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Multigroup Analysis of E-Service Quality, Satisfaction, and Loyalty in E-Grocery Services

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Abstract

Purpose: E-Grocery is a business-to-consumer (B2C) e-Commerce with the main objective of selling groceries online. The characteristics of this service include using a digital system (application/website) and sending goods immediately (door-step delivery). Amid the widespread use of e-Grocery, this study explores the relationship between e-Service Quality, e-Satisfaction, and e-Loyalty for e-Grocery products in Indonesia.

Methodology: The data collected in this study were obtained from 330 respondents who were e-grocery users in Indonesia.

Results: The model was estimated using partial least squares structural modeling (PLS-SEM) and multigroup analysis bootstrapping using Jamovi and SmartPLS version 4. After conducting this research, it was found that Utilitarian and Hedonic aspects have a significant relationship with e-Service Quality, e-Service Quality has an effect on e-Satisfaction, and there is a positive relationship between e-Satisfaction and e-Loyalty.

Conclusions: The findings confirm a sequential relationship between utilitarian/hedonic motivations, perceived service quality, customer satisfaction, and loyalty in the context of Indonesian e-grocery services. Sociodemographic variables moderate the strength of these relationships, suggesting the importance of customer segmentation strategies in improving service outcomes.

Limitations: This study is limited to the Indonesian market and may not fully represent consumer behavior in other cultural or regional contexts. Moreover, the cross-sectional design restricts the ability to infer causality, and potential self-reporting bias may affect the reliability of the responses.

Contribution: This study contributes to the literature on e-commerce and digital consumer behavior by demonstrating the mediating role of satisfaction in the e-service environment and the moderating effects of demographic characteristics.

Keywords: E-*Commerce, E-Grocery, E-Service Quality, Loyalty, Multigroup analysis, PLS SEM.*

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1. Introduction

Human have experienced rapid development in terms of disease management and hygiene. In fact, many mention that we are living in the golden era of health. New diseases continue to emerge. *Coronavirus Disease-19* (COVID-19) is a disease that affects the entire world. Starting in 2019, COVID-19 slowly spread and took on a pandemic status. The *Coronavirus Disease* 2019 pandemic began in 2019 and affected most of the world's population and many victims. According to World *Health Organization* data as of June 2022, COVID-19 has infected 539 million people and claimed the lives of 6 million people worldwide. The existence of this disease forces the world's population to change conventional lifestyles to adapt to and avoid COVID-19 infection. This change also eventually led to a global economic recession that caused economic hardship due to the loss of jobs and livelihoods for many workers around the world, including Indonesia (Kemenko, 2022).

Despite the many negative impacts of the global pandemic, the COVID-19 crisis has served as a catalyst for digitization and digital transformation (Pratiwi, Karta, Ramanita, Aprilia, & Wardani, 2023). This phenomenon occurred due to government-enforced social restrictions and public caution in daily activities to avoid infection with the COVID-19 virus. Companies, business entities, and governments were compelled to adjust their policies to minimize the risk of virus transmission in crowded environments (Aditia, Dharma, & Nur, 2022). Many businesses experienced a sharp decline in income, and some were even forced to shut down due to these conditions. In contrast, several companies managed to survive and seized this opportunity to grow by innovating and developing their products. The convenience offered by digital products has added value for consumers, leading to rapid growth in digital services, often surpassing long-term projections. Transformations were also evident in the employment sector, as many organizations adopted work-from-home models. This shift would not have been possible without the acceleration of digital transformation and the utilization of digital-based technologies such as teleconferencing tools (Irawanto, Novianti, & Roz, 2021; O'Toole, Schneider, Smaje, & LaBerge, 2020; Wisnuaji, Rachmawati, & Sudari, 2023).

Groceries are among the many types of products that have evolved during the COVID-19 pandemic. According to research conducted by Remes et al. (2021) at least six aspects of consumer behavior have changed due to the pandemic. The changes predicted by Remes et al. (2021) are the increased use of e-Grocery, the adoption of virtual healthcare or telehealth, home-nesting or the behavior of doing activities from home with the help of information technology, internet-based entertainment, air travel only for holidays, and learning through online platforms. These six aspects, changes in consumer behavior in the form of shopping through online platforms (e-Grocery) are at the top in terms of stickiness. Stickiness is the tendency of an adopted behavior to continue continuously. The higher the stickiness level, the higher the likelihood that consumer behavior will be adopted in the long term by consumers. Remote education and virtual learning were the last among the six consumer behaviors (Martiyanti, 2019).

Indonesian development of e-Grocery has occurred since 2013, when SeroyaMart, one of the pioneers of e-Grocery in Indonesia, emerged. Another player that entered the Indonesian e-Grocery market was HonestBee, which then went out of business in May 2019. Other big players that have emerged include Sayurbox, Tani Hub and HappyFresh. Changes are also reflected in the Indonesian market, where startups engaged in e-Grocery such as Sayurbox, HappyFresh, AlloFresh, Hypermart Online, GoMart, GrabMart, Tokopedia Now, and many others have emerged. Remes et al. (2021) predicted, the e-Grocery industry in Indonesia has experienced a stagnant increase and is predicted to continue to increase. Based on that, it was found that competition will also increase. This is strengthened by the decline in performance of big players, which is characterized by various forms of efficiency, as well as the emergence of various new players who have a competitive advantage and have the potential to take significant market share .

Several studies mention that service quality can be a competitive advantage for service providers and can affect consumer behavior in terms of purchases and loyalty to a service provider (Widiastuti, 2024; Zahara, 2020). Important for market players to be able to determine specific aspects that can affect service quality so that they can make improvements or improvements to services, especially specific digital services, so that the improvements made can be right on target. Considering the increasingly general and expanding segment of online purchase users, it will be beneficial for market players to map the needs of each segment according to its demographics, urgency, and tendencies. Multigroup analysis is one way to find trends in each user segment to be used later as a basis for e-Grocery industry activists to improve services according to the target segment. The service provider does not target it specifically, then the insights in this study are expected to be used to expand the scope of users and attract new segments that have not been accommodated before (Khomsin, Edris, & Utomo, 2023).

