Article

Supply Chain Sustainability during COVID-19: Last Mile Food Delivery in China

Yinan Lin [1], Rob Kim Marjerison [2,*] , Jeonghwan Choi [3] and Chungil Chae [4]

1   Warwick Business School, University of Warwick, Coventry CV4 7AL, UK; Yinan.Lin@warwick.ac.uk
2   Global Business, College of Business and Public Management, Wenzhou-Kean University,
    Wenzhou 325060, China
3   Management, College of Business and Public Management, Wenzhou-Kean University,
    Wenzhou 325060, China; jechoi@kean.edu
4   Data Analytics, College of Business and Public Management, Wenzhou-Kean University,
    Wenzhou 325060, China; cchae@kean.edu
*   Correspondence: rmarjeri@kean.edu

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Abstract: The COVID-19 pandemic triggered a strict 100-day lockdown period in Spring of 2020 in China. One of the consequences of the lockdown was the disruption of the food supply chain for the millions of people confined to their homes. The well-established online food delivery service (OFDS) in China were disrupted by pressure to scale up rapidly to resolve the last mile of food delivery. The importance of the OFDS during periods of crises became apparent, as did the realization that uninterrupted food distribution was only possible due to the presence and scalability of the existing delivery network. Focusing on the importance of an established OFDS as a foundation for food distribution, this paper seeks to explore factors that affect consumers' perception and acceptance of the retail food delivery system in urban China. By applying the extended theory of planned behavior (TPB), mean value calculation, univariate linear regression, and multiple linear regression have been adopted to test the hypotheses. Data obtained online from 260 participants demonstrate that the software's characteristics concerning *hedonic motivation* (HM), *convenience motivation* (CM), *perceived ease of use* (PEOU), *navigational design* (ND), *information quality* (IQ), *privacy and security* (PS), *restaurant credibility* (RC), and *perceived severity* (Psev) have positive and significant impacts on customers' *intention to use* (ITU), and thus, affects the *actual use* (AU) of the application in a positive way. The findings of this research contribute to the existing literature by consolidating, validating, and extending the TPB model, especially under the large-scale public health crisis circumstances. Customized practical insights are provided to emphasize developing HM, CM, Psev, and RC factors with maximal marginal effects that promote consumer acceptance; this is a prerequisite to the development of a robust OFDS. which can be repurposed during periods of crises to provide sustainable last-mile food delivery networks.

Keywords: food supply chain during crises; food distribution network; food delivery service; food supply chainduring COVID-19; sustainable food distribution; theory of planned behavior; China

1. Introduction

The importance of global supply chain sustainability has been brought to the forefront as a result of the COVID-19 pandemic (Pandemic). Millions of people worldwide have experienced periods of lockdown or self-isolation and have been reliant on the "last mile" of food distribution networks, sometimes for extended periods of time. While food delivery services were operational in most cities worldwide before the Pandemic, the distribution network in China was well established and operational. This proved to be fortuitous in March of 2020, when over one billion people were in lockdown on short notice; this resulted in extensive stress to the existing OFDS network, as it was called upon to increase capacity rapidly, and dramatically [1,2]. Under the immense pressure placed on delivery people, as

well as the technology platform, the food delivery network was able to repurpose and scale up quickly to provide crisis food distribution rapidly and very efficiently [3,4].

The formation and sustained presence of the delivery network could prove to be of vital importance during possible future periods of crisis, but such presence is heavily dependent upon consumer acceptance and use; therefore, exploration of the factors that affect consumer acceptance is of interest.

Technological development has dramatically changed consumption patterns and ways of life by promoting online transactions, e-commerce, and various online to offline (O2O) services [5], including the design of supply chains for increased sustainability and greater resiliency towards uncertainty [6]. According to Du and Tang [7], O2O is defined as the integrated business model achieved by mobile platform applications, combining online markets and offline commercial activities. Additionally, through digital application and interaction enhancement, the Web 2.0 era generates a vast pool of internet users contributing to an enormous consumption network [8].

The logistics of food delivery has taken on increased importance in recent years including an emphasis on environmentally conscious and sustainable logistics [9]. Food delivery from farm to fork (F2FO) has likewise become a topic of growing interest in recent years and has taken on increased relevance during the Pandemic of 2020 [10–12]. F2FO is a term commonly used to describe food supply chains that are focused on the delivery of local and regional agricultural products within a limited geographical area [11]. In addition to the costs associated with food delivery—both direct logistical expense and value lost due to shrinkage—since the Pandemic, there has been the added complexity of lockdowns and the limited movement of transport systems [13,14]. One consequence of the combined interest in F2FO and the added complexity of food distribution during the Pandemic has been a renewed interest in local food production in urban and peri-urban areas [15,16]. While urban agriculture has an important role to play in food chain sustainability and security [17], an in-depth exploration of urban agriculture is outside the scope of this study, and well worthy of exploration.

In the last mile (LM) of the food delivery network, the catering and food delivery market faces fierce competition and has become a large industry due to the introduction of online food delivery service (OFDS); these are driven by the technology and high level of adoption of mobile devices and applications to order food and process financial payments [18]. This digital-based commerce has rapidly substituted traditional shopping behavior. As a multi-function online platform, OFDS offers a wide range of food choices, mostly from micro and small enterprises (MSEs) to consumers, and completes a series of related services, including taking and retransmitting orders and monitoring transactions, and tracking delivery processes [19]. Food delivery applications such as Deliveroo, Meituan, and Uber Eats have emerged as a new service within the economy.

Especially during the first 100 days of the COVID-19 Pandemic in Spring of 2020 in China, the opportunity for OFDSs was magnified, and consequently strengthened, due to the strict indoor restriction policy [20]. To be specific, the OFDS gives consumers access to prepared meals within a short distance and allows businesses to continue operating. Observing the unpredictable nature of unfolding events in their present form, frequent use of OFDS will likely be a long-lasting and intensifying trend for consumers [21].

The OFDS market in China existed successfully prior to the Pandemic, but has increased in usage and is now one of the leading models globally. Nearly all kinds of foods, including traditional and specialty foods such as the popular "hot pot" menu items, can be delivered at customers' will, and at attractive price and quality. In 2019, China's O2O food ordering industry experienced 20% annual growth, and a 30-fold turnover in usage reaching 579 billion Renminbi (RMB) [22].

As indicated in Figure 1, the number of Chinese OFDS users has increased dramatically from 75 million to 650 million from 2015 to 2020 [23]. Consequently, the booming user base led to revenue growth from 3.2 billion dollars in 2015 to 51.5 billion dollars in 2020 according

to Figure 2; this was represented by two leading food delivery applications, Meituan Dianping and Alibaba's Ele.me, with a combined total revenue of 7 billion dollars [24].
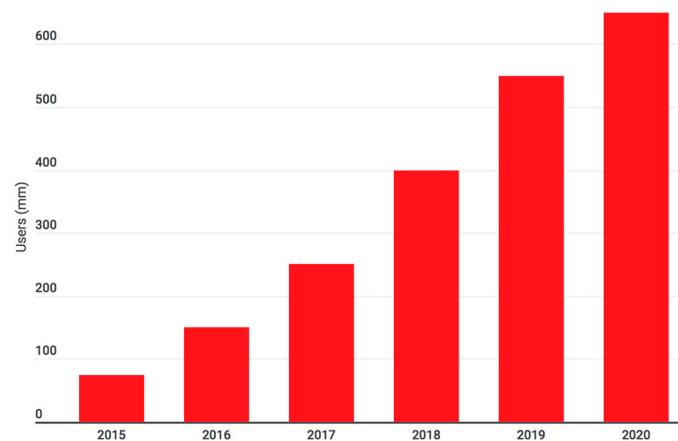
China Food Delivery App Users

Figure 1. China food delivery app users Copyright 2021 by Daxue Consulting, Goldstein Research, Forbes, FT.
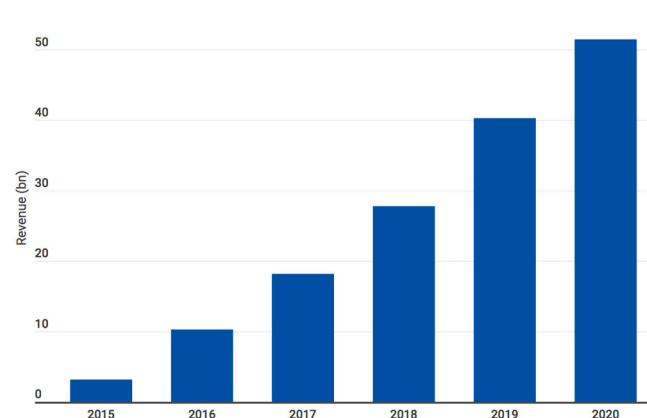
China Food Delivery App Revenue

Figure 2. China food delivery app revenue Copyright 2021 by Statista, Forbes.

Meanwhile, as pictured in Figure 3, from the specific perspective of the OFDS sector in China, the Meituan group's market share underwent a rather large surge in usage from 2019 to 2021. Compared to other brands, as well as being part of a continuingly growing trend, the Meituan Delivery (MD) application is an ideal and representative case for investigating the research subject selection for this study [25].

MD is one of the most successful online services in the Meituan corporation, with a 65% market share in the OFDS market in China. MD has become a food delivery giant, hitting a valuation of 100 billion dollars during the peak of the Pandemic. Their huge consumer and merchant base and extensive network of delivery persons and vehicles enabled them to achieve substantial growth, even during the Pandemic. For instance, the gross transaction value of the MD food delivery business increased from 24.5% to 488.9 billion RMB within a few months in the Spring/Summer of 2020 [26]. The extraordinary financial performance during 2020 demonstrates a combination of customers' preferences, ongoing trust, recognition of food delivery as a valuable service, and the resilience and scalability of MD's business model. MD's business strategy in 2020 was to focus on expansion in lower-tier, mid-sized cities, and for the main growth driver to be attracting new users and food memberships (frequent user discounts) to retain high-potential consumers with high

repurchase rates [27]. Additionally, consumption scenarios other than typical meals proved to be an area of growth, including such offerings as afternoon tea and midnight snacks.
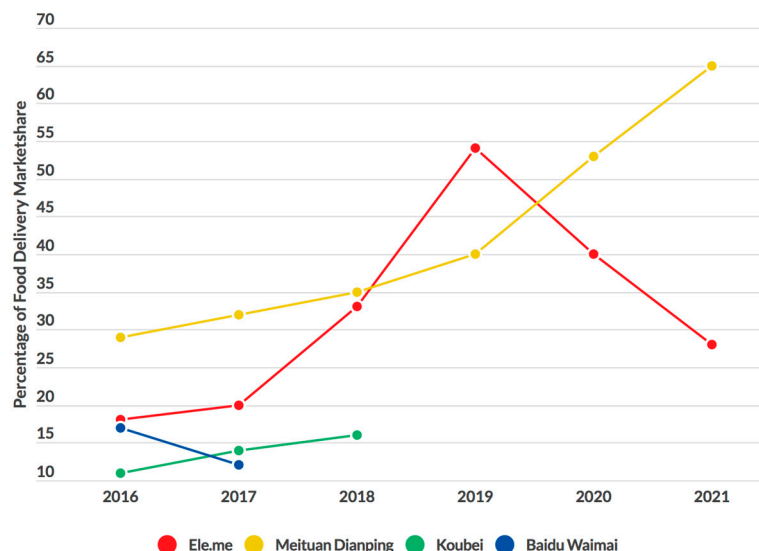
China Food Delivery App Market Share

Figure 3. China food delivery app market share. Copyright 2021 by Daxue Consulting, Forbes, TechNode.

