Structural Relationship between Attributes of Technology Acceptance for Food Delivery Application System: Exploration for the Antecedents of Perceived Usefulness

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Abstract: The aim of this research is to explore the antecedents of usefulness in the technology acceptance model for a food delivery application system and to confirm the accountability of the technology acceptance model in the area of food delivery application systems. The determinants of usefulness are information quality, swiftness, and food quality. For data collection, this research employs Amazon Mechanical Turk. The number of valid observations is 379. For the data analysis, confirmatory factor analysis and structural equation modeling were primarily implemented. The results indicate that usefulness is positively impacted by information quality, swiftness, and ease of use. Additionally, it is found that attitude is positively influenced by usefulness. Moreover, intention to use is positively affected by usefulness and attitude. This research is worthwhile in that it provides service providers with information for constructing better systems.

1. Introduction

According to Business of Apps [1], the food delivery application market size in 2022 was approximately USD 140 billion, and the market size is forecasted to be USD 320 billion in 2029. This suggests that the food delivery application market has been steadily growing. Business of Apps [1] also reported that numerous food delivery application services are competing in the US market, including Uber Eats, DoorDash, Deliveroo, and others. As a business condition, this implies fierce competition among these companies. Under these circumstances, business sustainability could be accomplished by creating a competitive advantage. Gaining an understanding of service user characteristics may be a starting point for a critical examination of this competition.

The technology acceptance model (TAM) is the main theoretical underpinning of this study. The TAM has been commonly used in various areas [2–7]. It can be inferred that the TAM's explanatory power is substantial. Hence, this research selects the TAM as the main theoretical background. A main element in the TAM is usefulness because it is associated with every attribute: ease of use, attitude, and intention to use [2,4,5,8]. Therefore, it might be worthwhile to scrutinize the influential determinants of usefulness. As the first domain, this research chooses information quality because the main function of food delivery applications is to inform food consumers [9–11]. Second, this research tests swiftness because time is a resource from the viewpoint of users, and waiting is a painful process in the food consumption process [12–14]. Third, this work selects food quality because food is the main outcome in food delivery application services, and most information deals with food in service [15–17].

Food delivery app service has two areas: online and offline. In detail, food delivery app service provides information for shopping, and consumers receive offline service from delivery service workers and food service vendors. The services for food delivery and food service vendors are likely to be related to swiftness and food quality, respectively, whereas information quality is linked with the online side. However, the extant literature exploring food delivery apps has scantly considered online and offline attributes together to account for user behavior [8,18]. Also, although prior studies have scrutinized the accountability of the TAM for user behaviors, insufficient works have been executed to examine the antecedents of the TAM's usefulness in the area of food delivery apps considering online and offline elements together [18,19]. Such a research gap leads this research to inspect more antecedents of the TAM to understand user behavior of food delivery apps considering attributes of online and offline services simultaneously. In other words, it might be valuable to examine the antecedents of usefulness in the TAM to figure out user behavior of food delivery apps by considering online and offline services together.

All things considered, the goal of this study is to (1) test the accountability of the TAM in the context of food delivery application services and (2) inspect the determinants of usefulness in food delivery service applications using information quality, swiftness, and food quality. This study sheds light on the literature by demonstrating the explanatory power of the TAM, as well as by presenting users' appraisal toward both online and offline services of food delivery apps. Furthermore, identifying the determinants of usefulness might provide useful information for food delivery application service providers. By doing so, this work is worthwhile in that it reveals the characteristics of food service delivery application users.

2. Review of Literature and Hypotheses Development

2.1. Food Delivery App

Food delivery app is a platform providing information and offering services based on the orders of customers [20–22]. Food delivery apps enable customers to save time and effort on food in daily life [23,24]. Business of Apps [1] also documented that food delivery apps have been growing because they meet customer needs well. Many studies have been performed to understand the behavior of food delivery app users. For example, Cho et al. [21] identified the consumer characteristics of food delivery app services using varied household types. Stephens et al. [25] found the negative effect of food delivery apps on health conditions. Moreover, Kaur et al. [16] and Chakraborty et al. [26] demonstrated the accountability of consumption value theory in the domain of food delivery apps. In the case of the TAM, multiple studies have demonstrated its explanatory power for the user behavior of food delivery apps [8,18,19].

