Measuring the Up-to-Date Quality of Online Food Delivery: Formative Index Construction

Structured abstract

Purpose - The quality measurements for online food delivery have not been well recognized, and even little is known after the COVID-19 outbreak. This study fills this paucity of knowledge by exploring and formulating a formative index to measure the up-to-date quality of online food delivery (DEQUAL).

Design/methodology/approach – Due to the explorative nature and the lack of developed quality theory under the unprecedented COVID-19 pandemic, DEQUAL is conceptualized as a formative construct. This study adopts a mixed-method approach including expert interviews and online surveys to ascertain the underlying structure of DEQUAL.

Findings - Using partial least squares structural equation modeling as the analytical method, the results support that DEQUAL is a formative construct with 32-indicator. The study provides a measurement index with robust psychometric properties to assist practitioners in evaluating DEQUAL.

Research limitations/implications - This study contributes a theoretical and empirical-based conceptualization of DEQUAL as a multi-dimensional construct. Supplementing the past studies which commonly applied the reflective approach, this study evinces that the formative approach is also appropriate and thence furnishes the relevance of the formative index in the service management theories.

Practical implications – Practitioners are suggested to apply the validated indicators for service audit and customer relationship management. By systematically monitoring and measuring the online food delivery service quality, restaurants can improve customer satisfaction and loyalty.

Originality/value - This study offers various insights to the service quality literature in the food delivery service context.

Keywords:

Service Quality, Online Food Delivery, Formative Index, COVID-19

Article Type: Research paper

1. Introduction

The rapid growth of e-commerce has brought newfound popularity of online food delivery services (Gunden et al., 2020; Cheng et al., 2021). The progress of online food delivery has been underpinned by the development of integrated online food delivery platforms. For instance, Uber Eats, Deliveroo, Swiggy, and Meituan are some of the examples of popular online food ordering and delivery applications (Li et al., 2020). Particularly, since the coronavirus disease 2019 (COVID-19) outbreak, amid social distancing and sweeping lockdowns measures worldwide, online food delivery has become a preferred option for those who were used to dine out (Gursoy and Chi, 2020; Tuzovic et al., 2021; Wei et al., 2021; Yost and Cheng, 2021). To cope with consumers' safety concerns and operation policies, many restaurants expanded delivery systems beyond the traditional way of food delivery. For example, Haidilao, a Chinese chain hot pot

restaurant famous for its attentive dine-in experience, launched its hot pot delivery service in New York (EaterNewYork, 2020). The Waldorf Hilton, a west-end hotel in London, provided a new afternoon tea home delivery service (The resident, 2020).

From on-premise to off-premise dining, smartphone apps have changed the way of dining and ordering (Kaur et al., 2021). Smartphone users are the main online consumers in the food and beverages (F&B) industry. An increase in the number of smartphone users signifies a substantial growth in online food delivery business. The world F&B e-commerce users reached 1.5 billion in 2019 and are expected to increase up to 800 million by 2024, with an average of 25% year-over-year growth (Businesswire, 2020). In particular, the worldwide online food delivery revenue is expected to show an annual growth rate (CAGR 2020–2024) of 7.5%, resulting in a projected market volume of US$182,327 million by 2024 (Statista, 2020).

The extant literature indicated the relationship between service quality and customer loyalty in the F&B industry (Chin and Tsai, 2013; Dani, 2014). In the context of food delivery, many previous studies examined the mobile food delivery service; however, its academic interest is still in the early stages (Alalwan, 2020). Based on the extended unified theory of acceptance and use of technology, Alalwan (2020) explored factors affecting customer e-satisfaction and continued intention to reuse mobile food delivery apps. Built upon on the theory of planned behavior, Belanche et al. (2020) revealed that some of the variables (i.e., attitude toward the behavior, subjective norms) influence customer use intentions and word-of-mouth (WOM). Apart from using the behavioral models as the theoretical underpin, other researchers focused on the information system aspect to examine customer loyalty. For instance, Wang et al. (2019) adopted the DeLone and McLean Information system success model. They found that information quality, system quality, service quality, product quality, perceived price, and promotions influence consumers' eWOM and reuse intention of catering apps. These studies shared a common feature of model accentuation in lieu of measurements of construct. Thus, empirical explorations of online food delivery quality are deficient, and little is recognized about what it represents and how it should be assessed. Existing academic research lacks a clear conceptualization and rigorous service quality measurement of the online food delivery construct, resulting in unclear specific factors of online food delivery.