As shown in Figure 4, business in the food delivery segment of Meituan Dianping not only plays a critical and major role in revenue generation, but has also experienced a consistent pattern of growth from 2017 to 2020, more than tripling revenue during that time period [28].
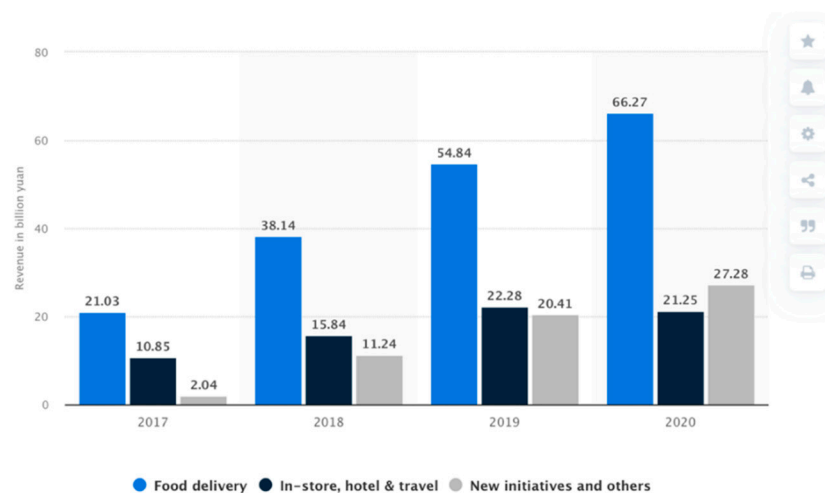
Figure 4. Annual revenue of Meituan from 2017 to 2020, by segment Copyright 2021 by Statista.

Although the O2O food delivery industry has seen great success in the last several years, it appears to have reached market saturation and is now in the maturity phase with more intensive competition [29]. As a consequence, companies are required to adapt and establish customer-centered strategies for sustainably developing the business model. These strategic needs are the subject of this study and are part of the value of the findings, specifically, to bridge gaps in the existing literature of Chinese OFDS.

As a consequence, two research questions are put forward:

RQ1: What factors affect Chinese customers' intention to use the Meituan Delivery app?

RQ2: What is the relationship between customers' intention to use and actual use of the Meituan Delivery app?

After presenting the research introduction in this part, five separate sections are as follows. The literature review in Section 2 will examine concepts related to, and supporting, the development of RQ 1 and RQ 2 and will highlight the research questions. The research methodology will be discussed in Section 3, followed by Sections 4 and 5, consisting of the analysis and findings, and discussion and implications, respectively. Finally, Section 6 will present the conclusion.

2. Literature Review

2.1. Research Gap

Jun et al. [30] reported that consumers in the US were more likely to use OFDSs since the Pandemic and indicated that further research was warranted both in other cultural settings and in a larger geographical setting. The same study was focused on consumer acceptance of technology leaving a gap regarding the intention to use OFDSs, and recommended further exploration in that area. Dsouza and Sharma [31] reported on the changes in consumer expectations in the OFDS sector during COVID-19 in India, and likewise suggest that further research is warranted, specifically in China, due to the enormous economically advanced population. A similar study in Algeria explored the TPB and intention to use OFDSs, and emphasized the need for research in a setting that is both larger, and that possessed a more developed OFDS prior to COVID-19 [32].

While there exists substantial work in the recent literature on OFDSs prior to COVID-19, and limited but relevant research on OFDSs since the Pandemic, there exists a distinct gap in the existing literature on the topic of this paper; specifically, there is a gap in the application of the theory of planned behavior to examine the factors that most influence Chinese consumers' perceptions and use of OFDSs during and since the COVID-19 pandemic, within the context of the complete lockdown in Spring of 2020, when OFDSs effectively transformed into the last mile food delivery network for tens of millions of people. This topic is an area of relative under exploration and worthy of consideration, from the perspective that only through consumer acceptance of OFDSs can the networks be established and sustained.

It is important to note the context of this study; specifically, external factors were relatively controlled and limited by the presence of a well-developed OFDS prior to COVID-19, the rapid and complete lockdown of the population at the time the data were gathered, and the size of the geographic area and population involved.

The specific aim of this research is to determine which factors are applicable in predicting both customer *intention to use* (ITU) and *actual use* (AU) in the OFDS market during the Pandemic, within the geographic context of China, by applying the extended theory of planned behavior (TPB) approach. The MD application is used as the study object because it is currently the most influential food delivery application in China and currently has the largest user base [33]. The theoretical research framework adapted from TPB targeting OFDS is used in this study to investigate the influencing factors towards customers' intent to use the MD application's service, as well as the relationship between *ITU* and *AU*. An examination of the relationships between these factors will enable an empirical test of the model validity in the MD application's use within the Chinese context and during a strict lockdown situation.

2.2. O2O Business and OFDS

The O2O business model provides opportunities for users to engage with integrated online and offline activities, thanks to the prevalence of mobile devices. O2O applications can moderate fluctuating demand by matching unsold items and services that cannot be stored for sale at a later time, and in doing so, utilize resources effectively [34]. In this way, sufficient information exchange can be realized, and resources can be optimally exploited due to the development of mobile phone-based communication technology. The development of O2O e-commerce is unprecedentedly prosperous worldwide, especially in Asia, and in various industries such as dining, transportation, tourism, and sharing

space [35]. More recently, the O2O food delivery industry has emerged as the third-party platform connecting individual customers and native restaurants to arrange online orders and deliveries [36]. Furthermore, restaurants without offline sites can make full use of the OFDS through specific digital platforms to gather scattered customers by saving on rent, logistic fees, and utility bills [37].

2.3. OFDS in China

The proliferation of smartphone adoption and last-mile logistics in China has resulted in the rapid expansion of Chinese e-commerce. With the adoption of digital devices, including mobile phones and tablets, there are more than one billion mobile service users in China [38]. As an alternative strategy, adaptive Chinese mobile application developers have targeted these innovative opportunities in the restaurant and food delivery industries by providing suitable products and services to increase sales revenue and profit. This combination of circumstances has enabled the rapid development of OFDSs, with China being an excellent example of the fast-moving development of the emerging online catering businesses [39]. Research suggests that the Chinese market for OFDSs increased from $3.4 billion to $32.5 billion between 2011 and 2017, accompanying the growing customer base, which expanded from 114 million to 343 million in the two years preceding 2017. In terms of the benefits brought by OFDSs, food is more readily available, accessible, and convenient [40]. Thus, the establishment of the new consumption habits of Chinese online users is a major reason that has driven the OFDS industry growth in China, which is predominantly dominated by the millennial group. The 2019 statistics show that 86.3% of primary OFDS platform use was contributed by customers aged 20 to 34 years in the first half-year [40].

As a consequence, an OFDS is a win–win solution for both take-out food merchants who have lower operating expenses and increased sales revenue, and consumers pursuing convenient dining experiences [41]. The timing of the emergence and rapid increase in the adoption of OFDSs in China proved to be very fortunate when in March of 2020, the entire nation was put into strict lockdown at very short notice [42]. For millions of people in lockdown, the last mile food distribution network was already in place and operational.

2.4. Theory of Planned Behavior in OFDS

2.4.1. Theory of Planned Behavior

The TPB is an established and well-accepted framework for recognition and measurement of the determining factors of behavioral intention and actual response, including consideration of the influence of individuals and society. TPB is widely applied to explain technology adoption behaviors [43]. After the development of the previous theory of reasoned action (TRA) and with the proposal of "perceived behavioral control", TPB was proposed in 1985 to combine "attitude" and "subjective norms" to better reflect individuals' actual behavior by analyzing behavioral intention. Over time, TPB has been expanded to various fields, including user interaction within online communities, O2O services, the intention of students to apply novel technology, drone delivery, and digital service [44–46]. In this study, individuals' intention is the central element of the framework and will be used to determine influencing factors towards actual behavior and to measure their willingness to exert the behavior.

Within the OFDS domain, Chen et al. [46] applied external and internal factors in TPB to discuss behavioral intention. Different motivations and benefits such as social norms, hedonic pursuit, convenience levels, savings in price, and time are tested to extend the TPB model [47]. Additionally, online grocery purchasing behavior has been studied using TPB [48], while personalities are tested as constructs in the model [49]. Overall, these factors are of critical value for business managers of online platforms, as they seek to improve applications' products and services.

2.4.2. Factors That Affect Intention to Use OFDS

1. Hedonic Motivation

Hedonic value can be gained by acquiring products, accomplishing work, and getting pleasure in the shopping process, and is valued based on perception, emotion, and imagination [50]. According to Alalwan et al. [51], hedonic value is able to positively impact an individuals' satisfaction and continued using intention when applying O2O services. Childers et al. [52] also indicate that consumers' hedonic value serves as one of the most significant elements regarding online shopping intentions. Based on results from these earlier studies, hedonic value has a very significant effect on consumer behavior online. Therefore, the first hypothesis is formulated as follows:

Hypothesis 1 (H1). *Hedonic motivation positively impacts consumers' intention to use, in the Meituan Delivery application's case.*

2. Convenience Motivation, Perceived Ease of Use, Navigational Design

Evidence suggests that in many situations, people in China feel busier than they have felt in the past [53]. Partly due to rapid urbanization, time becomes less of an option as people are getting busier, which brings increased importance to anything that can add convenience to daily life. Therefore, individuals are more inclined to use OFDSs to save time, instead of preparing food themselves or spending a few minutes of time eating offline at a specific physical place [54]. In terms of the convenient feature of OFDSs in savings of time, effort, and money, some researchers suggest that *convenience motivation* (CM) impacts perceived usage positively [55,56] As a consequence, the following hypothesis is proposed:

Hypothesis 2 (H2). *Convenience Motivation positively impacts consumers' intention to use MD.*

The flexibility to use OFDSs provides opportunities for people to conduct transactions whenever and wherever possible, and previous research has identified perceived ease of use as an important factor in consumer use of ODFSs; this is reported as a gap in the existing literature and is a suggested area for further research [30]. Consumers are often motivated by time constraints when making purchase decisions and are more likely to engage in OFDSs if they perceive the process as easy [57,58]. As a consequence, the following hypothesis is proposed:

Hypothesis 3 (H3). *Perceived ease of use* (PEU) *positively impacts consumers' intention to use MD.*

The availability of an easy-to-use OFDS *navigational design* (ND), that offers intuitive use and access to information during the use process, can be valuable and is likely to be adopted [59]. As a consequence, the following hypothesis is proposed:

Hypothesis 4 (H4). *Navigation design positively impacts consumers' intention to use MD.*

3. Information Quality

In the current era of convenient access to information, consumers expect comprehensive and up-to-date information in order make informed buying decisions. This is especially true in changeable market environments and conditions, and in the application of efficient technology [60]. Structured and qualified information on mobile applications can boost users' faith in the technology. Conversely, if consumers doubt the accuracy or information in online applications, they are less likely to use that service [31]; moreover, erroneous messages will negatively impact users' behavior in general, specifically towards OFDS apps, resulting in increased reluctance and decreased trust [59,61]. Thus, this study further hypothesizes that:

Hypothesis 5 (H5). *Information quality positively impacts consumers' intention to use, in the Meituan Delivery application's case.*

4. Privacy and Security

Individual information security is a pivotal element in the internet era, creating threats towards payment safety and personal data storage during digital transactions [62]. Information privacy is perceived as a factor of great importance during the use of mobile applications for many purposes, including online shopping [63] and, in particular, financial activities [64]. Users will be more inclined to use OFDSs if the security of the process is assured [64,65]. Therefore, a sixth hypothesis is put forth:

Hypothesis 6 (H6). *Privacy and security positively impact consumers' intention to use, in the Meituan Delivery application's case.*

5. Restaurant Credibility

Restaurants with high brand awareness are more likely to attract customers for business, and credibility is one of few selecting standards that can be measured online, thus, the reputation and rating of merchants is an influencing factor when using OFDSs. For instance, customers are more willing to order from merchants with a higher number of feedback ratings as it is perceived that those businesses will more likely ensure quality and availability [66]. In conclusion, the following hypothesis is put forth:

Hypothesis 7 (H7). *Restaurant credibility positively impacts consumers' intention to use, in the Meituan Delivery application's case.*

6. Perceived Severity of COVID-19 Pandemic

The sudden outbreak of the COVID-19 Pandemic forced governments to launch massive restriction policies and social-distancing policies, affecting offline public venues such as restaurants and gyms, which were compelled to temporarily close for health concerns [67,68]. From the perspective of individual safety, people were alerted to avoid gathering in groups, and to reduce going to public spaces to minimize the potential of being exposed to the virus [69]. Previously, many people, especially younger users, had already formed the habit of choosing various food options online. What changed was the increased use of OFDSs by other age groups, particularly middle-aged and elderly consumers, to access a suitable and effective solution to obtain food, prepared and not prepared, without the risk of getting infected [70]. Consequently, the following hypothesis is proposed:

Hypothesis 8 (H8). *Perceived Severity (Pandemic) positively impacts consumers' intention to use, in the Meituan Delivery application's case.*

2.4.3. Intention to Use and Actual Usage of OFDS

Intention to use (ITU) is defined as the probability of an individual performing certain behaviors, and can be a predictor of wishes to adopt an online service technology and purchase behavior [71–73]. The intention is related to identifying motivators for people's willingness to attempt a specific behavior, and the levels of effort they are committed to exert toward the behavior. These motivators will impact behaviors [74,75]. Previous research suggests that behavioral *ITU* and customer experience are correlated with each other [76]. In this research, the *ITU towards* OFDSs is explained as a person's intention to pay for food and beverage through online delivery platforms and applications [47,77].