2.2. Technology Acceptance Model (TAM)

The TAM is a theoretical foundation of this research. The extant literature states that the TAM evaluates a system's capability from the perspective of users [2–4]. Additionally, many studies have demonstrated the accountability of TAM in various areas: teleconference [2], e-learning technology [7], sharing accommodation [5], Uber taxi application systems [6], and virtual reality [27]. It can be inferred that the TAM's explanatory power has been revealed in various fields. Previous studies have documented that TAM attributes are ease of use, usefulness, attitude and intention to use [28–30]. Ease of use is the effort required of users to learn how to deal with a technology, and usefulness is the users' perceived utility of a technology [6,31,32]. Attitude is the viewpoint of the users toward a certain technology, while intention to use refers to the degree to which users select a technology for a task [7,33].

2.3. Hypotheses Development: Antecedents of TAM

Scholars have defined information quality as an assessment of information to improve working efficiency [34–36]. Prior works have also documented that information quality is a

central element in the positive assessment of users [37–39]. Specifically, Hsu [9] and Ung et al. [40] disclosed that users' appraisal is positively affected by information quality in the domain of the education system. Shim and Jo [38] also found a positive effect of information quality on user satisfaction by scrutinizing the habits of online health information website users. It can be inferred that information quality could become the strong motivation of using food delivery app. This research thus proposes the following research hypothesis:

Hypothesis 1. *Information quality positively impacts perceived usefulness of food delivery apps.*

Previous works have contended that the challenge for consumers in the use of food delivery app services is waiting time because consumers may need to endure hunger [12–14]. In a similar vein, scholars argue that the competitiveness of food delivery app services is established by swiftness because it saves time from the viewpoint of users [12,41,42]. Plus, prior studies also alleged that food delivery time is related to the temperature of food, which is an important indicator of service appraisal [12,22]. With respect to the extant literature, time could be considered as an imperative attribute of users. Hence, this study proposes the following research hypothesis:

Hypothesis 2. *Swiftness positively impacts perceived usefulness of food delivery apps.*

Next, a vast body of literature states that the central element of food delivery app service is food quality, including adequate temperature, freshness, and food condition to eat [15–17]. Moreover, Stephens et al. [25] argued that food quality is the concerning point in the food delivery app service. Scholars similarly alleged that food quality and condition are essential elements for better market reputation in food delivery app services. This is because consumers' main focus in the service process is food, and food conditions are likely to be undermined by careless delivery processes [16,17,43]. From the literature review, food quality might become the important element to appraise overall service. Given the review of the literature, this research proposes the following research hypotheses:

Hypothesis 3. *Food quality positively impacts perceived usefulness of food delivery apps.*

2.4. Hypotheses Development: Associations of TAM Attributes

Scholars have also argued that a technology's usefulness is affected by ease of use because a complex system becomes an obstacle for users [5,44,45]. Indeed, Lee et al. [8] demonstrated positive relationship between ease of use and usefulness by exploring food delivery app users. Additionally, Persico et al. [7] uncovered the positive effect of ease of use and usefulness on attitude exploring e-learning technology users. For instance, Lu et al. (2003) [46] and Kamal et al. (2020) [30] found that ease of use positively affects both usefulness and attitude in the context of wireless internet technology and telemedicine services, respectively. The literature review implied that ease of use is likely to exert a positive effect on both usefulness and attitude. Therefore, this research proposes the following research hypotheses:

Hypothesis 4. *Perceived ease of use positively impacts perceived usefulness of food delivery apps.*

Hypothesis 5. *Perceived ease of use positively impacts attitude of food delivery apps.*