Online food delivery service is a complex process that involves multiple phases of interactions. From searching and order placement to payment and delivery, service providers need to ensure a smooth delivery of every phase to maintain customer satisfaction (Suhartanto et al., 2019). Nevertheless, extant scales accessing online food delivery quality are not inclusive enough, especially under the outbreak of COVID-19 pandemic. For instance, Kapoor and Vij (2018) created the measurement scale with four mobile app attributes (i.e. visual, information, navigational and collaboration design) focuses on the customer's usage moment while the subsequent variables, such as, privacy and system overall efficiency of online food delivery are not thoroughly covered. Alternatively, despite Wang et al. (2019) extended the E-service quality measuring the success of mobile catering apps to a broader scope, the three main constructs of information, system and service qualities are still not extensive enough for assessing today's online food delivery quality. In particular, since the outbreak of COVID-19 pandemic, not just more food delivery demand has increased, but also more options of take-away and sanitation protocols are employed (Baum et al., 2020; Chan et al., 2021). Hence, the current E-service quality scales without including all essential variables of the comprehensive online food delivery process and the

alterations of COVID-19 pandemic are the research gaps calling for an updated E-service quality scale.

With the increasing demand and competition of the online food delivery market during the COVID-19 outbreak, customers' service quality perception toward food delivery becomes critical. In addition, as the pandemic has changed the landscape of food service delivery (Hwang and Choe, 2019; Cai and Leung, 2020; Choe et al., 2021), a systematic scale is needed for food service providers to gauge the service performance and for customers to evaluate their satisfaction. Hence, this study aims to fill the aforementioned knowledge gaps. Specifically, the objectives of this study are as follows:

1. Explore and develop a service quality index to effectively evaluate a customer's experience with online food deliveries.
2. Understand the latest consumer's perception of online food delivery service quality.
3. Predict customer satisfaction and loyalty toward the restaurant and delivery platform.

2. Literature Review

2.1 Conceptualization of online food delivery service

Online food delivery services refer to the Internet-based services through which customers order food and have it delivered to their doorsteps (Ray et al., 2019). Online food delivery has two divisions: restaurant-to-consumer delivery, which includes direct delivery of orders by the concerned restaurant, and platform-to-consumer delivery, which involves online delivery services provided by partner restaurants (Li et al., 2020). The restaurants themselves can take care of the delivery process in the restaurant-to-consumer delivery, whereas the platforms (e.g. Deliveroo, Uber Eats) handle the delivery process in the platform-to-consumer delivery. In either case, the online food delivery service provides convenience in food ordering and delivery.

Customers' experience with online food delivery is influenced by the food quality and e-service quality (Yeo et al., 2017; Annaraud and Berezina, 2020). Food quality refers to the overall fulfilment of customer needs for food (Ha and Jang, 2010). Customer satisfaction with the restaurant is influenced mostly by food quality (Sulek and Hensley, 2004), which is a major determinant of customer loyalty in casual dining (Mattila, 2001). Scholars empirically examined the food quality variables such as the presentation, taste, and freshness of the food (Namkung and Jang, 2007; Ha and Jang, 2010; Hanaysha, 2016). However, in the online food delivery context, a consensus on food delivery service quality and its constituent aspects is uncommon. E-service quality refers to the overall assessment of the excellence and quality that e-service provides on the Internet (Zeithaml et al., 2002). When ordering online food delivery, the customers' experience with e-service will affect their feelings toward the food purchased and loyalty (Suhartanto et al., 2019). Several researchers have examined the factors influencing the E-service quality of online food delivery in the mobile settings (Kapoor and Vij, 2018; Wang et al., 2019). Commonly, most of these existing E-service scales were developed based on the Technology Acceptance Model (TAM) that posits "attitude", "perceived usefulness" and "perceived ease of use" as the key elements in anticipating users' intention to use a new technology (Song et al., 2021). Considering the E-service quality for online food delivery is dependent on IT platform or third party primarily, and the process of online food delivery has become more challenging due to the outbreak of

COVID-19 pandemic (Chan et al., 2021), an up-to-date E-service quality scale with empirical validation is needed for today's online food delivery.