Attitudinal attention towards *ITU* technology has been widely investigated using the TPB model [64,78,79]. The latest research has applied TRA and TPB model as the foundation to study behaviors on internet purchase procedures concerning paying for goods, services, and information online [80]. Additionally, OFDSs can impact not only users' behavior, but also the continuance of intention to apply itself. Research conducted

during and since the Pandemic reports that subjective norms, individual attitude, credibility, and risk consciousness are critical elements in driving behavioral intention to apply OFDSs, by combining the Technology Acceptance Model and TPB [81]. Consumers that are willing to use, or open to the idea of using OFDSs are more likely to actually engage in using OFDSs. In conclusion, the last hypothesis is delivered:

Hypothesis 9 (H9). *Intention to use positively impacts consumers' actual usage, in the Meituan Delivery application's case.*

For further clarity, a summarized table of listed hypotheses is presented below as Table 1.

Table 1. Summary of Hypotheses.

Hypothesis	Relationship	Hypothesized Relationship
H1	HM → ITU	Positive
H2	CM → ITU	Positive
H3	PEOU → ITU	Positive
H4	ND → ITU	Positive
H5	IQ → ITU	Positive
H6	PS → ITU	Positive
H7	RC → ITU	Positive
H8	Psev → ITU	Positive
H9	ITU → AU	Positive

2.5. Research Model

In summary, the adapted conceptual framework of this research is shown in Figure 5, building on prior research [82] to explore the influencing factors towards *ITU* and *AU* of the OFDSs in the case of the typical OFDS MD application, within the Chinese context during the COVID-19 Pandemic.
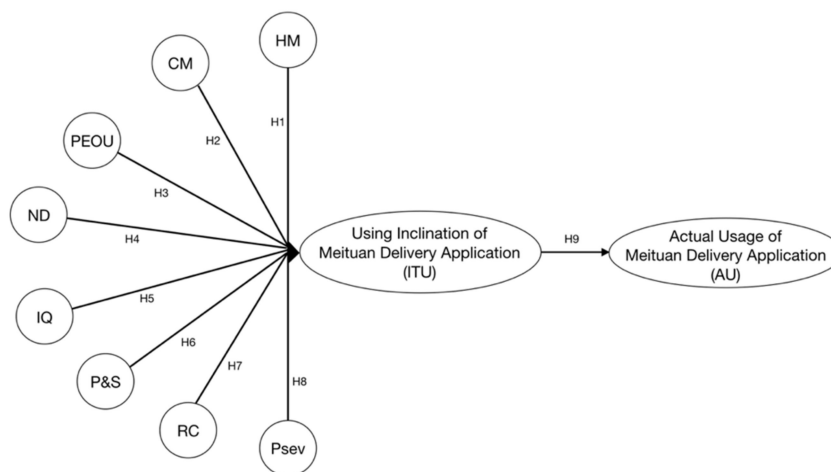
Figure 5. Theoretical framework.

3. Research Methodology

3.1. Sample and Data Collection

A quantitative methodology was applied in this research utilizing data from an online survey. An online survey as a data collection tool offers a variety of benefits, including wide geographic coverage, anonymity for respondents, a decreased bias level compared to the pressure given by in-person interviews, and, importantly, cost-saving [83]. Easily understood and neutral language was used during the survey design to facilitate the participant's comprehension of the material. Items in the survey from which the data were

derived for this study were, in turn, adapted from previous studies and used with minor modification for context. The survey items used in the previous study were initially written in English, so the survey was translated from English to Chinese. To validate the question translation, the survey translation was checked by two native Mandarin speakers with PhDs from western universities and then translated back into English. This translation and back-translation approach is a widely applied technique in cross-cultural social research to achieve translation accuracy and credibility with minimized differences [84]. Additionally, the survey was distributed to a pilot group of six people for trial and adjusted according to their feedback to assure the translation accuracy, proper length and time taken, as well as the ease of understanding.

The primary research sample data were collected by distributing self-administered online surveys via the Wen Juan Xing platform, an online survey software, to MD application users in China. The platform is widely used in China for online surveys, customer feedback, and for posting product and service reviews. Due to the significant market penetration by the MD application, nearly all smartphone users are familiar with the app and were therefore qualified for inclusion in the survey. Due to the online sharing behavior of the survey link on WeChat, the most widely adopted social media platform in China, a snowball sampling effect was caused [85]. A total of 268 surveys were obtained through convenience sampling from voluntary, anonymous respondents. After inspection, eight invalid or incomplete responses were removed from the original sample, resulting in a final number of 260 valid responses for the sample.

Details of demographics are presented in Table 2. There are 175 female (67.31%), 83 male (31.92%), and two special-identified-gender users. Respondents are nearly equally distributed into four age groups up to 54 years old, from 31.54% to 19.62%, with about a 4% decrease. The individual average payout per month of users' monthly income for most of the participants falls in the 2000–4999 RMB slot with 119 (45.77%), followed by 64 people in the 5000–7999 RMB range (24.62%). In addition, most of the respondents are employees, accounting for 70% of the sample, or 182 individuals. The students' percentage is 18.46%, with 48 people. With regard to educational background, most respondents are of university undergraduate level, tertiary education as well as postgraduate and over, with a ratio of 70%, 12.69%, and 12.31%, respectively. This is consistent with expectations, as the smartphone adoption rate among the first age group is known to be disproportionately high. Lastly, the monthly frequency of the MD application was interesting; three-quarters of participants used the service 1–9 times a month, as expected. Surprisingly, two users demonstrate their extremely high application usage rate, reaching 60 times per month, suggesting the possibility of deep penetration of OFDSs, considering the large population of China.

3.2. Instrumentation

The dependent and independent variables were gauged by using tested measurement approaches and scales. Customers' *using intention* of the MD application included eight factors serving as independent variables in the conceptual model. The instrument utilized the well-established measurement tool of the seven-point Likert scale ranging from 1 to 7, representing participants' attitudes from 'strongly disagree' to 'strongly agree'. The 7-point Likert scale is recognized as a reliable tool to optimize the credibility of research in business, as well as the social sciences domains [86]. The dependent variable *actual usage* was likewise weighed by three 7-point Likert scale questions. The survey questions that aimed to gather non-demographic data on the respondents are included in Figure 6, while the entire survey instrument is included as an Appendix A.

3.3. Survey Design

3.3.1. Survey Questions on Using Intention of the Meituan Delivery Application

ITU towards OFDS, in this case, the MD app, was measured by previous research designs through the scales described above. There are eight *using intention* related factors consisting of twenty-four items in total (three items each).

The testing scale for *hedonic motivation* (HM) was adapted from the research of Yeo, Goh, and Rezaei [47] and Prabowo and Nugroho [87]. The items for *CM* originated from Chai and Yat [88] and Kimes [36]. The *perceived ease of use (PEOU)* and *privacy and security* (PS) items in the survey were contributed from the research of Suhartanto et al. [89]. Items concerning *ND* and *information quality (IQ)* were adapted from the work of Kapoor and Vij [90] and Lee, Sung, and Jeon [29]. Restaurant credibility (RC) was gauged by items adapted from Han, Nguyen, and Lee [91]. In addition, previously tested scales towards the *perceived severity* (Psev) of the Pandemic were employed [82]. Lastly, the *ITU*, which was derived from the above factors, was weighed through three items derived from Lee et al. [29].

Table 2. The Demographics of the Valid Sample.

Variables		Frequency	Percent (%)
	Male	83	31.92%
Gender	Female	175	67.31%
	Others	2	0.77%
	15–24	82	31.54%
	25–34	66	25.38%
Age	35–44	57	21.92%
	45–54	51	19.62%
	55+	4	1.54%
	<2000	27	10.38%
Average Monthly	2000–4999	119	45.77%
Expenditure	5000–7999	64	24.62%
(RMB)	8000–10,999	32	12.31%
	11,000–13,999	7	2.69%
	14,000+	11	4.23%
	Students	48	18.46%
Occupation	Self-employed	18	6.92%
	Employee	182	70.00%
	Household wife/husband	12	4.62%
	High school or under	12	4.62%
	Tertiary education	33	12.69%
Education	Undergraduate	182	70.00%
	Postgraduate and over	32	12.31%
	Others	1	0.38%
	1–9	195	75.00%
	10–19	40	15.38%
	20–29	14	5.38%
Using Frequency			
of Meituan Delivery app	30–39	6	2.31%
(times in a month)			
	40–49	3	1.15%
	50–59	0	0.00%
	60+	2	0.77%

Note: N = 260.

Factors	Items	Measures
Hedonic Motivation (HM)	HM1	I find that using Meituan Delivery App is enjoyable.
	HM2	I use Meituan Delivery App for fulfilling both my basic need and enjoyment.
	HM3	I usually spend more using Meituan Delivery App rather than buying it by myself due to minimum purchase and promotion.
Convenience Motivation (CM)	CM1	I can use Meituan Delivery App to make an order anywhere and anytime.
	CM2	I feel that using Meituan Delivery App can reduce my travel effort to buy food/beverages.
	CM3	I think that Meituan Delivery App helps me to save time compared with going to stores for goods in person.
Perceived Ease of Use (PEOU)	PEOU1	I can easily find things that I need in Meituan Delivery App.
	PEOU2	I can complete a transaction quickly at Meituan Delivery App.
	PEOU3	I feel that Meituan Delivery App is well-organized in terms of design and position.
Navigational Design (ND)	ND1	I feel that Navigation Bar in Meituan Delivery App is helpful.
	ND2	I think that dynamic filler helps me to find restaurants or dishes that I look for.
	ND3	I think that order tracking status is essential to customers in Meituan Delivery App.
Information Quality (IQ)	IQ1	I find that Meituan Delivery App provides me with up-to-date information related to restaurants, food, and discount.
	IQ2	I enjoy using Meituan Delivery App because it gives me trustworthy information.
	IQ3	I think that Meituan Delivery App provides information at the right level of detail that I need.
Privacy and Security (PS)	PS1	I feel secure because Meituan Delivery App has protective payment instrument steps before the transaction occurs.
	PS2	I think that verification steps before using both for users and deliverers can reduce the privacy and security risk.
	PS3	I think that Meituan Delivery App provider has the responsibility of not giving personal information to other agents.
Restaurant Credibility (RC)	RC1	I think that the restaurant rating in Meituan Delivery App helps me to decide in making an order.
	RC2	I also concern with the number of ratings related to the restaurant in making an order.
	RC3	I think that the availability of offline restaurants influences me to make an order.
Perceived Severity (Psev)	Psev1	I understand social distancing regulations, so I choose to use Meituan Delivery App instead of dining in or buying it by myself.
	Psev2	I am afraid to dine in a restaurant due to the covid-19 pandemic.
	Psev3	I feel that Meituan Delivery App helps me to satisfy my craving for food during the covid-19 pandemic.
Actual Use (AU)	AU1	When buying food, I always use Meituan Delivery App.
	AU2	I always check the available food/restaurant at Meituan Delivery App.
	AU3	I always check the notification and promotions of Meituan Delivery App.
Intention to Use (ITU)	ITU1	I intend to continue using Meituan Delivery App.
	ITU2	I will use Meituan Delivery App in my daily life in the future.
	ITU3	I plan to continue to use Meituan Delivery App frequently.

Figure 6. Survey questions. Note: This figure is original.

3.3.2. Survey Questions on Actual Usage of Meituan Delivery Application

To measure of the actual usage of the MD application, this study applies a combination of the measurement scales developed and used in the related research of Rivera, Suhartanto and Prasetyo et al. [59,89,92] in the OFDS field. For *frequency of use*, level of *attention paid*, and *check frequency* by users towards information, the latest notification and promotion can be a practical approach to estimate user penetration and extent of practice [93].

