks in April 2020. After data cleaning, ten responses were discarded due to poor data quality and only 339 useable responses were included in the data analysis.

3.2 Scale measurement

The proposed research model (see Figure 3) consists of 12 variables-ATT, SN, PAE, NAE, PBC, desire, intention and five constructs of perceived risk (performance risk, financial risk, privacy risk, physical risk and COVID-19 risk). The items for MGB were adapted and contextualised from Perugini and Bagozzi (2001) and Bagozzi and Dholakia (2002) to represent OFD behaviours. The constructs of perceived risks were adapted from Murray and Schlacter (1990) and Yi *et al.* (2020). All items were assessed on a five-point Likert scale from strongly disagree (1) to strongly agree (5). The English language questionnaire was pre-tested on 30 OFD customers to ensure that the questions and instructions are well comprehended.
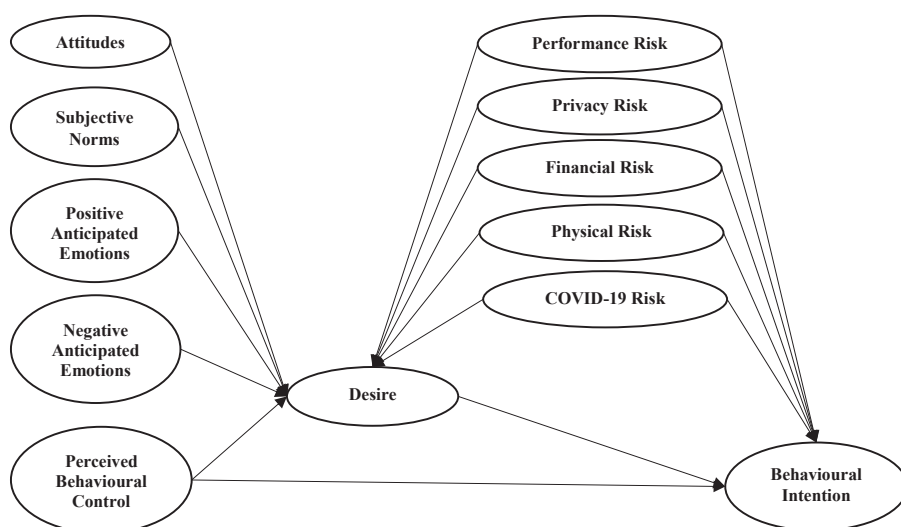

Figure 3.
Proposed research model

Minor amendments were made to the questionnaire based on the feedback from the pre-testing.

3.3 Analysis and results
To better understand the characteristics of respondents, the frequency distribution method was presented. In all, 62.2% of the respondents are female, 49.9% of them are aged between 20 and 29, 71.6% of the respondents are college or university graduates, and a majority earn a monthly income between RM 4,000 and RM 7,999 (34.5%). The summary of the demographic data is presented in Table 1.

As suggested by Cain *et al.* (2016), this study assessed the multivariate skewness and kurtosis. The results indicated that the data was not multivariate normal, Mardia's multivariate skewness ($\beta = 12.982, p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 191.807, p < 0.01$). Thus, to analyse the data, the partial least squares structural equation modelling (PLS-SEM) technique was adopted using SmartPLS 3.3.2 (Ringle *et al.*, 2015). The present study employed PLS-SEM due to the prediction-oriented variance-based approach compared with covariance-based structural equation modelling (CB-SEM), which is more confirmed-orientated (Hair *et al.*, 2017a). PLS-SEM was chosen to examine the predictability of exogenous variable (ATT, SN, PAE, NAE, PBC and perceived risk) on the endogenous variable (desire and behavioural intention). Furthermore, the two-stage analytical procedures by Gerbing and Anderson (1988) validity and goodness of the measurement model were first tested to evaluate the proposed research model (Poon and Mohamad, 2020a). For reflective constructs, item factor loading, construct reliability, composite reliability (CR) and average variance extracted (AVE) are evaluated (Hair *et al.*, 2017a). The minimum cut-off value for item factor loadings are above 0.70, AVE in each construct exceeds 0.50 and CR in each construct exceeds 0.708 (Bagozzi and Yi, 1988; Hair *et al.*, 2013). As can be observed, the MacDonald's Omega reliability indices exceed 0.70 which indicates satisfactory reliability (Hayes and Coutts, 2020). The model satisfies all of these criteria, as depicted in Table 2.