Based on the above-mentioned premise, the current study proposes that the online food delivery service quality comprises the customer's online food ordering experience with mobile apps, service quality and food quality. The evaluation of such experience will determine customer's satisfaction and behavioral intentions.

2.2 Dimensions of online food delivery quality

2.2.1 Food Quality

In order to determine food quality, Namkung and Jang (2007) proposed that the factors of the variety of the menu, food presentation, healthiness, taste, freshness, and food temperature are related. When assessing the influence of customers' food satisfaction and their intention to return, Ha and Jang (2010) suggested that food attributes of taste, nutrition, and variety are apposite. Similarly, Liu et al. (2017) utilized the menu, presentation, size, and variety as indicators of the quality of restaurant food. Evidently, past literature commonly examined food quality based on the restaurant proposition. However, different from the food delivery, the restaurant's physical setting has significantly affected customer satisfaction toward food quality and their repeat-patronage intentions (Sulek and Hensley, 2004). Recent studies discovered that consumer expectations and perceptions of food quality and service quality were found to be significantly different in robot-delivery, human-delivery and carry-out modes of off-premise restaurants (Cha, 2020; Christou et al., 2020; Byrd et al., 2021; Ivanov and Webster, 2021). With the characteristics of food delivery service compared to the food served in a restaurant (He et al., 2019), the variables of food presentation, temperature, and freshness are considered as the components of food quality.

2.2.2 Service Quality

Service quality is described as the discrepancy between expected and perceived services (Zeithaml et al., 2002). Based on the expectation-(dis)confirmation theory, Parasuraman et al. (1988) developed SERVQUAL to measure customer perception of service quality. The 22-item instrument categorizes service quality into five components, namely, tangibles, reliability, responsiveness, assurance, and empathy. Adapting SERVQUAL, Stevens et al. (1995) created the 40-item instrument DINESERV to assess customers' perceptions of restaurant service quality. Accordingly, tangibles refer to a restaurant's interior design and appearance of staff. Then, reliability involves freshness and temperature of the food, correct billing, and receiving ordered food. Responsiveness relates to staff assistance with the menu and prompt response to customers' needs and requests. Moreover, assurance pertains to customers' confidence that the food is not contaminated without fear of safety. Finally, empathy refers to providing personalized attention to customers or by being sympathetic toward customers' problems (Marković et al., 2010). However, DINESERV, which is used for restaurant service quality analysis, is not applicable for food delivery services. For instance, the physical environment, staff interaction with employees, and individual attention are not evident for online food delivery. Hence, we base our measurement scale on the fundamental SERVQUAL and DINESERV to capture the preliminary dimensions of service quality in the food delivery context (See Table 1).

2.2.3 E-service Quality

As aforementioned the E-service Quality of online food delivery is a thorough process involving IT applications, employees and cash flow payment variables (Suhartanto et al., 2019). With the extensive nature, Huang et al. (2015) created a scale named M-S-QUAL with five dimensions, that is, efficiency, fulfillment, privacy, contact, and responsiveness to assess mobile commerce service quality in the retail context. Although all developed measurements are still applicable for the contemporary online food delivery, it is noteworthy that the E-service quality of today's online food delivery has become more exacting due to the outbreak of COVID-19 pandemic. Several recent studies have confirmed that more take-away options and sanitation protocols are available after the outbreak of COVID-19 pandemic (Jiang and Wen, 2020; Chan et al., 2021; Kim et al., 2021). For example, during COVID-19 pandemic, the third party food delivery apps provided more options for groceries delivery service and strengthened strict adherence to hygiene standards and contactless delivery process to ensure minimal exposure during delivery (Yang et al., 2020; Kumar and Shah, 2021). All of these new initiatives are associated with the E-service quality from what and when consumers ordered online to the exact delivery and time. Due to the increasing demand and more complicated procedures involved in the online food delivery transactions, indicators including delivery time under the construct of fulfillment, the overall online food delivery system efficiency and the more specific indicators about personal and instant communication with provider should be considered for E-service quality.