Based on that therefore, in accordance with the explanation that has been conveyed, the researcher wants to find out more deeply about the relationship between aspects of e-Service Quality and customer satisfaction and loyalty on the e-Grocer service provider platform. This study is expected to conduct a

sociodemographic analysis as an additional insight for market players in making improvements to service provider platforms. The explanation that has been explained, a study was conducted with the title Multigroup Analysis of the Relationship between E-Service Quality, E-Satisfaction and E-Loyalty in E-Grocery Service Providers (Suciati, Simamora, Panusunan, & Fauzan, 2023).

2. Literature Review

2.1 Literature Studies

The purpose of this study is to determine how e-Service Quality affects e-Satisfaction and how e-Satisfaction affects e-Loyalty in e-Grocery products in Indonesia. This study also aims to determine which group has more tendency or significance than the other groups, especially in terms of gender, age, education level, and frequency of e-Grocery use of the respondents. This study examines the relationship between the constructs that form e-Service Quality, e-Satisfaction, and e-Loyalty in the context of e-Retail. The use of similar models in retail and grocery contexts can be justified because grocery is a specific form of retail. This can be seen in some studies, such as those that use this term side-by-side and as a general and special form. This study examines the intention to use (Martín, Pagliara, & Román, 2019) e-Grocery in the context of COVID-19, focusing on the risk aspects faced in the context of the pandemic that can affect the intention to use e-Grocery services.

2.2 Consumer Behavior

The term "consumer" behavior or *Consumer Behavior* can be interpreted as a science that studies the process of how an individual or group chooses, uses, or disposes of a product, service, idea, or experience to satisfy the needs and difficulties faced (Kustaji, Agustino, Noor, Budianto, & Calista, 2024). The term consumer itself can be applied to various groups and individuals, as well as to a group of decision-makers. Objects consumed can be in the form of various things, both tangible and intangible. The products consumed aim to satisfy consumers' needs or desires. Needs or desires have many levels at which a product can satisfy one or more of the existing dimensions of satisfaction. Consumer behavior theory is highly relevant to this study, as it aligns with the consumption processes described above. The use of e-Grocery services involves several stages of consumer behavior, beginning with the pre-purchase phase in which consumers evaluate options before choosing a specific e-Grocery platform. This is followed by the purchase phase, involving transactions conducted on the e-Grocery service, and subsequently the post-purchase phase, where users evaluate their experience. In this study, the focus lies on the purchase and post-purchase phases.

The purchasing phase is represented by the evaluation of e-Service Quality, which reflects how customers perceive the service experience during the transaction. The perceived quality then influences e-Satisfaction and e-Loyalty, both of which are core components of the post-purchase stage. Additionally, this study will employ grouping and multigroup analysis to examine the variability in consumer behavior across different demographic segments. This analytical approach is grounded in the theory that certain dimensions such as age, gender, or usage frequency can cause differences in consumer decision-making and satisfaction outcomes.

The theory of consumer behavior is closely related to this study, especially considering several things that will be done in accordance with what has been described in the previous paragraph. The process of using *e-Grocery* services is also not spared from the stages of the consumption process, starting from pre-purchase, when consumers pre-evaluate before making purchases through *certain e-Grocery channels*. This is followed by the process of purchasing products and transactions carried out on the *e-Grocery platform*, and finally, the post-purchase evaluation process carried out by buyers. What will be magnified is the purchasing and post-purchasing processes on this research. The purchasing process can be reflected in the calculation of *E-Service Quality*, in which customers assess their transaction experience through aspects of *E-Service Quality*. *E-Service Quality* obtained by consumers will have an impact on *Satisfaction* and *Loyalty*, both of which are part of Post Purchase at the consumption process stage. Grouping and *Multigroup analysis* in this study, will also be carried out. This is in line with the theory that certain dimensions can produce variability in consumer behavior.

2.3 E-Service Quality

E-Service Quality has historically undergone a change in meaning, especially with the development of the meaning of *Service Quality* before and after the existence of information technology. Various studies related to *e-Service Quality* have been conducted, which show the relationship between *e-Service Quality, Satisfaction*, and *Loyalty. E-Service Quality* itself cannot be seen as a single variable but as a holistic evaluation of various aspects that affect it. Service Quality is the degree of conformity between consumer expectations and the service or experience obtained (Latif, Wibowo, Nurdiani, Alimin, & Suharyat, 2023).

2.4 e-Satisfaction

Customer satisfaction *(Consumer Satisfaction)* in general is the distance between expectations before making a transaction and the experience felt after getting service (Djunaid, 2023). Similar to the concept of *e-Loyalty*, the concept of *Consumer Satisfaction* can also be defined more specifically. Considering the context of research that focuses on measuring IT-based services, the term *e-satisfaction* is more appropriate to use. The term *e-satisfaction* is defined as the experience obtained by customers compared to consumer expectations when using *e-Commerce services.*

2.5 e-Loyalty

Customer Loyalty is a positive attitude and consistent behavior on a brand *or brand.* Considering that the domain of this research and the previous research is the use of information technology-based services (*e-Commerce*), the use of a more appropriate term is *e-Loyalty*, which is defined as a positive attitude of consumers towards online shopping services (Rahman, Fadrul, Yusrizal, Marlyna, & Momin, 2022). The impact of this positive attitude is that purchases are made repeatedly, and the frequency of consumers making transactions or visits on the *service provider'*s platform increases.

2.6 COVID-19 Pandemic

Coronavirus disease 2019, commonly known as COVID-19, originated in the city of Wuhan, Hubei province, China. TheCOVID-19 had spread rapidly in 72 countries until this study was conducted. The WHO declared the *global pandemic* status in 2020 due to the spread of the SARS-CoV 19 virus, which can quickly infect humans and attack the respiratory system. During the pandemic, many victims fell and had an impact on their daily lives. This includes many health facilities that are full, owing to the increasing number of patients who need intensive services. Various steps have been taken at both global and local scales to reduce the number of infections, both in the form of *physical distancing,* limiting the number of visitors at public facilities, and massive vaccinations carried out by the government.