Moreover, prior research in the domain of TAM addressed that the positive attitude of users is built by usefulness because the attribute enables users to attain more enhanced efficiency in working [29,46,47]. Sagnier et al. [27] found that usefulness exerted positive effect on attitude. Plus, Jung et al. [5] and Moon et al. [6] also unveiled that usefulness plays a significant role in building positive attitudes and intentions to use. Additionally, TAM studies have stated that intention to use is determined by attitude, usefulness and positive

attitude [27,29,48]. Next, Alfadda and Mahdi [2] demonstrated a positive association between attitude and intention to use by exploring teleconference users. In addition, previous studies have alluded to intention to use as the outcome variable in TAM because intention to use is linked with the revenue of a system [4,5,33]. Sagnier et al. [27] and Moon et al. [6] also revealed significant and positive relations among usefulness, attitude, and intention to use by investigating virtual reality technology and mobile transformation service users, respectively. Based on the literature review, it can be inferred that attitude is likely to be influenced by usefulness, and usefulness and attitude are likely to exert positive impact on intention to use. Thus, this research proposes the following research hypotheses:

Hypothesis 6. *Perceived usefulness positively impacts attitude of food delivery apps.*

Hypothesis 7. *Perceived usefulness positively impacts intention to use of food delivery apps.*

Hypothesis 8. *Attitude positively impacts intention to use food delivery apps.*

3. Method

3.1. Research Model

Figure 1 shows the research model. There are four determinants of usefulness: information quality, swiftness, food quality, and ease of use. The directions are positive. Additionally, attitude is positively impacted by ease of use and usefulness; intention to use is positively affected by usefulness and attitude.
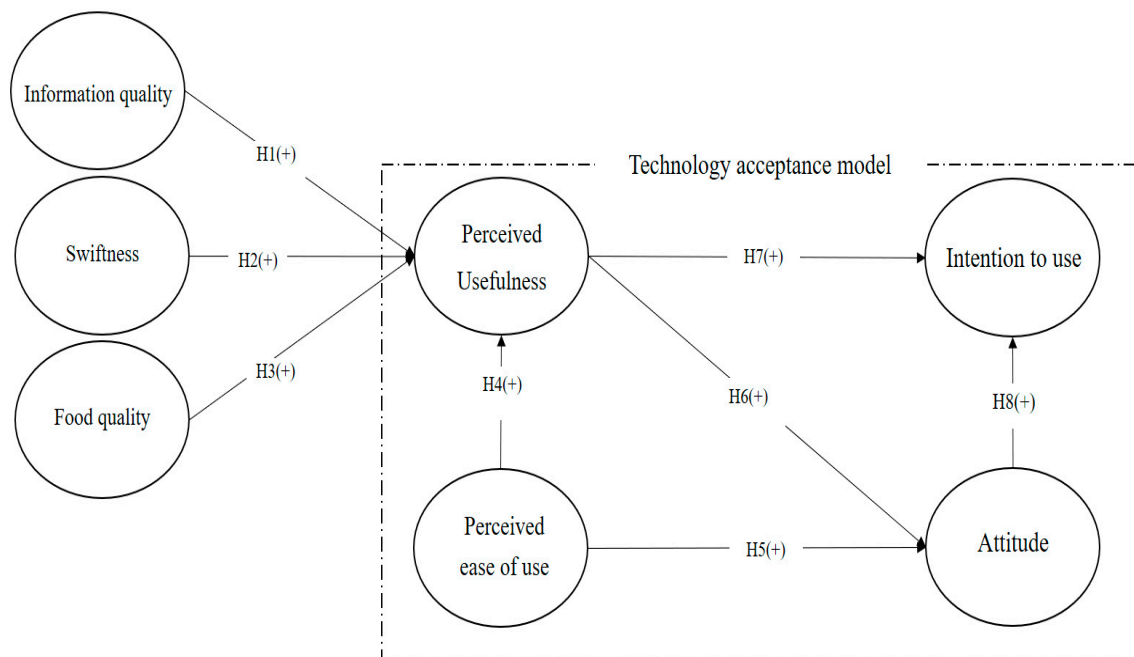

Figure 1. Research model.