2.3 Conceptualization of formative DEQUAL

Based on the above-mentioned premises, the index of food delivery quality has emerged as an important topic for F&B marketing scholars. In response to this call, this research aims to develop a measurement scale for food delivery quality, namely, up-to-date quality of online food delivery (DEQUAL). The study delineates that food delivery includes two segments: restaurant-to-consumer and platform-to-consumer. Food delivery comprises the customer's online ordering experience from either the website or mobile apps and food quality. The chronological stance is that the perception of DEQUAL is the antecedent, prior to satisfactory perception and behavioral intentions of repurchase.

Founded on the explorative nature and conceptualization, the present study puts forward formative indicators as the assessment structure of DEQUAL. In any case, formative and reflective indicators are two distinguished concepts. The reflective indicators are caused by the construct, which is represented as single-headed arrows pointing from the latent construct outward to the indicator variables (Hair et al., 2011). For any alteration of construct, the values of indicators change concurrently; thus, all the reflective indicators are highly correlated with one another (Hair et al., 2011). On the contrary, the formative indicators flow from the indicators to the construct, which means that the indicators cause an underlying construct (Hair et al., 2011). In the formative measurement, alterations in formative indicators are suggested to induce changes in their corresponding latent construct (Hair et al., 2011). In consequence, formative and reflective approaches are hypothetically and statistically different in interpreting the relationship between underlying indicators and constructs (Hair et al., 2011). Therefore, the Confirmatory factor analysis (CFA) used for measuring the reflective model with all reflective indicators is not applicable for the formative model (Hair et al., 2020).

Hypothesizing the formative indicators of DEQUAL, this study is justified in that all proposed indicators could potentially cause the latent constructs event if they are not necessarily correlated.

This case is a logical consideration specifically that this study is exploring the latest DEQUAL during the COVID-19 outbreak. Furthermore, the perceived quality of the delivered food is considerably different from the food served in a restaurant. For instance, a restaurant provides various food delivery menu options, but using a disposal box would degrade the perceived quality of food presentation. Hence, two indicators of food quality represent food presentation, that is, visually attractive (FOOD1) and the restaurant offering a variety of menu items (FOOD2). These indicators are disconnected, establishing the formative approach for DEQUAL. Although the DEQUAL is defined in the formative basic, the reflective measures of satisfactory and repurchase intention are used for the assessment. Figure 1 presents the conceptual framework of the DEQUAL index model.

3. Methodology

To produce and verify an up-to-date instrument, the current study employed a sequential-exploratory approach of mixed-method (Creswell, 2009). Qualitative and quantitative methods of in-depth interviews and online questionnaires were utilized. Given that the research goals are in explorative essence with predicting key target constructs, partial least squares structural equation modeling (PLS-SEM) was used (Hair et al., 2011). To do so, this study followed the methods provided by Diamantopoulos and Winklhofer (2001) and Hair et al. (2019). Figure 2 presents the four-step development.

3.1. Step 1: Content specification

First, we specified the scope of the construct to delineate the content domain in a formative index (Diamantopoulos and Winklhofer, 2001). Through an extensive review of hospitality, food and beverage, and service marketing literature, the domain of DEQUAL was defined in three constructs: service quality, E-service quality, and food quality. With the explicit definitions of three domains, we then generated a set of preliminary indicators from the literature review for each construct. The construct of service quality had 23 items (Stevens et al., 1995), E-service quality had 13 items (Huang et al., 2015), and food quality had 6 items (Namkung and Jang, 2007). A total of 42 items were captured, pending further indicator specification. Table 1 presents all initial indicators.