When this study was conducted, respondents were users of *e-Grocery services* (CNN, 2021) during the COVID-19 pandemic. The authrs already know during the COV-19 pandemic online shopping transactions in Indonesia increased dramatically.

2.7 Research Hypothesis

There are eight hypotheses posited in this study; however, for H1 and H2, there is branching. This is because the dimensions tested are processed from several constructs simultaneously; therefore, the significance of each construct needs to be tested. The elaboration of the hypotheses in this study is shown in Table 1.

Table 1. Hypothesis to be tested in the research

$H1_1$ to $H1_7$	The Utilitarian Quality *dimension* positively influences *E-Service Quality*
$H2_1$ to $H2_2$	The Hedonic Quality *dimension* positively influences *E-Service Quality*
H3	*E-Service Quality* positively influences *e-Satisfaction*
H4	*e-Satisfaction* positively influences *e-Loyalty*
H5	There was a significant difference in the relationship between *E-Service Quality, e-Satisfaction* and *e-Loyalty* in different genders.
H6	There is a significant difference in the relationship between *E-Service Quality, e-Satisfaction* and *e-Loyalty* based on age

H7	There was a significant difference in the relationship between *E-Service Quality, e-Satisfaction* and *e-Loyalty* at different levels of education.
H8	There was a significant difference in the relationship between variable relationships between *E-Service Quality, e-Satisfaction* and *e-Loyalty* at different *frequencies of* e-Grocery service usage

Source Data Research (2024)

The H_1 hypothesis positivity that *Hedonic Quality* positively affects *E-Service Quality*. The constructs of this dimension are *Research and Access* (R&A), *Detailed Information* (DI), *Privacy and Security* (P&S), *Interaction Facilities* (IF), *contact* (CON), *Delivery Service* (DS), and *reliability* (REL). For H2, the *Hedonic Quality dimension* can positively affect *E-Service Quality*. The constructs that can affect *E-Service Quality* in the *Hedonic Quality* dimension are *Enjoyment* (ENJ) and *Virtual Emotion* (VE). H3 posited that *E-Service Quality* had a positive effect on *e-satisfaction*. In H4, it was stated that *e-satisfaction* had a positive effect on *e-Loyalty*.

Hypotheses H5 to H8 in this study tested the impact of demographic differences on the model used. H5 positivity indicates gender-based differences in the results of *the E-Service Quality* test. H6 positivity is the same as H5, but the demographic differences are based on age. H7 and H8 saw differences based on the level of education and frequency of using *e-Grocery,* respectively.

3. Method

3.1 Research Model

This research will be carried out in a descriptive manner, using a survey in its implementation. In this study, the author tries to use the model used in the first research on different industries and geographical locations, namely e-Grocery in Indonesia, which is currently starting to grow in Indonesia. The researcher also continued the previous research by adding multigroup analysis as a moderator for the main model to find differences in different groups of users.

3.2 Number of Samples

The determination of the sample will be carried out by Random Sampling, because the respondents who are the target of this study are users with a certain demographic target, namely users of e-Grocery services. The sample to be taken in this study was 210 respondents. This number was obtained by multiplying the number of indicators in this study, which amounted to 42 times 5. To ensure data quality, several stages of data collection were conducted. Implementation of (Hair, Risher, Sarstedt, & Ringle, 2019) the Wording Test starting to test the ease of understanding the questions. After that pilot Testing was conducted to test the validity and reliability to measure the consistency of the measurement. The main sampling of a minimum of 180 respondents will be carried out for the purpose of data processing added from the number of pilot testing participants, so that an aggregate of 210 respondents will be produced.

3.3 Research Instruments

The research will be conducted using a questionnaire that will be distributed to respondents with the following profiles:

1. Customers of Consumer goods products who adopt e-Grocery as a shopping medium.
2. Have made purchases through e-Grocery during the COVID-19 pandemic?

The data taken apart from the demographic data in this study were taken using the Likert Scale with the following scales: (1) strongly disagree, (2) disagree, (3) somewhat disagree, (4) agree, (5) somewhat agree, and (6) strongly agree**.**

3.4 Research Variables

The following is an explanation of the variables and questions used to measure each variable:

Research and Access (R&A) is a construct that affects the E-Service Quality variable. Research and Access refers to the initial stages in building customer trust in using the service. This questionnaire uses three questions from a questionnaire developed by (Rodríguez, Villarreal, Valiño, & Blozis, 2020).

3.4.1 Detailed Information (DI)

The Detailed Information construct also affects the E-Service Quality variable. Detailed Information is a construct that measures the degree of the system's ability to provide appropriate and relevant information to support consumers in shopping activities, which is specific to e-Grocery services in the context of this research. This questionnaire uses four questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.2 Privacy and Security

Privacy and Security are variables used to measure the ability of service providers to store and maintain sensitive personal information belonging to customers and maintain the security of transactions carried out online. Similar to the previous construct, this construct is also used to measure E-Service Quality. This questionnaire uses five questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.3 Interaction Facilities

Interaction Facilities is a construct used to measure E-Service Quality. This construct measures the ability of consumers to communicate with other users on an e-commerce platform easily. This questionnaire used the five questions developed by (Rodríguez et al., 2020).

3.4.5 Contact

The Contact construct is used to measure the ability of service providers to provide a two-way communication platform between service providers and consumers. This construct is also one of the constructs used to measure E-Service Quality. This questionnaire uses three questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.6 Delivery Service (DS)

The Delivery Service construct is attached to the measurement of E-Service Quality because delivery services are an integral part of e-Grocery services. This construct measures the quality of delivery services by considering low costs and fast delivery speeds. This questionnaire uses three questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.7 Reliability

Reliability (REL) is a construct that affects the E-Service Quality variable. This construct is used to measure the performance capabilities of the service provider in accordance with the previously promised accurately, reliably, and on time. This questionnaire uses four questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.8 Enjoyment

The Enjoyment construct is part of the Hedonic Quality dimension, which affects the E-Service Quality variable. Enjoyment is a construct used to measure consumers' desire for novelty and change. This questionnaire uses four questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.9 Virtual Emotion

The last construct to measure E-Service Quality in the Hedonic Quality dimension is Virtual Emotion (VE), which is used to measure the effects of different services. This questionnaire uses three questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.10 Satisfaction

The Satisfaction variable is widely used in the context of marketing. In general, satisfaction is defined as the difference between expectations before making a transaction and the experience obtained after receiving services from a service provider. In the context of this research, a term that has been widely used and is more appropriately used is e-satisfaction, which is the compatibility between expectations before making a transaction and the experience obtained after getting services on electronic-based services, or it can be called e-Commerce. This questionnaire uses three questions from a questionnaire developed by (Rodríguez et al., 2020).

