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The Influence of Environmental Sustainability Awareness on Consumers' E-Loyalty to Online Grocery Shopping Platforms: A Comprehensive Study of Factors

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Abstract. While previous studies have focused on the role of Online Grocery Shopping (OGS) platforms in reducing food waste, limited attention has been given to consumers' awareness of food waste reduction and other environmental sustainability aspects when choosing shopping channels. This research aims to provide a win-win solution for consumers, e-retailers, and the environment by offering continuous grocery access, financial benefits, and pollution reduction support. A survey involving 180 respondents who have engaged in OGS activities in the Jabodetabek area in Indonesia was conducted. Structural Equation Modelling (SEM) analysis revealed that economic value, consumers' expectation of Augmented Reality (AR) implementation, and awareness of food waste reduction significantly contribute to satisfaction with the OGS platform. Furthermore, information quality and corporate image significantly impact trust in the OGS platform. Consumer satisfaction, trust, and the absence of cart abandonment significantly influence OGS loyalty. Based on these findings, we recommend that companies prioritize consumer satisfaction, which fosters loyalty to OGS platforms. Furthermore, we provide recommendations for companies to consider, emphasizing the importance of economic value, AR implementation, and support for consumer awareness of food waste reduction to enhance satisfaction with OGS platforms.

Keywords: food waste reduction, online grocery shopping, consumer loyalty, environmental sustainability

1. Introduction

Food waste is a never-ending problem in many parts of the world. In 2019, the amount of food waste from all countries reached 931 million tons, of which 61% came from households (United Nations, 2021). The National Development Planning Agency (Bappenas) noted that the amount of food waste produced by Indonesia in 2000-2019 reached 23-48 million tons per year, equal to 115-184 kilograms per capita. From an economic standpoint, Indonesia has lost 213-551 trillion rupiah annually due to food waste. From the energy sector, Indonesia has lost an amount of energy sources equal to the portion of food for 61-125 million people per year. The total food waste produced by Indonesia can overcome the problem of malnutrition that this country has experienced for years (Jakarta Globe, 2021). Food waste globally is expected to reach 3.4 billion tons in 2050 (World Bank Group, 2018).

Several stages of food distribution can create food waste, but mainly at the final stage of the supply chain, namely the household sector (Schanes et al., 2018; Ellison et al., 2022; Stancu & Lahteenmaki, 2022). There are various reasons why food waste can occur, one of which is because people overbuy or over-purchase when shopping for groceries due to inaccuracies in estimating spending plans. In addition, food waste can also be caused by overprovisioning or behaviour to increase the amount of food purchased. Overprovisioning happens due to various causes, such as time constraints and locations used to shop for groceries (Schanes et al., 2018; Stancu & Lahteenmaki, 2022). Previous research conducted by Jörissen et al. (2015) and Janssens et al. (2019) found that food waste tends to increase when grocery shopping is done at supermarkets but vice versa at shopping places with a smaller scope. This is mainly caused by impulsive buying behaviour; retailers intend to arrange store designs and product displays so that consumers make impulsive purchases (Chen et al., 2021; Stancu & Lahteenmaki, 2022).

Researchers have conducted various studies to find the most effective ways to reduce food waste. However, research has never been done to investigate how the relationship between consumer attitudes towards food waste reduction and e-loyalty to OGS platforms can potentially benefit environmental sustainability. Current research still focuses on discussing how e-loyalty can provide financial benefits for e-retailers as providers of OGS platforms (Rafiq et al., 2013; Sreeram et al., 2017; Faraoni et al., 2018; Khan et al., 2019; Singh, 2019; Al-Khayyal et al., 2020; Khan & Khan, 2020; Klepek & Bauerová, 2020; Singh & Rosengren, 2020; Islam & Balqiah, 2021). As an additional context, e-loyalty is an evolution from the traditional marketer-controlled concept to a modern consumer-controlled and technology-facilitated concept (Cartelli & Palma, 2009). E-loyalty focuses more on the effects that can arise from access to the internet (Radionova-Girsa & Batraga, 2020). E-loyalty is manifested in different forms, one of which is repurchase behaviour. If consumers do not repurchase through OGS, e-loyalty to OGS platforms cannot be maximally developed (Kaya et al., 2019). If e-loyalty to OGS platforms is not optimally developed, it will be difficult to empower the usage of the OGS platform as a medium to reduce food waste. Purchases through OGS platforms potentially promote further green purchasing (product provisioning with a lesser negative effect on the environment), which has become consumers' most employed environmentally-sustainable behaviour besides recycling, reusing, and natural resource saving (Han, 2021).

This study was conducted to enrich the research of e-business, consumer behaviour, and environmental sustainability, which discusses how e-loyalty to OGS platforms can provide a win-win solution for consumers, e-retailers, and the environment. Specifically, this study aims to fill the gap from the previous research, which does not yet focus on leveraging awareness of food waste reduction to drive purchases from OGS platforms. This study will discuss how various factors impact e-loyalty to OGS platforms, including consumers' awareness of maintaining environmental sustainability. This study's results will mainly be extracted into strategic steps that providers of OGS platforms can consider to grow the business and create a loyal consumer base. Since a company may be unable to focus on developing various things simultaneously due to limited human resources and funds, information about the order of influence factors that affect e-loyalty is essential to help companies formulate strong business strategy priorities and effective policies.

2. Literature Review

2.1. E-grocery/Online Grocery Shopping

E-grocery is a business with the main goal of selling groceries online to consumers. E-grocery concentrates on customer value, shopping convenience, and fast delivery (Jagani et al., 2020). E-grocery provides various benefits to consumers, such as the ability to shop in large quantities at any time with travel costs efficiency. E-grocery commonly has a varied product selection, availability, and access to attractive promotions (Asti et al., 2021). E-grocery promises that consumers can get groceries at the right time without leaving the comfort of their homes or office (Martín et al., 2019).

2.2. E-loyalty

E-loyalty is a positive attitude shown by consumers towards an e-retailer (a company that sells products online), which leads to repurchasing behaviour. E-loyalty consists of two components: attitudinal and behavioural loyalty. E-loyalty requires positive attitudes and behaviour: intention to repurchase and word-of-mouth recommendations (Kaya et al., 2019). It is very important for a company to gain a loyal market share; loyalty is considered one of the keys to the success of a company's marketing strategy (Mostafa & Kasamani, 2021).