4. Analysis and Findings

4.1. Analysis

Analysis of the data, including Cronbach's alpha, univariate linear regression, and multiple linear regression, were conducted successively using IBM SPSS Statistics Version 25. The means of factors were also calculated and plotted to measure the overall level of MD applications in each perspective. The detailed methodology of empirical research, quantitative methods, including means of factors, Cronbach's alpha, univariate linear regression, and multiple linear regression were adopted to analyze the data.

Structural equation modeling has been used effectively in some notable studies with characteristics in common with this one, particularly for examination of supply chain sustainability [94,95], and other research utilizing online surveys have employed linear regression analysis [96–99] For this study, a multiple regression analysis was employed as part of the methodology for the following reasons: firstly, means of factors were calculated to observe the performance of individual factors compared to the full scale, and also to see the overall level, to ultimately better identify the gap and where future progress can be

made; secondly, Cronbach's alpha was applied to measure internal consistency between a set of items, and to further investigate how closely they are related to each other as a group, as well as to measure the scale reliability [100]. Researchers apply this method to assure the credibility of the data among multiple items measuring a single factor, to finally confirm the reliability of the dataset [101].

The rationale for considering the usage of linear regression is that, compared to some machine algorithms, it has a considerably lower time complexity [102]. Considering the causal effect, this research requires distinct methods to conduct analysis, thus producing precise and explicable results. An evident advantage of linear regression models is linearity, which makes the estimation procedure simple and can be interpreted and understood in an accessible manner [103]. In this way, linear and similar models are widespread in academic and quantitative research fields, including psychology, social science and medicine [104,105]. For instance, it is not only used to predict the outcome of a patient in the medical domain, but also to generate a quantified impact of the drug while taking several variables such as sex and age into consideration, thus ensuring clear interpretation of the results [106]. To be specific, univariate linear regression focuses on determining the relationship between one explanatory variable and one dependent variable, which makes researchers interpret the results in a more explicit way [107]. At the same time, multiple linear regression enables investigators to apply several explanatory variables to predict the outcome of the dependent variable within one model, leading to a more precise and refined relationship between individual factors and the outcome [108,109].

Consequently, the results can be explained, and the reliability of the research can be assured, by combining these two regression methods. In order to present the real-time performance of the MD application and its users' *ITU* and behavior related to the application, means of separate factors were obtained initially by averaging the factors, after obtaining the mean of each item, to see the integrated performance from each aspect. As shown in Figure 7, all ten numbers are located at level 4 to 5 stability, explicitly ranging from 4.465 to 5.506. The two lowest values under 5 are AU at 4.465, HM at 4.477. Although the result of the MD application's factorial performance is passable, having not fallen into the low-level range of under 3.5, there is still a considerable range in the gap to reaching 7.
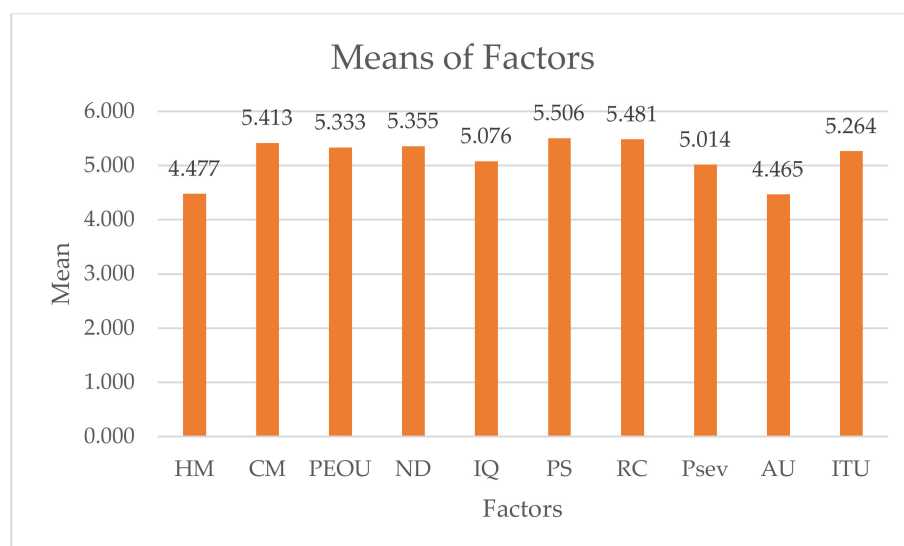

Figure 7. Means of factors.

Secondly, to assure the reliability of the data among multiple items measuring a single factor, a set of item's related degree in each dimension was measured by calculating Cronbach's alpha, a well-known tool for measuring internal consistency [100]. In the case of this research, after the calculations, the result of Cronbach's alpha in each dimension is shown in Table 3 for HM (0.731), CM (0.875), PEOU (0.832), ND (0.790), IQ (0.903), PS

(0.788), RC (0.792), Psev (0.725), ITU (0.937) and AU (0.878). According to Taber (2018), reliability coefficients of 0.7 or higher in Cronbach's alpha test are acceptable in the social science research domain, with higher reliability over 0.8. Based on the results, all of the tested item factors present satisfactory results with numbers higher than 0.7, indicating a robust correlation between relevant items and, thus, the reliability of the data. Moreover, factors including CM, IQ, ITU, and QU even reached around 0.9, demonstrating a relatively high inner consistency. As a consequence, all of the collected data are considered to be reliable in each dimension after Cronbach's alpha test, and were subsequently adopted for further analysis.

Table 3. The Cronbach's Alpha Reliability Test.

	HM	CM	PEOU	ND	IQ	PS	RC	Psev	ITU	AU
Cronbach's Alpha	0.731	0.875	0.832	0.790	0.903	0.788	0.792	0.725	0.937	0.878

After confirming the reliability of the dataset, two types of regressions were implemented to test the formulated hypotheses and further increase the credibility and robustness of the results. Items' values for each factor were averaged initially, then the averaged numbers in each dimension were applied in regression analysis. Detailed explanations are as follows.

The univariate linear regression was primarily conducted to test each hypothesis between each pair of factors. Specifically, the value of the beta coefficients, R squared, F, and *p*-value, are presented in Table 4. For Hypothesis 1, a simple linear regression was adopted to evaluate whether the HM of MD application users significantly predicts their *ITU* certain smartphone software. The dependent variable ITU was regressed on the independent variable HM to test hypothesis 1. The information in the first row of Table 4 suggests that $F_{(1, 258)} = 174.780$, $p < 0.001$, which indicates that the HM can play a significant role in shaping ITU ($\beta = 0.642$, $p < 0.001$). Additionally, $R^2 = 0.404$ for HM explains 40.4% of the variance in ITU in the model. As a consequence, a significant, and positive impact of HM on ITU is supported.

Table 4. The Univariate linear regression.

Hypothesis	Regression Weights	Beta Coefficient	R^2	F	*p*-Value	Percent Increase in Dependent Variables	Hypotheses Supported
H1	HM → ITU	0.642 ***	0.404	174.780	<0.001	12.196%	Yes
H2	CM → ITU	0.692 ***	0.495	253.131	<0.001	13.146%	Yes
H3	PEOU → ITU	0.749 ***	0.431	195.678	<0.001	14.229%	Yes
H4	ND → ITU	0.789 ***	0.448	209.618	<0.001	14.989%	Yes
H5	IQ → ITU	0.730 ***	0.463	222.156	<0.001	13.868%	Yes
H6	PS → ITU	0.741 ***	0.383	159.841	<0.001	14.077%	Yes
H7	RC → ITU	0.679 ***	0.332	128.420	<0.001	12.899%	Yes
H8	Psev → ITU	0.630 ***	0.342	134.304	<0.001	11.968%	Yes
H9	ITU → AU	0.807 ***	0.495	253.289	<0.001	18.074%	Yes

*** indicates a significance level of 1%.

Likewise, H2 has been examined concerning how *CM* can positively influence the *ITU* and is supported by the results. $F_{(1, 258)} = 253.131$, $p < 0.001$, $\beta = 0.692$, $p < 0.001$. $R^2 = 0.495$, suggesting that 49.5% of ITU variance was explained by CM. Hypothesis 3 assumes that *PEOU* can positively predict the *ITU towards* MD application, the result $F_{(1, 258)} = 195.678$, $p < 0.001$, $\beta = 0.749$, $p < 0.001$ supports the statement, and $R^2 = 0.431$ suggests that PEOU explained 43.1% of ITU's variance within the construct. Accordingly, the value of $F_{(1, 258)} = 209.618$, $p < 0.001$, and $F_{(1, 258)} = 222.156$, $p < 0.001$ indicate that

the *ND* and *IQ* of the MD application significantly and positively impact the *ITU* (β = 0.789, $p < 0.001$, and β = 0.730, $p < 0.001$). The R^2 values at 0.448 and 0.463 suggest that ND and IQ explain 44.8% and 46.3% of the variance of ITU, respectively; thus H4 and H5 are strongly supported.

Similarly, Hypotheses 6–8 regarding *ITU* are positively influenced by the software's *PS* level. RC within the application and the individual Psev of the pandemic could be credibly supported by the calculated results shown as $F(1, 258) = 159.841$, $p < 0.001$, β = 0.741, $p < 0.001$; $F(1, 258) = 128.420$, $p < 0.001$, β = 0.679, $p < 0.001$ and $F(1, 258) = 134.304$, $p < 0.001$, β = 0.630. In terms of R^2 specification, the variance of ITU is explained by PS, RC and Psev at 38.3%, 33.2%, and 34.2%, respectively. Finally, as stated in hypothesis 9, individuals' *ITU towards* the MD application has impact on actual usage of customers in a positive way, which can also be supported by viewing the statistics in the last row, $F(1, 258) = 253.289$, $p < 0.001$, β = 0.807, $p < 0.001$. The value of $R^2 = 0.495$ suggests that 49.5% of AU variance is explained by ITU, as expected.

The economic meaning of the model is compelling; HM is taken as an example for illustration, HM's beta coefficient at 0.642 conveying the message that, with the increase of one unit of HM, ITU will be promoted by 0.642 units at the same time; additionally, each unit increase in HM can lead to the growth of ITU's mean level by 12.196%, and all other factors follow. Table 4 presents the summary of the findings of the univariate linear regression.

Critical data in the model result, including the R^2 and P-value, will be briefly summarized. All values of R^2 are above 0.33; six of them are higher than 0.4, among which two of them even approach the 0.5 level at 0.495. Based on previous research, the R-squared value standards differ between study fields, e.g., pure science and social science [110]. Although a relatively significant R-squared, higher than 0.6 is required in pure science for particles, behavior can be more accurately predicted with higher accuracy. A value of 10% is already acceptable in domains including the humanities and social science due to the high variability of human actions, which is not forecastable. In this way, the values of R^2 in this research provide a convincing result, demonstrating and validating the formulated hypotheses from 1 to 9 effectively. With regard to P-value, all significances of coefficients are below 0.01, depicting the significance level of 1% within expectation. Consequently, based on the results of the univariate linear regression, all nine hypotheses are reasonably supported.

In addition, to increase the credibility of the result above, H1 to H8 were further tested within the research model by adopting multiple linear regression. Compared with simple linear regression, multiple linear regression allows the investigator to apply several explanatory variables to predict the outcome of the dependent variable within one model, resulting in a more precise and refined relationship between the individual factors and the outcome [111,112]. All of the related factors were averaged to process the analysis, and the detailed information is presented in Table 5.

Table 5. The multiple linear regression.

	Unstandardized Coefficients Beta	Std. Error	t-Value	*p*-Value	Collinearity Tolerance	Statistics VIF
HM	0.235 ***	0.051	4.648	<0.001	0.557	1.795
CM	0.316 ***	0.064	4.947	<0.001	0.330	3.035
PEOU	−0.099	0.092	−1.075	0.283	0.215	4.655
ND	0.121	0.088	1.374	0.171	0.250	3.994
IQ	0.118	0.078	1.520	0.130	0.265	3.775
PS	0.055	0.080	0.689	0.491	0.311	3.214
RC	0.142 **	0.066	2.153	0.032	0.443	2.260
Psev	0.168 ***	0.055	3.046	0.003	0.533	1.874

Dependent Variable: ITU. ** and *** indicate a significance level of 5% and 1%, respectively.

There is a possible issue of collinearity when conducting multiple linear regression with more than two independent variables; collinearity tolerance, and statistics VIF are two ways to measure the degree of collinearity. As Midi, Sarkar, and Rana argue (2010), values of collinearity tolerance are supposed to be higher than 0.1 or 0.2, and statistics VIF should ideally be lower than 10. As figures in Table 5 meet the condition, the collinearity problem of the tested model is acceptable; thus, the value of multiple linear regression results indicate the feasibility of multiple linear regressions in this research.