Henseler *et al.* (2009) suggested the use of heterotrait-monotrait (HTMT) ratio, which is the average of the heterotrait-heteromethod correlations (i.e. the correlations of indicators across constructs measuring different phenomena) relative to the average of the monotrait-heteromethod correlations (i.e. the correlations of indicators within the same construct). Thus, this study used the most conservative criterion HTMT to examine discriminant validity at the cut-off value of 0.85. A value is greater than 0.85 signifies an issue with discriminant validity (Henseler *et al.*, 2009; Voorhees *et al.*, 2016). As depicted in Table 3, the measurement

Variable	Description	Frequency	%
Gender	Male	128	37.8
	Female	211	62.2
Age	Below 19 years old	9	2.7
	20–29 years old	169	49.9
	30–39 years old	120	35.4
	40–49 years old	34	10.0
	50–59 years old	7	2.1
Highest education level	High/secondary school	10	2.9
	College/university	329	97.1
Monthly income	No fixed monthly income	67	19.8
	Less than RM 4,000	97	28.6
	RM 4,000 to RM 7,999	117	34.5
	RM 8,000 and above	58	17.1

Table 1. Demographic profile of respondent and SMEs

Item	Loadings	ω	CR[a]	AVE[b]	Item	Loadings	ω	CR	AVE
ATT1	0.712	0.805	0.867	0.621	PBC1	0.816	0.776	0.868	0.686
ATT2	0.759				PBC2	0.821			
ATT3	0.848				PBC3	0.848			
ATT4	0.826				PER1	0.818	0.829	0.872	0.632
BI1	0.900	0.924	0.945	0.813	PER2	0.735			
BI2	0.938				PER3	0.899			
BI3	0.940				PER4	0.714			
BI4	0.823				PPR1	0.869	0.839	0.901	0.752
DE1	0.800	0.851	0.899	0.689	PPR2	0.876			
DE2	0.838				PPR3	0.856			
DE3	0.836				PR1	0.835	0.892	0.925	0.755
DE4	0.846				PR2	0.922			
FR1	0.880	0.632	0.751	0.511	PR3	0.855			
FR2	0.545				PR4	0.862			
FR3	0.680				SN1	0.896	0.930	0.949	0.822
NAE1	0.912	0.925	0.946	0.815	SN2	0.934			
NAE2	0.900				SN3	0.923			
NAE3	0.889				SN4	0.873			
NAE4	0.911				PAE1	0.856	0.858	0.907	0.710
COR1	0.865	0.885	0.920	0.793	PAE2	0.890			
COR2	0.907				PAE3	0.816			
COR3	0.899				PAE4	0.805			

Note(s): [a] Composite reliability (CR) = (square of the summation of the factor loadings)/ [(square of the summation of the factor loadings) + (square of the summation of the error variance)
[b] Average variance extracted (AVE) = (summation of squared factor loadings)/(summation of squared factor loadings) (summation of error variances)
ω = Omega, CR = Composite reliability, AVE = Average variance extracted, ATT = attitude, BI = behavioural intention, DE = desire, FR = financial risk, NAE = negative anticipated emotions, PAE = positive anticipated emotions, PBC = perceived behavioural control, PER = performance risk, PPR = privacy risk, PR = physical Risk, COR = COVID-19 risk, SN = subjective norms

Table 2.
Loadings, McDonald's Omega, composite reliability and average variance extracted

	1	2	3	4	5	6	7	8	9	10	11	12
1. Attitude												
2. Behavioural intention	0.733											
3. COVID-19 risk	0.220	0.157										
4. Desire	0.718	0.848	0.173									
5. Financial risk	0.218	0.175	0.424	0.219								
6. NAE	0.346	0.287	0.062	0.461	0.092							
7. PBC	0.388	0.375	0.263	0.243	0.123	0.092						
8. Performance risk	0.204	0.129	0.522	0.110	0.607	0.058	0.114					
9. Physical risk	0.218	0.167	0.675	0.071	0.353	0.064	0.256	0.475				
10. PAE	0.623	0.537	0.144	0.618	0.247	0.485	0.145	0.198	0.090			
11. Privacy risk	0.089	0.164	0.362	0.146	0.355	0.117	0.093	0.595	0.447	0.111		
12. Subjective norms	0.631	0.477	0.148	0.532	0.190	0.360	0.143	0.124	0.075	0.588	0.077	

Note(s): NAE = Negative anticipated emotions, PAE = Positive anticipated emotions, PBC = Perceived behavioural control

Table 3.
Heterotrait-monotrait (HTMT) ratio analysis

model attains discriminant validity based on HTMT analysis. In assessing the model fit, the present study adopts standardised root mean square residual (SRMR). As suggested by Hu and Bentler (1999), the cut-off value of less than 0.08 for SRMR indicates a good fit. In this light, the present study's SRMR value is 0.07, indicating a good model fit.