3.4.11 Loyalty

As explained in the previous section, in the previous study, it was stated that e-Loyalty is positively influenced by customer satisfaction in using electronic-based services. In general, loyalty in the context of marketing is defined as the positive attitude and behavior that consumers have towards a brand in the long term. . This questionnaire uses three questions from a questionnaire developed by (Rodríguez et al., 2020).

3.5 Data Analysis

The data analysis in this study used PLS SEM. SEM conducts the analysis in two stages, namely; Mesurement model and Measuremet strutural model. The Multigroup Analysis conducted in this study was carried out with reference to research by. Sociodemographic aspects in this study were taken from gender, age, education, and frequency. The difference with the previous study is the difference in the frequency of data collection, where the frequency context in the previous study refers to the frequency of Internet use., Frequency in this study used was the frequency of service use (Barrera, García, & Moreno, 2014).

4. Results and Discussion

4.1 Respondent Demographic Data

Several of 459 respondents obtained from the data search process, 374 samples had a suitable profile and suitability in terms of the quality of the data obtained. The demographic profile of respondents from the 374 samples obtained was divided based on several criteria, including gender, age range, marital status, occupation, geographical location, frequency of system use, level of education, and service preferences used to shop for e-Grocery products.

Table 2. Percentage of Research Respondent Profiles

Gender				
Man		Woman		
97 (24%)		324 (76%)		
Age Range				
18-30 Years		31 Years and Above		
242 (65%)		132 (35%)		
19-25 Years	26-30 Years	31-35 Years	36-40 Years	40 years and above
109 (26%)	157 (37%)	97 (23%)	38 (9%)	20 (5%)
Marital Status				
Marry		Single		
287 (68%)		134 (32%)		
Work				
Housewives	Private Employees	Entrepreneur	Students/Students	SOE Employees
155 (38%)	130 (31%)	77 (18%)	27 (7%)	26 (6%)
Geographical Location				
Jabodetabek	West Java	East Java	Central Java	Outside Java
157 (37%)	85 (20%)	69 (16%)	57 (14%)	53 (13%)

Frequency of Use *of E-Grocery*

Low Frequency		High Frequency	
251 (67%)		123 (32%)	
Less frequent than once a month	1-3 times a month	4-6 times a month	More than 6 times a month
99 (24%)	179 (42%)	81 (19%)	62 (15%)

Education Level				
Don't Have a Degree		Have a Degree		
184 (49%)		190 (51%)		
JUNIOR	SMA	S1	S2	S3
17 (4.5%)	167 (44.6%)	167 (44.6%)	21 (5.6%)	2 (0.53%)

e-Grocery *Service Preferences*		
Alfacart	27	7.22%
Alfagift	2	0.53%
Astro	2	0.53%
GoMart	59	15.78%
GrabMart	41	10.96%
HappyFresh	13	3.48%
ClickIndomaret	46	12.30%
Lazada	2	0.53%
Sayurbox	33	8.82%
Segari	13	3.48%
Shopee	101	27.01%
TiktokShop	2	0.53%
Tokopedia	33	8.82%

Source: Data research (2024)

4.2 Validity and Reliability Testing

Table 3. Validity and Reliability Test using SmartPLS Software

Variable	Cronbach's alpha	Composite *Reliability* (rho_a)	Composite *Reliability* (rho_c)	Average variance extracted (AVE)
Contact	0.875	0.875	0.923	0.800
Delivery Service	0.869	0.872	0.911	0.718
Detailed Information	0.853	0.854	0.911	0.774
Enjoyment	0.972	0.973	0.974	0.514
Interaction Facilities	0.873	0.881	0.913	0.725
Privacy Security	0.892	0.897	0.920	0.697
Reliability	0.840	0.841	0.904	0.758
Research Access	0.905	0.907	0.930	0.726
Virtual Emotion	0.847	0.850	0.897	0.685
e-Loyalty	0.866	0.866	0.909	0.715
e-Satisfaction	0.927	0.930	0.948	0.820
E-Service Quality	0.745	0.757	0.852	0.658

Source: Data research (2024)

Internal Consistency *Reliability* measures how well an indicator can measure its latent construct. The indicators used to assess this are composite (Memon, Ting, Ramayah, Chuah, & Cheah, 2017) *Reliability* and *Cronbach's Alpha*. The composite Reliability value of 0.6 – 0.7 is considered to have good reliability (), and the expected (Hair et al., 2019) *Cronbach's Alpha* (Ghazali & Latan, 2015) value is above 0.7 Based on Table 3, it can be seen that all constructs have a *Cronbach's Alpha* value above 0.6 so it can be said that all the constructed tested from the data taken are reliable. Unidimensionality test was carried out to ensure that there were no problems in the measurement. The undimensionality test was carried out using composite *indicators of Reliability* and *Cronbach's alpha*. The both of these indicators, the cuT-value is 0.7. Based on Table 3, all constructs met the unidimensionality requirements

because the composite *reliability* value > 0.7. The example is if the Composite *Reliability* of the latent variable CON is 0.923 > 0.7, then CON is reliable.

The validity of convergence was determined based on the principle that the measuring instrument of a construct should be highly correlated. The convergence validity of a construct with reflective indicators is evaluated with Aver (Ghazali & Latan, 2015) *age* Variance Extracted (AVE). The AVE value should be equal to 0.5 or more. An AVE value of 0.5 or more means that the construct can account for 50% or more of the variance of the item. And based on the Aver (Hair et al., 2019) *age* Variance Extracted (AVE) value to determine the achievement of the convergent validity requirement, all constructs have reached the convergent validity condition because the AVE value is all >0.50.