Meanwhile, the value of R-square at 0.650 in the multiple linear regression demonstrates that eight dependent variables explain 65% of the variance of *ITU towards* the MD application. Regarding *p*-value, there are three variables, including *HM*, *convenience incentive*, and Psev of COVID-19, which are shown as significant at a 1% level. In addition, the coefficient of *RC* (0.032) is significant at a 5% level. Those mentioned variables still play significant roles in controlling other variables, further supporting the above hypotheses. In addition, based on the observation of the unstandardized beta in the multiple linear regression, CM, HM, Psev, and RC have the maximal marginal impact on ITU among the group for their high-value and significant coefficients at 0.316, 0.235, 0.168, and 0.142, respectively. However, due to a certain degree of multiple collinearities, another remaining four variables PEOU, ND, IQ and PS, whose coefficients did not pass the significance test at a 10% level, have *p*-values of 0.283, 0.171, 0.130, and 0.491, respectively.

4.2. Summary of Results

Key results concerning means of factors, Cronbach's alpha reliability test, simple linear regression, and multiple linear regression will be presented in this section to briefly summarize the findings above.

Firstly, each factor's mean is distributed at a slightly hyper-mean level, ranging from 4.465 to 5.50 based on the calculation, while AU and HM are the only two factors with values under five at 4.465 and 4.477. In this way, the MD application's current service and product function can be determined as just satisfying and slightly above the middle level. In addition, all of the computed values in the Cronbach's alpha test reached the 0.7 thresholds, and some factors, including IQ, achieved 0.9, validating the reliability of the items and factors, as well as the internal consistency of the model.

All of the proposed hypotheses are supported by the results of the univariate linear regression. The results of the regression robustly support that HM, CM, PEOU, ND, IQ, PS, RC, and Psev have significant and positive effects on ITU in varying degrees, and ITU positively influences AU. During the process, all of the *p*-values were shown to be <0.001, demonstrating the significance level of 1% to validate the hypothesized relationships between factors. These findings are consistent with previous research from the perspective of TPB theory in the online food delivery industry [47].

Lastly, the multiple linear regression tested out CM, HM, Psev, and RC as factors with the largest marginal impact on ITU among the group, by observing unstandardized Beta for their significant coefficients at high levels, at 0.316, 0.235, 0.168, and 0.142, respectively. At the same time, the ideal *p*-values suggest a significance level at 1% and 5%, thus indicating that the above four independent variables can consistently have significant impacts on the results, and even influence other elements. As individuals' online purchasing intention was triggered by *convenience level*, *enjoyment*, and *reputation of restaurants*, the findings further support the TPB statements in the OFDS domain [18,51,66,69].

Participation in the survey was limited to users of the MD application, and responses show a generally positive attitude towards it. Within the overall expectation, however, MD's early mover advantage and effective operational and marketing efforts cannot be ignored. According to the significant correlation for all of the considered factors, a potential problem exists, as it is highly likely that all the measures of independent variables are correlated with each other. To check the possible issue of similarities between the answers of participants, the original dataset was rechecked, and it was observed that answers in

the measures' values varied between respondents; this was a positive sign of engagement, thus reducing the possibility of the mentioned problem to some extent.

5. Discussion and Implications

5.1. Discussion of Meituan Delivery Application and Other OFDS

It is important to note that last mile food distribution networks, the subject of this study, have two differing and equally important applications. The first, and most apparent, is the day-to-day delivery of meals and food from businesses, many of which are small and medium-sized enterprises (MSEs), to consumers. The importance of MSEs as drivers of sustainable socioeconomic activity and growth is well established [113]. MSEs are vital sources of innovation and job creation [114]. For consumers, MD and similar services provide a high degree of cost-effective and convenient access to a wide variety of foods and prepared meals. For some consumers, for example, those with limited time to visit restaurants, or perhaps without access to facilities for the preparation of meals, delivery service is of particular value. For consumers with limited mobility or who are differently abled, or perhaps for the elderly, food delivery services can play a vital role in maintaining independence and quality of life.

The second possible application of last mile food delivery services became evident during the initial days of the Pandemic in China, when hundreds of millions of people were in high states of lockdown for approx. 100 days. It was then that the importance of an effective, efficient and scalable system for the last mile distribution of food became obvious.

While the first application of last mile food distribution may be of greater interest to some, it is the second use that may ultimately prove to be of greater importance. While the course of the COVID-19 pandemic remains uncertain at the time of this study, it is likely that similar events in the future, either a pandemic or another crisis, will again call upon the existing OFDSs to repurpose to last mile-food delivery networks. For that reason, the remainder of the discussion on the topic of this study will first consider how MD and similar services can best position themselves for consumer acceptance, and efficiencies that can allow them to be established and sustained in order to serve either purpose, as needed; it will then explain the theoretical contribution made by this study to the greater knowledge.

5.2. Practical Implications

As all of the raised hypotheses are supported, there are practical industrial implications for the MD application, which could—especially if supported by similar studies in other contexts—be expanded to the entire online food, last-mile supply chain service sector, universally. In terms of the significance for the MD application, HM, CM, PEOU, ND, IQ, PS, RC, and Psev are demonstrated to have positive impacts on *ITU* for users of the app, and on finally to converting this to *AU*. It is worth investing in technologies, activities, and other relevant resources to boost the individual factors' future development, especially during the Pandemic and similar circumstances [115]. Moreover, it is worthwhile to form targeted project teams to check leakage, fill the vacancies, adapt to the changing Chinese consumption environment, be prepared to seek out, and address pain points and adapt The MD application to local and regional market conditions. It could also be beneficial to monitor the result of each factor-based project with specification before and after, by regular solicitation of customer feedback or analysis of customers' behavior through big data, then to gradually shape a program to support the development of innovative and effective methods to promote actual figures [116]. By aiming at increasing the above factorial function on customers' *ITU* and *AU*, MD's resources and capabilities can most efficiently be utilized to establish sustainable competitive advantage and support a sustainable last-mile supply chain for food distribution both during normal times, and during times when the last mile food distribution network could be disrupted, such as during the Pandemic.

Terlutter and Moick [117] state that with the expansion of mobile technology worldwide, the O2O consuming behavior has converged and crossed geographical borders in the new digital era. The findings of this study are based on the most popular OFDS application

in China with a vast and growing user base, and can be a foundation for reference within China and possibly even within the context of other regions of Asia. Emerging OFDS companies in other markets that do not have complete service and product models can benefit from considering the findings of this study as they develop and perfect their services, including the eight dimensions. For those more developed markets and companies, it could be helpful to consider those influencing factors as starting points from which to further develop a competitive strategy for growth. OFDS firms can further develop their service offerings after taking into consideration local needs, preferences, and priorities, in order to motivate consumers and optimize delivery appeal and efficiency.

As Psev of the Pandemic is a particular element during the COVID-19 pandemic, which at the time of this study, appears to be an ongoing global problem, the MD application's endeavor to form a normalized epidemic delivery service with adaptability and flexibility can be beneficial both to its users and as a model for other markets. Although the operation of the business can be affected by restriction policies, OFDS companies should still assure the comprehensive safety of supply chains by protecting them from viruses, then raising customers' satisfaction securely [118]. Initially, the health conditions of every platform delivery person, and of workers engaged in food production and preparationin restaurants, should be assured. Secondly, by referencing the results of the means of factors, independent variables are nearly all situated at just above the middle level, at 4-5, on the scale of 7, which means that there is still possible room for improvement to provide first-rate OFDSs to end-users. Therefore, the MD application can make progress by remedying weaknesses, further cultivating these factors with average rated performance, and propelling them to a higher level. Except for the concentration on HM, CM, Psev, and RC, it is possible to form collateral impact by giving additional attention to the PEOU, ND, IQ, PS dimensions and building a sophisticated service function net. Although their marginal effects are not critical compared to the four factors, they still have higher positive and significant impacts on consumers' *ITU* than on *actual usage*. Moreover, considering the potential boost to the high level of 7, Meituan must focus on these aspects in order to improve and enhance the service structure and position of the firm for future business development.

PEOU and ND are two core elements related to software development, both technically and visually. In terms of operations within the MD application, it is necessary to simplify and update the user interface and functionality; in turn, this can provide more accurate, timely, and relevant messages and make the whole user process more fluent based on customers' preferences, while maintaining the familiarity of the interface (for instance, adding efficient functions and buttons [119]). Novel versions can be tested within corporations internally, or disseminated to customers at a small scale as a beta test to assure feasibility. Moreover, capable IT teams should be consistently assigned to the development and innovation of technologically based business models in order to achieve continuous improvement [120].

To strengthen the app's *IQ*, the MD application can consider measures from three aspects: timeliness, reliability, and appropriateness of the level of detail. Specifically, this means providing credible sources, and the most up-to-date information related to restaurants, products, and discounts, all in a consistent and well-organized format to support customers in making consumption decisions. The level of detail of the information can impact satisfaction [121].

Lastly, we discuss issues in the *PS* of personal data during the internet age, especially with the deployment of 5G [122]. During an online exchange, payment is one of the weakest parts; MD can consider employing several strategies to achieve multiple safeguards, including in-person verification codes and individual face recognition [123]. As a customer-data-owner, the company should take prudent steps to prevent personal information from leaking externally.

5.3. Theoretical Contribution

This study also provides a theoretical contribution to the greater body of knowledge. The findings of this study serve to consolidate and validate the TPB and contribute to the existing literature by extending the TPB model to the application of consumer perception, acceptance and use of OFDSs, during the circumstances of a large-scale and highly rigid lockdown period resulting from a public health crisis in China; thus, they address a gap in the existing literature as discussed in Theoretical Contribution (Section 5.3) above. Specifically, it should be noted that during the initial lockdown period in China, which was approximately 100 days in duration, circumstances were unusual due to both the extreme strictness of enforcement of the lockdown, and the high level of uncertainty regarding the severity of the virus itself. The implications of the social and psychological effects of that period of prolonged isolation make this study unique. In addition, as the Chinese OFDS users presented a considerably larger consumer base, an entire nation of over a billion people, under the rigorous pandemic management and control imposed by the authorities is unique among the related literature discussed in Section 2.1. The empirical result of this research can strengthen the previous theoretical models under this extreme case by demonstrating that MD, HM, CM, PEOU, ND, IQ, PS, RC, and Psev are tested to have a positive influence on ITU for OFDS users, and thus, towards AU. Assuming that the circumstances of COVID-19 will be normalized in the future, the results of this study offer a distinctive and solid theoretic perspective for further study on the repurposing of OFDSs as last mile food delivery networks.

5.4. Limitations and Future Research

Despite contributions, this research still has some limitations which may provide insight and incentive for future research. Firstly, this research is narrowly focused on the MD application, yet many OFDS users use several OFDS applications in parallel, and simultaneously, in China. Future research can expand the research theme to other OFDS software in China and even make comparisons between brands. Indeed, there is ample reason to support replicative research in other contexts, cultural or geographical. In addition to brands, the form of the OFDS is another direction to explore. The MD application's configuration as platform-to-customer is not the only type of business model within the OFDS industry. There are several existing and emerging structures concerning restaurant-to-customer, communal WeChat Mini Program, market to consumer, and others that are worthy of consideration. In addition, although the demographic information in this research is distributed equally to better portray a general picture, specific age groups, e.g., millennials, can be set as specialized research subjects to enact more targeted marketing and development plans.

The sustained stress placed on delivery workers due to the increased demand for their services, and to the uncertainty of the severity of the virus, is worthy of further exploration; however, this is outside of the scope of this study.

Lastly, to amend the deviation that arises using the self-report method between the answers of the surveys and actual behavior, purely objective methodologies can be adapted to gather data in future research—for example, acquiring second-hand business information about the MD application through programming and a big-data technique, or obtaining an accessible internal corporate database for deeper analysis.

