Analysis of Coastal Green Product Services Quality Toward Customer Loyalty, With Intervening Variable Customer Satisfaction.

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Abstract.

This study aims to determine whether Coastal Green Products have an influence on Consumer Loyalty. Coastal green products referred to in this study are furniture and interior products for household needs, which are produced from processed marine waste around the coastal areas of Surabaya and Sidoarjo, East Java. The population is not known with certainty, so using the Slovin formula, 100 respondents were obtained. Sampling was done in writing, respondents filled out a questionnaire using a Likert scale. Data processing was done with SMART PLS because it has an intervening variable, namely consumer satisfaction. From the results of data processing, the following discussion was obtained. Coastal Green Products have a significant direct influence on Consumer Loyalty. Service Quality has a significant direct influence on Consumer Loyalty. Consumer Satisfaction has a direct influence on Consumer Loyalty. Coastal Green Product and Service Quality have an indirect influence on Consumer Loyalty.

Keywords: Coastal Green Product, Service Quality, Customer Loyalty, Customer Satisfaction, Sustainable Coastal Business.

A. Introduction

Environmental sustainability has become an increasingly important issue in both academic research and business practice. One of the major concepts associated with sustainable consumption is the green product, which refers to products that are produced, used, and disposed of with minimal negative impact on the environment throughout their life cycle. This includes the use of sustainable raw materials, efficient production processes, waste reduction practices, long product durability, and consumer education regarding environmentally responsible consumption.

In coastal regions, green product development has unique relevance because many coastal communities generate by-products and waste from marine processing activities. These waste materials, such as shell waste, may be transformed into value-added handicraft products. Such products not only reduce environmental burdens but also create economic opportunities for local communities. In this study, the term coastal green product refers to handicraft products made from marine processing waste, especially shell-based materials commonly found in coastal areas.

Despite the growing global emphasis on sustainability, not all consumers fully understand or support green products. Therefore, consumer education remains essential. Based on a six-month outreach and socialization effort conducted by the researchers, this study was designed to examine scientifically and empirically whether customer

loyalty toward coastal green products is influenced by customer satisfaction, product attributes, and service quality.

Customer satisfaction is a critical factor in business performance because it reflects the extent to which products and services meet consumer expectations. A failure in product quality, delayed delivery, or unclear service may quickly erode customer trust. In turn, satisfaction is often regarded as an important antecedent of customer loyalty. Loyal customers are more likely to repurchase, buy in larger quantities, visit more frequently, and recommend products to others. Accordingly, this study aims to analyze the effects of **Coastal Green Product (X1)** and **Service Quality (X2)** on **Customer Satisfaction (Z)** and **Customer Loyalty (Y)** among customers of processed marine-based products in East Java.

B. Literature Review

1. Costal Green Product (X1)

Green products are products developed with attention to environmental sustainability across their life cycle, from raw material selection to disposal or recycling. In the context of this study, coastal green products are marine waste-based handicrafts, particularly those made from shell waste generated by coastal processing activities.
The main principles of green product development include:

a. the use of environmentally friendly raw materials from sustainable or recyclable sources;
b. efficient production processes that minimize waste;
c. waste reduction and safe waste management;
d. product durability and longer useful life; and
e. consumer education regarding sustainable product use.

Green products have become increasingly important because environmentally conscious consumers often choose such products to support ecological preservation and reduce the harmful consequences of consumption.

2. Service Quality (X2)

Service quality refers to the extent to which a company is able to meet customer needs and expectations through its service delivery. Operational performance, employee competence, technological support, and customer involvement all influence perceived service quality. Service quality is an important aspect that requires careful managerial attention, as the operational processes of a company largely determine the quality of service delivered. The effectiveness of these operational processes is influenced by multiple factors, including employees, technological systems, and customer or member involvement (Pritandhari, 2015).

This study adopts the **SERVQUAL** dimensions proposed by Parasuraman et al. (1988), as cited in Tiong (2018), consisting of: **Reliability**, or the ability to deliver promised services accurately and dependably; **Responsiveness**, or the willingness to help customers promptly; **Tangibles**, including physical facilities, equipment, and personnel appearance; **Assurance**, including employee knowledge, courtesy, competence, and trustworthiness; and **Empathy**, or individualized attention and understanding of customer needs.

