Research Contribution

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GENDER DIFFERENCES IN DIGITAL FOOD ORDERING EXPERIENCES: AN APPLICATION OF THE TECHNOLOGY ACCEPTANCE MODEL AND SELF-CONGRUITY THEORY

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ABSTRACT
The purpose of this study was to examine the digital food ordering experience by applying the technology acceptance model and self-congruity theory. A research model was developed and examined, focusing on gender differences. Results showed that both perceived ease of use and perceived usefulness had significant positive effects on the certainty of the digital ordering process. Additionally, both certainty and self-technology congruence significantly influenced customer satisfaction. Multi-group analysis results revealed that the effect of certainty on customer satisfaction was significantly higher for females, while the effect of self-technology congruence was significantly higher for males.

Keywords: digital food ordering; gender difference; technology acceptance model; self-congruity theory; certainty

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INTRODUCTION

The U.S. restaurant industry, in 2020, was projected to grow continuously, with $899 billion in sales in more than 1 million locations (National Restaurant Association [NRA], 2020). Technology advancement has brought changes to many industries including the restaurant industry. Restaurateurs need to continually adapt and innovate to stay competitive in the fast-changing business environment (NRA, 2019). On the other hand, consumers are more comfortable using technology and are adopting it, especially Millennials and Centennials who live for social engagement and experience online (NRA, 2019). This consumer trend is driving changes in the restaurant industry (NRA, 2019).

Digital ordering, as one form of technology that triggered various changes in the restaurant industry, was favored by a growing number of customers because of its fast and convenient features (He *et al.*, 2019; Kimes, 2011). According a NRA report, 44% of customers surveyed had placed digital food orders in the past year (NRA, 2020). Digital ordering for takeout or delivery of food has grown tremendously in the past decade and is expected to drive growth in restaurant sales for the next decade (Nunes, 2019). Many quick-service restaurants have adopted various digital ordering methods for their operations (Kimes, 2011). Pizza was the most frequently ordered food via digital platforms (Kimes, 2011). Examples of popular platforms for placing digital food orders include restaurant apps, restaurant websites, and smart speakers.

Restaurateurs enjoyed the benefits of adopting digital food orders, such as increased revenue, increased productivity, reduced labor costs, improved capacity management, increased accuracy of orders placed, and improved customer relationship management (Kimes, 2011; Kimes & Laqué, 2011). However, restaurant managers have expressed concern over declining service quality associated with the reduced interaction between customers and restaurant staff (He et al., 2019; Kimes & Laqué, 2011). The traditional human-to-human interactions between customers and restaurant staff have been replaced with human-computer interactions or human-to-robot interactions (Atkinson, 2018). In other words, how customers interact with the digital platform influences their perceptions of the service quality of the restaurant. Therefore, research is needed to examine the impact of such interaction on customer digital ordering experience.

With the increasing adoption of digital food ordering platforms in the restaurant industry, it is important to understand the customer experience when placing orders. During the COVID-19 pandemic, customers placed more digital food orders than ever before. Previous studies about digital food ordering mainly focused on food quality, service quality, and customer satisfaction (Alalwan, 2020; He, Han, Cheng, Fan, & Dong, 2019; Suhartanto, Helmi Ali, Tan, Sjahroeddin, & Kusdibyo, 2019). However, no research has been conducted to examine consumers' food ordering experience through the perspectives of certainty and self-congruence. Therefore, this study aimed to investigate customers' digital food ordering experience by proposing and testing a research model. As gender differences were frequently mentioned in previous studies related to technology adoption and user experience (Gefen & Straub, 1997; Kim, 2016; Park, Kim, Cho, & Han, 2019; Venkatesh & Morris, 2000; Zhang, Nyheim, & Mattila, 2014), the study will further explore whether there are gender differences in the proposed relationships in the research model.

In the next section, the literature review and development of hypotheses are described. A research model is proposed based on the technology acceptance model and the self-congruity theory. The methodology of the current study, results, discussions, and conclusions are presented afterward.

