The Influence of Food Delivery Application Attributes in Developing e-Loyalty: The Mediating Role of e-Satisfaction

Wanda Wandoko[1]*, Budi* Haryanto[2], *Laila* Meiliyandrie Indah Wardani[3], *Erna* Risnawati[4] and *Ignatius Enda* Panggati[5]*

[1]Information Systems Department, School of Information Systems, Bina Nusantara University, Jakarta, Indonesia 11480
[2]STMIK Insan Pembangunan, Information System Department, Tangerang, Indonesia
[3]Mercu Buana University, Faculty of Psychology, Jakarta, Indonesia
[4]Open University Indonesia, Early Childhood Education Study Programme, Jakarta, Indonesia
[5]Management Department, BINUS Business School Undergraduate Program, Bina Nusantara University, Jakarta, Indonesia 11480

Abstract. Food delivery application or FDA is a promising online food delivery service today. Even during the COVID-19 pandemic, the FDA is helping restaurants grow and helping consumers order food. This study fills the gap in the FDA literature by analyzing and empirically testing the mediating effect of e-satisfaction on the relationship between FDA attributes and e-loyalty. The FDA attributes are represented in information quality, visual design, and navigational design. Data was collected using an online questionnaire for 651 FDA user respondents in Indonesia during the COVID-19 pandemic. The data is analyzed using Partial Least Square. The findings of this study indicate that customer e-satisfaction is proven to mediate partially from visual design, navigation design with e-loyalty, and customer e-satisfaction is proven to fully mediate information quality with e-loyalty. This research closes with theoretical and managerial implications, as well as limitations.

1 Introduction

In recent years, food delivery application or FDA services have become a trend in consumer lifestyles. A food delivery application service is an online service where customers use an application to search for their favorite restaurant or desired food, then order it and then deliver it to the customer. The growth in smartphone penetration, internet growth, and advances in information technology are driving the growth of food delivery service applications. According to a report by Statista, the FDA market reached US\$95.4 billion in 2018, with a compound annual growth rate of 9.6% per year [1].

In early 2020, the world faced a global catastrophe in the form of a novel variant of the coronavirus pandemic (COVID-19) [2]. The infection of COVID-19 can easily spread among humans, and it may cause lung infection, pneumonia, difficulty in breathing, and many more symptoms [2]. Covid-19 infection emerged as a very severe global pandemic, prompting the governments of several countries to take preventive measures, such as social restrictions and strict lockdowns, to reduce the virus's spread rate [3]. The preventive measures for the COVID-19 pandemic have impacted decreasing revenue in various industries, especially the restaurant industry. The lockdown pushes restaurants to adapt their business with FDA during the COVID-19 pandemic [4]. By using the FDA, customers do not need to go to a restaurant to order food. FDA allows customers to search for nearby restaurants, view existing promotions, choose from a list

of the food and drinks they want; and FDA is also equipped with an online payment feature making it easier for customers to place orders and purchases. It is evident that the COVID-19 pandemic has become an opportunity and challenge for FDA growth. To be able to compete and develop amid growing and competitive industry, companies need to develop their customer loyalty as their main aspect. Customer loyalty is an important source for a company's advantage amid competition [5]. One of the important predictors for customer loyalty in the context of information systems is customer satisfaction. the relationship between satisfaction and loyalty is one of the topics that has been raised in many previous studies in the context of online applications. Research from Kim et al [6] concluded the significant impact of satisfaction on loyalty from mobile shopping application users in China. Research from Alalwan [7] also states the importance of the significant influence of satisfaction on the loyalty of FDA users. Therefore, this study explores factor-factors that build consumers' satisfaction and loyalty toward FDA during the COVID-19 pandemic.