The validity of discrimination aims to determine whether a reflective indicator is indeed a good measure of its construct based on the principle that each indicator must be highly correlated with its construct alone. Different construction gauges should not be highly correlated. SmartPLS application use for the validity test of discrimination uses the values of cross loadings and the Fornell-Larcker Criterion, which can be seen in Table 4, and Heterotrait-Monotrait (HTMT) (Henseler, Ringle, & Sarstedt, 2015).

Table 4. Fornell-Larcker Criterion test using SmartPLS

	CON	AT	DS	ENJ	**ESQ**	IF	LOY	PS	RA	RAIL	SAT	VE
CON	**0.895**											
AT	0.679	**0.848**										
DS	0.656	0.683	**0.880**									
ENJ	0.711	0.715	0.749	**0.852**								
ESQ	**0.837**	**0.877**	**0.833**	**0.874**	**0.717**							
IF	0.698	0.597	0.581	0.650	**0.802**	**0.835**						
LOY	0.653	0.707	0.630	0.757	**0.811**	0.653	**0.871**					
PS	0.706	0.843	0.729	0.755	**0.911**	0.649	0.760	**0.852**				
RA	0.626	0.800	0.657	0.672	**0.825**	0.565	0.667	0.759	**0.828**			
RAIL	0.672	0.671	0.703	0.659	**0.837**	0.666	0.652	0.745	0.597	**0.845**		
SAT	0.722	0.717	0.668	0.786	**0.844**	0.651	0.778	0.798	0.677	0.700	**0.906**	
VE	0.656	0.615	0.620	0.751	**0.788**	0.649	0.649	0.631	0.567	0.635	0.670	**0.811**

Source: Data research (2024)

The measurement of discriminant validity aims to test the extent to which the latent construct is completely different from other constructs. A high value of discriminant validity indicates that a construct is unique and capable of explaining the phenomenon being measured. A construct is said to be valid by comparing the root value of the AVE (Fornell-Larcker Criterion) with the correlation value between latent variables. The root value of AVE must be greater than the correlation between the latent variables. Based on the several tests that have been described, it can be concluded that the results of the data collection are reliable and valid for analysis.

Table 5. HTMT Test Using SmartPLS Software

	CON	AT	DS	E-SQ	ENJ	IF	LOY	PS	RA	RAIL	SAT
CON											
AT	0.779										
DS	0.759	0.793									
E-SQ	0.908	0.950	0.909								
IF	0.783	0.667	0.656	0.864							
SAT	0.801	0.796	0.750	0.886	0.866						
LOY	0.762	0.827	0.744	0.897	0.882	0.746					
RA	0.723	0.931	0.769	0.904	0.771	0.638	0.788				
RAIL	0.770	0.771	0.814	0.910	0.750	0.750	0.762	0.836			
VE	0.801	0.741	0.745	0.916	0.917	0.798	0.802	0.744	0.684		

ENJ	0.813	0.815	0.859	0.945	0.000	0.000	0.000	0.000	0.000	0.000	
PS	0.793	0.947	0.830	0.965	0.843	0.711	0.872	0.000	0.000	0.000	0.000

Based on analyze a test was carried out on the Variance Inflation Factor (VIF), which showed that there was a correlation between indicators in the model that could affect the processing results shown in Table 6.

Table 6. VIF (Variance Inflation Factor) Test

Construct	Indicators	VIF
Research & Access	RA1	2.5
	RA2	2.214
	RA3	2.371
	RA4	2.704
Detailed Information	DI1	2.385
	DI2	2.707
	DI3	2.168
	DI4	2.281
Privacy & Security	PS1	2.426
	PS2	2.475
	PS3	2.458
	PS4	2.758
	PS5	2.724
Interaction Facilities	IF1	2.847
	IF2	2.861
	IF3	2.414
	IF4	2.446
	IF5	2.726
Contact	CON1	2.617
	CON2	2.603
	CON3	2.648
Delivery Service	DS1	2.837
	DS2	2.479
	DS3	2.683
Reliability	REL1	2.800
	REL2	2.854
	REL3	2.925
	REL4	2.413
Enjoyment	ENJ1	2.621
	ENJ2	2.638
	ENJ3	2.417
	ENJ4	2.933
Virtual Emotion	VE1	2.585
	VE2	2.136
	VE3	2.423
Satisfaction	SAT1	3.204
	SAT2	3.34
	SAT3	3.212
	SAT4	3.642
Loyalty	LOY1	2.11
	LOY2	2.441
	LOY3	1.753

Source: Data research (2024)

4.3 Results of Structural Model Analysis

Referring to the results of running data using the SEM-PLS method, it was found that the relationship between variables in the *second order* (RA, DI, PS, IF, CON, DS, REL, ENJ, VE) on *E-Service Quality* and *first order* (E-SQ SAT and SAT LOY) was significant so that the hypothesis of H1 1-H7, H21-H22, H3 and H4 was accepted. This can be seen in Table 7, where it is shown that in all the hypotheses, the *T-Value* obtained is above the *t-table value*. This shows that all significant variables and hypotheses are accepted. A representation of the data processing results is shown in Figure 7.

Table 7. *Path Coefficient test results* on the model

H	Path	*T-Value*	*t-table*	*p-value*	Conclusion
H11	RA -> *E-SERVICE QUALITY*	21.105	1.645	0.000	Accepted
H12	DI -> *E-SERVICE QUALITY*	21.229	1.645	0.000	Accepted
H13	PS -> *E-SERVICE QUALITY*	32.194	1.645	0.000	Accepted
H14	IF -> *E-SERVICE QUALITY*	18.653	1.645	0.000	Accepted
H15	CON -> *E-SERVICE QUALITY*	20.829	1.645	0.000	Accepted
H16	DS -> *E-SERVICE QUALITY*	21.672	1.645	0.000	Accepted
H17	REL -> *E-SERVICE QUALITY*	21.619	1.645	0.000	Accepted
H21	ENJ -> *E-SERVICE QUALITY*	27.788	1.645	0.000	Accepted
H22	VE -> *E-SERVICE QUALITY*	15.980	1.645	0.000	Accepted
H3	*E-SERVICE QUALITY* -> SAT	47.468	1.645	0.000	Accepted
H4	SAT -> LOY	23.847	1.645	0.000	Accepted

Source: Data research (2024)

The results of this study also confirm the findings of the previous study, where it was found that the model used can measure the influence of hedonistic and utilitarian dimensions on E-Service Quality (Rodríguez et al., 2020). Table 8 shows the existence of *an indirect effect* on the relationship between variables. Based on the data, it was found that the variables Privacy *and Security*, *Enjoyment*, and *Detailed Information* had the highest *indirect effect* on the Satisfaction variable. The variables in Table 8 are arranged in order starting from *the largest to the smallest* indirect effect values.