3.2. Step 2: Indicator specification

Step two was to stipulate a census of indicators (Diamantopoulos and Winklhofer, 2001). Aiming to use the specific items as indicators to cover the entire scope of the construct, we conducted eight in-depth expert interviews. The interviewees were chosen based on their expertise in F&B which included having at least 5-year managerial experience in restaurants, teaching and practical experience in the disciplines of hospitality and tourism management, and experiences in either ordering or providing food deliveries in the past 6 months. The designated 6 months was with reference to the enduring memory retrieval from the study of Borovsky and Rovee‐Collier (1990). Such timeframe was also adopted by Hwang and Kim (2021) for their recent study about online delivery system. A semi-structured interview was employed. Interviewees initially screened out the appropriate items describing DEQUAL from the 42 items in step 1 of content specification.

Then, they were asked for any other item that they could come up with for DEQUAL examination. The average interview length was approximately 20 minutes. The audio interview recordings were transcribed for content analysis. The findings showed that seven items were inappropriate in this study, and no new item was suggested by the experts. Table 1 shows the deleted items marked with asterisk.

3.3. Step 3: Indicator collinearity

Given the formative measurement model, ensuring no multicollinearity is needed in step 3 (Diamantopoulos and Winklhofer, 2001). To accomplish this, an online pilot study was administered through Qualtrics, with a convenient sample of 150 students from a university in Hong Kong in November 2020. To start with, screening questions were applied to make certain participants' appropriateness to join. Participants must be older than 18 years old and have used food delivery apps for food delivery within 6 months. Among all the participants, 26.7% have used food delivery service within the past three days and 62.2% have used within the past one month. In addition, 44.4% of the participants indicated that they used the food delivery service over one time a week. We then asked the participants to indicate whether they agreed or disagreed with the 35 items with respect to the service dimensions they have experienced on a seven-point Likert scale (1 = strongly disagree and 7 = strongly agree).

For collinearity examination, the variance inflation factor (VIF) and outer weights were inspected using the SmartPLS (Hair et al., 2019). Bootstrapping of 5,000 replications was operated (Hair et al., 2011). Following Hair et al. (2019), three insignificant outer weights in Table 1 remarked with ** were removed. The remaining 32 indicators were then confirmed as the valid formative indicators with significant outer weights ($p < 0.05$) and VIF <3 under the specific construct. The results of step 3 corroborated all question items used for the main study and general data collection completed hereafter. Results showed that all 32 indicators met the requirements, pending for the final examination of external validity.

3.4. Step 4: External validity

The final step was to examine the external validity (Diamantopoulos and Winklhofer, 2001). For this purpose, a formative measurement and structural model were sequentially assessed, following Hair et al. (2019). The formative measurement model can conjecture how much each indicator contributes to the formative construct, whereas the formative structural model assessment can test if the overall measurement model is satisfactory in its predictive power (Hair et al., 2019). Hence, combining two assessments fulfills the objectives of external validity. In addition, this study randomly grouped the overall sample into two samples for the assessments with the intention to enhance the generalization quality allied to the same function of prediction (Calder et al., 1982). With reference to the cross-validation method used by Woodside et al. (1989), the results of two split samples can test for predictive validity for a new scale development. Such method has also been used formative index construction for developing a new scale for memorable dining experience (Cao et al., 2019).

3.5. Main study data collection

Data were collected from Amazon Mechanical Turk (MTurk) for two days in November 2020 using a web-based questionnaire. A qualifying criterion was the same as the pilot study aforementioned in step 3. The target population was U.S. adults. The survey consisted of three parts. After consenting, participants answered preliminary questions regarding their online food delivery ordering experience (i.e., the most recent experience of ordering food delivery service online, the frequency of ordering food delivery service online, and the platforms used). Next, participants answered questions on a seven-point Likert scale regarding the service quality, the platform quality, food quality, their satisfaction, and behavioral intentions. Last, participants answered demographic questions.

Following the minimum sample size of 10 times empirical rule for each indicator (Hair et al., 2012), we purposively increased the sample size ratio to 15 times, striving for the additional precise index validation of the measurement model and higher predictive power of the structural model. Therefore, with the 32 indicators defined from step 3, at least 480 samples were needed. After the data screening of 500 participants, 485 valid questionnaires were received. In the step with four external validities, the overall sample (N = 485) was split into two halves at random: Sample 1 (N = 243) and Sample 2 (N = 242) for further data analysis.