Mobile application is welcomed by consumers because it has diverse application attributes that enable users to perform many tasks, such as searching, browsing, purchasing, and sharing [8]. Application attributes are important aspect in the mobile application. Plenty of research on online food delivery application that examine the influence of application attributes on consumer behavior. A prior study by Alalwan [7] analyzed the influence of mobile food ordering attributes (online

* Corresponding author: enda@binus.ac.id

review, online rating, and online tracking) on customer satisfaction. Research by Kapoor and Vij [8] analyze online food delivery aggregator application attributes (visual, navigational, information, and collaboration design) on consumer conversion. Most of the research on FDA services has focused on the influence of application attributes on consumers' intention and acceptance of using the FDA. However, since the COVID-19 pandemic, there are many numbers of consumers that already familiar with and using the FDA in their daily activities. Instead of focusing on consumer intention, this study focuses on customer satisfaction and loyalty perspectives. [9]. Based on a prior study by Pal et al [9], there are three FDA attributes that are considered important for customers during the COVID-19 pandemic, which are information quality, virtual design, and navigational design; therefore, this study proposes information quality, virtual design and navigational design as FDA attributes. Despite the fact that there is little study on FDA attributes influences on customer e-loyalty and e-satisfaction, there is a lack study that examines the role of customer e-satisfaction as a mediating variable between FDA attributes and customer e-loyalty.

To address the gap in the FDA research, this study aims to examine the mediating effect of customer e-satisfaction on the relationship between FDA attributes and e-loyalty. The context of this study consumers is Indonesian FDA consumers during the COVID-19 pandemic. Indonesia is one of the countries that suffer the global COVID-19 pandemic. Indonesia is one of the countries that have great potential growth for the FDA during the COVID-19 pandemic. Indonesia is the largest online food delivery service market in Southeast Asia. According to the Momentum Works report, the gross merchant value (GMV) of these services in Indonesia will reach US\$4.5 billion in 2022 [10].

From theoretical perspective, this study explain the mediating effect of customer e-satisfaction on the relationship between FDA attributes (information quality, virtual design and navigation design) and customer e-loyalty. From managerial perspective, this study can guide FDA companies to understand FDA consumers and develop a strategy that focuses on developing FDA attributes that deliver customer loyalty and satisfaction.

2 Literature review

2.1 Customer e-Loyalty

Building customer loyalty is an important purpose of business strategy [11]. Loyal customers are an essential asset for businesses because they tend to repeat their transactions and they have a positive attitude toward the business [12]. This study defines customer e-loyalty as customers' positive attitude toward FDA and their commitment to repeat their transactions using the FDA.

2.2 Customer e-Satisfaction

Customer satisfaction is based on expectancy-disconfirmation. Customer satisfaction is customers'

comparison between the perceived product performance experience with their expectations toward product performance [13]. In the case of the FDA, the FDA customers compare the FDA's performance with their expectations; if the FDA's performance meets the customer's expectations, the customers will be satisfied. However, if the FDA performs below the customer's expectations, the customers will feel dissatisfied. A satisfied customer will likely have a positive attitude toward the product and has a strong motivation to continue using the product. A prior study found that satisfied customers influence their loyalty [9], [11], [14]. Study by Liu et al [15] showed that customer satisfaction act as predictor to customer loyalty. Thus, this study hypothesized that.

H1: Customer e-satisfaction has a positive influence on building customer e-loyalty toward FDA.

2.3 Visual Design

The visual design is based on the visual design of Pal et al. The visual design of apps is an important gratification that shapes consumers' interaction and experience with the apps. The visual design is defined as the overall look quality of the FDA based on aesthetic perspectives. The visual design aspects consist of the type of fonts, size of fonts, colors, images, animations, shapes, and also the app's layouts [9], [16]. The visual design of the FDA is one of the essential assets because customers' perception of the FDA's visual design will shape their overall perception of the apps [9]. An application with better visual design will enhance the customer's subjective experience [17]. A prior study found that online games with better visual design will promote customer loyalty [17]. FDA that has good visual design leads to better customer satisfaction and customer loyalty [9]. A prior study also found that e-banking service with good website design positively influences customer loyalty [18]. E-commerce with good visual experience influences customer loyalty [19]. Smartphone apps that have good aesthetic visual design quality lead to greater customer satisfaction and more downloads [20], [21]. In addition, study by Liu et al [15] conclude that online store image has positive influence in building customer satisfaction and loyalty. Previous research from Ivana et al [22] also gave similar results, which in their research concluded that customer satisfaction is significantly influenced by the design of the website. From the above discussion, this study proposed H2 and H3.