There are several indicators to measure e-loyalty. E-loyalty can be measured based on research respondents' repurchase behaviour and loyalty intention. The consumer's loyalty to a shopping platform reflects the intention to repurchase and recommend the platform to others. These elements are predictors of retention or repeated purchases on a platform (Zheng et al., 2017; Parra-Lopez et al., 2018; Buhalisa et al., 2020).

2.3. Previous Research Findings on OGS Purchases to Reduce Food Waste

Study conducted by Burningham et al. (2014) specifically describe that purchases made at physical stores or traditional markets are likely to be “unstructured” due to the large number of items in each aisle. This makes consumers spend more money to buy less necessary goods or make unplanned purchases. As a result, the possibility of creating food waste will increase. The OGS platform minimizes consumers' experience of feeling real products, such as seeing and smelling aromas, thus "impoverishing" the shopping experience. The “poor” shopping experience through OGS platforms encourages more effective and structured shopping activities.

Alaimo et al. (2021) discussed OGS activities during the COVID-19 pandemic in Italy. The study results show that consumer satisfaction with the OGS experience will increase the intention to repurchase, which can reduce food waste due to minimum exposure to offline store marketing that makes consumers shop uncontrollably. In particular, the COVID-19 pandemic has changed consumer habits to cook more at home and plan detailed food menus. Consumers are also becoming more aware of their health, so they are more careful in making food choices, contributing to food waste reduction.

Belavina et al. (2016), Aziz et al. (2022), and Ellison et al. (2022) discussed the impact of OGS platforms on minimizing environmental pollution. The research found that the OGS platforms effectively make smaller grocery purchases more frequent, thus reducing food waste and providing higher value for consumers. Although frequent delivery can cause air pollution, researchers believe that OGS purchases are still relevant to reduce environmental pollution because pollution caused by food waste is greater than vehicle emissions.

2.4. Previous Research Findings on OGS Loyalty

Studies have been done on factors influencing OGS loyalty by researchers in various countries, as summarized below.

Table 1: Previous Research Findings on OGS Loyalty

Reference	Sample	Variable	Method	Findings
Rafiq et al., 2013	491 OGS buyers in the United Kingdom	• **Dependent**: E-perceived relationship investment • **Independent**: E-loyalty • **Moderating**: E-trust, e-relationship satisfaction, e-affective commitment	Structural Equation Modeling (SEM)	• Relationship satisfaction (consumer satisfaction with an organization), perceived relational investment (consumer's perception of how much effort the organization has in providing maximum service to maintain relationships with consumers), and affective commitment (consumer's emotional relationship with an organization) has a strong positive relationship with e-loyalty. • Trust affects e-loyalty but works through relationship satisfaction as a mediator.
Sreeram et al., 2017	240 OGS buyers who live in remote areas in India (the presence of the nearest grocery store/ supermarket is very limited)	• **Dependent**: E-loyalty • **Independent**: Product assortment, social influence, design aesthetics, economic value, physical effort, time pressure • **Mediating**: Perceived ease of use, perceived usefulness, behavioural intention, satisfaction, entertainment value		• Perceived ease of use has a positive influence on perceived usefulness, where perceived usefulness influences behavioural intention (to do OGS). • Product variations and social influences positively influence perceived ease of use and behavioural intention. • Design aesthetics has a significant influence on perceived ease of use; perception of price has a positive influence on perceived usefulness and entertainment value; physical effort has a positive influence on perceived ease of use; time pressure (narrow time allocation due to the busyness that makes consumers rush to do something) has a positive effect on perceived usefulness. • Behavioral intention positively affects satisfaction, but satisfaction does not affect loyalty.
Faraoni et al., 2018	250 postgraduate students taking Business Administration and Management course at the University of Florence, Italy	• **Dependent**: E-loyalty • **Independent**: Security/privacy, e-perceived relationship investment, website design • **Mediating**: E-trust, e-relationship satisfaction, e-affective commitment		• Website design, security, and privacy, affect e-loyalty, but website design does not affect e-satisfaction. • The relationship between e-trust and e-loyalty is positive, where e-trust also contributes to e-satisfaction. • The relationship between e-relationship satisfaction and e-affective commitment is proven, where e-affective commitment has a positive relationship with e-loyalty. • E-perceived relationship investment has proven to have a positive effect on e-trust.
Khan et al., 2019	390 internet users in Pakistan who have done online shopping activities	• **Dependent**: E-satisfaction, e-loyalty • **Independent**: E-service quality (efficiency, system availability, fulfilment, privacy/security)		• E-customer satisfaction and e-customer loyalty are influenced by e-service quality. • E-service quality has a strong positive relationship with e-customer satisfaction, as well as the relationship between e-service quality and e-customer loyalty.
Singh, 2020	1.004 OGS reviews on forums and websites	• **Dependent**: Behavioral response • **Independent**: Service excellence, customer return on investment, aesthetics, playfulness • **Mediating**: Frictionless customer experience, pleasurable customer experience	Content Analysis	• A smooth and pleasant user experience for shopping on OGS platforms influences e-loyalty (repurchase intention and WoM). • “Smooth user experience” is broken down into several attributes, such as service excellence, performance (delivery, returns and refunds, and order cancellation management), employee skills/capabilities (trustworthy customer service and responsiveness), return on investment from consumers, service efficiency (ease of use, website navigation, and delivery speed), and economic profit (product price, product quality, and product variety). • "Pleasant user experience" is broken down into these attributes: aesthetics, visual display, playfulness, and emotional enhancement (pleasure/joyfulness).