Technology Acceptance Model

Technology Acceptance Model (TAM; Davis, 1985; 1989) has been frequently used by researchers to evaluate the attitudes and behaviors of customers when adopting technology in the hospitality industry (Morosan, 2011; Salehi-Esfahani & Kang, 2019; Zhang, Seo, & Ahn, 2019). TAM identified that the perceived usefulness and the perceived ease of use of technologies are two basic factors that influence an individual decision to adopt the technology (Davis, 1985; 1989). Perceived usefulness measures an individual subjective evaluation of the utility provided by certain technology (Zhang & Mao, 2008). An individual is more likely to adopt the technology if he or she perceives it as useful in achieving goals (Premkumar, Ramamurthy, & Liu, 2008). The perceived ease of use refers to an

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individual's subjective evaluation of the efforts required to learn and use the technology (Ko, Kim, & Lee, 2009; Zhang & Mao, 2008). Similarly, an individual is more likely to adopt the technology if he or she perceives that it is easy to use (Davis, 1989).

Both constructs of perceived ease of use and perceived usefulness have been found to influence consumer attitudes, emotions, intentions, and behaviors in terms of technology adoption and usage (Morosan, 2011; Salehi-Esfahani & Kang, 2019; Zhang, Seo, & Ahn, 2019). Certainty refers to an individual subjective sense of conviction in their attitudes (Rucker, Tormala, Petty, & Briñol, 2014). It is also considered a dimension of customer attitude or emotion in marketing research (Rucker, Tormala, Petty, & Briñol, 2014; Tiedens & Linton, 2001). This concept can also be interpreted by its synonymous terms such as "confidence", "commitment", and "correctness" (Gross, Holtz, & Miller, 1995). In addition, the impact of certainty on consumer brand loyalty and satisfaction was proved in previous consumer studies (Tuu & Olsen, 2012; Tuu, Olsen, & Linh, 2011). Based on the above-mentioned literature, we proposed in this study that:

H_1: Perceived ease of use has a positive impact on the certainty of the digital ordering process.

H_2: Perceived usefulness has a positive impact on the certainty of the digital ordering process.

H_3: Certainty of the digital ordering process has a positive impact on customer satisfaction.

Self-congruity Theory

Self-congruity refers to the degree to which an individual's self-perception matches their perception of a product or the brand image of a product (Sirgy, 2015; Sirgy & Su, 2000). In specific, self-concept is defined as the "totality of the individual thoughts and feelings having reference to himself as an object" (Rosenberg, 1979, p. 7). Thus, the self-congruity theory is developed based on the assumption that consumers will prefer a product or service that matches their self-perception (Sirgy, 1982). The self-congruity theory has been widely applied in hospitality and tourism studies (Boksberger, Dolnicar, Laesser, & Randle, 2011). For example, researchers found that self-congruity had positive influences on tourist satisfaction toward the destination (Kumar & Nayak, 2014), hotel guest satisfaction (Sop & Kozak, 2019), and customer satisfaction with service quality in restaurants (Shamah, Mason, Moretti, & Raggiotto, 2018). In an attempt to study the influence of such congruence between consumers themselves and the technology on consumer satisfaction in the digital ordering experience, the following hypothesis was proposed:

H_4: Self-technology congruence has a positive impact on customer satisfaction.

Gender, a fundamental aspect of culture, was frequently tested in information technology studies to understand consumer behaviors. In early studies, researchers suggested that males and females perceive technology differently and further called for future studies to examine the impact of gender on TAM (Gefen & Straub, 1997). In response to the call, Venkatesh and Morris (2000) identified that perceived usefulness had a stronger effect on the technology adoption decisions of males, while the decision-making processes of females were more influenced by subjective norms and perceived ease of use of the technology. When applying TAM in hospitality and tourism studies, the role of gender was also explored. Zhang, Nyheim, and Mattila (2014) found that males had higher computer self-efficacy and tended to find the information systems easier to use and more enjoyable when compared with females. Using TAM to study hotel tablet apps, Kim (2016) claimed that gender did not moderate the relationships between predictors and consumer behavioral intentions. However, gender differences were found in consumer preferences toward specific tablet app functions (Kim, 2016). As limited previous research has examined the gender differences in digital food ordering experience, this current study also used the multi-group analysis method to explore the gender differences in the proposed research model. Thus, the last hypothesis was proposed:

H_5: Hypothesized relationships will be different between female consumers and male consumers.