H2: The visual design of the FDA has a direct and significant effect on customer e-loyalty with FDA.

H3: The visual design of the FDA has a direct and significant effect on e-customer satisfaction with FDA.

2.4 Information Quality

Information quality is defined as the consumer's perception of the quality of the information provided by the FDA. The quality of information is related to the accuracy, details, and validity of the information delivered by the FDA to consumers [9]. A transaction using apps is

a process that requires a substantial amount of information, such as products, restaurant status, delivery time, and payment methods; hence the quality of the information provided by the FDA will greatly enhance consumers' experience with the FDA[23]. Consumers will have more satisfaction and loyalty in their experience with the FDA by having the ease of finding the right information, the ease of accessing information, timely information, and accurate information [9]. A prior study also revealed the importance of information quality in building customer loyalty in the e-tailing context [24]. A prior study also revealed that information quality affects customers' satisfaction with Chinese mobile applications [6]. This relationship is also strengthened by a study conducted by Ariesty and Sari [25] where in their study concluded that information quality plays a significant role as a predictor of loyalty and satisfaction. Accordingly, this study hypothesized.

H4: The information quality of the FDA has a positive impact on customer e-loyalty.

H5: Information quality of the FDA has a positive impact on customer e- satisfaction.

2.5 Navigation design

Navigation design is one of the important factors in building an effective FDA. Navigation design refers to the transitions between different parts of a mobile application that a user experiences when using the application. The navigation design of the application has an impact on the customer because the navigation design will reduce the effort required by the user to use the application. Navigation designs that are widely liked by users are usually efficient navigation designs where the navigation controls are easy for users to use and use filters that are easy and according to user needs [26]. Good navigation design also allows users to complete transactions easily, efficiently, seamlessly, and without significant interruptions [8]. Navigation design is an important attribute of an application to generate high conversions. App users love an easy, simple, efficient, and seamless app experience. Prior study by Kumar et al [27] empirically proved that website design is an important predictor to customer satisfaction. In addition, study by Faisal et al [28] revealed that website design is an important features to develop customer satisfaction.

Previous research confirms the importance of navigation design in contributing to the formation of e-satisfaction.

Therefore, this study states the following hypothesis.

H6: Navigation design drives the formation of e-loyalty.

H7: Navigation design has an important influence in forming e-satisfaction.

The prior literature mentioned above revealed that information quality, visual design, and navigation design contribute to better customer e-satisfaction. Given that the extant literature also shows that information quality, visual design, and navigation design lead to better customer e-loyalty. It is expected that information quality, visual design, and navigation design have an indirect impact on customer e-loyalty. Based on the arguments before, it can be postulated that the relationship between information quality, visual design, and navigation design with customer e-loyalty is mediated by e-satisfaction.

Hence, the following hypothesis can be proposed.

H8: The relationship between information quality and customer e-loyalty is mediated by customer e-satisfaction.

H9: The relationship between navigation design and customer e-loyalty is mediated by customer e-satisfaction.

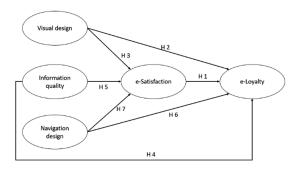H10: The relationship between visual design and customer e-loyalty is mediated by customer e-satisfaction.

Fig. 1. Research model.

3 Methodology

3.1 Data Collection

The population from this study is customers of the FDA in Indonesia. The selected sample is representative of the population of FDA customers in Indonesia.

This study uses a cross-sectional design to collect data. Due to the COVID-19 pandemic circumstance in Indonesia, this study uses an online survey to collect the data. The data collection took place from January 3, 2022, to June 5, 2022. The questionnaires were administrated via an online survey using Google Forms. The online survey links were sent to 660 prospective respondents. Out of the 660 prospective respondents, only 651 were selected as respondents in this study. Nine questionnaires were considered not usable due to the incomplete response. The data were analyzed and calculated using the structural equation modelling – partial least square (SEM-PLS). Table 1 shows the demographic information of the sample.