4. Result

4.1 Descriptive statistics

Table 2 displays the distribution of the participants' demographic characteristics generated by SPSS 26.0. The demographic data for participants (N = 485) demonstrated that 41.6% of the participants were female and 58.4% were male. Moreover, 93.8% were aged between 21 and 60, 83.1% had a college degree or above, and 88.2% earned a yearly income between US$20,000 and US$99,999. This study found that all demographics from the two sub-samples showed a similar distribution as the original sample.

4.2 Formative measurement model assessment

Hair et al. (2019) noted that the formative measurement model includes four assessments, namely, convergent validity, indicator collinearity, statistical relevance, and significance of the indicator weights. The relationships of the indicators and their relevant inherent construct in measurement model was assessed using Smart PLS 3 in Sample 1 (N = 243) and Sample 2 (N = 242).

4.2.1 Convergent validity

The convergent validity of the formative measurement model was assessed using the redundancy test (Chin, 1998), wherein the formative–formative form of hierarchical factor model was proven. Considering this study focused on the relationships of the DEQUAL constructs, the convergent validity was appraised on the second-order level. The path coefficient between DEQUAL and the four-indicator reflective measurement of satisfactory for 0.827 and 0.803 of Samples 1 and 2 respectively. Both path coefficients of the two samples exceeded the minimum threshold of 0.8 in the redundancy analysis (Chin, 1998). Hence, the convergent validity was assured.

4.2.2 Indicators collinearity

After ensuring the convergent validity, the collinearity was checked both split samples. Hair et al. (2019) indicated that VIF values of five or above indicate critical collinearity issues among the indicators of formatively measured constructs and those close to three and lower are considered ideal. As presented in Table 3, the VIF values of all the indicators in Sample 1 (N = 243) and Sample 2 (N = 242) were close to and below three, indicating no collinearity problem for the formative measurement model.

4.2.3 Significance and relevance of indicator weights

Given the nonparametric method used in PLS-SEM, bootstrapping of 5,000 was used to assess the weights' statistical significance and relevance of the indicators (Chin, 1998). Results showed that the outer weights of all 32 indicators (Table 3) were positive and significant at $p < 0.05$. Given that the larger the significant weights, the more relevant the indicator, the positive outer weights prove its relevance, resulting in no item removal (Hair et al., 2019). Furthermore, for the indicator relevance, outer loadings of ≥ 0.50 are considered statistically significant and pertinent (Hair et al., 2019). Table 3 shows that all indicators met this standard, except for Tang_5 that received 0.481 and 0.486 of two split samples, which were slightly lower than 0.5. However, Hair et al. (2019) stated that only when the outer weight and outer loading were insignificant, then the indicator should be considered to eliminate. Thus, the overall results support that no indicator should be removed for the DEQUAL index construction.

In this context an Exploratory Factor Analysis (EFA) used for discovering the factor structure of a measure and examining its internal reliability is not applicable for formative DEQUAL model (Jarvis et al., 2003). This is because the EFA has an assumption that all reflective items are correlated with reflective latent factors, while formative factors do not require items to be correlated (Jarvis et al., 2003).

4.3 Formative structural model assessment

This assessment aims to verify the overall formative model's predictive relevance and accuracy. Three standard assessments, namely, the relevance of the path coefficients and statistical significance, the blindfolding-based cross-validated redundancy measure (Q^2), and the coefficient of determination (R^2), are required (Hair et al., 2019). First, the path coefficients were tested on the second-order level between DEQUAL and each dimension. Figure 3 displays all the positive path coefficients of each construct. Service quality has the most significant contribution to DEQUAL, followed by E-quality and lastly food quality. The results of Samples 1 and 2 denoted that all path coefficients were significant at the 0.01 level. Hence, supported by the statistics, all three dimensions considerably relate to DEQUAL, which also contribute to the reflective measures of satisfaction and repurchase intention. Second, the R^2 values from 0.50 to 0.75 can be considered moderate to substantial, and R^2 ranging from 0 to 1 with higher values indicates a greater explanatory power and predictive accuracy (Hair et al., 2019). Figure 3 shows that the R^2 value under DEQUAL of split samples was 1, whereas the reflective measure of satisfactory and repurchase intention all received more than 0.50. Therefore, all R^2 values represented at least moderate to substantial predictive accuracy and explanatory power of each construct. In particular, the robust value of R^2 for DEQUAL signified its strong prediction power. Third, by applying the blindfolding procedure, the Q^2 value of DEQUAL was 0.408 and 0.381; the reflective measure of satisfactory was 0.421 and 0.385; and the repurchase intention was 0.479 and 0.445 for Samples 1 and 2, respectively, depicting medium to large predictive relevance of the PLS-path model. Lastly,