Figure 1 presents the research framework with all hypothesized relationships among the constructs.

METHODS

Data Collection

The study was approved by the Institutional Review Board (IRB) at a large public university located in the southern region of the United States before data collection. Data were collected between March 2019 and May 2019. Traditional lab studies have used students as the pool of valid participants (Druckman & Kam, 2011). In the marketing field, Wang and Yang's (2008) study identified that the effect sizes of studies using college student samples and regular consumer samples are very similar. In addition, young consumers with higher education levels are more likely to adopt digital food ordering methods (Leung & Wen, 2020). Therefore, although with limitations, undergraduate student samples in this study can still represent the restaurant customer population who are inclined to place digital food orders. Researchers posted study flyers in the student union and major academic buildings to recruit undergraduate students with a food voucher incentive. Undergraduate students who were interested in this study were invited to go to a research lab to participate in the research project. Upon arriving at the lab, students were first asked to choose one of the three digital ordering methods (mobile app, website, or chatbot) to make a test takeout food order with a real restaurant (TGI Friday). The real menu from the restaurant was used in the study. The purpose of the test takeout food order is to ensure that participants had digital food experiences before they took the survey. Then all participants were required to complete an online survey.

A total of 211 participants completed the survey. In the study sample, 34.6% of them are males, and 65.4% are females. The age ranged between 18 and 49, with the average age being 21.8 years old. In terms of ethnicity, more than 41% of the participants are White, 25% of them are Hispanic or Latino Americans, 16% of them are African Americans, and 14% of them are Asian Americans. More than 97% of the participants have placed orders, and almost half of the participants placed takeout orders once every week.

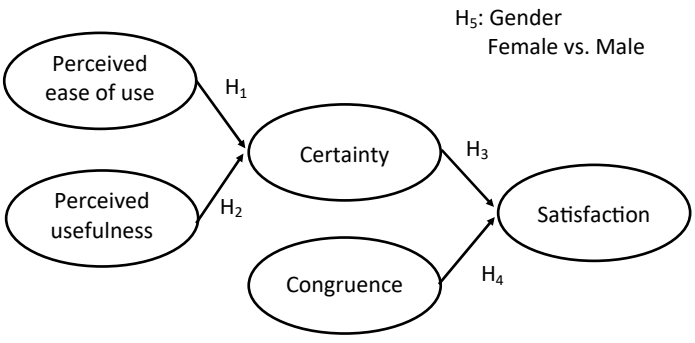

Figure 1. Research Framework

Measurement

The online survey questionnaire consisted of two sections. The first section contained questions regarding all the constructs in the proposed research model. The measurements of all the constructs were adopted from the previous literature to fit the context of this study. Perceived ease of use and perceived usefulness were measured using four items adopted from the study of Davis (1989). Certainty was measured using three items borrowed from Smith and Ellsworth (1985). Self-technology congruence was measured using four items borrowed from Sirgy et al. (1997). Satisfaction was measured using three items borrowed from Westbrook & Oliver (1991). All measurement items are listed in Table 1. A seven-point Likert-type scale anchored from one (strongly disagree) to seven (strongly agree) is used for all items. The second section collected demographic information from the respondents, including gender, age, ethnicity, academic standing, and past restaurant takeout order experience. A pilot test was conducted with over 20 study participants. The wording of some questions was slightly modified according to the feedback from the pilot study.