Table 1. Respondents descriptive.

		numbers
Gender	Male	309
	Female	340
Jobs	College student	302
	Employee	195
	[1] Professional	62

		numbers
	² Entrepreneur	36
	³ Housewife	23
	⁴ State official	33
Age	<20	173
	⁵ 21 – 25	204
	⁶ 26 -30	64
	⁷ 31- 35	71

Sample of a Table footnote. (*Table footnote*)

3.2 Instruments Development

The items in the questionnaires use a five-point Likert scale with ratings from (very unlikely) to 5 (very likely) based on prior studies on a similar topic [29], [30]. All items in the questionnaires were adapted from prior studies. The navigational design items were adapted from prior studies by [26], [31], which reflected the environmental quality. The visual design of FDA items was adapted from prior studies, which reflected the visual design [32]. The delivery quality items were adapted from [31], [33], which captures the rating, review, description, and timeliness of the information. The items that represent delivery quality were adapted from [34]. The customer satisfaction items were measured by adapting from prior studies [31], [35]. Items from prior studies [35] were adapted to measure customer trust toward FDA. Customer loyalty toward FDA was measured with items adapted from [31]. All the items in the online questionnaire are administered in Indonesia and then translated into English.

4 Data Analysis

The structural equation modeling – partial least square or SEM-PLS was used to analyze and calculate the data and the research model. The SEM-PLS method can estimate complex models with many indicators' variables and structural paths. This study uses the SEM-PLS approach because SEM-PLS is suitable to be used for exploratory analysis and for developmental theories [36]. The objective of this study is not to test the theory but to investigate the structural relationship between customer satisfaction with loyalty toward FDA and explore customer trust as mediating variable between the satisfaction and loyalty relationship. The SEM-PLS assessment consists of a measurement model and a structural model.

4.1 Measurement Model

The reflective measurement model assessment consists of indicator loading, internal consistency reliability, discriminant validity, and convergent validity. The full measurement model of indicator loading, internal reliability, and convergent validity is presented in Table2. First, the loading factor of each indicator needs to be above 0.708. The second is convergent validity. The

convergent validity measures the extent to of each latent variable converges to explain the validity of variance in its items. The convergent validity uses average variance metric (AVE) measurement, and the acceptable value is 0.5. Third, the evaluation of internal consistency reliability uses composite reliability analysis or CR. The rule of thumb for an acceptable CR value is above 0.7. Fourth, the assessment of multicollinearity by the variance inflation factor (VIF). The VIF value for each item needs to be below 0.5 to provide evidence the multicollinearity problem does not exist in the model.

Table 2. Reflective measurement.

Latent variables	Items	Loading factor	CR	AVE	VIF
Navigation design	ND1	0.805	0.919	0.741	2.056
	ND2	0.871			2.109
	ND3	0.872			1.784
	ND4	0.892			1.778
Information quality	IQ1	0.846	0.896	0.682	1.680
	IQ2	0.853			1.680
	IQ3	0.796			1.815
	IQ4	0.808			2.394
e-Loyalty	CL1	0.916	0.900	0.818	2.505
	CL2	0.892			2.814
e-Satisfaction	CS1	0.918	0.941	0.798	3.940
	CS2	0.904			3.560
	CS3	0.862			2.397
	CS4	0.889			2.742
Visual design	VD1	0.877	0916	0.733	2.756
	VD2	0.899			3.063
	VD3	0.800			1.800
	VD4	0.845			2.050

The result in Table 2 stated that all the indicators from latent variables have loading factors greater than 0.708, which indicates that the latent variables are capable of explaining more than 50 percent of the variance in the indicators [37].

The result in Table 2 shows that all the AVE values from each latent variable are more than 0.5, meaning that more than half of the variance observed in the indicators is explained by their latent variables [38].

The result in Table 2 showed that all the CR values exceed the recommended threshold or above 0.70, meaning all the latent variables have good reliability [37].