Reference	Sample	Variable	Method	Findings
Al-Khayyal et al., 2020	21 online shopping platform users in Uni Emirat Arab	• **Dependent**: E-loyalty • **Independent**: Website design, privacy, security, efficiency, customer service/ communication • **Mediating**: E-satisfaction, e-trust, e-shopping	Summative Content Analysis	• Consumer satisfaction in an electronic product or service (e-satisfaction) and trust in an electronic product or service (e-trust) influence consumer behaviour and loyalty in online shopping. • E-satisfaction and e-trust are dimensions of e-service quality (how far an online shopping website provides effectiveness and efficiency in purchasing activities and product delivery).
Khan & Khan, 2020	250 OGS buyers in India	• **Dependent**: E-loyalty • **Independent**: Perceived enjoyment, concentration • **Mediating**: Attitude, ease of use	Structural Equation Modeling (SEM)	• Concentration and a feeling of enjoyment when doing online grocery shopping activities affect consumer attitudes. • Consumer attitudes towards e-grocery have a positive influence on e-loyalty. Meanwhile, perceived ease of use influences attitude and e-loyalty.
Singh & Rosengren, 2020	250 OGS buyers in the United States of America who have transacted at least twice	• **Dependent**: Switching intention • **Independent**: Customer service, delivered products, price perception, technical issue, switching cost, past switching, WoM, alternative attraction		Customer service, problems with products received, technical problems (which affects the ease and speed of OGS), the perception that a product has an expensive price, WoM, and attractiveness from competitors' platforms contribute directly and have a strong relationship by moving consumers from one platform to another.
Klepek & Bauerová, 2020	670 OGS and non-OGS buyers in Czech	-	Content Analysis	Consumers who frequently shop at retail stores are reluctant to do OGS because of the desire to directly see the appearance of food ingredients before buying, distrust of the selection of food quality by OGS platforms, and the duration of OGS is considered not as fast as shopping in physical stores.
Islam & Balqiah, 2021	341 OGS buyers in Indonesia from April to October 2020	• **Dependent**: E-satisfaction, trust • **Independent**: Repurchase intention, customer engagement, positive WoM, security, privacy concern, ease of use	Structural Equation Modeling (SEM)	• Consumer perceptions of the risk of OGS (security and privacy concern) and ease of use positively affect e-satisfaction and trust. • E-satisfaction and trust positively affect consumer engagement, which also has a positive relationship with consumer intention to repurchase and WoM practices.

Based on various studies about OGS loyalty, price (economic value), e-service quality, and social influence are commonly included as independent variables. Although not commonly studied, several independent variables are essential in OGS, such as product assortment (Rishi et al., 2018; Hartono & Kumar, 2022) and quality of information on websites or applications (Kang & Namkung, 2022). Corporate image is also essential for building consumer loyalty (Kaur & Soch, 2013). Trust and satisfaction are commonly included as mediating variables, especially in studies discussing loyalty to OGS platforms. However, no studies specifically discuss how the type of consumers, consumers' awareness of food waste reduction, and consumers' expectations of AR implementation can affect OGS loyalty. Realizing that OGS loyalty cannot be created by empowering awareness of food waste reduction alone, in this study, we propose various variables, both the ones that are already included and have never been discussed in the previous findings, as seen in Table 2.

Table 2: Proposed Variables

Type of Variable	Variable Name
Independent Variable	X_1 = *Economic value* X_2 = *Fulfillment* X_3 = *Efficiency* X_4 = *e-WoM* X_5 = *Product assortment* X_6 = *Information quality* X_7 = *Corporate image* X_8 = *Awareness of food waste reduction* X_9 = *Expectation of AR Implementation*
Dependent Variable	Y = *OGS loyalty*
Mediating Variable	Z_1 = *Satisfaction* Z_2 = *Trust*
Moderating Variable	W = *Type of consumer*

2.5. Economic Value

Economic value is the perspective of whether the value of the product or service acquired is proportional to the transaction value. Economic value is the return on investment consumers get when they spend a certain amount. Economic value manifests not only in financial terms, such as discounts, promotions, and limited offers, but also in saving time and energy (Sreeram et al., 2017).

A study by Sreeram et al. (2017) found that economic value is a key variable that influences user satisfaction with OGS platforms, where user satisfaction positively affects OGS loyalty. Mustikasari & Astuti (2021) found that economic value significantly affects buyer satisfaction in OGS activities. Variables related to finance and the economy, such as product prices and the amount of consumer income, are the main determinants of whether or not food waste is created. Consumers tend not to throw away food if the food is purchased at a high price. If the portion of leftover food is still enough to serve as one meal, rather than throwing it away, consumers will store the leftovers to be consumed the next day (Berjan et al., 2019; Lusk & Ellison, 2020). Based on the study's findings, we formulated the following hypothesis.

H_1: Economic value significantly affects OGS loyalty through satisfaction.

2.6. E-service Quality

E-service quality is a service that is distributed through electronic media with an internet connection. Generally, e-service quality involves purchase transactions initiated and controlled by consumers. E-service quality is the element that most determines whether an internet-based business can succeed or fail. E-service quality defines the relationship between consumers and a particular platform. It includes the user experience of the entire e-service process, from information search services to aftersales (Khan et al., 2019). Consumers' positive perceptions of e-service quality directly affect satisfaction and intention to purchase, leading to loyalty to internet-based business providers (Sreeram et al., 2017; Khan et al., 2019).

E-service quality can be derived into several dimensions: efficiency and fulfilment (Mouakket & Al-Hawari, 2012; Asgari et al., 2014; Kilburn et al., 2016; Khan et al., 2019). In this case, efficiency is defined as consumers' ability to access websites and find the products and information they seek with minimum effort (Kilburn et al., 2016; Khan et al., 2019; Davidavičienė et al., 2020). Fulfilment is defined as how far the website claims that order delivery can be made and product stock is available (Kilburn et al., 2016; Khan et al., 2019).

Generally, e-service quality is the main driver for consumers to feel satisfied and trust an online shopping platform (Salegna, 2018). Efficiency and fulfilment as derivatives of e-service quality positively influence consumer satisfaction with service-based websites (Khan et al., 2019). Rafiq et al. (2012) and Alaimo et al. (2021) stated that high customer satisfaction would encourage consumers to repeat

transactions and recommend the OGS platform to potential consumers. Thus, we formulate the hypothesis as follows.

H_2: Fulfillment significantly affects OGS loyalty through satisfaction.

H_3: Efficiency significantly affects OGS loyalty through satisfaction.

2.7. E-WoM

E-WoM is one of the sources consumers rely on to get good OGS platform recommendations. E-WoM can contribute directly and significantly to the movement of consumers from one platform to another; WoM can make consumers disloyal to an OGS platform (Singh & Rosengren, 2020).

In the general context of online shopping through e-commerce or websites, e-WoM has positively impacted consumer satisfaction in purchasing decisions (Yoo et al., 2015; Pereira et al., 2017). Other studies discussing OGS platforms mention that WoM positively relates to satisfaction and trust. The more often consumers purchase through an OGS platform, the stronger the relationship between consumer satisfaction and willingness to spread positive recommendations about the platform to potential buyers (Islam & Balqiah, 2021). These findings become the basis for formulating the following hypotheses.

H_4: e-WoM significantly affects OGS loyalty through satisfaction.

H_5: e-WoM significantly affects OGS loyalty through trust.