Data Analysis

Before data analysis, the collected data were cleaned and checked for missing data in SPSS Version 24.0. No missing data were identified. The proposed model was then examined through partial least squares structural equation modeling (PLS-SEM) using the SmartPLS 3 statistical software package. When measuring the survey data, many hospitality researchers considered the PLS-SEM method as a robust and reliable method (Ali, Rasoolimanesh, Sarstedt, Ringle, & Ryu, 2018); therefore, this method was also used in the current study. According to Hair et al. (2017), our proposed model with a 5% significance level and 80% statistical power requires 110 minimum sample size for PLS-SEM analysis. A three-step PLS-SEM process was used to analyze data. First, using the full sample in the outer (measurement) model, all the constructs were assessed for the indicator loadings, reliability, and validity in the measurement model. Second, the inner (structural) model was validated again using the full sample for the overall model fit, path coefficients significance, and the coefficient of determination (R^2 value; Hair et al. 2017). Third, the full sample was divided into two groups: females versus males. Multigroup analysis in PLS-SEM was conducted to compare the path coefficients between the two groups. Statistical significance was determined at $p < 0.05$.

RESULTS AND DISCUSSION

Measurement Model

The PLS-SEM algorithm using a path-weighting scheme was run to evaluate the reliability and validity of the construct measures in the outer model. The solution of the PLS-SEM algorithm was obtained in five iterations. Table 1 summarizes the results of the measurement model. First, the construct convergent validity was tested by examining the factor loadings and the average variance extracted (AVE). All factor loadings of the five constructs were above the minimum threshold value of 0.708 and were all kept for further analysis (Hair *et al.*, 2017). The value of AVE for the constructs all exceeded the minimum threshold value of 0.5 (Hair *et al.*, 2017). Therefore, convergent validity was met.

Moreover, the internal consistency (reliability) of all the constructs was tested by composite reliability (Fornell & Larcker, 1981). The composite reliability of all constructs was well above the minimum threshold value of 0.708 (Hair *et al.*, 2017). Discriminant validity was examined using both the Fornell-Larcker criterion and the heterotrait-monotrait ratio (HTMT). As shown in Table 2, the square root of AVE values for each construct were higher than the correlation coefficient between a pair of constructs (Fornell & Larcker, 1981). In addition, the HTMT values for all constructs were below the threshold value of 0.85 (Hair *et al.*, 2017), demonstrating good discriminant validity. In summary, the construct validity and reliability of the measurement model were met.

Table 1. Results Summary for The Measurement Model

	Outer Loadings	Composite Reliability	AVE
Perceived ease of use		0.963	0.866
1. Using digital methods to place a to-go order was easy for me.	0.941		
2. I found it easy to get digital ordering methods to do what I want it to do.	0.939		
3. My interaction with digital ordering methods was clear and understandable.	0.899		
4. It was easy for me to become skillful at using digital methods to place a to-go order.	0.943		
Perceived usefulness		0.963	0.868
1. Using digital methods enabled me to place a to-go order more quickly.	0.927		
2. Using digital methods enhanced my effectiveness on food ordering.	0.923		
3. Using digital methods made it easier to place a to-go order.	0.949		
4. I found digital methods useful in placing a to-go order.	0.927		
Certainty		0.931	0.818
1. I had a good understanding of what was happening in the ordering process.	0.918		
2. I was certain about what was happening in the ordering process.	0.938		
3. I was able to predict what was going to happen during the ordering process.	0.855		
Self-technology congruence		0.962	0.864
1. I am very much like the typical user of digital food ordering.	0.924		
2. I can identify with the typical user of digital food ordering.	0.943		
3. The image of the typical user of digital food ordering reflects the kind of person I am.	0.927		
4. I feel my personality is similar to a digital food ordering user.	0.923		
Satisfaction		0.965	0.903
1. I am happy with the digital ordering process.	0.969		
2. I am satisfied with the digital ordering process.	0.965		
3. The decision to use the digital ordering method to place a to-go order was a wise one.	0.916		