3. Customer Satisfaction (Z)

Customer satisfaction is a critical factor in business development and profit enhancement. It is frequently used by firms as a key benchmark for evaluating business performance. The level of customer satisfaction not only reflects the extent to which products or services successfully meet customer needs, but also influences customer loyalty, business image, and customer retention. In general, customer satisfaction in this study may be assessed through six indicators:

a. **Product Quality**
   Customers expect that the products they purchase will possess satisfactory quality and perform in accordance with the claims made in advertisements or promotions. Therefore, business actors must ensure that the quality of the products offered does not disappoint consumers.

b. **Service Quality**
   Service quality is an important determinant of customer satisfaction because good service creates comfort and trust. Factors such as speed, accuracy, and the friendliness of customer service personnel play a significant role in shaping satisfaction.

c. **Product Price**
   Price substantially affects customer satisfaction, as consumers may hesitate to purchase a product if its price is perceived as too high relative to its expected quality. Therefore, price should be aligned with the value and quality of the product offered.

d. **Ease of Access to Products**
   Customers are more likely to feel satisfied when the products they want are easy to obtain. Thus, accessibility and convenience in the purchasing process are important considerations, as consumers tend to avoid products that are difficult to find or complicated to purchase.

e. **Product Advertising**
   Product advertisements should be easy to understand and appropriately aligned with the intended target market.

f. **Consistency and Professionalism**
   Customers generally hold high expectations regarding the products they purchase. They expect products to function properly from the first use and expect professional support services to be available whenever problems arise.

4. Customer Loyalty (Y)

According to Fandy Tjiptono (2015:30), customer loyalty is a combination of the likelihood that consumers will continue to purchase a company's products or services across different price levels and the likelihood that they will repurchase from the same provider in the future. Similarly, Lili Suryati (2015:93) states that customers who consistently make purchases, particularly repeat purchases, may be categorized as loyal customers. The dimensions and indicators of customer loyalty, as proposed by Novianti et al. in *Jurnal Ilmiah Manajemen* (2018, Vol. 3, No. 1), include:

a. Repeat purchases
b. Purchasing in greater quantities
c. More frequent visits or transactions
d. Providing recommendations to others

C. Research Method

This study employed a survey research method using a quantitative approach. The model examined the relationships among two independent variables, namely Coastal Green Product (X1) and Service Quality (X2), with Customer Satisfaction (Z) as an intervening variable and Customer Loyalty (Y) as the dependent variable. The statistical procedures applied in this study included reliability testing, validity testing, normality testing, classical assumption testing, and hypothesis testing. Data were analyzed using SmartPLS.

1. Research Variable
   According to Agung (2017:18), a research variable is an attribute, characteristic, or value of a person, object, or activity that varies and is determined by the researcher for the purpose of investigation and conclusion drawing. Similarly, Solimun (2020:31) defines a research variable as a characteristic, property, or attribute of a research object or subject that is relevant to the problem under investigation, measurable, and variable across different objects or subjects. Research objects or subjects may include individuals, classes, organizations, firms, industries, regions, or countries.
   Agung (2017:18) classifies research variables into several categories:
   a. **Dependent Variable**
      This variable is influenced by or dependent upon the independent variable. It is also referred to as the output, criterion, consequent, or bound variable
   b. **Independent Variable**
      This variable influences or causes changes in the dependent variable. It is also known as a stimulus, predictor, antecedent, or explanatory variable.
   c. **Moderating Variable**
      This variable affects the strength or direction of the relationship between the independent and dependent variables, either by strengthening or weakening that relationship.
   d. **Intervening or Mediating Variable**
      This variable functions as an intermediary in the relationship between the independent and dependent variables, serving as a connecting mechanism between them.

   In the present study, **Coastal Green Product (X1)** and **Service Quality (X2)** function as the independent variables, **Customer Satisfaction (Z)** acts as the mediating variable, and **Customer Loyalty (Y)** serves as the dependent variable.

2. Data Collection Thecnique
   To ensure the validity of the data, this study relied on primary data, which were collected directly by the researchers through the distribution of questionnaires to respondents.