Following the recommendation from Hair *et al.* (2017a, b), the bootstrapping method of 5,000 resampling procedures was applied to determine the level of significance of each indicator weight. Bootstrapping is a resampling technique that draws a large number of subsamples from the original data (with replacement) and estimates models for each subsample. Table 4 summarises the results from the PLS path analysis for structural model evaluation. ATT ($\beta = 0.374$, $p < 0.001$), SN ($\beta = 0.088$, $p < 0.10$), PBC ($\beta = 0.096$, $p < 0.10$), PAE ($\beta = 0.192$, $p < 0.05$), and NAE ($\beta = 0.169$, $p < 0.05$) have positive effect on desire. The result indicates that individual ATT, SN, PBC, PAE and NAE influences desire. PBC ($\beta = 0.154$, $p < 0.001$), and desire ($\beta = 0.738$, $p < 0.001$) have a positive effect on intention.

Performance risk ($\beta = -0.119$, $p < 0.05$), privacy risk ($\beta = -0.133$, $p < 0.05$), financial risk ($\beta = -0.088$, $p < 0.05$), physical risk ($\beta = -0.150$, $p < 0.05$) and COVID-19 risk ($\beta = -0.105$, $p < 0.10$) have a negative effect on desire. The findings indicate that performance risk, privacy risk, financial risk, physical risk and the risk of contracting COVID-19 negatively influence the desire of OFD users. Physical risk ($\beta = -0.147$, $p < 0.05$) and COVID-19 risk ($\beta = -0.106$, $p < 0.05$) have a negative effect on intention. The result implies that users' intention is influenced by their physical risk and the risk of contracting COVID-19. However, the results indicate the insignificant relationship between performance risk ($\beta = -0.012$, $p > 0.10$), privacy risk ($\beta = -0.020$, $p > 0.10$), financial risk ($\beta = -0.013$, $p > 0.10$) and intention. Table 4 presents the value of R^2 for endogenous variables. The R^2 values are 0.626 for desire and 0.491 for intention. The R^2 value indicates that 62.6% of the variance explained for desire and 49.1% of variance explained for intention (see Table 4).

PLS predict was used to examine the model's predictive relevance. Shmueli *et al.* (2019) described the method comprises training and holdout sample-based procedure generating case-level predictions on the item or construct level using the PLS-predict with a 10-fold procedure to identify predictive relevance. According to Shmueli *et al.* (2019), the PLS model offers predictive performance if the Q^2 prediction value is positive. There is a strong predictive power and vice versa if all the item differences linear regression model (LM) are lower than the PLS model. There is moderate predictive power when the majority item

	β	Std. Error	t-value	Hypothesis testing	R^2
H1 ATT → desire	0.374	0.059	6.376***	Supported	0.626
H2 SN → desire	0.088	0.052	1.694*	Supported	
H3 PBC → desire	0.096	0.049	1.939*	Supported	
H4 PBC → BI	0.154	0.038	4.026***	Supported	0.491
H5 PAE → desire	0.192	0.063	3.051**	Supported	
H6 NAE → desire	0.169	0.050	3.353**	Supported	
H7 desire → BI	0.738	0.028	26.578***	Supported	
H8 PER → desire	−0.119	0.056	2.138**	Supported	
H9 PER → BI	−0.012	0.045	0.262	Rejected	
H10 PPR → desire	−0.133	0.043	3.093**	Supported	
H11 PPR → BI	−0.020	0.040	0.505	Rejected	
H12 FR → desire	−0.088	0.040	2.178**	Supported	
H13 FR → BI	−0.013	0.034	0.379	Rejected	
H14 PR → desire	−0.150	0.059	2.524**	Supported	
H15 PR → BI	−0.147	0.048	3.094**	Supported	
H16 COR → desire	−0.105	0.058	1.825*	Supported	
H17 COR → BI	−0.106	0.046	2.308**	Supported	