Table 2. Discriminant Validity

	Perceived ease of use	Perceived usefulness	Certainty	Congruence	Satisfaction
Perceived ease of use	0.931				
Perceived usefulness	0.827	0.931			
Certainty	0.806	0.726	0.904		
Congruence	0.670	0.671	0.538	0.929	
Satisfaction	0.861	0.836	0.745	0.682	0.950

Structural Model

A path analysis was then conducted using the bootstrapping method with 5000 iterations of resampling to examine the goodness-of-fit index, the significance of path coefficients, and the coefficient of determination (R^2 value). As suggested by Henseler et al. (2014), the standardized root mean square residual (SRMR) was used as the goodness-of-fit measure of PLS-SEM. The proposed model had an SRMR value of 0.038, lower than the threshold value of 0.08 (Hu & Bentler, 1998), suggesting a good model fit.

The tested structural model with path coefficients is shown in Figure 2. All the proposed relationships were significant, supporting hypotheses H_1 to H_4. Both perceived ease of use and perceived usefulness had significant positive effects on the certainty of the digital ordering process (β = 0.65 and 0.19, p < 0.001 and < 0.05, respectively). Additionally, both certainty and self-technology congruence significantly influenced customer satisfaction levels when placing orders (β = 0.53 and 0.40, ps < 0.001, respectively). The tested model demonstrated that 65.9% of the variance of certainty was explained by both perceived ease of use and perceived usefulness, while 66.6% of satisfaction was accounted for by both certainty and congruence, well above the minimum threshold R^2 value of 25% (Hair et al., 2017).

The study findings are consistent with previous literature. First, the extensive application of the TAM model in the hospitality field all tested positive effects of perceived ease of use and perceived usefulness on the attitude toward adopting technology, such as mobile apps (Zhang, Seo, & Ahn, 2019), biometric systems in restaurants (Morosan, 2011), or restaurant review websites (Salehi-Esfahani & Kang, 2019). In marketing research, certainty is considered a dimension of customer attitude or emotion (Rucker, Tormala, Petty, & Briñol, 2014; Tiedens & Linton, 2001). Thus, the result of this study indicates that both perceived ease of use and perceived usefulness significantly impact certainty, resonant with previous TAM studies. Additionally, Watson and Spence (2007) found that certainty is relevant to consumer decision-making, including satisfaction and post -purchase behavior, supporting the positive relationship between certainty and satisfaction demonstrated in this study result. Moreover, the self-congruity theory (Sirgy, 1985) posits that self-image congruence is a strong predictor of post-purchase behavior, including customer satisfaction (Sirgy et al., 1997). The application of self-congruity theory in the technology field also suggests self-image congruence as an essential indicator of customer attitude (Antón, Camarero, & Rodríguez, 2013) and satisfaction with technology adoption (Cowart, Fox, & Wilson, 2008). Thus, the positive relationship between congruence and satisfaction found in this study corroborates the self-congruity theory.

Multigroup Analysis

To test H_5, a multi-group analysis was conducted to investigate whether and how the hypothesized relationships vary between female customers and male customers. The PLS-MGA test in SmartPLS 3 was run, and the results of the multi-group analysis are presented in Figure 3 and Table 3. For female consumers, the path model showed similar relationships as the full sample model. However, for male consumers, the proposed relationship was not significant. Perceived usefulness did not significantly impact certainty for males.

The results of the multi-group analysis revealed that two paths differed significantly between males and females, partially supporting H_5. Specifically, the effect of certainty on customer satisfaction was significantly higher for females, while the effect of self-technology congruence was significantly higher for males. However, no significant gender difference was found in the relationships between perceived ease of use and certainty and between perceived usefulness and certainty.