3.2. Measurement Items and Data Collection

Table 1 describes the measurement items. All constructs are composed of four items. Most items, except for attitude, are measured by a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). A five-point scale was applied for the measurement of attitude. The survey also included demographic information: gender, age, weekly use frequency of food delivery apps, and household income. Most items are derived from the extant literature; they are adjusted to become more adequate for the aim of the current work. The definition of information quality is how users assess offered information as a valuable piece. Swiftness is defined as how food delivery is implemented in a quick manner. The

definition of food quality is how food delivery app users appraise delivered food overall. Perceived ease of use refers to how simple the system is to control, and perceived usefulness stands for perceived utility from the use of food delivery systems. Attitude is measured as food delivery app users' overall perception toward the system. Finally, intention to use is defined as the degree of intention to adopt the use of the system.

Table 1. Description of measurement.

Construct	Code	Item	Reference
Information quality	IQ1	Food delivery app provides information what I need.	Hsu, 2021 [9], Ung et al., 2022 [40]
	IQ2	Food delivery app provides sufficient information.	
	IQ3	Food delivery app offers appropriate information.	
	IQ4	Food delivery app offered me updated information.	
Swiftness	SW1	Food delivery app service is on time.	Sun, 2019 [12], Kumar & Shah, 2021 [24] Popan, 2021 [42]
	SW2	Food delivery app service is prompt.	
	SW3	Food delivery app service is time-saving.	
	SW4	Food delivery app provides service with less waiting.	
Food quality	FQ1	Food quality by food delivery app is sound.	Kaur et al., 2021 [16] Wu & Hsiao, 2021 [17] Yang et al., 2021 [43]
	FQ2	Food condition by food delivery app is suitable.	
	FQ3	Food temperature by food delivery app is adequate.	
	FQ4	Food amount by food delivery app is sufficient.	
Perceived usefulness	UF1	Using food delivery app is useful for the product information and shopping.	King & He, 2006 [33] Persico et al., 2014 [7]
	UF2	Using food delivery app enabled me to experience more enhanced service.	
	UF3	Using food delivery app improved my product purchasing experience.	
	UF4	Using food delivery app enhanced the effectiveness of buying goods.	
Perceived ease of use	EU1	Food delivery app was easy to use	Scherer et al., 2019 [29] Kamal et al., 2020 [30]
	EU2	It was simple to use food delivery app.	
	EU3	Food delivery app provided easy system to use.	
	EU4	It was straightforward to use food delivery app.	
Attitude	AT1	Food delivery app is (negative–positive)	Moon et al., 2022 [6]
	AT2	Food delivery app is (bad–good)	
	AT3	Food delivery app is (unfavorable–favorable)	
	AT4	Food delivery app is (worthless–worthy)	
Intention to use	IU1	I intend to use food delivery app.	Granić & Marangunić, 2019 [4] Alfadda & Mahdi, 2021 [2]
	IU2	I am going to adopt food delivery app.	
	IU3	Food delivery app will be chosen for shopping by me.	
	IU4	I will use food delivery app.	

The data collection for this research was performed using Amazon Mechanical Turk. Amazon Mechanical Turk is a broadly adopted system for data collection that provides compensation to survey participants. Numerous studies have used Amazon Mechanical Turk to collect data, and the results have shown statistical significance [49–51]. This implies that the quality of data for data analysis could be suitable; such suitability led this research to select the system. The data collection was executed between 20 January 2023 and 24 January 2023. At the beginning, survey participants were asked whether they were experienced with food delivery applications. The initial number of observations was 409. If the participants had no experience, they were deleted from the data analysis. Therefore, 19 observations were eliminated. Then, unfaithful responses, such as too many missing responses, were dropped from the data analysis, and the number of dropped observations was 11. As a result, this research used 379 valid observations for the data analysis.

3.3. Data Analysis

First, frequency analysis was performed to derive the demographic information. Confirmatory factor analysis was implemented to ensure convergent validity of measurement items with the computation of mean and standard deviation. The extant literature claims that the convergent validity of measurement can be ensured by multiple criteria (loading > 0.5, average value extracted (AVE) > 0.5, and construct reliability (CR) > 0.7) [52–54].