Note(s): *$p < 0.10$, **$p < 0.05$, ***$p < 0.001$, ATT = attitude, SN = subjective norms, BI = behavioural intention, FR = financial risk, NAE = negative anticipated emotions, PAE = positive anticipated emotions, PBC = perceived behavioural control, PER = performance risk, PPR = privacy risk, PR = physical risk, COR = COVID-19 risk

Table 4.
Standard beta, standard error, *t*-Value and variance explained

differences in LM are lower than the PLS model, while there is low predictive power if the minority item differences in LM are lower than the PLS model, then. As shown in Table 5, using ten folds and ten repetitions, all PLS models' items were lower than the PLS LM model; thus, the result concludes that the model has strong predictive power for behavioural intention and desire.

Following the guideline by Ringle and Sarstedt (2016), all outer weights of the measurement model are positive. The importance performance matrix (IPMA) revealed that PBC appears as the most important influencing factor for behavioural intention to use OFD with a score of (0.225; 75.336). The second most influential factor for behavioural intention with a score of (0.276; 68.128) was the ATT towards OFD. Interestingly, the result revealed that financial risk as the third most influential factor for behavioural intention with a score of (0.276; 67.259). Desire with a score of (0.738; 62.366) appears to be the fourth most influential factor for behavioural intention (see Table 6).

4. Discussion and implications

Little attention was paid to OFD consumer's behaviour and the decision-making process of OFD users. This study's objective is to use MGB to investigate the relationship between consumer's intentions towards OFD services to address the gap in the literature. Perugini and Bagozzi (2001) hypothesised that desire reflects the ATT, SN, PBC and AEs. Consistent with expectations, ATT, SN, PBC and AEs positively influence desire and intention. This study's results have further demonstrated the validity of the theoretical foundation used. The addition of desire and PAE and NAE guided by the literature suggests that what people want

	PLS RMSE	LM RMSE	PLS - LM RMSE	Q^2_predict
BI1	0.709	0.729	−0.020	0.360
BI2	0.761	0.783	−0.022	0.343
BI3	0.746	0.750	−0.004	0.338
BI4	0.818	0.877	−0.059	0.292
DE1	0.930	0.968	−0.038	0.258
DE2	0.769	0.789	−0.020	0.342
DE3	0.871	0.929	−0.058	0.298
DE4	0.881	0.929	−0.048	0.318

Table 5.
PLS predict

Note(s): BI = behavioural intention, DE = desire, LM = Linear Regression Model, RMSE = root mean squared error

	Desire Total effect	Behavioural intention	
		Total effect	Performances
Attitude	0.374	0.276	68.128
COVID-19 risk	−0.105	0.028	49.101
Desire	–	0.738	62.366
Financial risk	−0.088	−0.077	67.259
Negative anticipated emotions	0.169	0.125	33.029
Perceived behavioural control	0.096	0.225	75.366
Performance risk	0.119	0.076	54.642
Physical risk	0.150	−0.037	27.136
Positive anticipated emotions	0.192	0.142	54.970
Privacy risk	−0.133	−0.118	55.268
Subjective norms	0.088	0.065	58.568

Table 6.
Performance and total effects

to do is an essential variable in explaining intention. On top of that, the study contributes to our understanding of various types of perceived risk that have not been explored in-depth in previous literature and their effects on the desire and intention to use OFD. OFD users would be more open towards continuance adoption of food delivery services when they are sure that it is safe to do so. Addressing specific concerns among OFD users would lead to an increase in desire. Subsequently, the desire will influence the intention to use OFD services.

Consumer's favourable ATT towards OFD suggests that consumers are comfortable with the concept of purchasing products or services online, given that the e-commerce industry had more than a decade to educate and build trust among OFD user. Such favourable ATTs could be attributed back to policies by e-commerce players, such as a 100% authenticity or money back warranty. The entry of branded and luxury items into the online platform is a signal of consumers' willingness to spend money on big-ticket items. These trends indicate the increasing level of trust among consumers towards online purchases, positively impacting OFD services. Therefore, capitalising on this trend, restaurant operators should introduce high-ticket items that could generate a higher margin. Currently, offerings available on OFD for consumers are largely cheaper options that are design to entice first-time users to try out the delivery service. Current restaurant operators could offer family meal menu or monthly subscription meal plan that could provide a better financial stability long-term. As ATT towards OFD changes, Michelin-starred chef and high-end restaurants could venture into the food delivery space and offer higher ticket items. Conversely, OFD operators would need to revamp its deliver processes taking into account the need of these high-end restaurants such as timeliness of delivery or the use of temperature-controlled storage boxes.