2.8. Product Assortment

The availability of new products, products with certain brands, and popular products is called product assortment. It is also often associated with the variety of product variations available (Hartono & Kumar, 2022), both in terms of product type and size (Kang & Namkung, 2022). Product assortment is one of the reasons consumers use online services to buy fresh products because sometimes certain products are difficult to find in physical stores, especially processed food and agricultural products (Kang & Namkung, 2022). However, increasing competition in online marketplaces makes consumers vulnerable to switching to competitors' platforms. This becomes possible because consumers see the economic value and the variety of products certain platforms offer (Sreeram et al., 2017). The more diverse the products, the more likely consumers are to transact on an OGS platform (Rishi et al., 2018; Frentz, 2020; Hartono & Kumar, 2022; Kang & Namkung, 2022). Product assortment influences customer satisfaction and transaction intention (Hartono & Kumar, 2022).

Product assortment affects consumer satisfaction and intentions to make transactions, both in physical stores (Gogoi & Dutta, 2020; Desara et al., 2021; Hartono & Kumar, 2022) and in non-physical or online stores (Endo et al., 2012; Beneke et al., 2013; Nguyen et al., 2018; Soni & Vohra, 2022). When shopping online, consumers want an experience similar to at a physical store – getting fresh products with various choices, including substitutes that make sense when a product is out of stock. The inability of consumers to select products when shopping for groceries online creates concerns about the product being delivered, which can impact the overall shopping experience (Singh & Söderlund, 2020). Based on previous findings, we formulate the following hypothesis.

H_6: Product assortment significantly affects OGS loyalty through satisfaction.

2.9. Information Quality

Information quality is the ability of a website or application to provide information to help consumers get accurate and detailed updates. Good quality information must be relevant to consumer needs. A website or application has to present information that helps consumers make decisions easily so they no longer need to search through other websites or applications. When a website or application has high-quality information, the bigger influence it has on consumers to make certain decisions. Information quality can strongly drive satisfaction (Mahadin et al., 2020).

In the context of OGS, information quality can reduce consumer anxiety about the product being purchased and satisfy the intellectual side of the consumer. Information quality significantly affects trust

and satisfaction when buying fresh food online (Kang & Namkung, 2022). Even if the OGS platform successfully fulfils orders, satisfaction will not be achieved without good information quality. Good information quality is an absolute attribute of a platform for online shopping (Oh et al., 2012). Satisfaction and trust in information quality are important factors that can make consumers continue to use OGS platforms (Gunawan et al., 2021). Thus, the following hypotheses are formulated.

H_7: Information quality significantly affects OGS loyalty through satisfaction.

H_8: Information quality significantly affects OGS loyalty through trust.

2.10. Corporate Image

Corporate image is a measurable and valuable entity because it is difficult to imitate. A good image can help companies get superior and sustainable financial benefits. A corporate image consists of four elements: perception of the company, recognition of the company, company reputation, and competition against companies with similar business lines. Corporate image impacts employees who work in companies, communities, consumers, and business partners (Vivian et al., 2016).

Previous research related to e-banking and public services stated that corporate image is a factor that influences trust (Salehnil et al., 2014; Sualihu et al., 2017). Other research related to the telecommunication sector states that corporate image significantly affects consumer loyalty (Agyei, 2014). Research discussing OGS explains that companies with a good corporate image will easily influence consumers to make repeat purchases (Ma et al., 2022). If a service or product provider is widely known, consumers will have a more positive perspective. A positive corporate image can give consumers stronger trust; they will strongly support the service or product providers (Ma et al., 2022; De et al., 2023). A company's investment in preventing and mitigating food waste can improve the corporate image and encourage consumer visits. Furthermore, restaurants trying to reduce food waste will gain loyalty from consumers who care for environmental sustainability (Filimonau & Uddin, 2021). Thus, we formulate the hypothesis as follows.

H_9: Corporate image significantly affects OGS loyalty through trust.

2.11. Food Waste

Food waste consists of food ingredients intended for human consumption but discarded, lost, degraded or contaminated (Girotto et al., 2015). Food waste is different from food loss. Food waste occurs when someone throws away food that is still suitable for consumption, while food loss occurs when food is no longer suitable for consumption before someone can consume it — damaged or destroyed by pests or fungi (United Nations, 2021). Food waste generally occurs when food has been distributed to consumers, while food loss occurs during production, after harvest, or when food is in the processing stage (FAO, 2015).

Consumer satisfaction with the OGS platform will increase the intention to repurchase online. This reduces food waste due to minimizing consumers' exposure to offline store marketing tactics that intend to make uncontrollable purchases (Alaimo et al., 2021). Since OGS platforms minimize consumers' experience of feeling real products, such as seeing and smelling aromas, the “poor” shopping experience encourages more effective and structured shopping activities (Burningham et al., 2014). Findings in the previous studies led us to formulate the following hypothesis.

H_{10}: Awareness of food waste reduction significantly affects OGS loyalty through satisfaction.

2.12. Augmented Reality (AR)

In education and marketing, the application of AR is quite common. AR is a suitable method for creating learning experiences that combine theoretical and experiential aspects (Honee et al., 2022). In terms of marketing, instead of looking at images, AR has succeeded in highlighting product visuals in real environments and delivering sensory-rich experiences. This pleasant experience positively influences the association and value of a brand, where the cognitive control provided by AR can increase purchase intention (Javornik et al., 2021).

Implementing AR in an application can improve user understanding of food visualization. Because the

visualization is more real and clear than the two-dimensional photos, the tendency of users to understand information is higher. This increased understanding can help consumers to understand food specifications; they will have a strong basis to make decisions related to food consumption which ultimately influences food waste reduction (Honee et al., 2022). Based on the results of these studies, the hypothesis is formulated as follows.

H_{11}: Expectation of AR Implementation significantly affects OGS loyalty through satisfaction.

2.13. Trust

Trust is an attitude that describes consumer confidence in making online orders. Trust is often associated with consumer perceptions regarding how companies protect consumer data and their commitment to honesty and integrity (Faraoni et al., 2018; Khoa & Huynh, 2022). Trust is a more critical component of online platforms than physical stores. This is related to increased risk due to minimal physical contact (Rafiq et al., 2013). Research conducted by Faraoni et al. (2018) stated that the relationship between trust and loyalty is positive in OGS activity. Rafiq et al. (2013) stated that trust affects loyalty but works through satisfaction as the mediator. Another study conducted by Al-Khayyal et al. (2020) also stated a similar finding, where trust positively affects consumers' desire to use and adapt OGS; if consumers are satisfied with the OGS process and trust an OGS platform, this will affect loyalty. The following is a hypothesis formulated based on the aforementioned theories.