Table 8. *Indirect effect* on *the Satisfaction variable*

Indirect effect	*Standard Deviation*	*T statistics*
PS -> *E-SERVICE QUALITY* -> SAT	0.005	30.729
ENJ -> *E-SERVICE QUALITY* -> SAT	0.005	26.535
DI -> *E-SERVICE QUALITY* -> SAT	0.005	22.391
CON -> *E-SERVICE QUALITY* -> SAT	0.004	22.041
RA -> *E-SERVICE QUALITY* -> SAT	0.005	20.59
IF -> *E-SERVICE QUALITY* -> SAT	0.006	19.951
REL -> *E-SERVICE QUALITY* -> SAT	0.006	19.454
DS -> *E-SERVICE QUALITY* -> SAT	0.005	18.357
VE -> *E-SERVICE QUALITY* -> SAT	0.005	15.007

Source: Data research (2024)

Table 8 shows the *indirect effect on the* loyalty *variable*. Based on the previous table, this table displays the indirect effect information from the largest to the smallest value. Ignoring the first line, it was found that *Privacy and Security* had the greatest *indirect effect* value, followed by *Detailed Information* and *Enjoyment*. This result is the same as the indirect *effect analysis on the* Satisfaction *variable*, which indicates that there is a positive relationship between the constructs that make up *E-Service Quality*, the *Satisfaction variable,* and the Loyalty variable.

Table 9. *Indirect effect* on *Loyalty variables*

Indirect effect	*Standard Deviation*	*T statistics*
E-SERVICE QUALITY -> SAT -> LOY	0.034	19.068
PS -> *E-SERVICE QUALITY* -> SAT -> LOY	0.007	17.791
DI -> *E-SERVICE QUALITY* -> SAT -> LOY	0.005	16.703
ENJ -> *E-SERVICE QUALITY* -> SAT -> LOY	0.006	15.917
REL -> *E-SERVICE QUALITY* -> SAT -> LOY	0.005	15.733
DS -> *E-SERVICE QUALITY* -> SAT -> LOY	0.004	15.529
CON -> *E-SERVICE QUALITY* -> SAT -> LOY	0.005	14.878
RA -> *E-SERVICE QUALITY* -> SAT -> LOY	0.005	14.817
IF -> *E-SERVICE QUALITY* -> SAT -> LOY	0.007	13.762
VE -> *E-SERVICE QUALITY* -> SAT -> LOY	0.004	12.712

The results of data processing at this stage can be used as the basis for hypothesis acceptance tests. The hypotheses that can be tested at this stage are H1 1-H17, H21-H22, H3, H4, and H5, which are described as follows:

Hypothesis 1_1
H11: *Research and Access* has a positive effect on *E-Service Quality*
Hypothesis 1 measures the *utilitarian* dimension of aspects that can determine the level *of e-Service Quality*. This hypothesis is used to measure the influence of *Research and Access* (RA) variables on *E-Service Quality*. Referring to the calculation results shown in Table 7, it is found that the *T-value* result in this hypothesis is 21.105. This means that the relationship between *the Research and Access* (RA) variables on *E-Service Quality* has a significant positive relationship.

Hypothesis 1_2
H12: *Detailed Information* has a positive effect on *E-Service Quality*
Hypothesis 12 is used to measure the influence of *the Detailed Information* (DI) variable on the *E-Service Quality* variable. Based on the calculation results that can be seen in Table 7, it is found that the *T-Value* result in this hypothesis is 21,229, which shows a relationship between the Detailed *Information* (DI) variable and *E-Service Quality*.The two variables have a significant positive relationship.

Hypothesis 1_3
H13: *Privacy and Security* have a positive effect on *E-Service Quality*
This hypothesis measures the influence of *the Privacy and Security* (PS) variable on the *E-Service Quality* variable. Referring to the calculation results that can be seen in Table 7, the same as the previous two hypotheses, it is found that *the T-Value* result in this hypothesis has a number of 32,194, which shows the relationship between *the Privacy and Security* (PS) variables and *E-Service Quality*. The two variables have a significant positive relationship. Compared with other hypotheses that affect *E-Service Quality*, it was found that the relationship between *Privacy and Security* and *E-Service Quality* has the highest significance.

Hypothesis 1_4
H14: *Interaction Facilities* have a positive effect on *E-Service Quality*
Hypothesis 1_4 is used to measure the influence of *Interaction Facilities* (IF) variables on *E-Service Quality*. Referring to the calculation results shown in Table 7, it is found that the *T-Value* result in this hypothesis is 18,653. Based on that, its means that the relationship between these variables and *E-Service Quality* has a significant positive relationship so that the hypothesis can be accepted.

Hypothesis 1_5
H15: *Contact* has a positive effect on *E-Service Quality*
Hypothesis 1_5 is used to measure the influence of *the Contact* (CON) variable on *E-Service Quality*. Based on the calculation results shown in Table 7, the researcher found that the *T-value* result in this hypothesis is 20.829. The relationship consequently between these variables and *E-Service Quality* has

a significant positive relationship so that the hypothesis can be accepted, considering that the *T-Value* is higher than *that of the t-table*.