Apart from having a favourable ATT, PAE and NAE forms the desire to use OFD services. AE influences the decision-making process (Bagozzi *et al.*, 2016); hence OFD users are more motivated to engage with OFD services in anticipation of a positive outcome from the delivery service. To leverage on these emotions, platforms could also employ promotional strategies such as "Refer-a-Friend" campaign after each successful transaction. Having succeeded in achieving the desired goal-directed behaviour, consumers are more likely to become platform ambassadors offering vouchers or cash rebates to entice new users. It is worthy to note that PBC had significant influences on consumer's desire and intention to use OFD services. In the performance of behavioural intention to engage with OFD services, PBC emerged as the most critical factor. OFD users who are capable of using mobile application to make purchases and past experiences, will likely contributed to an increase in the usage of OFD services. Therefore, OFD operators ought to focus on removing obstacles that would inhibit consumer's intention to use OFD services. These improvements will undoubtedly improve consumer's overall experience. On top of that, due to a number of reasons, the delivery service could be delayed. OFD operators should consider appropriate action in ensuring that the consumer's experience and emotion remains positive as these favourable perspective influences consumer's desire and subsequently their intention. These findings provide a more complex view in understanding consumers" intention to use OFD services that both OFD operators and restaurant managers must consider in their decision-making.

The present study had also explored the influences of perceived risks on desire and intention to use OFD services, and the results indicated interesting results. Performance, privacy, financial physical and COVID-19 risk negatively affect consumer's desire, while only physical and COVID-19 risk negatively affect consumer intention to engage in OFD services. These findings are consistent with previous studies on perceived risk and consumer behaviour research (Han and Kim, 2017; Kamalul Ariffin *et al.*, 2018; Bashir *et al.*, 2018; Lăzăroiu *et al.*, 2020). An intricate mechanism influences one's motivation to act a certain way. The results suggest that OFD users consider different critical risk factors (i.e. performance risk, privacy risk, financial risk, physical risk and COVID-19 risk) in determining one's motivation.

Issues ranging from poor delivery service, food being stolen, wrong order, leak of personal information, financial dispute, potential physical harm and the risk of contracting COVD-19 from the delivery person could reduce users' desire to engage with OFD services. In a physical restaurant, issues such as delivery service, stolen food, wrong order or financial dispute could have been quickly addressed. However, with OFD, consumers need to contact the OFD service provider online to ask for a refund, and this could take up to a week to resolve or longer. Therefore, managerial actions should specifically consider improving consumer complaint process and establish hiring guidelines along with appropriate key performance index for delivery person. Clear procedures should be developed to manage simple issues faced by users. However, for more complicated issues, an independent third party should be appointed to manage it effectively and efficiently. Apart from performance issues, financial concerns could be mitigated through a money-backed guarantee scheme introduced by OFD companies. OFD operators that introduces a guaranteed scheme gain a competitive edge, develop loyal customers over time, and this information be used to provide useful feedback to the restaurant if ordered were wrongly completed, eventually improving both OFD and F&B operators' performance.

Another concern among OFD users is that their credentials (i.e. banking details, credit card information, house address, hand phone number, email address and password) are not sufficiently secured, and their online behaviour data could be leaked or sold to third-party advertisers. Practitioners, such as OFD companies, should continuously seek to reassure consumers that their data and private information are managed and stored securely according to the government's countries' regulation and guideline. Apart from that, government too plays an active role in regulating all businesses, including OFD operators, by enacting relevant data protection regulation to protect its citizen from exploitation, such as General Data Protection Regulation (GDPR) in the European Union. While such moves could incur additional cost to some industries, consumers' privacy concern would be alleviated, prompting higher consumption in data-driven industries such as e-commerce, healthcare, insurance services and financial services.