A correlation matrix was then employed to attest to the relationship of constructs, and discriminant validity was confirmed by applying the following criteria: square root of average value extracted > correlation coefficient. A structural equation model was chosen to test the hypotheses. According to the extant literature, the following criteria were employed to ensure goodness of fit: Q (CMIN/degrees of freedom) < 4, goodness-of-fit index (GFI), normed fit index (NFI), relative fit index (RFI), incremental fit index (IFI), Tucker–Lewis index (TLI), comparative fit index (CFI) > 0.8, and root mean square error of approximation (RMSEA) < 0.1 [52,53]. Furthermore, Kline [55] recommended 200 sample size for trustworthy statistical inference in structural equation model. Regarding such a recommendation, the sample size of this work could be sufficient for statistical inference (n = 379).

4. Results

4.1. Profile of Survey Participants

Table 2 presents the profile of the survey participants. The number of participants was 379. In terms of gender, the numbers of males and females are 192 and 187, respectively. Table 2 also presents information on age (20–29 years old or younger: 266; 30–39: 69; 40–49: 32; older than 50 years old: 12) and monthly household income (less than USD 2000: 56; USD 2000–3999: 89; USD 4000–5999: 79; USD 6000–7999: 63; USD 8000–9999: 40; more than USD 10,000: 52). The rate of employment for participants is 91.3 percent. Additionally, the information on weekly use frequency is depicted in Table 2 (less than 1 time: 53; 1–2 times: 187; 3–5 times: 106; more than 5 times: 33).

Table 2. Demographic information (N = 379).

Item	Frequency	Percentage
Male	192	50.7
Female	187	49.3
20–29 years old or younger	266	70.2
30–39 years old	69	18.2
40–49 years old	32	8.4
Older than 50 years old	12	3.2
Unemployed	33	8.7
Employed	346	91.3
Monthly household income		
Less than USD 2000	56	14.8
Between USD 2000 and USD 3999	89	23.5
Between USD 4000 and USD 5999	79	20.8
Between USD 6000 and USD 7999	63	16.6
Between USD 8000 and USD 9999	40	10.6
More than USD 10,000	52	13.7
Weekly use frequency		
Less than 1 time	53	14.0
1~2 times	187	49.3
3~5 times	106	28.0
More than 5 times	33	8.7

4.2. Results of Confirmatory Factor Analysis and Correlation Matrix

Table 3 shows the results of the confirmatory factor analysis. The goodness-of-fit index indicates that the results are statistically sound (χ^2 = 631.476, df = 329, χ^2/df = 1.919 GFI = 0.889; NFI = 0.900; RFI = 0.885; IFI = 0.950; TLI = 0.942; CFI = 0.949; RMSEA = 0.049). The values of loading, CR, and AVE are statistically satisfactory. Additionally, Table 3 shows the mean and standard deviation values of the constructs (information quality: mean = 4.12, SD = 0.64; swiftness: mean = 4.17, SD = 0.64; food quality: mean = 4.07, SD = 0.66; perceived usefulness: mean = 4.13, SD = 0.66; perceived ease of use: mean = 4.36, SD = 0.56; attitude: mean = 4.33, SD = 0.63; intention to use: mean = 4.11, SD = 0.69).

Table 3. Confirmatory factor analysis.