H_{12}: Trust significantly affects satisfaction.

2.14. Satisfaction

Subjective satisfaction describes the satisfaction when interacting with an application (Lazar et al., 2017, p. 31). In OGS, satisfaction and e-loyalty are affected by e-service quality, where e-service quality has a strong positive relationship with satisfaction and e-loyalty (Khan et al., 2019). Satisfaction and trust positively affect consumer behaviour and loyalty in online shopping, including making repurchases and WoM practices (Al-Khayyal et al., 2020; Islam & Balqiah, 2021). Thus, we formulate the hypothesis as follows.

H_{13}: Satisfaction significantly affects OGS loyalty.

H_{14}: Trust significantly affects OGS loyalty.

2.15. Type of Consumer

In the context of online shopping, there are various types of consumers. Besides consumers who immediately make purchases when opening OGS platforms or when they have added products to the "Cart" page, there are also consumers who delay buying products even though the products are already in the "Cart" (called “cart abandonment”). Cart abandonment can be done by first-time or existing buyers, where the level of cart abandonment will get higher along with the increase in impressions of the "Cart" page. Cart abandonment happens due to trust issues — consumers are increasingly aware of online shopping risks. Cart abandonment will also happen as consumers search or explore products and continue to add products to the "Cart" page. Adding products to the "Cart" page will create greater financial consequences — transaction and shipping costs will become more expensive — so consumers are reluctant to complete transactions (Rausch & Brand, 2022). The following is a hypothesis formulated based on the aforementioned past findings.

H_{15}: Type of consumer significantly affects OGS loyalty.

Consumers who shop more often tend to have higher loyalty and can provide greater financial benefits for retail stores. The frequency of purchases is more relevant in OGS than in other contexts, like purchasing clothes or electronic equipment online, because the need for food tends to be more consistent and occurs continuously. The different frequencies of consumer purchases will likely affect satisfaction, trust, and loyalty. Consumers not conducting repurchase behaviour may have minimal satisfaction, and vice versa. Furthermore, consumers who rarely transact via an OGS platform may have less trust due to less shopping experience than active buyers. This can also be caused by an uncomfortable shopping experience that makes

consumers not return to shop through an OGS platform (Mortimer et al., 2016). Thus, we formulate the hypothesis as follows.

H_{16}: The type of consumer moderates the relationship between satisfaction and OGS loyalty.

H_{17}: The type of consumer moderates the relationship between trust and OGS loyalty.

Figure 1 shows the design of the proposed research model.

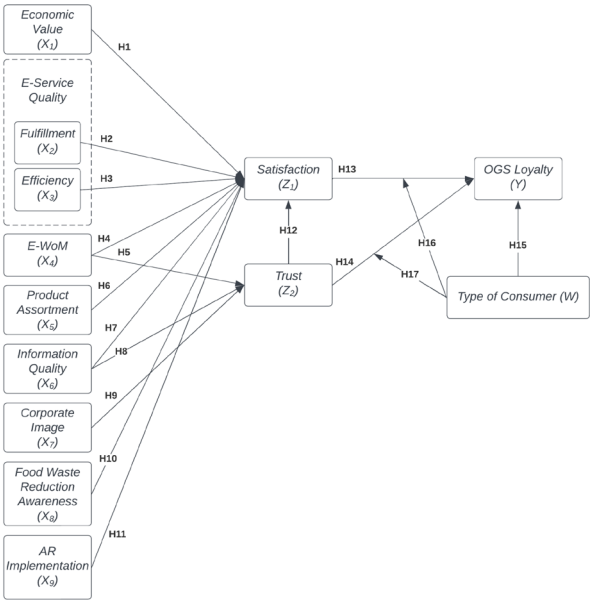

Fig. 1: Proposed Model

3. Methodology

3.1. Data Collection

We utilized an online questionnaire (in Google Forms) as the primary data collection instrument. The online questionnaire was distributed through various channels, such as social media and messaging apps, which the respondents will fill out independently. Each indicator in the questionnaire will be measured with a Likert scale with a value of 1 (strongly disagree) to 5 (strongly agree).

3.2. Population and Sample

The population in this study are all consumers who have transacted using OGS platforms in Indonesia. The research sample consisted of consumers who had made at least one purchase through any OGS platform. Since the service of OGS platforms is still concentrated in Jakarta and some satellite cities around it (Bogor, Depok, Tangerang, and Bekasi, or called "Jabodetabek"), samples will be taken from those areas. The sampling technique used is simple random sampling, where each individual in the population has the same opportunity to become a research respondent. The calculation of the samples using the Slovin formula is as follows.

$$n = \frac{N}{1 + N\,(d^2)}$$

n = number of samples
N = population size
d = margin of error (0.15)

We assume that the total number of consumers in Jabodetabek who have transacted through OGS platforms is 100,000. Thus, the calculation of the sample size is as follows.

$$n = \frac{100000}{1 + 100000\,(0{,}15^2)}$$

$n = 44.425 \approx \mathbf{40}$ (rounded down)

3.3. Data Analysis

We adapted Structural Equation Modeling (SEM) to analyze the data. SEM is a statistical technique popular in business research, science, and other fields. SEM is used to create and test mathematical models, especially models with causality (Sharma et al., 2021). SEM is more commonly used to test models and determine whether they are valid.

Content-related evidence methods involving expert judgment will be used for the validity test. Statistical tests will be carried out to determine the value of the loading factor (the link between indicators and latent variables) and AVE (Average Variance Extracted), which describes the validity of the relationship between indicators and latent variables. If the loading factor value is less than 0.6 and the AVE value is less than 0.5, then the indicators that are indicated as invalid will be deleted. The validity test will be repeated until the results show that all indicators are valid. Cronbach's Alpha is used to conduct reliability tests since this method is generally used to test the reliability of research instruments in various fields. The indicator is reliable and consistent if Cronbach's Alpha exceeds 0.6. We will use SmartPLS software to test the validity and reliability.

The partial test determines whether the independent variables significantly affect the dependent variable or vice versa. The partial test will be based on the significant value of the applied alpha value (we use an alpha value of 0.05 in this study). We apply several test conditions as follows.

- If the significance of the *p-value* <0.05, the independent variable has a significant effect on the dependent variable.
- If the p-value > 0.05 is significant, the independent variable has no significant effect on the dependent variable.