The multicollinearity assessment showed that all the items have VIF values below 0.50 which means that multicollinearity does not exist in the research model.

The last measurement model assessment is discriminant validity. The discriminant validity examines the extent how which each latent variable is truly empirically different from the other [39]. The calculation of discriminant validity is shown in Table 3. discriminant validity

Table 3. Discriminant validity

	CL	CS	IQ	ND	VD
CL	0,904				
CS	0,833	0,893			
IQ	0,583	0,648	0,826		
ND	0,635	0,655	0,653	0,861	
VD	0,605	0,632	0,611	0,691	0,856

CS: Customer e-satisfaction
CL: Customer e-loyalty
ND: Navigation design
IQ: Information quality
VD: Visual design

The result in Table3 shows that the discriminant validity is good because the score of square roots of AVE from each latent variable is greater than any other latent variables.

4.2 Hypothesis testing

The first step in hypothesis testing is the measurement of R^2. R squared or R^2 or the coefficient of determination is a statistical measurement that shows the extent to which the contribution of the independent variables in the regression model is able to explain the variation of the dependent variable [40]. the results of the R^2 measurement of this study are shown in Table 4.

Table 4. R^2 analysis

	R^2	**Adjusted R^2**
e-loyalty	0.711	0.709
e-satisfaction	0.543	0.541

The hypotheses in the research model were tested, and the results are presented in Table 4. Based on table 4 the determinant coefficient value of the e-loyalty variable is 0.709, this shows that all independent variables simultaneously have an effect of 70.9% on e-loyalty. While the e-satisfaction variable has a determinant coefficient of 0.541, this shows that all independent variables simultaneously have an impact of 54.1% on e-satisfaction.

The endogenous variables in the research model can be influenced by various variables. F-square is an analysis to see the effect of exogenous latent variables on endogenous latent variables having a substantive effect [37]. The f square value of 0.02 is small, 0.15 is medium, and 0.35 is large [41]. Values less than 0.02 can be ignored or considered as having no effect. The result of f square analysis is shown in Table 5.

Table 5. F^2 analysis

	e-loyalty	e-satisfaction
e-loyalty		
e-satisfaction	0,790	
information quality	0,000	0,114
navigation design	0,020	0,074
visual design	0,009	0,063

Based on the F-square values in the table above, the e-loyalty and e-satisfaction relationships that have a large effect size are where the f-square value is above 0.35. The effect of information quality, navigation design and visual design on e-satisfaction has a small effect size because the f-square value is in the range of 0.35 and 0.02.

The analysis of the significance test of the hypothesis of the research model can be seen in Table 6.

Table 6. Direct relationship hypothesis

Hypotheses	t-value	p-value	Beta	Notes
H1 e-satisfaction -> e-loyalty	21.730	0.000	0.707	Accepted
H2 visual design -> e-loyalty	2.132	0.033	0.076	Accepted
H3 visual design -> e-satisfaction	5.703	0.000	0.246	Accepted
H4 information quality -> e-loyalty	0.027	0.979	0.001	Rejected
H5 information quality -> e-satisfaction	6.751	0.000	0.316	Accepted
H6 navigation design -> e-loyalty	3.364	0.001	0.118	Accepted
H7 navigation design -> e-satisfaction	5.414	0.000	0.279	Accepted

The results showed that there is a significant and positive relationship between e-satisfaction with e-loyalty (t-value= 21.730; p-value= 0.00); thus, H1 is accepted. The results showed that there are significant and positive relationships between e-satisfaction with visual design (t-value = 5.703; p-value= 0.00), information quality (t-value = 6.751; p-value= 0.00), and navigation design (t-value= 5.414; p-value= 0.00). Therefore H3, H5, and H7 are accepted. Furthermore, the result also shows that there is a significant and positive relationship between e-loyalty with visual design (t-value= 2.132; p-value= 0.033) and navigation design (t-value= 3.364; p-value = 0.001). Thus, H2 and H6 are accepted. However, the result also stated that there is no significant relationship between e-loyalty with information quality (t-value= 0.027; p-value = 0.979); thus, H4 is rejected.