Construct	Code	Loading	Mean (SD)	CR	AVE
Information quality	IQ1	0.723	4.12 (0.64)	0.831	0.551
	IQ2	0.753			
	IQ3	0.755			
	IQ4	0.737			
Swiftness	SW1	0.739	4.17 (0.64)	0.810	0.516
	SW2	0.717			
	SW3	0.722			
	SW4	0.696			
Food quality	FQ1	0.755	4.07 (0.66)	0.822	0.536
	FQ2	0.686			
	FQ3	0.772			
	FQ4	0.712			
Perceived usefulness	UF1	0.705	4.13 (0.66)	0.810	0.516
	UF2	0.734			
	UF3	0.735			
	UF4	0.699			
Perceived ease of use	EU1	0.713	4.36 (0.56)	0.841	0.570
	EU2	0.769			
	EU3	0.768			
	EU4	0.769			
Attitude	AT1	0.775	4.33 (0.63)	0.867	0.619
	AT2	0.756			
	AT3	0.816			
	AT4	0.799			
Intention to use	IU1	0.762	4.11 (0.69)	0.810	0.518
	IU2	0.677			
	IU3	0.663			
	IU4	0.769			

Note: SD stands for standard deviation. Goodness of fit indices: $\chi^2 = 631.476$, df = 329, $\chi^2/df = 1.919$ GFI = 0.889; NFI = 0.900; RFI = 0.885; IFI = 0.950; TLI = 0.942; CFI = 0.949; RMSEA = 0.049. CR stands for construct reliability; AVE is average variance extracted.

　　Table 4 is the correlation matrix. Comparing diagonal values with correlation coefficients, the discriminant validity of the data could be acceptable, other than information quality and swiftness ($r = 0.737$, $p < 0.05$). Attitude positively correlates with intention to use ($r = 0.698$, $p < 0.05$), perceived ease of use ($r = 0.644$, $p < 0.05$), perceived usefulness ($r = 0.644$, $p < 0.05$), food quality ($r = 0.664$, $p < 0.05$), swiftness ($r = 0.686$, $p < 0.05$), and information quality ($r = 0.714$, $p < 0.05$). Moreover, intention to use positively correlates with perceived ease of use ($r = 0.618$, $p < 0.05$), perceived usefulness ($r = 0.711$, $p < 0.05$), food quality ($r = 0.579$, $p < 0.05$), swiftness ($r = 0.644$, $p < 0.05$), and information quality ($r = 0.670$, $p < 0.05$).

Table 4. Correlation matrix.

	1	2	3	4	5	6	7
1. Information quality	0.743						
2. Swiftness	0.692 *	0.718					
3. Food quality	0.742 *	0.737 *	0.732				
4. Perceived usefulness	0.703 *	0.636 *	0.608 *	0.718			
5. Perceived ease of use	0.635 *	0.597 *	0.573 *	0.669 *	0.754		
6. Intention to use	0.670 *	0.644 *	0.579 *	0.711 *	0.618 *	0.719	
7. Attitude	0.714 *	0.686 *	0.664 *	0.644 *	0.644 *	0.698 *	0.787

Note: * $p < 0.05$. Diagonal is square root of average variance extracted. SD stands for standard deviation.
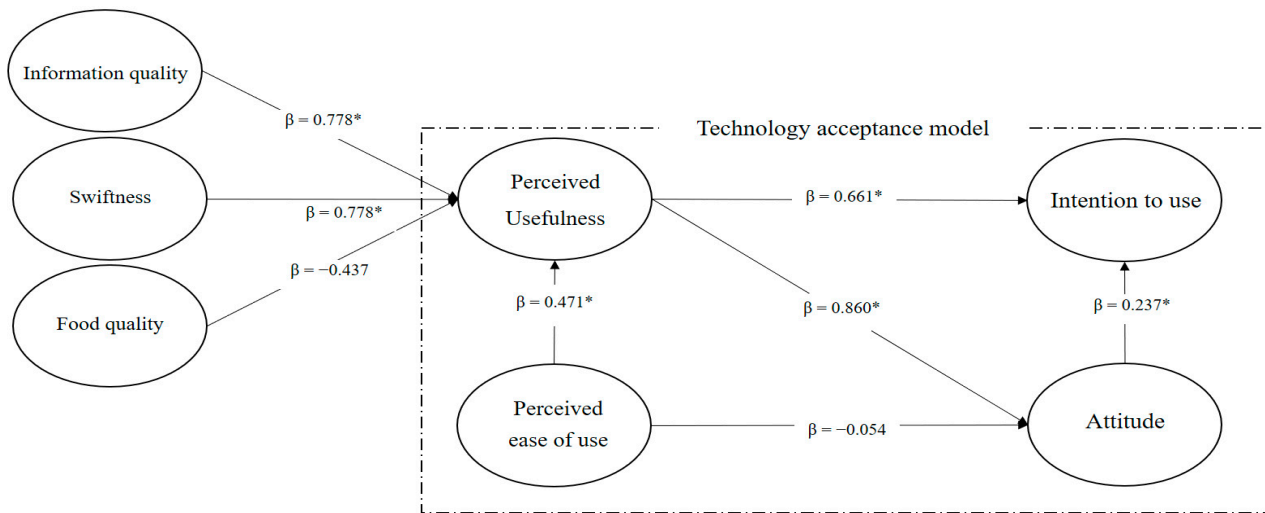
4.3. Results of Hypothesis Testing