The structural or inner model is measured by calculating the value of R-square (R^2). The greater the value of R^2, the greater the influence of the independent variables on the dependent variable. An R^2 value that is greater than or equal to 0.67 indicates a large influence, while an R^2 value that is less than or equal to 0.19 indicates a weak influence.

4. Results

4.1. Respondent Characteristics

During the data collection period (from the first to the third week of April 2023), we collected answers from 209 respondents. However, only 180 respondents met the criteria (live in Jabodetabek and have done OGS activities). The demographic characteristics of the respondents are described in Table 3.

Table 3: Respondent Demographic Characteristics

Attribute		Total
Gender	Male Female	17.8% 82.2%
Age	18-24 years old 25-34 years old 35-44 years old 45-54 years old	60.0% 33.9% 4.4% 1.7%
Occupation	Student Private employee Freelancer/part-time worker Entrepreneur Professional Housewife Teacher Government employee Unemployed	48.9% 37.8% 4.4% 3.9% 2.2% 1.1% 0.6% 0.6% 0.6%

Based on Table 3, more than 80% of the respondents are female and around 90% of respondents are in the age range of 18 to 34 years. Around 50% of the respondents are students, while nearly 38% of the other respondents work as private employees. Apart from demographics, we also collected some of the respondent's data related to the habit of doing OGS activities.

Table 4: Respondent OGS Behavior

Attribute		Total
Shopping Frequency	Three times in the past three months	55.6%
	Once in the past three months and have not transacted again	24.4%
	Once in the past six months, but have not transacted in the past three months	20.0%
OGS Platform Used	Shopee	42.2%
	GO-JEK (through GO-MART)	41.7%
	Tokopedia	35.0%
	GRAB (through GRAB Mart)	31.1%
	Sayurbox	30.0%
	Klik Indomaret	21.1%
	Segari	20.0%
	ASTRO	18.9%
	Alfacart	13.3%
	HappyFresh	12.8%
	Blibli	4.4%
	Lazada	4.4%
	AlloFresh	2.2%
	Others	2.2%

From Table 4, more than 50% of respondents have routinely done OGS at least three times in the last three months. There are various platforms used to buy groceries online, such as Shopee (42.2%), GO-MART (41.7%), Tokopedia (35%), GRAB Mart (31.1%), and Sayurbox (30%).

4.2. Validity Test with Loading Factor

In the first cycle of the validity test, there were several invalid indicators: CI1, CI2, and FR3. After those indicators were deleted, the validity test was repeated. There was still one invalid indicator in the second cycle of the validity test (CI4). After deleting the invalid indicator, the validity test was repeated for the second time. The results of the third validity test are all valid, as shown in Table 5.

Table 5: Validity Test with Loading Factor

Variable	Indicator	*Loading Factor*	Result
Economic Value	EV1	0.853	Valid
	EV2	0.865	Valid
	EV3	0.849	Valid
Efficiency	EF1	0.727	Valid
	EF2	0.791	Valid
	EF3	0.791	Valid
	EF4	0.836	Valid
Fulfillment	FF1	0.717	Valid
	FF2	0.818	Valid
	FF3	0.785	Valid
e-WOM	EW1	0.867	Valid
	EW2	0.914	Valid
	EW3	0.911	Valid
	EW4	0.888	Valid
Product Assortment	PA1	0.673	Valid
	PA2	0.750	Valid
	PA3	0.752	Valid
	PA4	0.786	Valid
Information Quality	IQ1	0.795	Valid
	IQ2	0.846	Valid
	IQ3	0.841	Valid
	IQ4	0.818	Valid

Variable	Indicator	*Loading Factor*	Result
	IQ5	0.810	Valid
Corporate Image	CI3	0.659	Valid
	CI5	0.889	Valid
	CI6	0.905	Valid
	CI7	0.901	Valid
Expectation of AR Implementation	AR1	0.897	Valid
	AR2	0.872	Valid
	AR3	0.858	Valid
OGS Loyalty	OL1	0.744	Valid
	OL2	0.793	Valid
	OL3	0.719	Valid
	OL4	0.745	Valid
	OL5	0.845	Valid
	OL6	0.768	Valid
	OL7	0.673	Valid
Trust	TR1	0.806	Valid
	TR2	0.827	Valid
	TR3	0.779	Valid
	TR4	0.727	Valid
	TR5	0.647	Valid
Satisfaction	ST1	0.836	Valid
	ST2	0.796	Valid
	ST3	0.834	Valid
	ST4	0.633	Valid
Awareness of Food Waste Reduction	FR1	0.835	Valid
	FR2	0.805	Valid
Type of Consumer	TC1	0.856	Valid
	TC2	0.891	Valid
	TC3	0.876	Valid

4.3. Validity Test with AVE Value

The AVE value in Table 6 indicates that all indicators are valid because all values are above 0.5.

Table 6: Validity Test with AVE Value

Variable	AVE Value	Result
Economic Value	0.732	Valid
Efficiency	0.620	Valid
Fulfillment	0.600	Valid
E-WoM	0.801	Valid
Product Assortment	0.550	Valid
Information Quality	0.676	Valid
Corporate Image	0.714	Valid
AR Implementation	0.767	Valid
OGS Loyalty	0.573	Valid
Trust	0.577	Valid
Satisfaction	0.607	Valid
Food Waste Reduction Awareness	0.672	Valid
Type of Consumer	0.765	Valid

4.4. Reliability Test

The Cronbach's Alpha value of each indicator is shown in Table 7. The Cronbach's Alpha analysis results on the awareness of food waste reduction show a value below 0.6 (not consistent or reliable). The value of rho_a in this variable is also below 0.6. This could be due to the small number of indicators in the respective variable (only two indicators are available) since the value of Cronbach's Alpha is sensitive to the number of indicators. However, the composite reliability or rho_c in the respective variable is 0.804. Since the composite reliability value is more than 0.6, the awareness of food waste reduction can be considered consistent or reliable.