4.3 Mediation analysis

The mediation analysis results are presented in Table 7.

Table 7. Mediation analysis

Hypotheses	t-value	p-value	Notes
information quality -> e-loyalty (Total effect)	4.841	0.000	accepted
information quality -> e-satisfaction -> e-loyalty (Specific indirect effect)	6,189	0,000	accepted
navigation design -> e-loyalty (Total effect)	5,929	0,000	accepted
navigation design -> e-satisfaction -> e-loyalty (Specific indirect effect)	5,367	0,000	accepted
visual design -> e-loyalty (Total effect)	5,245	0,000	accepted
visual design -> e-satisfaction -> e-loyalty (Specific indirect effect)	5,549	0,000	accepted

This study uses the approach of Baron and Kenny to analyze the effect of mediation where Baron and Kenny's approach has been widely used in several previous studies examining the effect of mediation [42], [43].

According to Baron and Kenny, the steps to test mediation in research are [42]–[45]:
1) Verify the significance of the relationship between the independent variables and the mediator;
2) Verify the significance of the relationship between the independent variables and the dependent variable;
3) Verify the significance of the relationship between the mediator and the dependent variable;
4) Verification of the insignificant relationship between the independent variables and the dependent variable in the presence of a mediator.

If all four conditions are met, then there is a complete mediation effect. However, if only the first three conditions are met, then there is a partial mediating effect.

The results of this study are shown in Table 4-6 reveals:
1) the three independent variables (visual design, navigation design, and information quality) have a significant effect on the mediator variable (e-satisfaction).
2) The independent variable visual design and navigation design have a significant effect on the dependent variable (e-loyalty). However, the information quality variable has no significant effect on the dependent variable.
3) There is a significant relationship between the mediator variable (e-satisfaction) and the dependent variable (e-loyalty).
4) There is a significant relationship between the three independent variables (visual design, navigation design, and information quality) with the dependent variable (e-loyalty) through a mediator (e-satisfaction).

From the results of the analysis above, it can be concluded that customer e-satisfaction partially mediates the relationship between navigation design and visual design with e-loyalty, but e-satisfaction fully mediates the relationship between information quality and e-loyalty. Thus hypotheses 8,9 and 10 are accepted.

5 Discussions

The aim of this study is to empirically test the influence of information quality, navigation design, and visual design on customer e-satisfaction and e-loyalty. The purpose of this study is also to examine the direct and mediated effect of customer e-satisfaction on the relationship between information quality, navigation design, and visual design with customer e-loyalty in Indonesia's FDA during the COVID-19 pandemic.

Our study found that visual design has a positive impact on delivering customer e-satisfaction and e-loyalty. The quality of food images, the color combination used, the size and font used, and the design of the application turns out to play a very important role for customers. Where the quality of the visual design of the application develops interaction with customers so that customers become satisfied with their experience using the application and become loyal users of the application. The findings in this study also support prior research by Kapoor & Vij, (2018) and Pal et al., (2022), which stated that visual design leads customers to continue to use online apps to order food.

Additionally, our study also revealed that navigation design is one of the factors that have a positive influence in delivering customer e-satisfaction and e-loyalty. Navigation design refers to the transitions between different sections of an application that a user experiences. The result of our study found that navigation design has a positive influence to deliver customer e-satisfaction and e-loyalty. Customer experience when navigating certain FDA is an important element of the FDA for customers. Customers like and pay attention to several factors when navigating FDA, such as the ease of navigation, smoothness, and seamless transition felt by customers when navigating the FDA menu from the home page, review page, list page, and finally, the payment transaction page. This navigation experience will shape customer satisfaction when using the FDA and encourage customers to use FDA again and become loyal. A similar result was reported in prior study by Pal et al [9] and Kapoor & Vij [8], which stated that navigational design help to deliver customers' e-satisfaction with the FDA experience and continue to use FDA to order food.