6. Conclusions

In conclusion, the motivation of this study is to provide insights into consumers' perceptions of smartphone apps and food distribution systems. The rationale for this study is based on the underlying assumption that food delivery networks can be, and have been, rapidly repurposed to provide last mile food distribution during periods of crisis, specifically the Pandemic of 2020. As such, the development and sustained operation of robust and efficient last mile food distribution networks can be of vital importance in the event of mass lockdowns of large urban populations. Consumer acceptance and use

of food delivery networks during non-crisis periods can ensure that such networks are available and operational if, and when, they are needed. To gain an understanding of the factors that affect consumer acceptance of food delivery services that may become last-mile food distribution networks, this study focuses on the leading OFDS software application in China, the MD application, and attempts to contribute to the foundation of knowledge on that topic. The research framework is based on the extended TPB model, in theory, to examine factors influencing individuals' willingness to adopt the MD application during a period of crisis, and then offer feasible and targeted recommendations. The data were analyzed by calculating the mean value and conducting the Cronbach's alpha test, and linear regression with one and multiple regressors; these subsequently addressed the main research question concerning Chinese customers' attitudes towards OFDS in the case of MD application. The results suggest that HM, CM, PEOU, ND, IQ, PS, RC, and Psev can all impose positive and significant impacts on ITU. ITU, subsequently, positively affects AU at a significant level. Furthermore, evidence is found to support that HM, CM, Psev, and RC factors have marginal effects indicating their high development potential in the future. According to the mean value result, PEOU, ND, IQ, PS performing at the middle level still has ample room to improve, consequently heading to higher standards. As a consequence, key recommendations for the MD application firstly concentrate on potential aspects, then make further efforts to boost factors with only moderate performance, ideally lifting the whole service level during the application, as well as the service development procedure, based on the model formulated in this study.

The practical implications of this study are apparent, and have been validated as recently as December 2021 to January 2022 when the city of Xian, population 13m, was completely locked down again. Food shortages were reported before the OFDSs could be repurposed to last mile food distribution networks. A robust and scalable OFDS can help to prevent food shortages during periods of crisis, including, but not limited to, contagious disease outbreaks; moreover, consumer acceptance and use is a precursor to the establishment and sustainability of such a system.

This study also provides a theoretical contribution to the greater body of knowledge. The findings of this study serve to consolidate and validate the TPB, and contribute to the existing literature by extending the TPB model to the application of consumer perception, acceptance and use of OFDSs during the circumstances of a large-scale public health crisis in China; thus, this study addresses a gap in the existing literature, as discussed in Theoretical Contribution (Section 5.3) above.

Limitations, as discussed above in Section 5.4, include the narrow scope of the study, which is based on one smart phone app. Although, the high market penetration of the MD application makes this limitation less critical, inclusion of some of the other apps may yield interesting results as the app interfaces tend to be distinct, and one may be perceived to be more intuitive, easier to use, or include more desirable features. Additionally, for the reasons discussed above, this study is focused on urban China. Similar studies in other cities or countries could result in very interesting findings, either because they could confirm the generalizability of this study, or they could yield findings indicating that other factors are relevant in different situations.

One thing is certain: the development of an efficient and robust food delivery network can be of critical importance the last mile supply chain for delivery of food during certain types of crises, such as a contagious disease epidemic, when people must be in lockdown for extended periods of time.

Author Contributions: Conceptualization, Y.L.; methodology, Y.L.; software, Y.L.; validation, Y.L., R.K.M.; formal analysis, Y.L.; investigation, Y.L.; resources, Y.L.; data curation, Y.L.; writing—original draft preparation, Y.L.; writing—review and editing, R.K.M., C.C.; project administration, Y.L., R.K.M., J.C. All authors have read and agreed to the published version of the manuscript.

List of Abbreviations

e-commerce	Electronic Commerce
O2O	Online to Offline
MD	Meituan Delivery
RMB	Renminbi
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behavior
OFDS.	Online Food Delivery Service
HM	Hedonic Motivation
CM	Convenience Motivation
PEOU	Perceived Ease of Use
ND	Navigational Design
IQ	Information Quality
PS	Privacy and Security
RC	Restaurant Credibility
Psev	Perceived Severity
AU	Actual Use
ITU	Intention to Use

Appendix A

Instrumentation: Questionnaire Measurements

The Questionnaire of Chinese Customers' Attitudes towards Online Food Delivery Services:

1–6, multiple-choice

7–36, 7-point-Likert scale: To what extent do you agree with each of the following (1 = strongly disagree, 7 = strongly agree)?

1. What is your gender?

    Male
    Female
    […] Or do you describe yourself in another way (write in gender identity)

2. What is your age group?

    15–24
    25–34
    35–44
    45–54
    55+

3. What is your occupation?

    Students
    Self-employed
    Employee
    Household wife/husband

4. What is your average expenditure per month?

    −2000 RMB
    2000–4999 RMB
    5000–7999 RMB
    8000–10,999 RMB

11,000–13,999 RMB
14,000+ RMB

5. What is your highest level of education?

High school or under
Tertiary education
Undergraduate
Postgraduate and over
Others

6. What is your frequency to use Meituan Delivery App?

1–9 times in a month
10–19 times in a month
20–29 times in a month
30–39 times in a month
40–49 times in a month
50–59 times in a month
More than 60 times in a month

Hedonic motivation (HM)

HM1 7. I find that using Meituan Delivery App is enjoyable.
HM2 8. I use Meituan Delivery App for fulfilling both my basic need and enjoyment.
HM3 9. I usually spend more using Meituan Delivery App rather than buying it by myself due to minimum purchase and promotion.

Convenience motivation (CM)

CM1 10. I can use Meituan Delivery App to make an order anywhere and anytime.
CM2 11. I feel that using Meituan Delivery App can reduce my travel effort to buy food/beverages.
CM3 12. I think that Meituan Delivery App helps me to save time compared with going to stores for goods in person.

Perceived ease of use (PEOU)

PEOU1 13. I can easily find things that I need in Meituan Delivery App.
PEOU2 14. I can complete a transaction quickly at Meituan Delivery App.
PEOU3 15. I feel that Meituan Delivery App is well-organized in terms of design and position.

Navigational design (ND)

ND1 16. I feel that Navigation Bar in Meituan Delivery App is helpful.
ND2 17. I think that dynamic filler helps me to find restaurants or dishes that I look for.
ND3 18. I think that order tracking status is essential to customers in Meituan Delivery App.

Information quality (IQ)

IQ1 19. I find that Meituan Delivery App provides me with up-to-date information related to restaurants, food, and discount.
IQ2 20. I enjoy using Meituan Delivery App because it gives me trustworthy information.
IQ3 21. I think that Meituan Delivery App provides information at the right level of detail that I need.

Privacy and security (PS)

P&S1 22. I feel secure because Meituan Delivery App has protective payment instrument steps before the transaction occurs.
P&S2 23. I think that verification steps before using both for users and deliverers can reduce the privacy and security risk.

P&S3 24. I think that Meituan Delivery App provider has the responsibility of not giving personal information to other agents.

Restaurant credibility (RC)

RC1 25. I think that the restaurant rating in Meituan Delivery App helps me to decide in making an order.

RC2 26. I am also concerned with the number of ratings related to the restaurant in making an order.

RC3 27. I think that the availability of offline restaurants influences me to make an order.

Perceived severity (Psev)

Psev1 28. I understand social distancing regulations, so I choose to use Meituan Delivery App instead of dining in or buying it by myself.

Psev2 29. I am afraid to dine in a restaurant due to the COVID-19 Pandemic.

Psev3 30. I feel that Meituan Delivery App helps me to satisfy my craving for food during the COVID-19 Pandemic.

Actual Use (AU)

AU1 31. When buying food, I always use Meituan Delivery App.

AU2 32. I always check the available food/restaurant at Meituan Delivery App.

AU3 33. I always check the notification and promotions of Meituan Delivery App.

Intention to use (ITU)

ITU1 34. I intend to continue using Meituan Delivery App.

ITU2 35. I will use Meituan Delivery App in my daily life in the future.

ITU3 36. I plan to continue to use Meituan Delivery App frequently.

References

1. Niu, B.; Li, Q.; Mu, Z.; Chen, L.; Ji, P. Platform Logistics or Self-Logistics? Restaurants' Cooperation with Online Food-Delivery Platform Considering Profitability and Sustainability. *Int. J. Prod. Econ.* **2021**, *234*, 108064. [CrossRef]
2. Wang, Y.; Hong, A.; Li, X.; Gao, J. Marketing innovations during a global crisis: A study of China firms' response to COVID-19. *J. Bus. Res.* **2020**, *116*, 214–220. [CrossRef] [PubMed]
3. Hong, C.; Choi, H.H.; Choi, E.-K.C.; Joung, H.-W.D. Factors Affecting Customer Intention to Use Online Food Delivery Services before and during the COVID-19 Pandemic. *J. Hosp. Tour. Manag.* **2021**, *48*, 509–518. [CrossRef]
4. Huang, H. Riders on the Storm: Amplified Platform Precarity and the Impact of COVID-19 on Online Food-Delivery Drivers in China. *J. Contemp. China* **2021**, 1–15. [CrossRef]
5. Shi, S. *Research on The Present Situation and Development Trend of O2O Model*; Atlantis Press: Amsterdam, The Netherlands, 2017.
6. Goswami, M.; Daultani, Y.; De, A. Decision Modeling and Analysis in New Product Development Considering Supply Chain Uncertainties: A Multi-Functional Expert Based Approach. *Expert Syst. Appl.* **2021**, *166*, 114016. [CrossRef]
7. Du, Y.; Tang, Y. Study on the Development of O2O E-Commerce Platform of China from the Perspective of Offline Service Quality. *Int. J. Bus. Soc. Sci.* **2014**, *5*, 308–312.
8. O'reilly, T. *What Is Web 2.0*; Routledge: Oxfordshire, UK, 2005.
9. De, A.; Aditjandra, P.; Pang, G.; Hubbard, C.; Gorton, M.; Thakur, M.; Samoggia, A. *Environmentally Conscious Transportation and Logistics Modelling for Agri-Food Supply Chains*; Newcastle University: Newcastle, UK, 2019.
10. Vyas, S.; Chanana, N.; Chanana, M.; Aggarwal, P.K. From Farm to Fork: Early Impacts of COVID-19 on Food Supply Chain. *Front. Sustain. Food Syst.* **2021**, *5*, 15. [CrossRef]
11. Alsetoohy, O.; Ayoun, B.; Abou-Kamar, M. COVID-19 Pandemic Is a Wake-Up Call for Sustainable Local Food Supply Chains: Evidence from Green Restaurants in the USA. *Sustainability* **2021**, *13*, 9234. [CrossRef]
12. Sanyé-Mengual, E.; Orsini, F.; Gianquinto, G. Revisiting the Sustainability Concept of Urban Food Production from a Stakeholders' Perspective. *Sustainability* **2018**, *10*, 2175. [CrossRef]
13. Rizou, M.; Galanakis, I.M.; Aldawoud, T.M.; Galanakis, C.M. Safety of Foods, Food Supply Chain and Environment within the COVID-19 Pandemic. *Trends Food Sci. Technol.* **2020**, *102*, 293–299. [CrossRef]
14. Olaimat, A.N.; Shahbaz, H.M.; Fatima, N.; Munir, S.; Holley, R.A. Food Safety during and after the Era of COVID-19 Pandemic. *Front. Microbiol.* **2020**, *11*, 1854. [CrossRef]
15. Erälinna, L.; Szymoniuk, B. Managing a Circular Food System in Sustainable Urban Farming. Experimental Research at the Turku University Campus (Finland). *Sustainability* **2021**, *13*, 6231. [CrossRef]
16. Pulighe, G.; Lupia, F. Food First: COVID-19 Outbreak and Cities Lockdown a Booster for a Wider Vision on Urban Agriculture. *Sustainability* **2020**, *12*, 5012. [CrossRef]

17.   Lal, R. Home Gardening and Urban Agriculture for Advancing Food and Nutritional Security in Response to the COVID-19 Pandemic. *Food Secur.* **2020**, *12*, 871–876. [CrossRef]

18.   Gao, F.; Rau, P.L.; Zhang, Y. Perceived mobile information security and adoption of mobile payment services in China. In *Mobile Commerce: Concepts, Methodologies, Tools, and Applications*; IGI Global: Hershey, PA, USA, 2018; pp. 1179–1198.