Table 5 shows the results of hypothesis testing. The goodness-of-fit index shows the statistical significance of the results (χ^2 = 898.263, df = 339, χ^2/df = 2.650, GFI = 0.860; NFI = 0.858; RFI = 0.842; IFI = 0.907; TLI = 0.895; CFI = 0.906; RMSEA = 0.066). Perceived usefulness is positively affected by information quality (β = 0.778, p < 0.05), swiftness (β = 0.492, p < 0.05), and ease of use (β = 0.471, p < 0.05). Moreover, attitude is positively influenced by perceived usefulness (β = 0.860, p < 0.05). Intention to use is also positively impacted by perceived usefulness (β = 0.661, p < 0.05) and attitude (β = 0.237, p < 0.05). Regarding the results of hypothesis testing, six hypotheses, other than H3 and H5, are supported. Figure 2 is the graphical presentation of the results of hypotheses testing.

Table 5. Result of hypotheses testing.

Path	Beta	t-Value	*p*-Value	Results
Information quality → Perceived usefulness	0.778	4.53	0.000	H1 supported
Swiftness → Perceived usefulness	0.492	2.88	0.004	H2 supported
Food quality → Perceived usefulness	−0.437	−1.84	0.066	H3 not supported
Perceived ease of use → Perceived usefulness	0.471	8.24	0.000	H4 supported
Perceived ease of use → Attitude	−0.054	−0.97	0.331	H5 not supported
Perceived usefulness → Attitude	0.860	9.96	0.000	H6 supported
Perceived usefulness → Intention to use	0.661	5.53	0.000	H7 supported
Attitude → Intention to use	0.237	2.18	0.029	H8 supported

Note: Goodness of fit indices: χ^2 = 898.263, df = 339, χ^2/df = 2.650, GFI = 0.860; NFI = 0.858; RFI = 0.842; IFI = 0.907; TLI = 0.895; CFI = 0.906; RMSEA = 0.066. R^2(UF) = 0.582, R^2(AT) = 0.490, R^2(IU) = 0.581.

Note: *p<0.05

Figure 2. Results of hypotheses testing.

5. Discussion

This research inspects the characteristics of food delivery application users using TAM as a theoretical foundation. This study adopted three determinants of usefulness: information quality, swiftness, and food quality. The results showed that information quality is an influential attribute on the usefulness of food delivery apps. The findings might be able to support the outcomes of Lee et al. [8] because this work also disclosed that information and timeliness are essential attributes of food delivery apps for better utility from the viewpoints of users. The results also revealed that swiftness is an essential