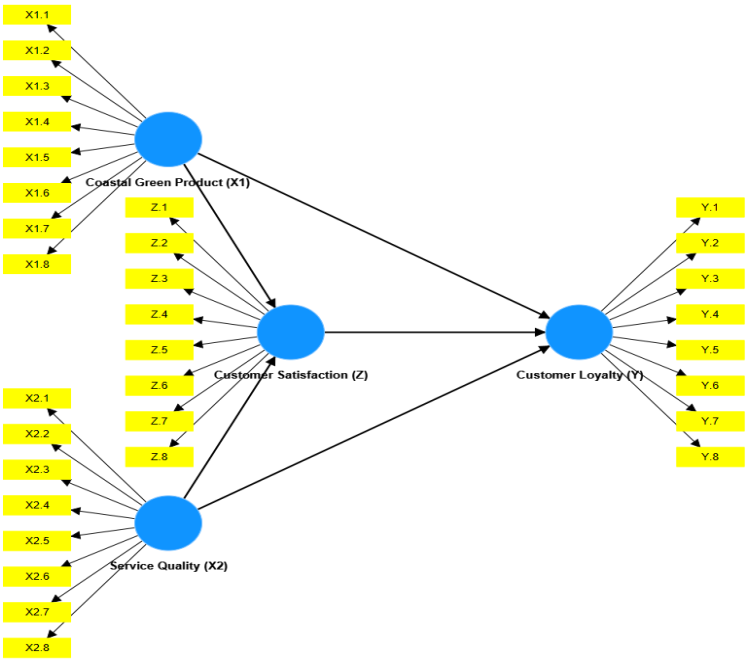
3. Sampling Technique
   Population refers to a generalized area consisting of objects or subjects with particular qualities and characteristics determined by the researcher for study

and subsequent conclusion drawing (Sugiyono, 2022:80). The population in this study comprised customers of processed marine products from processing industries located in East Java, specifically in the Sidoarjo and Surabaya areas. The study involved 100 respondents. The sampling method included only a portion of the total population rather than the entire population.

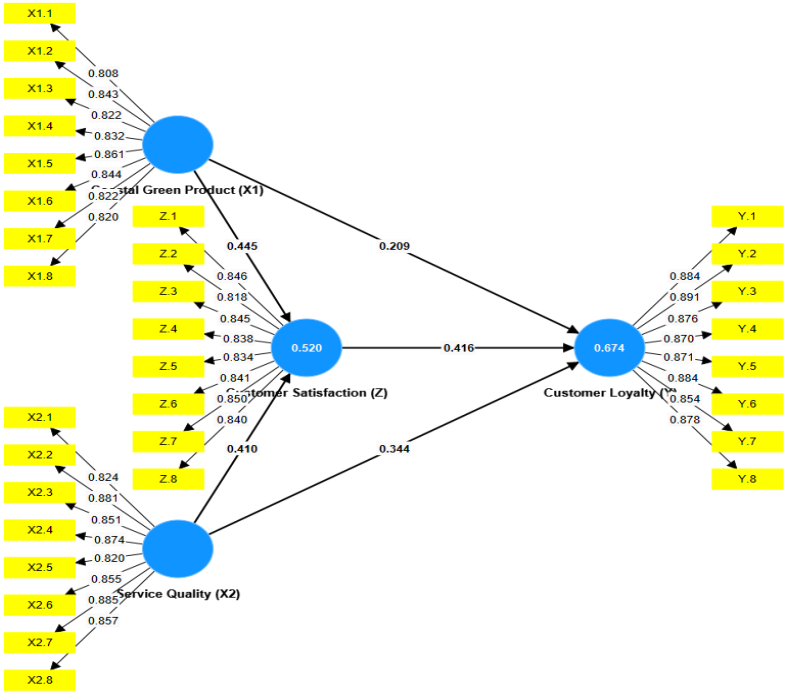
D.Pembahasan

In the present study, hypothesis testing was performed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique implemented in SmartPLS software. The inner model, or structural model, was applied to estimate and evaluate the causal relationships among the latent constructs. This procedure is essential for determining the extent to which the proposed hypotheses are supported by the empirical data. The following subsection reports the results of the inner model assessment in the construct testing process.

Picture 1.1
The Structural Model of the Study



Picture 1.2
Assessment of the Research Model Constructs



1. Convergen Validity

Convergent validity was examined through the **outer loading** values of each indicator. In this study, an outer loading threshold of > **0.70** was adopted to confirm that the indicators reliably measured their respective latent variables. The results of the outer loading analysis are presented below.