19.   Pigatto, G.; Machado, J.G.d.C.F.; dos Santos Negreti, A.; Machado, L.M. Have You Chosen Your Request? Analysis of Online Food Delivery Companies in Brazil. *Br. Food J.* **2017**, *119*, 639–657. [CrossRef]

20.   Gavilan, D.; Balderas-Cejudo, A.; Fernández-Lores, S.; Martinez-Navarro, G. Innovation in Online Food Delivery: Learnings from COVID-19. *Int. J. Gastron. Food Sci.* **2021**, *24*, 100330. [CrossRef]

21.   Zhao, A.; Li, Z.; Ke, Y.; Huo, S.; Ma, Y.; Zhang, Y.; Zhang, J.; Ren, Z. Dietary Diversity among Chinese Residents during the COVID-19 Outbreak and Its Associated Factors. *Nutrients* **2020**, *12*, 1699. [CrossRef]

22.   China: Market Size of Online Food Delivery 2011–2020 | Statista. Available online: https://www.statista.com/statistics/699310/china-sales-in-home-delivery/ (accessed on 6 December 2021).

23.   Food Delivery App Revenue and Usage Statistics (2021)—Business of Apps. Available online: https://www.businessofapps.com/data/food-delivery-app-market/ (accessed on 6 December 2021).

24.   Online Food Delivery—China | Statista Market Forecast. Available online: https://www.statista.com/outlook/dmo/eservices/online-food-delivery/china (accessed on 6 December 2021).

25.   The Food Delivery Market in Great China in 2019 | Daxue Consulting. Available online: https://daxueconsulting.com/o2o-food-delivery-market-in-china/ (accessed on 6 December 2021).

26.   Meituan. Available online: https://about.meituan.com/en (accessed on 6 December 2021).

27.   Zhang, M.; Guo, Z.; Zheng, H.; Zuo, W. *Research on the Innovation of Business Ecosystem Model in China's Online Food Reservation Market at Sharing Economic Era*; Association for Information Systems AIS Electronic Library (AISeL): Atlanta, GA, USA, 2016.

28.   Meituan: Revenues by Segment 2020 | Statista. Available online: https://www.statista.com/statistics/1125405/meituan-dianping-revenues-by-segment/ (accessed on 6 December 2021).

29.   Lee, S.W.; Sung, H.J.; Jeon, H.M. Determinants of Continuous Intention on Food Delivery Apps: Extending UTAUT2 with Information Quality. *Sustainability* **2019**, *11*, 3141. [CrossRef]

30.   Jun, K.; Yoon, B.; Lee, S.; Lee, D.-S. Factors Influencing Customer Decisions to Use Online Food Delivery Service during the COVID-19 Pandemic. *Foods* **2022**, *11*, 64. [CrossRef]

31.   Dsouza, D.; Sharma, D. Online Food Delivery Portals during COVID-19 Times: An Analysis of Changing Consumer Behavior and Expectations. *Int. J. Innov. Sci.* **2020**, *13*, 218–232. [CrossRef]

32.   Bouarar, A.C.; Mouloudj, S.; Mouloudj, K. Extending the Theory of Planned Behavior to Explain Intention to Use Online Food Delivery Services in the Context of COVID-19 Pandemic. In *Advances in Global Services and Retail Management*; USF M3 Publishing: Tampa, FL, USA, 2021; Volume 5, pp. 1–16. [CrossRef]

33.   Wang, X.; Wang, L.; Wang, S.; Chen, J.; Wu, C. An XGBoost-Enhanced Fast Constructive Algorithm for Food Delivery Route Planning Problem. *Comput. Ind. Eng.* **2021**, *152*, 107029. [CrossRef]

34.   Chang, Y.-W.; Hsu, P.-Y.; Yang, Q.-M. Integration of Online and Offline Channels: A View of O2O Commerce. *Internet Res.* **2018**, *28*, 926–945. [CrossRef]

35.   Ram, J.; Manoharan, A.; Sun, S. O2O Adoption Benefits: A Managerial Perspective of Customer Benefits. *Electron. J. Inf. Syst. Eval.* **2020**, *23*, 65–78. [CrossRef]

36.   Kimes, S.E. *Customer Perceptions of Electronic Food Ordering*; Cornell University School of Hotel Administration: Ithaca, NY, USA, 2011.

37.   Patel, M. *Online Food Order System for Restaurants*; Grand Valley State University: Allendale Charter Township, MI, USA, 2015.

38.   GSMA Intelligence. Number of Mobile Subscribers Worldwide Hits 5 Billion. 2017. Available online: https://www.gsma.com/newsroom/press-release/number-mobile-subscribers-worldwidehits-5-billion (accessed on 16 July 2021).

39.   Li, C.; Mirosa, M.; Bremer, P. Review of Online Food Delivery Platforms and Their Impacts on Sustainability. *Sustainability* **2020**, *12*, 5528. [CrossRef]

40.   Zhao, X.; Lin, W.; Cen, S.; Zhu, H.; Duan, M.; Li, W.; Zhu, S. The Online-to-Offline (O2O) Food Delivery Industry and Its Recent Development in China. *Eur. J. Clin. Nutr.* **2021**, *75*, 232–237. [CrossRef] [PubMed]

41.   He, J. *The Effect of COVID-19 on The Chinese Restaurant Industry and The Role That Third-Party Food Delivery Businesses Played in Helping Restaurants Respond to The Crisis*; Auckland University of Technology: Auckland, New Zealand, 2021.

42.   Ren, X. Pandemic and Lockdown: A Territorial Approach to COVID-19 in China, Italy and the United States. *Eurasian Geogr. Econ.* **2020**, *61*, 423–434. [CrossRef]

43.   Vermeir, I.; Verbeke, W. Sustainable Food Consumption among Young Adults in Belgium: Theory of Planned Behaviour and the Role of Confidence and Values. *Ecol. Econ.* **2008**, *64*, 542–553. [CrossRef]

44.   Hwang, J.; Kim, H. Consequences of a Green Image of Drone Food Delivery Services: The Moderating Role of Gender and Age. *Bus. Strategy Environ.* **2019**, *28*, 872–884. [CrossRef]

45.   Mouakket, S. Factors Influencing Continuance Intention to Use Social Network Sites: The Facebook Case. *Comput. Hum. Behav.* **2015**, *53*, 102–110. [CrossRef]

46.   Chen, H.-S.; Liang, C.-H.; Liao, S.-Y.; Kuo, H.-Y. Consumer Attitudes and Purchase Intentions toward Food Delivery Platform Services. *Sustainability* **2020**, *12*, 10177. [CrossRef]

47. Yeo, V.C.S.; Goh, S.-K.; Rezaei, S. Consumer Experiences, Attitude and Behavioral Intention toward Online Food Delivery (OFD) Services. *J. Retail. Consum. Serv.* **2017**, *35*, 150–162. [CrossRef]
48. Hansen, T.; Jensen, J.M.; Solgaard, H.S. Predicting Online Grocery Buying Intention: A Comparison of the Theory of Reasoned Action and the Theory of Planned Behavior. *Int. J. Inf. Manag.* **2004**, *24*, 539–550. [CrossRef]
49. Belanche, D.; Flavián, M.; Pérez-Rueda, A. Mobile Apps Use and WOM in the Food Delivery Sector: The Role of Planned Behavior, Perceived Security and Customer Lifestyle Compatibility. *Sustainability* **2020**, *12*, 4275. [CrossRef]
50. Hirschman, E.C.; Holbrook, M.B. Hedonic Consumption: Emerging Concepts, Methods and Propositions. *J. Mark.* **1982**, *46*, 92–101. [CrossRef]
51. Alalwan, A.A.; Dwivedi, Y.K.; Rana, N.P.; Lal, B.; Williams, M.D. Consumer Adoption of Internet Banking in Jordan: Examining the Role of Hedonic Motivation, Habit, Self-Efficacy and Trust. *J. Financ. Serv. Mark.* **2015**, *20*, 145–157. [CrossRef]
52. Childers, T.L.; Carr, C.L.; Peck, J.; Carson, S. Hedonic and Utilitarian Motivations for Online Retail Shopping Behavior. *J. Retail.* **2001**, *77*, 511–535. [CrossRef]
53. Wang, Y.; Wang, L.; Xue, H.; Qu, W. A Review of the Growth of the Fast Food Industry in China and Its Potential Impact on Obesity. *Int. J. Environ. Res. Public Health* **2016**, *13*, 1112. [CrossRef]
54. Collier, J.E.; Kimes, S.E. Only If It Is Convenient: Understanding How Convenience Influences Self-Service Technology Evaluation. *J. Serv. Res.* **2013**, *16*, 39–51. [CrossRef]
55. Indiani, N.L.P.; Fahik, G.A. Conversion of online purchase intention into actual purchase: The moderating role of transaction security and convenience. *Bus. Theory Pract.* **2020**, *21*, 18–29. [CrossRef]
56. Ray, A.; Dhir, A.; Bala, P.K.; Kaur, P. Why Do People Use Food Delivery Apps (FDA)? A Uses and Gratification Theory Perspective. *J. Retail. Consum. Serv.* **2019**, *51*, 221–230. [CrossRef]
57. Saad, A.T. Factors affecting online food delivery service in Bangladesh: An empirical study. *Br. Food J.* **2020**, *123*, 535–550. [CrossRef]
58. Akram, U.; Junaid, M.; Zafar, A.U.; Li, Z.; Fan, M. Online purchase intention in Chinese social commerce platforms: Being emotional or rational? *J. Retail. Consum. Serv.* **2021**, *63*, 102669. [CrossRef]
59. Dewi, G.M.M.; Joshua, L.; Ikhsan, R.B.; Yuniarty, Y.; Sari, R.K.; Susilo, A. Perceived Risk and Trust in Adoption E-Wallet: The Role of Perceived Usefulness and Ease of Use. In Proceedings of the 2021 International Conference on Information Management and Technology (ICIMTech), Jakarta, Indonesia, 19–20 August 2021; Volume 1, pp. 120–124. [CrossRef]
60. Schnall, R.; Rojas, M.; Bakken, S.; Brown, W.; Carballo-Dieguez, A.; Carry, M.; Gelaude, D.; Mosley, J.P.; Travers, J. A User-Centered Model for Designing Consumer Mobile Health (MHealth) Applications (Apps). *J. Biomed. Inform.* **2016**, *60*, 243–251. [CrossRef]
61. Ji, Y.G.; Park, J.H.; Lee, C.; Yun, M.H. A Usability Checklist for the Usability Evaluation of Mobile Phone User Interface. *Int. J. Hum.-Comput. Interact.* **2006**, *20*, 207–231. [CrossRef]
62. Bélanger, F.; Crossler, R.E. Privacy in the Digital Age: A Review of Information Privacy Research in Information Systems. *MIS Q.* **2011**, *35*, 1017–1041. [CrossRef]
63. D'Adamo, I.; González-Sánchez, R.; Medina-Salgado, M.S.; Settembre-Blundo, D. E-Commerce Calls for Cyber-Security and Sustainability: How European Citizens Look for a Trusted Online Environment. *Sustainability* **2021**, *13*, 6752. [CrossRef]
64. Ali, G.; Dida, M.A.; Elikana Sam, A. A Secure and Efficient Multi-Factor Authentication Algorithm for Mobile Money Applications. *Future Internet* **2021**, *13*, 299. [CrossRef]
65. Merhi, M.; Hone, K.; Tarhini, A. A Cross-Cultural Study of the Intention to Use Mobile Banking between Lebanese and British Consumers: Extending UTAUT2 with Security, Privacy and Trust. *Technol. Soc.* **2019**, *59*, 101151. [CrossRef]
66. Hoyer, W.D.; Brown, S.P. Effects of Brand Awareness on Choice for a Common, Repeat-Purchase Product. *J. Consum. Res.* **1990**, *17*, 141–148. [CrossRef]
67. Lu, N.; Cheng, K.-W.; Qamar, N.; Huang, K.-C.; Johnson, J.A. Weathering COVID-19 Storm: Successful Control Measures of Five Asian Countries. *Am. J. Infect. Control* **2020**, *48*, 851–852. [CrossRef]
68. Szczepańska, A.; Pietrzyka, K. The COVID-19 Epidemic in Poland and Its Influence on the Quality of Life of University Students (Young Adults) in the Context of Restricted Access to Public Spaces. *J. Public Health* **2021**, 1–11. [CrossRef]
69. Williams, N. Social Distancing in the COVID-19 Pandemic. *Occup. Med.* **2020**, *70*, 305. [CrossRef]
70. Ali, S.; Khalid, N.; Javed, H.M.U.; Islam, D.M. Consumer Adoption of Online Food Delivery Ordering (OFDO) Services in Pakistan: The Impact of the COVID-19 Pandemic Situation. *J. Open Innov. Technol. Mark. Complex.* **2021**, *7*, 10. [CrossRef]
71. Harsono, L.D.; Suryana, L.A. Factors Affecting the Use Behavior of Social Media Using UTAUT 2 Model. In Proceedings of the Asia-Pacific Conference on Global Business, Economics, Finance and Social Sciences, Singapore, 1–3 August 2014; pp. 1–14.
72. Brown, S.A.; Venkatesh, V. Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle. *MIS Q.* **2005**, *29*, 399–426. [CrossRef]
73. Gan, C.; Li, H. Understanding the Effects of Gratifications on the Continuance Intention to Use WeChat in China: A Perspective on Uses and Gratifications. *Comput. Hum. Behav.* **2018**, *78*, 306–315. [CrossRef]
74. Ajzen, I. The Theory of Planned Behavior. *Organ. Behav. Hum. Decis. Processes* **1991**, *50*, 179–211. [CrossRef]
75. Fishbein, M.; Ajzen, I. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. *Philos. Rhetor.* **1977**, *10*, 244–245.
76. Olorunniwo, F.; Hsu, M.K.; Udo, G.J. Service Quality, Customer Satisfaction, and Behavioral Intentions in the Service Factory. *J. Serv. Mark.* **2006**, *20*, 59–72. [CrossRef]

77. Hooi, R.; Leong, T.K.; Yee, L.H. Intention to Use Online Food Delivery Service in Malaysia among University Students. *CoMBInES—Conf. Manag. Bus. Innov. Educ. Soc. Sci.* **2021**, *1*, 60–73.