Table 7: Reliability Test

Variable	*Cronbach's Alpha*	*rho_a*	*rho_c*	Result
Economic Value	0.817	0.818	0.891	Reliable
Efficiency	0.796	0.807	0.867	Reliable
Fulfillment	0.670	0.660	0.818	Reliable
E-WoM	0.918	0.922	0.942	Reliable
Product Assortment	0.726	0.727	0.830	Reliable
Information Quality	0.880	0.883	0.912	Reliable
Corporate Image	0.860	0.873	0.908	Reliable
AR Implementation	0.849	0.864	0.908	Reliable
OGS Loyalty	0.875	0.878	0.903	Reliable
Trust	0.814	0.815	0.871	Reliable
Satisfaction	0.782	0.773	0.860	Reliable
Food Waste Reduction Awareness	**0.513**	**0.515**	0.804	Reliable
Type of Consumer	0.847	0.854	0.907	Reliable

4.5. Inner Model Test

Table 8 shows that independent variables in the study influence OGS loyalty by 50.1%. Meanwhile, independent variables in the study influence satisfaction and trust by 62.4% and 47.2%, respectively. In other words, OGS loyalty, satisfaction, and trust are influenced by other variables outside this study's scope.

Table 8: Reliability Test

	R-square **(R^2)**
OGS Loyalty	0.501
Satisfaction	0.624
Trust	0.472

4.6. Hypothesis Test

The hypothesis testing criteria are as follows.

- Reject H_0 if the *p-value* < 0.05
- Accept H_0 if the *p-value* ≥ 0.05

The results of hypothesis testing are described in Table 9.

Table 9: p-values of Direct Effects on Variables

	p-values
AR Implementation -> Satisfaction	0.016
Corporate Image -> Trust	0.000
Economic Value -> Satisfaction	0.003
Efficiency -> Satisfaction	**0,733**
Food Waste Reduction Awareness -> Satisfaction	0,019
Fulfilment -> Satisfaction	**0,894**
Information Quality -> Satisfaction	**0,465**
Information Quality -> Trust	0,000
Product Assortment -> Satisfaction	**0,417**
Satisfaction -> OGS Loyalty	0,000
Trust -> OGS Loyalty	0,019
Trust -> Satisfaction	0,000
Type of Consumer -> OGS Loyalty	0,015
e-WOM -> Satisfaction	**0,782**
e-WOM -> Trust	**0,094**
Type of Consumer x Trust -> OGS Loyalty	**0,718**
Type of Consumer x Satisfaction -> OGS Loyalty	**0,644**

We also analyze the indirect effect between the variables, as seen in Table 10.

Table 10: p-values of Indirect Effects on Variables

	p-values
Information Quality -> Satisfaction -> OGS Loyalty	**0,489**
Economic Value -> Satisfaction -> OGS Loyalty	0.014
Corporate Image -> Trust -> Satisfaction -> OGS Loyalty	0.001
e-WOM -> Trust -> Satisfaction -> OGS Loyalty	**0,122**
Corporate Image -> Trust -> Satisfaction	0.000
e-WOM -> Trust -> Satisfaction	**0,105**
Food Waste Reduction Awareness -> Satisfaction -> OGS Loyalty	0.031
Trust -> Satisfaction -> OGS Loyalty	0.000
e-WOM -> Trust -> OGS Loyalty	**0,189**
Efficiency -> Satisfaction -> OGS Loyalty	**0,739**
Information Quality -> Trust -> OGS	0.037
AR Implementation -> Satisfaction -> OGS Loyalty	0.027
Information Quality -> Trust -> Satisfaction -> OGS Loyalty	0.006
Fulfilment -> Satisfaction -> OGS Loyalty	**0,897**
Information Quality -> Trust -> Satisfaction	0.001
Corporate Image -> Trust -> OGS Loyalty	0.047
e-WOM -> Satisfaction -> OGS Loyalty	**0,786**
Product Assortment -> Satisfaction -> OGS Loyalty	**0,438**

Referring to several hypotheses formulated, it can be concluded that H_1, H_8, H_{10}, H_{11}, H_{12}, H_{13}, H_{14}, and H_{15} are accepted, while others are rejected.

5. Discussion

Based on the research results, consumers need an OGS platform with an economic value to create satisfaction. In line with the acceptance of H_1, Sreeram et al. (2017), Singh (2019), Singh & Rosengren (2020), and Mustikasari & Astuti (2021) mention similar findings, where perceived price affects satisfaction when browsing products on the OGS platform. The more discounts or good offers consumers can get, the greater their satisfaction in transacting through the OGS platform. In addition, satisfaction can grow into loyalty and positive WoM towards the OGS platform.

According to Singh (2019) and Klepek & Bauerová (2020), fulfilment and efficiency can affect consumer disloyalty on an OGS platform, where this conclusion is in line with the rejection of H_2 and H_3. If an OGS platform fails to provide the best service and a comfortable platform, consumers will get a bad shopping experience. A bad experience will frustrate consumers; thus, they will give bad reviews and influence other buyers to switch to other OGS platforms. Therefore, the OGS platform must demonstrate reliability by offering service fulfilment and helping consumers find their needs.

Research by Singh (2019) and Singh & Rosengren (2020) concluded that WoM is like a double-edged knife. Positive WoM can support consumers' loyalty to OGS platforms, while negative WoM — which indicates consumer dissatisfaction and distrust of a platform — can influence consumers to move to another OGS platform. This is in line with the rejection of H_4 and H_5. The rejection of H_6 aligns with a study by Singh (2019). The lack of variety and product stock on the OGS platform makes consumers dissatisfied and adopts a negative attitude, which can cause consumers to look for other platforms to shop. In addition, compared to physical stores, the OGS platform often provides inaccurate stock information, and there is no early confirmation when a product is out of stock. As a result, consumers feel disappointed because the product ordered is incomplete.

The acceptance of H_8 is supported by many previous studies, where good information quality can increase consumer confidence in the product purchased (Kang & Namkung, 2022) and can make consumers continue to use the OGS platform (Gunawan et al., 2021). Good quality information can sharpen consumer understanding of products and help create expectations regarding the actual product they will receive. Even though good quality information can satisfy the intellectual side of consumers (Kang & Namkung, 2022),

in line with the rejection of H_7, a study by Klepek & Bauerová (2020) concludes that limited information avoids loyalty to the OGS platform. Limited information makes consumers suspicious of the ability of the OGS platform to select and deliver the best products.

A positive corporate image is also important to make consumers trust the OGS platform, according to the acceptance of H_9 and the conclusions in the research of Ma et al. (2022). A company or business with a good reputation and image tends to get stronger consumer support. This can help businesses to direct consumers to repurchase. Furthermore, Filimonau & Uddin (2021) stated that food providers who prioritize reducing food waste have a higher potential to gain loyalty from consumers who care about environmental sustainability. In other words, consumer satisfaction and trust will follow the positive image created by the company or business.