Table 1.1
***Outer Loading* Result**

	Outer loadings
X1.1 <- Coastal Green Product (X1)	0.808
X1.2 <- Coastal Green Product (X1)	0.843
X1.3 <- Coastal Green Product (X1)	0.822
X1.4 <- Coastal Green Product (X1)	0.832
X1.5 <- Coastal Green Product (X1)	0.861
X1.6 <- Coastal Green Product (X1)	0.844
X1.7 <- Coastal Green Product (X1)	0.822
X1.8 <- Coastal Green Product (X1)	0.820
X2.1 <- Service Quality (X2)	0.824
X2.2 <- Service Quality (X2)	0.881
X2.3 <- Service Quality (X2)	0.851
X2.4 <- Service Quality (X2)	0.874
X2.5 <- Service Quality (X2)	0.820

X2.6 <- Service Quality (X2)	0.855
X2.7 <- Service Quality (X2)	0.885
X2.8 <- Service Quality (X2)	0.857
Y.1 <- Customer Loyalty (Y)	0.884
Y.2 <- Customer Loyalty (Y)	0.891
Y.3 <- Customer Loyalty (Y)	0.876
Y.4 <- Customer Loyalty (Y)	0.870
Y.5 <- Customer Loyalty (Y)	0.871
Y.6 <- Customer Loyalty (Y)	0.884
Y.7 <- Customer Loyalty (Y)	0.854
Y.8 <- Customer Loyalty (Y)	0.878
Z.1 <- Customer Satisfaction (Z)	0.846
Z.2 <- Customer Satisfaction (Z)	0.818
Z.3 <- Customer Satisfaction (Z)	0.845
Z.4 <- Customer Satisfaction (Z)	0.838
Z.5 <- Customer Satisfaction (Z)	0.834
Z.6 <- Customer Satisfaction (Z)	0.841
Z.7 <- Customer Satisfaction (Z)	0.850
Z.8 <- Customer Satisfaction (Z)	0.840

The table shows that all indicators have **outer loadings exceeding 0.70**, confirming that all measurement indicators are valid.

3. *Cronbach alpha, Composite reliability*, dan *Average Variance Extracted* (AVE)
   The results of the reliability analysis and the average variance extracted (AVE) for each variable are summarized in the following table.

Table 2
***Cronbach alpha, Composite reliability,* dan *Average Variance Extracted* (AVE)**

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Coastal Green Product (X1)	0.936	0.939	0.947	0.692
Customer Loyalty (Y)	0.957	0.958	0.963	0.767
Customer Satisfaction (Z)	0.940	0.941	0.950	0.704
Service Quality (X2)	0.948	0.950	0.956	0.733

Reliability was assessed using Cronbach's alpha. According to Ghozali (2021), an instrument is considered reliable when its Cronbach's alpha value exceeds 0.70. As presented in the table, the results show that each variable has a Cronbach's alpha value greater than 0.70. Therefore, it can be concluded that all variables meet the reliability criterion and are considered reliable.

Furthermore, the results of the composite reliability test indicate that each variable has a composite reliability value greater than 0.60. Thus, all variables satisfy the required threshold for composite reliability.In addition, the Average Variance Extracted (AVE) results show that each variable has an AVE value greater than 0.50, indicating that all variables meet the acceptable criterion for convergent validity.

4. Discriminant validity

The HTMT results indicated that all values were below **0.90**, confirming that discriminant validity was established.

Table 3
Hasil HTMT (Heterotrait-Monotrait Ratio (HTMT)

	Heterotrait-monotrait ratio (HTMT)
Customer Loyalty (Y) <-> Coastal Green Product (X1)	0.643
Customer Satisfaction (Z) <-> Coastal Green Product (X1)	0.652
Customer Satisfaction (Z) <-> Customer Loyalty (Y)	0.789
Service Quality (X2) <-> Coastal Green Product (X1)	0.442
Service Quality (X2) <-> Customer Loyalty (Y)	0.710
Service Quality (X2) <-> Customer Satisfaction (Z)	0.628

5. *Inner Model* untuk *full model*

The inner model was assessed to examine the structural model fit. The results of the inner model evaluation are presented as follows.

a. Coefficient of Determination (R^2)

Table 4
Structural Inner Model Assessment

	R-square	R-square adjusted
Customer Loyalty (Y)	0.674	0.664
Customer Satisfaction	0.520	0.510

The coefficient of determination (R^2) shows that the variance in customer loyalty is explained by the predictor variables at 0.674, or 67.4%, while the remaining 32.6% is attributable to other factors not examined in this study. Likewise, the R^2 value for customer satisfaction indicates that 52.0% of its variance is explained by the predictor variables included in the model, whereas the remaining 48.0% is accounted for by other variables beyond the scope of this research.