Furthermore, the physical risk and risk of contracting COVID-19 negatively influence consumer's desire and intention to use OFD services. Undoubtedly, all consumers would not subject themselves to any physical harm or potential exposure to diseases regardless of physically patronising a restaurant or purchasing food online. With COVID-19 risk looming in the back of mind, the introduction of contactless delivery, pick-up, or unmanned last-mile delivery would make it more comfortable among OFD customer and F&B operators significantly reduce the risk of transmission. F&B operators could designate an area in the restaurant as a contactless pick-up area for both walk-in customers and delivery personnel. Apart from that, OFD platform could implement "Just-In-Time" concept where delivery personnel would only enter the restaurant once the food is ready for collection. These steps are deemed necessary to protect essential workers, such as delivery personnel, by preventing overcrowding, enforcing strict standard operating procedures (SOPs) and upholding high safety standards throughout the entire F&B industry. It is worth noting that while this study was conducted during the height of the COVID-19 pandemic, consumers might be more biased towards health-related issues. However, contracting any transmittable diseases or hygiene issues would naturally be the top concern of many consumers, primarily when it comes to food. Traditional take-away option offered by restaurants, consumers that do so are more likely to be in contact with other people if they were to leave their houses. If health advisories such as physical distancing, wearing of face mask or washing of hands are not adhered to religiously by the community at large, consumers that leaves their home are more likely to contract COVID-19 (World Health Organization, 2020) or other types of transmittable diseases. Conversely, if consumers were to use OFD services, it would pose a lower risk if compared with take-away option. With that said, necessary precaution would need to be

practised by the OFD users and workers to reduce the risk of transmission. OFD operators raise awareness for OFD users and workers on the latest health advisors by health experts and secondly, to introduce a feedback system for the public to raise concerns if food delivery riders are seen flaunting these SOPs.

Continuous real-time tracking via Global Position System (GPS) or geolocation allows for unscrupulous actors the ability to pinpoint the exact location of consumer and delivery personnel, hence exposing them to unnecessary physical risk. As OFD requires a location-based tracking system, the application developer should introduce a method to quickly disable location tracking in food delivery applications if the user felt that their life is threatened. On top of that, OFD operator should introduce a panic button alert would allow users to report any issues quickly. OFD and F&B operators could not afford to overlook these risks as concerns on physical safety would ultimately steer the customer away from the OFD provider. As OFD and F&B operators are in the service sector, poor performance would create a bad image of the service resulting in lower purchases (Hwang and Choe, 2019). As such, both physical risk and risk of contracting COVID-19 would influence consumer's decision-making process.

All in all, any of these concerns show that consumers' desire and intention to use OFD services are impaired. Consumers tend to be more motivated to engage with OFD services if they perceived it would bring minimal adverse effects. Hence, it falls on the OFD operators and restaurants to be ambidextrous in managing and mitigating these risks through new policies and strategies. This study postulates that the food delivery culture worldwide is set to grow in the coming years. With the rise of ghost kitchen coupled with efficient operation and lowering cost, the food delivery culture is set to transform the F&B industry. All stakeholders need to come together to create a new sustainable framework in addressing these dynamic changes.

4.1 Limitation and future research
While this study offers important implication for practitioners, it has several limitations. The first concern is related to external validity. As the data were only collected from Malaysian consumers, the data might offer a narrow perspective and could differ from other countries. Future studies are recommended to collect data in other parts of Malaysia and other countries to provide a broader view of perceived risk among OFD consumers. Another limitation is that the study was conducted during the pandemic, and the responses might only be relevant to the current scenario. Thus, future studies should consider conducting the research post-pandemic and compare the findings with the current results. The convenience sampling method was used for data collected in the current study, which can cause selection biases (Wright, 2005). It is recommended to use another type of sampling method to reduce biases. In this study, the respondent may be biased towards the looming threat of a pandemic, which may skew their overall risk perception. Thus, future studies could use longitudinal data to assess the perceived risk profile more accurately as the relationship may change over time.