an evaluation for the second-order measurement model results from the Sample 1 and Sample 2 was carried out, as presented in Table 4. In sum, this assessment empirically validated the formative structure of the 32-indicator elucidation. The DEQUAL formative index was confirmed across sub-samples.

5. Discussion and Conclusions

Online food delivery has been proliferating since the global trend toward e-commerce and notably the changing social behaviors owing to the COVID-19 pandemic. As the pandemic has subsisted and additional consumers have acclimated to this dining format, we believe that consumers continue to be more reliant on this service even when the pandemic is over. Henceforth, the research question pertaining to the up-to-date consumers' service quality assessment toward online food delivery has yet been addressed. By constructing the formative DEQUAL index, this study answers all of these questions and provides theoretical and practical insights into the hospitality industry.

Online food delivery service quality consists of multiple dimensions, including characteristics of the traditional service quality, e-service quality, and food quality. Given that the previous literature could not cover these multi-dimensional service attributes, the current research reviewed key studies and extracted the three dimensions to capture the online food delivery service quality. The formative DEQUAL index consists of 32 indicators within three key dimensions. Specifically, service quality includes the traditional items of SERVQUAL (Stevens et al., 1995; Zeithaml et al., 2002; Marković et al., 2010). E-quality includes efficiency, fulfillment, privacy, and contact dimensions (Zeithaml et al., 2002; Ding et al., 2011; Huang et al., 2015). Food quality includes visual attractiveness, variety, temperature, and healthiness of the food (Namkung and Jang, 2007; Ha and Jang, 2010).

According to the PLS-SEM results, DEQUAL has a significant relationship with customer satisfaction and repurchase intention. This result reflected that the DEQUAL model has a robust predictive power for investigating consumer's satisfaction and repurchase intention. As a supplement to the past studies showing the similar result of the correlated relationship of satisfaction and repurchase (Suhartanto et al., 2019; Yeo et al., 2021), the current results specifically exhibited that the DEQUAL has a stronger influence on repurchase intention than satisfaction. Although the outer loadings of both constructs are high, the overall result revealed that consumers have higher inclination to purchase again with the restaurant and the food delivery company. Comparatively, among all high satisfaction indicators, consumers have slightly lower satisfaction on enjoying the purchasing process from apps or site. Combining various results of this study, the model of DEQUAL can be further decomposed into theoretical and practical contributions.

5.1 Theoretical Implications

Theoretically, this study contributes to the hospitality service literature by exploring the underlying structure of DEQUAL, which is the second-order formative construct. Supplementing the past literature on SERVQUAL (Zeithaml et al., 2002), DINSERV (Stevens et al. (1995), E-service quality (Huang et al. (2015), and food quality (Namkung and Jang (2007), this study provides a theoretical and empirical-based conceptualization of the multi-dimensional construct of DEQUAL.

It identified the key components of online food delivery service consisting of service quality, E-quality and food quality. In addition, our findings suggest the downstream consequences of the DEQUAL – satisfaction and repurchase intention. These findings support the notion that satisfaction derives from the evaluation of service performance and results in repurchase intention in the online food delivery service context (Oliver, 1980; Kim et al., 2009).