Table 5

Q–*Square Predictive Relevance* (Q^2)

	SSO	SSE	Q^2 (=1-SSE/SSO)
Customer Loyalty (Y)	800.000	394.222	0.507
Customer Satisfaction (Z)	800.000	517.783	0.353

The Q^2 predictive relevance results were found to be greater than zero, indicating that the model demonstrates adequate predictive relevance. In other words, the observed values were reconstructed satisfactorily by the model.

6. Hypothesis Testing Result

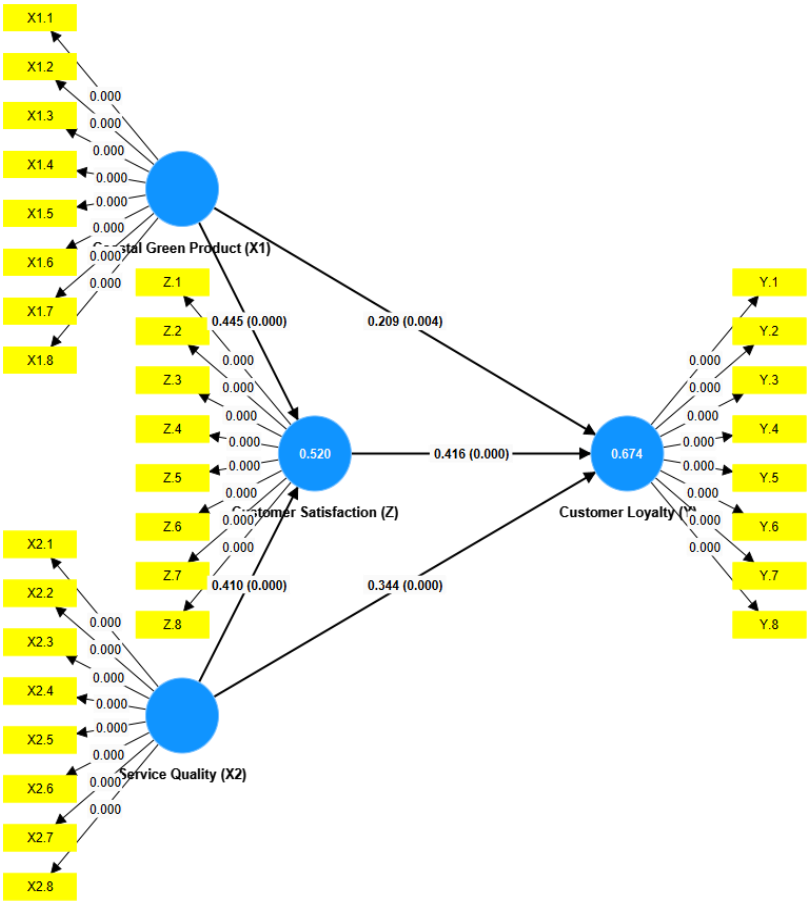
The significance of the estimated parameters offers important insights into the relationships among the constructs examined in this study. Hypothesis testing was carried out by assessing both the probability values (p-values) and the t-statistics. At a significance level of $\alpha = 0.05$, a p-value of less than 0.05 indicates statistical significance, while the corresponding critical t-value is 1.986. Accordingly, a hypothesis is considered supported when the t-statistic exceeds the critical t-value. In this study, hypothesis testing was conducted in SmartPLS using the bootstrapping procedure, allowing the estimation of the effects of exogenous variables on endogenous variables, as reported below.

Table 7

Bootstrapping Results for Direct Effects (Hypotheses)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Coastal Green Product (X1) -> Customer Loyalty (Y)	0.209	0.208	0.070	2.977	0.004
Coastal Green Product (X1) -> Customer Satisfaction (Z)	0.445	0.447	0.066	6.739	0.000
Customer Satisfaction (Z) -> Customer Loyalty (Y)	0.416	0.409	0.106	3.928	0.000
Service Quality (X2) -> Customer Loyalty (Y)	0.344	0.346	0.088	3.890	0.000
Service Quality (X2) -> Customer Satisfaction (Z)	0.410	0.400	0.082	4.979	0.000

Picture 1.3
***Boostrapping* Result**



Direct Effects

Based on the bootstrapping results obtained from SmartPLS, all relationships among the variables showed t-statistics greater than 1.96 and p-values lower than 0.05, indicating that all proposed direct-effect hypotheses were statistically supported.