Hypothesis 1_6
H16: *Delivery Service* has a positive effect on *E-Service Quality*
Hypothesis 1_6 is used to measure the influence of *Delivery Service* (DS) variables on *E-Service Quality*. Referring to the calculation results shown in Table 7, it is found that the *T-value* result in this hypothesis is 21,672. This means that the relationship between *the Delivery Service* (DS) variables and *E-Service Quality* has a significant positive relationship, and the hypothesis is acceptable.

Hypothesis 1_7
H17: *Reliability* has a positive effect on *E-Service Quality*
The last hypothesis in the *utilitarian* dimension is Hypothesis 1_7. This hypothesis is used to measure the influence of *reliability* (DS) variables on *E-Service Quality*. Referring to the calculation results shown in Table 7, it is found that the *T-Value* result in this hypothesis is 21,619, which indicates that there is significance between the two variables and the hypothesis is acceptable.

Hypothesis 2_1
H21: *Enjoyment* has a positive effect on *E-Service Quality*
Hypothesis 2 aimed to measure how the *Hedonic Quality* Dimension affects *E-Service Quality*. Based on study, it was found that the variables in the *Hedonic Quality dimension* po= sitively affected *E-Service Quality*. Hypothesis 21 measures the first variable in the *Hedonic Quality dimension*, namely *enjoyment*. Based on that the *enjoyment* had a positive relationship with *a T-value* of 27,788. This shows the significance of the relationship between the two variables, considering that the *T-value* is higher than *the t-table*.

Hypothesis 2_2
H22: *Virtual Emotion* has a positive effect on *E-Service Quality*
The second variable in the *hedonic quality* dimension is *Virtual Emotion*. Hypothesis 21 is used to test whether the *Virtual Emotion* (VE) variable in the *Hedonic Quality dimension* has a positive relationship with *E-Service Quality*. Based on analyze, with *a T-Value* of 15,980, which is relatively smaller than the *T-Value* in the *Enjoyment variable*, there was a significant positive relationship so that the hypothesis could be accepted.

Hypothesis 3
H3: *E-Service Quality* has a positive effect on *e-Satisfaction*
Based on analyze the next hypothesis tested was the relationship between *e-Service Quality* and *e-Satisfaction*. Hypothesis three positivity that *e-Service Quality* has a positive relationship with *e-Satisfaction*. The results show that *E-Service Quality* has a significant positive relationship with *e-satisfaction*. This is shown by the *T-Value* value from the data processing results, which shows a figure of 47,468.

Hypothesis 4
Q4: *e-Satisfaction* has a positive effect on *e-Loyalty*
Still, in the *second order*, the second hypothesis tested is the relationship between *e-satisfaction* and *e-Loyalty*. This hypothesis posits that *e-satisfaction* has a positive influence on *e-loyalty*. Based on analyze *T-value* of 23,847 proves that this hypothesis is acceptable because there is a significant positive relationship between the two variables.

4.4 Discussion
The results of the data processing and calculations showed that all influences between constructs had a significant and positive relationship. The same results were also found in previous studies, where the research was conducted using the same model but in different geographical locations and industries. Based on analyze from each hypothesis proposed in this study, the following discussion and analysis can be conducted:

4.4.1 Test Results of the Influence of the Utilitarian Quality Dimension on E-Service Quality

Table 10. The results of data processing using SEM-PLS and the analysis of the relationship between *the Utilitarian Quality* Dimension and *E-Service Quality*

Order	Hypothesis	Path	T Value	*t-table*	P values
1	H13	PS -> *E-SERVICE QUALITY*	32.194	1.645	0
2	H16	DS -> *E-SERVICE QUALITY*	21.672	1.645	0
3	H17	REL -> *E-SERVICE QUALITY*	21.619	1.645	0
4	H12	DI -> *E-SERVICE QUALITY*	21.229	1.645	0
5	H11	RA -> *E-SERVICE QUALITY*	21.105	1.645	0
6	H15	CON -> *E-SERVICE QUALITY*	20.829	1.645	0
7	H14	IF -> *E-SERVICE QUALITY*	18.653	1.645	0

Source: Data research (2024)

Based on analyze in this study, H1 is divided into seven sub-hypotheses, each of which measures the relationship between the variables in the *Utilitarian Quality* dimension and *E-Service Quality*. The results of the data processing process are presented in Table 10, which displays the hypotheses in order, starting from the hypothesis with *the highest T-value*. The variables in this hypothesis are *Research and Access* (H11), *Detailed Information* (H12), Privacy and Security ($H1_3$), *Interaction Facilities* (H14), *Contact* (H15), *Delivery Service* (H16), and *Reliability* (H17), all of which have a positive and significant relationship. Based on analyze of previous research, it was found that the Privacy and Security component is the most important factor in the context of online shopping, especially in *e-Grocery service products* (47,468). The second component of *E-Service Quality* that has the greatest influence on *E-Service Quality* is *Delivery Service* (21,672). The next component is *Reliability* (21,619), followed by *Detailed Information* (21,229), *Research and Access* (21,105), *Contact* (20,829), and Interaction *Facilities* (18,653). The results in the second and subsequent components show differences from previous studies that have an e-Retail context. Based on analyze the most important components after *Privacy and Security* were *Detailed Information*, *Reliability*, and then *Research and Access*. It is likely that the difference in context was the main reason for this difference. Based on analyze in the context of *e-Grocery*, the freshness and quality of goods are highly dependent on the quality of delivery so that the Delivery *Service aspect* is concerned. Based on analyze meanwhile, in the retail context, the goods delivered will not be damaged if delivery does not occur on time. The *Reliability* component was in third place in both studies, which shows that this component has a similar position in the context of both *e-Retail* and *e-Grocery*.

4.4.2 Test Results of the Effect of Hedonic Quality Dimension on E-Service Quality

The next hypothesis is the positive influence of the dimensions *of Hedonic Quality* on *E-Service Quality*. This hypothesis is divided into $H2_1$, which tests the positive relationship between the Enjoyment variable and *E-Service Quality*, and H22, which tests the positive relationship between *the Virtual Emotion* variable and *E-Service Quality*.