The multi-group comparison results contribute to the ongoing debate on the gender effects on consumer behaviors and decision-making. Previous literature regarding gender differences in the relationships between perceived ease of use/perceived usefulness and technology adoption decisions revealed mixed findings. Some studies identified significant gender differences in relationships between perceived ease of use/perceived usefulness and traveler UGC usage or mobile payments (Acheampong et al., 2018; Assaker, 2020). However, many studies did not find any gender differences in relationships between perceived ease of use/perceived usefulness and mobile shopping adoption or hotel tablet app usage (Kim, 2016; Lian & Yen, 2014). Similarly, this study did not identify any gender difference in the relationships between perceived ease of use/perceived usefulness and certainty, indicating that the type and nature of the technology studied may lead to different gender difference findings (Assaker, 2020).

In a meta-analysis study of gender differences in risk-taking, Byrnes, Miller, and Schafer (1999) indicated that males are more likely to take risks than females. This finding approved the proposition that risk-taking is an attribute of masculine psychology (Wilson & Daly, 1985). The current study found that females were impacted more strongly by certainty than males, suggesting that females prefer certainty

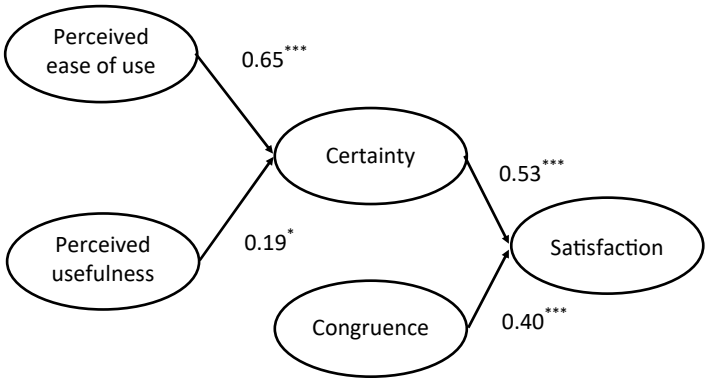

Figure 2. Path Model of Digital Food Ordering Experience

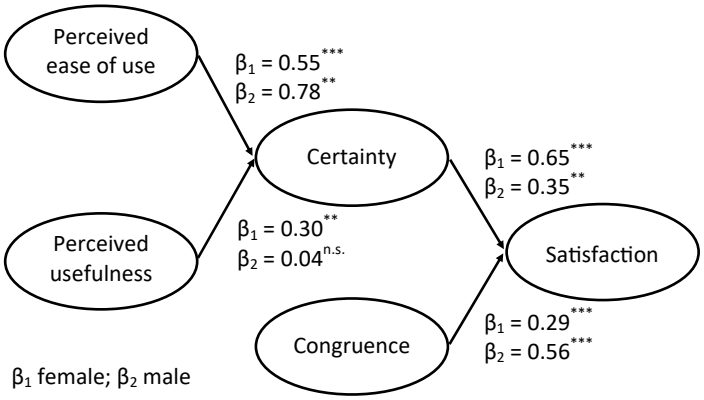

Figure 3. Multigroup Path Models of Risk Perception in Online Food Delivery Orders

more than males. This result supports previous findings that females are inclined not to take risks (Byrnes et al., 1999). In addition, the study revealed that male satisfaction with digital food ordering was more strongly impacted by self-technology congruence than females. The previous results on the effects of self-image congruence were contradictory. Although Das (2014) found that female shoppers value self-image congruence more than male shoppers in terms of retail brand loyalty, Fugate and Phillips (2010), on the other hand, demonstrated that males are more likely to seek product-gender congruence than females. In this study, we focused on how consumers feel congruent with the digital ordering process. As Lie (1995) indicated, products with technology (here as digital ordering) are always associated with masculinity. Therefore, the result is consistent with Fugate and Phillips's (2010) study to indicate~~s~~ that in the context of technology, male customers are impacted more strongly by self-technology congruence as they view technology as a high masculinity product (or experience).