Consumers' awareness of reducing food waste is also important to drive satisfaction with the OGS platform, which aligns with the acceptance of H_{10}. When consumers realize they want to support food waste reduction, they will be more motivated to adopt more structured grocery shopping practices. One way to do structured shopping is to utilize the OGS platform instead of buying products through physical stores, which generally makes consumers shop impulsively (Burningham et al., 2014; Alaimo et al., 2021). When OGS succeeds in making consumers do more structured shopping — resulting in reduced food waste — consumers will feel satisfied and appreciate the existence of the OGS platform to help them preserve the environment.

In line with the acceptance of H_{11}, applying AR technology to provide real product representation is important for creating satisfaction with the OGS platform. As mentioned in previous research, AR implementation can satisfy consumers because it increases understanding of product visualization; consumers can see the product's shape and description in more detail than two-dimensional photos. Thus, AR provides consumers with greater certainty about the products they want to purchase — helping them make informed decisions about food consumption — ultimately influencing food waste reduction (Honee et al., 2022).

As seen in the previous analysis and acceptance of H_{12}, H_{13}, and H_{14}, consumers' satisfaction and trust can create loyalty to OGS. This finding is in line with previous research conducted by Faraoni et al. (2018), Singh (2019), Al-Khayyal et al. (2020), and Islam & Balqiah (2021), where satisfaction and trust have a positive effect on consumer behaviour and loyalty in online shopping, including making repurchases and WoM practices. Consumers' behaviour of continuously adapting e-shopping will occur if they are satisfied with their past experiences and trust the platform. Islam & Balqiah (2021) also found that consumer satisfaction positively impacts repurchase intention, where repurchase intention is one of the components that shape loyalty. Even though some potential risks may occur when conducting OGS (e.g. data breach), consumers will continue to transact if they have a satisfactory experience.

Acceptance of H_{15} and rejection of H_{16} and H_{17} confirm that the type of consumer who does not do cart abandonment is directly related to OGS loyalty, but does not moderate the relationship between satisfaction and trust with loyalty. A similar finding was concluded by Rausch & Brand (2022), where new consumers have a higher tendency to abandon carts, but vice versa for consumers who have made transactions repeatedly. Because new consumers have less impression of a particular OGS platform, they have difficulty creating expectations for their transaction experience. If new consumers face major barriers to making their first transaction, it will be difficult to create repurchase intention, let alone loyalty to the OGS platform.

The results of this study have several implications, both theoretically and practically. As theoretical implications, this study contributes to enriching knowledge in e-grocery practice, mainly about the relationship between awareness of environmental sustainability and OGS loyalty. The previous explanation shows that OGS loyalty is mainly influenced by consumer satisfaction, followed by trust in the OGS platform. Types of consumers who do not frequently conduct cart abandonment also affect OGS loyalty. To create satisfaction, an OGS platform should provide good economic value, promote AR implementation, and support consumers' awareness of food waste reduction. Meanwhile, the OGS platform needs quality

information and a good corporate image to create trust. The practical implications of this research are mainly for companies which become OGS platform providers, where they can prioritize creating consumer satisfaction to boost loyalty. Efforts to actualize other aspects, such as trust and consistent purchase behaviour (consumers not abandoning the cart), can be executed once consumer satisfaction is created since it plays the most significant role in affecting OGS loyalty.

6. Conclusion

Previous research has given minimal attention to consumers' awareness of food waste reduction and other environmental sustainability aspects when choosing grocery shopping channels. Thus, this study aims to fill the gap and reveal how those factors impact e-loyalty to OGS platforms. Since a company may be unable to focus on developing various things simultaneously due to limited human resources and funds, this study will provide insights into the order of influence factors that affect e-loyalty. This will help companies formulate strong business strategy priorities and effective policies to grow their business and create a loyal consumer base.

Consumer satisfaction and trust significantly influence loyalty to the OGS platform. The type of consumer who does not frequently do cart abandonment also significantly affects OGS loyalty. To create consumer satisfaction, an OGS platform has to offer economic value, promote AR implementation, and support consumers' awareness of food waste reduction. An OGS platform can provide quality information and an excellent corporate image to create trust.

Satisfaction plays the most significant role in creating loyalty to the OGS platform, followed by the type of consumer and trust. The more satisfied consumers with the OGS platform, the more loyal consumers will be to OGS activities. In addition, the more consumers trust and are committed to executing purchases right away, the more loyal consumers will be to OGS activities. Economic value is the aspect that plays the most significant role in creating satisfaction with the OGS platform, followed by AR implementation and awareness of food waste reduction. Information quality and corporate image are the most significant aspects that promote trust in the OGS platform.

Since satisfaction plays the most significant role in creating OGS loyalty, companies can prioritize bringing this aspect to reality. To help create consumer satisfaction, there are several things that companies need to consider related to economic value, AR implementation, and support for consumers' awareness of food waste reduction. Companies can consider providing more varied product assortments, loyalty programs, and customized transactions according to consumers' needs, preferences, and budgets to create economic value. To promote AR implementation, companies can make a smart feature to compare product specifications or virtual carts to make easier shopping adjustments. To support consumers' awareness of food waste reduction, companies can offer recipe ideas, a smart shopping list based on transaction history, and an expiry date warning for products from past purchases.

7. Limitation and Future Research

This study only covers the dynamics of OGS buyers in Jabodetabek, a considerably small area compared to the entire territory of Indonesia. While consumers in each region have their characteristics, this study only captures a small part of the social dynamics related to OGS. Careful consideration is required if researchers and OGS platform providers intend to generalize or adapt the results of this study to consumers in other regions. Since different dynamics may occur, certain adjustments are needed. Thus, in that case, researchers and OGS platform providers should ensure that future work is conducted at specific locations with the targeted market so that the conclusions and recommendations can be more relevant.

According to the inner model test result, independent variables studied in this research influence OGS loyalty by 50.1%, satisfaction by 62.4%, and trust by 47.2%. In other words, there are still many potential variables affecting OGS loyalty, satisfaction, and trust that this study has not yet covered. Thus, more exploration and literature study is needed to uncover other variables that may support the creation of OGS loyalty, satisfaction, and trust.

When reflecting on the e-grocery practice in the real world, there may be changes in consumer behaviour that may occur over time. Various reasons, such as economic fluctuations and technological developments, can cause this behaviour change. While this study does not focus on monthly or yearly trends, future research on OGS loyalty must be done continuously to ensure that the conclusions and recommendations remain per the current context. Researchers must be responsive to the latest conditions in society, especially those related to e-grocery practice and environmental sustainability.

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