Our result also revealed that information quality is the greatest predictor of customers' e-satisfaction among other FDA attributes. Information quality is defined as the consumer's perception of the quality of the information provided by the FDA. The quality of information is an important factor that is considered by customers when using FDA. Detailed information from the displayed menu, detailed food information, displayed price information, and detailed information about restaurants is one example that must be considered from the quality of information expected by users of the FDA. One of the pieces of information that must also be considered in the quality of information is customer reviews [9]. Customer reviews posted on FDA will give a realistic impression and can represent the opinions of users so that they can encourage other users to try. Prior study by Zhao et al [46] found that user reviews posted by hospital patients drive customer e-satisfaction. Similar results by other research in the application context showed that designing good information quality was found to be a good predictor of customer e-satisfaction [6], [47].

In addition, the findings in our study proved our prepositions that customer e-satisfaction mediates the influence of information quality, visual design and navigation design on customer e-loyalty. Our study suggests that customer e-satisfaction partially mediates the relationship between navigational design and visual design with e-loyalty. This study's results also showed that customer e-satisfaction fully mediates the relationship between information quality and customer e-loyalty. These findings support a prior study that proved customer e-satisfaction as a mediating variable between informativeness and web design on e-loyalty in online shopping e-commerce [48].

6 Theoretical Implications

The literature research on online food delivery services is still in a nascent state and only limited empirical research that tested issues related to FDA services [9]. Thus, this study makes a valuable theoretical contribution by expanding the growing academic study on FDA services. First, the current study is one of the few studies that examined FDA attributes relationship with e-loyalty and e-satisfaction. Consequently, this study contributes to the emerging and ongoing literature on FDA by examining and empirically proved the influence of FDA attributes (information quality, visual design, and navigation design) on customer e-satisfaction and customer e-loyalty.

Second, this study also extends the FDA literature by examining and empirically investigating the influence of customer e-satisfaction as a mediating variable between FDA attributes with customer e-loyalty.

7 Managerial Implications

This study provides several unique practical implications that will help FDA stakeholders.

First, this study found that visual design and navigation design have a positive influence on customer e-satisfaction and e-loyalty. FDA vendor should give more attention on the FDA design from an aesthetic perspective; for example, using the right type of fonts, and good graphic quality will help enhance user satisfaction and loyalty. Moreover, the navigation design of the FDA should be efficient, where the navigation controls and filters are simple and easy for users to use. Good navigation design also allows users to complete transactions easily, efficiently, seamlessly, and without significant interruptions. In addition, FDA also should be able to deliver accurate, relevant, up-to-date, and comprehensive personalized information to their customers because it will build their e-satisfaction.

Second, this study found that information quality has the highest influence in building customers' e-satisfaction toward FDA. FDA vendors should give importance to the information provided by FDA apps to users. The information regarding food and restaurant should be detailed, easy to understand, and up to date. FDA vendors also should focus on their customer reviews. Showing reviews from past customers and allowing them to post pictures on FDA apps can lead to other customers being interested, and increase their satisfaction, that leads to their loyalty. The FDA vendor could use a reward system for their customers to post reviews and pictures after they order food, thereby increasing the number of posts that are in the app.

8 Limitations

Although this study provides contributions to the ongoing FDA literature, this work has several limitations. First, the current study focuses only on consumers' behavior toward FDA applications. Consequently, the findings cannot be generalized to other mobile applications. Second, the data used in the current study is collected from Indonesian FDA customers, which can be generalized to other countries. Future studies can collect customer data from other countries where FDA is flourished, such as Singapore, Thailand, or Vietnam. Third, this study analyses antecedents from FDA attributes perspectives, which consist of information quality, navigation design, and visual design. Future studies can examine other antecedents of consumer perceptions, such as hedonic motivation, price, perceived ease of use, and perceived usefulness. Fourth, another limitation of this study is that this study analyzes the role of e-satisfaction as a mediating variable between FDA attributes and e-loyalty, so the mediation analysis of this study is limited to e-satisfaction. Subsequent research can examine and provide empirical evidence regarding other variables as mediating variables, such as trust, engagement, attitude.

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