The majority of the past studies shared the common approach of applying the reflective measurement. The reflective approach, which accentuates that indicators under a specific construct must be correlated, has been frequently adopted (Cenfetelli and Bassellier, 2009; Ahn and Kwon, 2021). Alternatively, the present study argues that the formative approach is a more appropriate mode for examining DEQUAL that is rested on the explorative basic since the unprecedented COVID-19 pandemic. Moreover, the conceptualization of DEQUAL is still in the incipient stage. This study thence furnishes the relevance of the formative index in the service management literature, inspiring more academic researchers to implement the formative approach when appropriate. On this basis, apart from explanatory power, this study further advocates that the significance of predictive power should be accentuated although the conflation between these two is common (Shmueli, 2010). Despite this study offering predictive and explanatory results, the formative approach using the PLS-SEM is accredited for its strong predictive power (Hair et al., 2011). From the theoretical standpoint, predictive power is evaluated using metrics computed from a holdout set or cross-validation, whereas explanatory power is measured through strength-of-fit that refers to a causal theoretical model, testing the causal hypotheses (Shmueli and Koppius, 2011). In brief, predictive power focuses on the accuracy of indicators, whereas explanatory power centers on the strength of association indicated by a statistical model (Kalampokis et al., 2013). Both indicators and models are intertwined for the entire research development. Although most of the referred research tends to highlight the overall model fitness, the present study promotes that the accentuation of indicator quality is also fundamental in exploration study particularly in its strengthened predictive power (Hair et al., 2011).

5.2 Practical Implications

The current study proposes numerous practical suggestions for restaurant service quality management. Primarily, the 32-indicator index serves as an effective instrument for restaurant managers who offer online delivery services to evaluate the service quality. The DEQUAL can be used in customer surveys, mystery shopping, or service auditing to assess the food delivery service quality and improve customer satisfaction. As the indicators in the DEQUAL revolve around the online food delivery experience, the DEQUAL survey can provide particular insights on which specific area of the service experience needs improvement. By learning from the DEQUAL results, restaurant managers can target the service defects accurately and carry out service improvement plans efficiently.

Customer relationship management (CRM) is critical to the success of service industry. Using the DEQUAL survey to regularly assess the service quality can not only monitor and improve the restaurant's service, it can also signal the company's competiveness in maintaining customer satisfaction and customer relationship. Restaurant companies can put a link or QR code to the DEQUAL survey on a receipt to collect the data. By showing the care and efforts to strive for customer satisfaction, companies can differentiate themselves from their competitors.

Unlike the dine-in experience that emphasizes restaurant ambiance, value-added service, and exceptional food quality, food delivery concerns more about safety and efficiency. Thus, it is crucial for restaurant managers who supervise both dine-in service and delivery service to be aware of the differences in customer expectations. For instance, this study finds that although food quality is relatively uninfluential in DEQUAL compared with service quality and E-quality, consumers consider food temperature as the most vital attribute in addition to attractive presentation and taste. In addition, in order to strive for a more satisfactory online food delivery process, we also recommend food delivery apps or sites designers to spend more effort on personalization. This is in line with the suggestions from Alalwan (2020) suggesting that a high level of personalized services when using food ordering apps can contribute to customer satisfaction. On the whole, the DEQUAL index not only provides a comprehensive set of indicators to evaluate and improve food delivery service quality, but also inspires managers to take additional measures to impress customers with better food delivery performance.

6. Limitation and Future research

This study had several limitations, proposing avenues for future research. One of the limitations is that the application of DEQUAL is not everlasting. The study delineated the DEQUAL and collected data after the COVID-19 outbreak, and various uncertainties occur afterward. For example, when the government continues to ban dine-in meals, online food delivery is the only option, making it a factor influencing DEQUAL. Besides, given that different food has varying safe temperature standards, instead of the general question about delivered food temperature, additional questions of how different types of food and its temperature should be considered. Therefore, future research can cross-validate the findings with different types of cuisine. Similarly, as illustrated, this study adopted the formative approach owing to the undeveloped theory predicated on the unexampled COVID-19 pandemic. Thus, hereafter with this developed DEQUAL index model, researchers are encouraged to conduct similar research using the reflective approach. The comparative results of both are potential for additional academic insights. Last, this study mainly relies on the responses from U.S. consumers. The results might not be generalizable to food delivery services in different cultures. On this point, future research is advised to extend this study to other demographics for further exploration of cultural variance in online food delivery.

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