CONCLUSIONS AND APPLICATIONS

Built upon the technology acceptance model and the self-congruity theory, this study proposed and tested a research model to examine the digital food ordering experience and the role of gender in this process. Results suggested that perceived usefulness and perceived ease of use both positively influenced consumer certainty toward using digital methods to order foods. Furthermore, consumer certainty and self-technology congruence significantly influenced their satisfaction regarding the digital ordering process. The impacts of gender on the proposed path model are significant. In specific, when placing digital food orders, female consumers value certainty more, while male consumers tend to focus on self-technology congruence more. On the other hand, the effects of perceived usefulness and perceived ease of use did not differ by gender. According to the results, the theoretical and practical implications of this study were discussed.

Table 3. Multigroup Comparison Test Results

Path Name	Difference (Female - Male)	*p-Value*
Perceived ease of use → Certainty	-0.23	0.127$^{n.s.}$
Perceived usefulness → Certainty	0.26	0.126$^{n.s.}$
Certainty → Satisfaction	0.30	0.034*
Congruence → Satisfaction	-0.27	0.039*

Note. * $p < 0.05$; $^{n.s.}$ $p \geq 0.05$

Theoretical Implications

This study contributes to the existing literature in two ways. First of all, even though gender differences were well-noticed in studies related to technology adoption, this study confirmed its impacts in the context of digital food ordering processes. The gender differences revealed in this study advanced our understanding of consumer behaviors in the foodservice field. Additionally, although the TAM model has been applied extensively in the hospitality literature, this study innovatively combined it with the self-congruity theory to develop a research framework. The study provides empirical evidence (the significant relations in the proposed research model) to support the application of the proposed theoretical framework in the foodservice context. The successful combination of the two theories and the proposed research model offers guidance for future researchers when studying information technology in the foodservice industry.

Practical Implications

Digital ordering has recently triggered many changes in the restaurant industry. With a short history and wide application, this technology is still evolving. Therefore, it is imperative to understand consumer attitudes and behaviors when placing digital food orders at restaurants. The study findings provide restaurateurs and digital application developers with several suggestions to improve the digital food ordering experience. First, perceived ease of use and perceived usefulness are both important for consumers when using digital food ordering methods. When restaurateurs are developing or adopting digital applications for consumers to order online or on mobile devices, a special focus should be placed on the efficiency and effectiveness of the digital application. Second, smartphone application developers may incorporate functions in digital applications to cater to the needs of male consumers and female consumers. As certainty had a greater impact on female consumers, the design of digital applications should focus on triggering positive emotions and attitudes from female consumers. Examples include presenting a colorful flow chart to show customers what to expect in the ordering procedure and giving instructions on the main page to help customers better gain control in the ordering process. Third, this study did not identify any gender differences in the relationships between perceived ease of use/perceived usefulness and certainty, indicating that this technology is suitable for both males and females. Restaurant operators and app/website designers do not need to differentiate their strategies on this aspect. Fourth, in the context of the COVID-19 pandemic, the role of digital food ordering played a more critical role than ever before in restaurant businesses. Restaurant operators should take the time during the pandemic as an opportunity to advance their digital food ordering platforms to attract and retain customers. With the increasing amount of pickup and delivery orders, digital food ordering methods help restaurant operators to increase productivity and order accuracy while reducing labor costs (Kimes, 2011; Kimes & Laqué, 2011) and decreasing the risk of COVID from person-to-person interactions. While human interactions are reduced, customer satisfaction toward the digital food ordering process will have a greater impact on customer overall satisfaction with the restaurant.

Limitations and Future Research

The current study is not free from limitations. Because a convenience sample of undergraduate students attending a public university was recruited to participate in the present study, results should be

interpreted with caution. In addition, a self-administered online survey instrument was used, and results may be impacted by social desirability bias. In this study, we used an anonymous online survey with carefully worded questions to combat social desirability bias. Future studies may explore other methods, such as analyzing actual user data, to avoid social desirability bias. Considering that digital ordering methods are still evolving, the results of this study may not represent the most recent state of consumers' experience, though the practical implications are still meaningful for practitioners. Lastly, this study was conducted in the U.S. and the results may not be generalizable to consumer digital ordering experience in other countries.

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