element for usefulness. However, the link between food quality and usefulness appeared to be nonsignificant. This might be explained by the food category in food delivery apps. That is, food delivery apps might mainly offer unhealthy menus with high calories, such as pizza, chicken, and hamburgers. From the perspective of users, the quality of food might be assessed poorly because most food from food delivery apps does not promote health and may lead to such conditions as cardiovascular disease and obesity. Indeed, Stephens et al. [25] documented that the food quality in food delivery app service is not healthy, which is linked with the poor food quality. Hence, such a menu composition in food delivery app services might become the reason for nonsignificance. Moreover, the finding might be aligned with the findings of Kaur et al. [16] because the results indicated that food safety and health concerns related to food quality were not significant to account for the user behavior. Additionally, this work demonstrated the accountability of the TAM by identifying the significance between ease of use, usefulness, attitude, and intention to use. That is, the results unveiled that ease of use is a significant determinant of usefulness. Plus, the results revealed that usefulness is positively associated with attitudes toward food delivery apps. Furthermore, the results revealed that food delivery app users' intention to use is elevated by a higher level of usefulness and a more positive attitude. The results of the current work appeared to be similar to those of Choe et al. [19] and Song et al. [18] by unveiling the significant link between ease of use, usefulness, and attitude in the domain of food delivery app service.

However, it was found that ease of use was not significant for attitude. This is varied from the findings of Sagnier et al. [27] and Moon et al. [6] because ease of use did not significantly determine attitude. The results indicated that the perception of food delivery apps is different from the perception of using the Uber taxi application and virtual reality technology in terms of attitude and ease of use. This could be explained by the mean value of ease of use and the characteristics of the survey participants. Among the attributes, the mean value for ease of use was the highest. This implies that the food delivery app users did not have difficulty controlling the food delivery app system. Such a perception of users might take the ease of use for granted. This might become the reason for the limited impact of ease of use on attitude. Moreover, approximately 70 percent of survey participants are in their 20 s or younger. It can be inferred that they might be familiar with the food delivery app system. Therefore, the ease of system control might be taken for granted from the perspective of most survey participants. Thus, the effect of ease of use might be limited to usefulness rather than attitude.

6. Conclusions

This paper investigates the explanatory power of the TAM in the domain of food delivery app systems. This study showed that the attributes of the TAM are significantly related to each other. The results could expand and support the findings from previous works [5,29,46,47]. However, this study might vary from previous works in that usefulness and attitude are not significant in the context of food delivery app systems. While previous studies, including Persico et al. [7], Jung et al. [5], and Moon et al. [6] showed a crucial effect of ease of use on attitude, the results were varied in this work. Moreover, this study sheds light on the literature by showing the significance of the determinants of usefulness. In fact, previous studies studying food delivery app users have sparsely scrutinized the antecedents of usefulness regarding online and offline pieces at the same time [8,16,18]. This is because food delivery app services link online information with offline food delivery. In order to fill such a research gap, this research adopted three attributes of usefulness in the TAM and demonstrated the essential association between attributes. In detail, the results unveiled that usefulness is significantly affected by information quality and swiftness. Such findings might become the distinctive point of this work in terms of the expansion of the TAM.

This study has practical implications. First, food delivery app users might need to focus more on information quality. The information quality might become the review com-

ments from other guests and more diverse and unique food and food vendor information. Additionally, food delivery app managers might concentrate more on decreasing delivery time. This may be accomplished by employing more delivery staff. However, this might cause a considerable increase in costs from the perspective of the service provider. Instead of such tactics, the provision of precise delivery times and expected time information could become an avenue for the positive appraisal of users because the information might become a good reference for consumer decision making. Furthermore, food delivery app users may need to allocate their own resources to offer easier systems to handle. Next, positive attitude building might become another area to invest. This could be achieved by emphasizing ESG (environmental, social, and governance) management, which is useful for establishing a positive image of business. With regard to magnitude, information quality exerted a stronger impact on usefulness than swiftness. This information might be employed by food delivery app service providers for more efficient resource allocation. Last, the magnitude of usefulness is greater than attitude on intention to use; this information might be worth reviewing for food delivery app managers for better investment decision making.

This study does have limitations. First, this research was limited to the TAM to explore the user characteristics of food delivery apps. Future studies might be able to consider more diverse theoretical backgrounds for the investigation of food delivery app users. Moreover, approximately 70 percent of survey participants in this research were in their 20s or younger. Scholars might consider older survey participants because technology control capabilities could vary depending on age. Such an effort might allow scholars to further understand food delivery app users' behavior.

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