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Appendix

Constructs	Items	Measurement items
Attitude (ATT)	ATT1	I think that using food delivery applications (e.g. foodpanda and GrabFood) is desirable behaviour
	ATT2	I think that using food delivery applications (e.g. foodpanda and GrabFood) is useful
	ATT3	I think that using food delivery applications (e.g. foodpanda and GrabFood) is wise behaviour
	ATT4	I think that using food delivery applications (e.g. foodpanda and GrabFood) is valuable
Subjective norm (SN)	SN1	Most people who are important to me will highly recommend using food delivery applications (e.g. foodpanda and GrabFood)
	SN2	Most people who are important to me will actively consider using food delivery applications (e.g. foodpanda and GrabFood)
	SN3	Most people who are important to me will use food delivery applications (e.g. foodpanda and GrabFood)
	SN4	Most people who are important to me will agree that I use food delivery applications (e.g. foodpanda and GrabFood)
Positive anticipated emotion	PAE1	If I use food delivery applications (e.g. foodpanda and GrabFood), I will be satisfied
	PAE2	If I use food delivery applications (e.g. foodpanda and GrabFood), I will be happy
	PAE3	If I use food delivery applications (e.g. foodpanda and GrabFood), it is a memorable experience
	PAE4	It will be fun to use food delivery applications (e.g. foodpanda and GrabFood)
Negative anticipated emotion (NAE)	NAE1	If I can't use food delivery applications (e.g. foodpanda and GrabFood), I will be worried
	NAE2	If I can't use food delivery applications (e.g. foodpanda and GrabFood), I will be disappointed
	NAE3	If I can't use food delivery applications (e.g. foodpanda and GrabFood), I will be sorry
	NAE4	If I can't use food delivery applications (e.g. foodpanda and GrabFood), I will be sad
Behavioural intention	BI1	I think I will be using food delivery applications (e.g. foodpanda and GrabFood) in the future
	BI2	I plan to use food delivery applications (e.g. foodpanda and GrabFood) in the future
	BI3	I am thinking of using food delivery applications (e.g. foodpanda and GrabFood) in the future
	BI4	I intend to try to use food delivery applications (e.g. foodpanda and GrabFood) within a year
Perceived behavioural control (PBC)	PBC1	I am confident that it's up to my will to use food delivery applications (e.g. foodpanda and GrabFood)
	PBC2	The decision to use food delivery applications (e.g. foodpanda and GrabFood) lies entirely with me
	PBC3	There is no obstacle to my use of food delivery applications (e.g. foodpanda and GrabFood)

Table A1.
Measurement items for constructs

Constructs	Items	Measurement items
Physical risk	PR1	I am afraid the delivery person is going to commit a crime against me
	PR2	Using food delivery applications (e.g. foodpanda and GrabFood) increases the risk of being harmed by criminals
	PR3	Using food delivery applications (e.g. foodpanda and GrabFood) can increase my chances of being a target of sexual harassment or sexual assault
	PR4	Using food delivery applications (e.g. foodpanda and GrabFood) is likely to increase the risk for me
Financial risk	FR1	Using food delivery applications (e.g. foodpanda and GrabFood) will be more expensive than going to a restaurant
	FR2	It is likely that the costs will actually be higher than those proposed by food delivery applications (e.g. foodpanda and GrabFood)
	FR3	I think I will get a lower service compared to the money I paid for food delivery applications (e.g. foodpanda and GrabFood)
Privacy risk	PPR1	Using food delivery application (e.g. foodpanda and GrabFood) may make privacy of payment information uncontrolled
	PPR2	If I use food delivery application (e.g. foodpanda and GrabFood), there is a possibility that my personal information may be leaked without my knowledge
	PPR3	If I use food delivery application (e.g. foodpanda and GrabFood), I think hackers or criminals will be able to access my account
Performance risk	PER1	I am worried that food delivery applications (e.g. foodpanda and GrabFood) would not provide me with the level of benefits that I expected them to
	PER2	I am worried that the information on the food delivery applications (e.g. foodpanda and GrabFood) might be different from the actual product
	PER3	I am afraid that the delivery service is below expectations when using food delivery applications (e.g. foodpanda and GrabFood)
	PER4	I am concerned that my request or complaint at the order may not be handled promptly when using food delivery applications (e.g. foodpanda and GrabFood)
Desire	DE1	If I want to eat, I want to order through food delivery applications (e.g. foodpanda and GrabFood)
	DE2	I Would like to use food delivery applications (e.g. foodpanda and GrabFood) in the near future
	DE3	My desire for using food delivery applications (e.g. foodpanda and GrabFood) in the near future is very weak (1) and very strong (5)
	DE4	If I can use food delivery applications (e.g. foodpanda and GrabFood) in the near future, I will not miss that opportunity
COVID-19 risk	COR1	I am afraid the delivery person is going to transmit COVID-19 to me
	COR2	Using food delivery applications (e.g. foodpanda and GrabFood) increases the risk of contracting COVID-19
	COR3	Using food delivery applications (e.g. foodpanda and GrabFood) is likely to increase the risk of being sick in general

Table A1.

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