H1: The relationship between Coastal Green Product (X1) and Customer Satisfaction (Z) yielded an original sample value of 0.445, a sample mean of 0.447, and a standard deviation of 0.066. The resulting t-statistic was 6.739, with a p-value of 0.000. These results indicate that Coastal Green Product (X1) has a positive and significant effect on Customer Satisfaction (Z). The positive coefficient suggests that better performance in terms of Coastal Green Product is associated with higher customer satisfaction. Moreover, the t-statistic exceeding 1.96 and the p-value below 0.05 confirm that this effect is statistically significant.

H2: The relationship between Service Quality (X2) and Customer Satisfaction (Z) produced an original sample value of 0.410, a sample mean of 0.400, and a standard deviation of 0.082. The t-statistic was 4.979, with a p-value of 0.000. These findings demonstrate that Service Quality (X2) has a positive and significant effect on Customer Satisfaction (Z). The positive coefficient indicates that higher service quality tends to

increase customer satisfaction. Since the t-statistic is greater than 1.96 and the p-value is below 0.05, the effect is statistically significant.

H3: The relationship between Coastal Green Product (X1) and Customer Loyalty (Y) showed an original sample value of 0.209, a sample mean of 0.208, and a standard deviation of 0.070. The t-statistic obtained was 2.977, with a p-value of 0.004. These results suggest that Coastal Green Product (X1) has a positive and significant effect on Customer Loyalty (Y). The positive coefficient implies that improvements in Coastal Green Product are associated with higher customer loyalty. The t-statistic above 1.96 and the p-value below 0.05 confirm the statistical significance of this relationship.

H4: The relationship between Service Quality (X2) and Customer Loyalty (Y) yielded an original sample value of 0.344, a sample mean of 0.346, and a standard deviation of 0.088. The resulting t-statistic was 3.890, with a p-value of 0.000. These findings indicate that Service Quality (X2) has a positive and significant effect on Customer Loyalty (Y). The positive coefficient shows that better service quality tends to enhance customer loyalty. This effect is statistically significant, as indicated by the t-statistic greater than 1.96 and the p-value lower than 0.05.

H5: The relationship between Customer Satisfaction (Z) and Customer Loyalty (Y) produced an original sample value of 0.416, a sample mean of 0.409, and a standard deviation of 0.106. The t-statistic was 3.928, with a p-value of 0.000. These results demonstrate that Customer Satisfaction (Z) has a positive and significant effect on Customer Loyalty (Y). The positive coefficient indicates that higher customer satisfaction tends to lead to greater customer loyalty. Since the t-statistic exceeds 1.96 and the p-value is below 0.05, the relationship is statistically significant.

Table 8
Indirrect effect

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Coastal Green Product (X1) -> Customer Satisfaction (Z) -> Customer Loyalty (Y)	0.185	0.182	0.051	3.627	0.000
Service Quality (X2) -> Customer Satisfaction (Z) -> Customer Loyalty (Y)	0.170	0.166	0.064	2.678	0.009

Indirect Effects
The indirect effect analysis was conducted to examine the mediating role of customer satisfaction in the relationships between coastal green product and service quality on customer loyalty. The significance criteria were determined based on t-statistics > 1.96 and p-values < 0.05.

H6: The indirect effect of Coastal Green Product (X1) on Customer Loyalty (Y) through Customer Satisfaction (Z) showed an original sample value of 0.185, a sample mean of 0.182, and a standard deviation of 0.051. The resulting t-statistic was 3.627, with a p-

value of 0.050. These results indicate that Coastal Green Product (X1) has a positive indirect effect on Customer Loyalty (Y) through Customer Satisfaction (Z). The positive coefficient suggests that better coastal green product performance tends to increase customer satisfaction, which in turn contributes to higher customer loyalty. Since the t-statistic exceeds 1.96, this mediating effect may be regarded as statistically significant at the threshold level.

H7: The indirect effect of Service Quality (X2) on Customer Loyalty (Y) through Customer Satisfaction (Z) showed an original sample value of 0.170, a sample mean of 0.166, and a standard deviation of 0.064. The resulting t-statistic was 2.678, with a p-value of 0.009. These findings indicate that Service Quality (X2) has a positive and significant indirect effect on Customer Loyalty (Y) through Customer Satisfaction (Z). The positive coefficient implies that higher service quality tends to improve customer satisfaction, which subsequently enhances customer loyalty. As the t-statistic is greater than 1.96 and the p-value is below 0.05, the mediating effect is statistically significant.

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