Table 11. The results of data processing using SEM-PLS and the analysis of the relationship between *the Utilitarian Quality* Dimension and *E-Service Quality*

Order	Hypothesis	Path	*T-Value*	*T-table*	*P-value*
1	H21	ENJ -> *E-SERVICE QUALITY*	27.788	1.645	0
2	H22	VE -> *E-SERVICE QUALITY*	15.98	1.645	0

Source: Data research (2024)

Table 11 mentions that, although the two have a positive and significant relationship so that both hypotheses can be accepted, it is found that the relationship between *Enjoyment* and *E-Service Quality* is more significant than *that of Virtual Emotion* and *E-Service Quality*. Interestingly, the results of this study differ from those of previous studies. Both components in previous studies in *Hedonic Quality* were at the bottom. Based on analyze, it was found that, in the context of *e-Grocery Enjoyment, it* is the most significant component after *Privacy and Security*. Based on that this means that for e-Grocery

service users in Indonesia, it was found that the *enjoyment* aspect is one of the components that need to be considered for *e-Grocery service providers*.

4.4.3 Test Results of the Influence of E-Service Quality on e-Satisfaction

The first order hypothesis tested in this study is the relationship between *e-Service Quality* and *e-Satisfaction*. Significant results were found in the positive relationship between *e-Service Quality* and *e-Satisfaction* with *a T-Value* (Carlson & O'Cass, 2010; Sabiote, Frías, & Castañeda, 2012) of 47,468. This is in accordance with the findings of several previous studies that discussed this relationship. Judging from the *indirect effect* when *bootstrapping* this model, it is found that each variable that affects *E-Service Quality* has a positive and significant indirect effect, with the values of *the Privacy and Security*, *Detailed Information*, and *Enjoyment* components having a high indirect influence on *e-Satisfaction*.

4.4.4 Test Results of the Influence of e-Satisfaction on e-Loyalty

The hypothesis in the first order tested in this study is the relationship between *e-satisfaction* and *e-loyalty*. Previous research has stated that *e-satisfaction* has a positive effect on *e-loyalty*. Thus, it can be concluded that the higher the level of customer satisfaction, the higher the level of loyalty to the brand or service provider. In this study, it was found that the relationship between (Al-dweeri, Obeidat, Al-dwiry, Alshurideh, & Alhorani, 2017; Kaya, Behravesh, Abubakar, Kaya, & Orús, 2019; Rodríguez et al., 2020) *e-Satisfaction* and *e-Loyalty* was significant and positive, as well as the previous research mentioned. T-Statistics value of 23,847, which shows that there is a significance between the two variables. Another aspect to consider is line with the findings in H1, it was found that Privacy and Security had the greatest *indirect effect* on this model. This was followed by *Interaction Facilities* and *Enjoyment*. Evidence also shows that finding of this study is the position of *Delivery Service*, which is one of the important components in determining *E-Service Quality*; in fact, the *indirect effect* has a relatively low significance impact compared to other components (0.069).

As the concluding point of the frequency of using *E-Service*, there is a difference in the relationship between *the Virtual Emotion* variable and *E-Service Quality*. *Virtual Emotion* is the impact of different services on consumers' perception of quality. *Virtual Emotion* in particular is the impact of the consumption of various content on the quality standards owned by users. Conducting *a multigroup analysis* based on the frequency of service use in this study, it was found that the relationship between *Virtual Emotion* and *E-Service Quality* in the group of respondents with high frequency of use was stronger than that in the group of respondents with low frequency of use. Several of that it can be concluded that the impact of *Virtual Emotion*, namely, the perception of quality for users, will have a stronger effect if the frequency of service use is higher. The impact of this is that there is a higher sensitivity to the perception of service quality for users with a high frequency of service use.

5. Conclusion

The results of the analysis of this study show that there is a significant and positive influence on the relationship between variables in the proposed model. Of the eight hypotheses proposed, all were accepted, as were the studies that became references for this study. The results of running PLS-SEM (structural model) as well as Bootstrapping and Multigroup analysis produce the following conclusions.

The analysis results demonstrate that all eight hypotheses proposed in this study were accepted, confirming the positive and significant relationships between the variables in the model. Utilitarian dimensions such as Research and Access, Detailed Information, Privacy and Security, Interaction Facilities, Contact, Delivery Service, and Reliability all significantly contribute to E-Service Quality. Among these, Privacy and Security emerged as the most influential factor, followed by Interaction Facilities and Detailed Information, reflecting the importance of trust, social interaction, and transparency in e-Grocery platforms. Reliability and system accessibility through Research and Access also play a vital role, while Contact and Delivery Service, despite lower significance, remain relevant to the user experience.

The hedonic dimension, Enjoyment and Virtual Emotion were found to significantly affect E-Service Quality. This finding highlights that e-Grocery consumers consider not only functional value but also emotional and pleasurable experiences when interacting with the platform. Hedonic Quality was even identified as the second most significant factor after Privacy and Security, emphasizing the role of consumer engagement and satisfaction through positive digital experiences.

Variations based on sociodemographic characteristics further enrich the findings. For instance, male respondents placed higher importance on Interaction Facilities, and Research and Access showed greater influence among mid-career users compared to younger ones. Respondents with higher education levels demonstrated a stronger link between satisfaction and loyalty. Sensitivity to Virtual Emotion also differed by usage frequency, with more frequent users exhibiting a stronger perception of service quality. These variations suggest that personalized strategies based on user demographics are essential to optimizing e-Grocery service delivery and enhancing consumer loyalty.

Limitations and Future Study

This study is limited by its focus on a specific geographical context Indonesia which may affect the generalizability of the findings to other countries or cultural settings. The cross-sectional nature of the research also restricts the ability to observe changes in consumer behavior over time, particularly in a rapidly evolving digital market. Additionally, the study relied on self-reported data, which may introduce bias related to respondents' perceptions and recall. Future research is encouraged to expand the scope by including respondents from multiple countries to allow for cross-cultural comparisons in e-Grocery consumer behavior. Longitudinal studies could also be conducted to examine the evolution of satisfaction and loyalty in response to service improvements or market dynamics. Furthermore, future studies could explore additional moderating variables such as lifestyle, digital literacy, or technological trust to enhance the explanatory power of the model.

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