78. Kaimann, D.; Tanneberg, I. What Containment Strategy Leads Us through the Pandemic Crisis? An Empirical Analysis of the Measures against the COVID-19 Pandemic. *PLoS ONE* **2021**, *16*, e0253237. [CrossRef]

79. Taherdoost, H. A Review of Technology Acceptance and Adoption Models and Theories. *Procedia Manuf.* **2018**, *22*, 960–967. [CrossRef]

80. Khalifa, M.; Limayem, M. Drivers of Internet Shopping. *Commun. ACM* **2003**, *46*, 233–239. [CrossRef]

81. Troise, C.; O'Driscoll, A.; Tani, M.; Prisco, A. Online Food Delivery Services and Behavioural Intention—A Test of an Integrated TAM and TPB Framework. *Br. Food J.* **2020**, *123*, 664–683. [CrossRef]

82. Prasetyo, Y.T.; Tanto, H.; Mariyanto, M.; Hanjaya, C.; Young, M.N.; Persada, S.F.; Miraja, B.A.; Redi, A.A.N.P. Factors Affecting Customer Satisfaction and Loyalty in Online Food Delivery Service during the COVID-19 Pandemic: Its Relation with Open Innovation. *J. Open Innov. Technol. Mark. Complex.* **2021**, *7*, 76. [CrossRef]

83. Gosling, S.D.; Vazire, S.; Srivastava, S.; John, O.P. Should We Trust Web-Based Studies? A Comparative Analysis of Six Preconceptions about Internet Questionnaires. *Am. Psychol.* **2004**, *59*, 93–104. [CrossRef]

84. Brislin, R.W. Back-Translation for Cross-Cultural Research. *J. Cross-Cult. Psychol.* **1970**, *1*, 185–216. [CrossRef]

85. Marjerison, R.K.; Lin, Y.; Kennedyd, S.I. An Examination of Motivation and Media Type: Sharing Content on Chinese Social Media. *Int. J. Soc. Media Online Communities (IJSMOC)* **2019**, *11*, 15–34. [CrossRef]

86. Croasmun, J.T.; Ostrom, L. Using Likert-Type Scales in the Social Sciences. *J. Adult Educ.* **2011**, *40*, 19–22.

87. Prabowo, G.T.; Nugroho, A. Factors That Influence the Attitude and Behavioral Intention of Indonesian Users toward Online Food Delivery Service by the Go-Food Application. *Adv. Econ. Bus. Manag. Res.* **2019**, *72*, 204–210.

88. Chai, L.T.; Yat, D.N.C. Online Food Delivery Services: Making Food Delivery the New Normal. *J. Mark. Adv. Pract.* **2019**, *1*, 62–77.

89. Suhartanto, D.; Dean, D.L.; Leo, G.; Triyuni, N.N. Millennial Experience with Online Food Home Delivery: A Lesson from Indonesia. *Interdiscip. J. Inform. Knowl. Manag.* **2019**, *14*, 277–294. [CrossRef]

90. Kapoor, A.P.; Vij, M. Technology at the Dinner Table: Ordering Food Online through Mobile Apps. *J. Retail. Consum. Serv.* **2018**, *43*, 342–351. [CrossRef]

91. Han, S.H.; Nguyen, B.; Lee, T.J. Consumer-Based Chain Restaurant Brand Equity, Brand Reputation, and Brand Trust. *Int. J. Hosp. Manag.* **2015**, *50*, 84–93. [CrossRef]

92. Rivera, M. Online Delivery Provider (ODP) Services: Who Is Getting What from Food Deliveries? *Int. J. Hosp. Manag.* **2019**, *80*, A1–A2. [CrossRef]

93. Chen, C.-Y. Smartphone Addiction: Psychological and Social Factors Predict the Use and Abuse of a Social Mobile Application. *Inf. Commun. Soc.* **2020**, *23*, 454–467. [CrossRef]

94. Goswami, M.; De, A.; Habibi, M.K.K.; Daultani, Y. Examining Freight Performance of Third-Party Logistics Providers within the Automotive Industry in India: An Environmental Sustainability Perspective. *Int. J. Prod. Res.* **2020**, *58*, 7565–7592. [CrossRef]

95. Choudhary, A.; De, A.; Ahmed, K.; Shankar, R. An Integrated Fuzzy Intuitionistic Sustainability Assessment Framework for Manufacturing Supply Chain: A Study of UK Based Firms. *Ann. Oper. Res.* **2021**, 1–44. [CrossRef]

96. Tufahati, N. The Impact of Customer Satisfaction of Repurchase Intention. *J. Bus. Appl. Manag.* **2021**, *14*, 177–186.

97. Weirich, S.; Hecht, M.; Becker, B.; Zitzmann, S. Comparing Group Means with the Total Mean in Random Samples, Surveys, and Large-Scale Assessments: A Tutorial and Software Illustration. *Behav. Res. Methods* **2021**, 1–12. [CrossRef]

98. Lukong, A.M.Y.; Jafaru, Y. COVID-19 Pandemic Challenges, Coping Strategies and Resilience among Healthcare Workers: A Multiple Linear Regression Analysis. *Afr. J. Health Nurs. Midwifery* **2021**, *4*, 16–27.

99. Wahab, S.N.; Khong, W.L. Multiple Linear Regression Modelling of Parcels' Distribution Design Factors and Online Shopping Customer Satisfaction. *Int. J. Model. Oper. Manag.* **2019**, *7*, 95–110. [CrossRef]

100. Tavakol, M.; Dennick, R. Making Sense of Cronbach's Alpha. *Int. J. Med. Educ.* **2011**, *2*, 53–55. [CrossRef]

101. Regression Analysis, Linear—Rosenthal—Major Reference Works—Wiley Online Library. Available online: https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118901731.iecrm0208 (accessed on 20 January 2022).

102. Meer, P.; Mintz, D.; Rosenfeld, A.; Kim, D.Y. Robust Regression Methods for Computer Vision: A Review. *Int. J. Comput. Vis.* **1991**, *6*, 59–70. [CrossRef]

103. Hope, T.M.H. Chapter 4—Linear Regression. In *Machine Learning*; Mechelli, A., Vieira, S., Eds.; Academic Press: New York, NY, USA, 2020; pp. 67–81. ISBN 978-0-12-815739-8.

104. Vittinghoff, E.; Glidden, D.V.; Shiboski, S.C.; McCulloch, C.E. Linear Regression. In *Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models*; Vittinghoff, E., Glidden, D.V., Shiboski, S.C., McCulloch, C.E., Eds.; Statistics for Biology and Health; Springer: Boston, MA, USA, 2012; pp. 69–138. ISBN 978-1-4614-1353-0.

105. Fox, J. *Applied Regression Analysis, Linear Models, and Related Methods*; Sage Publications, Inc.: Thousand Oaks, CA, USA, 1997; pp. xxi, 597. ISBN 978-0-8039-4540-1.

106. Aalen, O.O. A Linear Regression Model for the Analysis of Life Times. *Stat. Med.* **1989**, *8*, 907–925. [CrossRef]

107. Schneider, A.; Hommel, G.; Blettner, M. Linear Regression Analysis. *Dtsch. Arztebl. Int.* **2010**, *107*, 776–782. [CrossRef]

108. Marill, K.A. Advanced Statistics: Linear Regression, Part II: Multiple Linear Regression. *Acad. Emerg. Med.* **2004**, *11*, 94–102. [CrossRef]

109. Taber, K.S. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Res. Sci. Educ.* **2018**, *48*, 1273–1296. [CrossRef]
110. Erick, M.; Marko, S. *A Concise Guide to Market Research: The Process, Data, and Methods Using IBM SPSS Statistics*; Springer: Berlin/Heidelberg, Germany, 2011.
111. Tranmer, M.; Elliot, M. Multiple Linear Regression. *Cathie Marsh Cent. Census Surv. Res. (CCSR)* **2008**, *5*, 1–5.
112. Midi, H.; Sarkar, S.K.; Rana, S. Collinearity Diagnostics of Binary Logistic Regression Model. *J. Interdiscip. Math.* **2010**, *13*, 253–267. [CrossRef]
113. Marjerison, R.K. Gender and Entrepreneurship in Developing Economies: Exploring of the Drivers, Challenges, and Opportunities for Women Entrepreneurs and Stakeholders. In *Handbook of Research on Entrepreneurial Leadership and Competitive Strategy in Family Business*; IGI Global: Hershey, PA, USA, 2019; pp. 1–21.
114. Marjerison, R.K.; Chen, R.; Lin, Y. The Nexus of Social Cause Interest and Entrepreneurial Mindset: Driving Socioeconomic Sustainability. *Sustainability* **2021**, *13*, 13558. [CrossRef]
115. Brochado, D.; Silva, C.; Silva, S.; Azevedo, D. *Digital Technologies to Minimize the Impact of the COVID-19 Pandemic in Restaurant Sector*; Academic Conferences International: Reading, UK, 2021; p. 92.
116. Das, J. Consumer Perception towards' Online Food Ordering and Delivery Services': An Empirical Study. *J. Manag.* **2018**, *5*, 155–163.
117. Terlutter, R.; Moick, M. Convergence and Consumer Behavior. In *Media and Convergence Management*; Springer: Berlin/Heidelberg, Germany, 2013; pp. 163–176.
118. Limon, M.R. Food Safety Practices of Food Handlers at Home Engaged in Online Food Businesses during COVID-19 Pandemic in the Philippines. *Curr. Res. Food Sci.* **2021**, *4*, 63–73. [CrossRef] [PubMed]
119. Gupta, V.; Duggal, S. How the Consumer's Attitude and Behavioural Intentions Are Influenced: A Case of Online Food Delivery Applications in India. *Int. J. Cult. Tour. Hosp. Res.* **2020**, *15*, 77–93. [CrossRef]
120. See-Kwong, G.; Soo-Ryue, N.; Shiun-Yi, W.; Lily, C. Outsourcing to Online Food Delivery Services: Perspective of F&B Business Owners. *J. Internet Bank. Commer.* **2017**, *22*, 1–18.
121. Willermark, S.; Pantic, N.; Pehrson, H. *Subjectively Experienced Time and User Satisfaction: An Experimental Study of Progress Indicator Design in Mobile Application*; ScholarSpace: Honolulu, HI, USA, 2021; p. 4476.
122. Liyanage, M.; Salo, J.; Braeken, A.; Kumar, T.; Seneviratne, S.; Ylianttila, M. 5G Privacy: Scenarios and Solutions. In Proceedings of the 2018 IEEE 5G World Forum (5GWF), Silicon Valley, CA, USA, 9–11 July 2018; pp. 197–203.
123. Pal, D.; Vanijja, V.; Patra, S. Online Learning During COVID-19: Students' Perception of Multimedia Quality. In Proceedings of the 11th International Conference on Advances in Information Technology, Bangkok, Thailand, 1–3 July 2020; Association for Computing Machinery: New York, NY, USA, 2020; pp. 1–6.