

AN EMPIRICAL STUDY OF REVERSE LOGISTICS IN NATURAL COSMETIC PRODUCTS ON CONSUMER SATISFACTION

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Abstract

This study aims to analyze the influence of reverse logistics on consumer satisfaction with cosmetic products at PT Nectars Natura Karya. Reverse logistics, which involves the management of product returns for recycling, repairs, or waste handling, is a crucial element in enhancing sustainability while meeting the expectations of modern consumers. The study employs a simple linear regression analysis method to understand the relationship between reverse logistics as the independent variable and consumer satisfaction as the dependent variable. Data were collected through questionnaires distributed to consumers of PT Nectars Natura Karya's best-selling product, Tamanu Daycream. Based on the simple linear regression test results, the simple linear regression equation obtained is $Y = 0.666 + 0.464X$, indicating that if the reverse logistics variable is zero or constant, consumer satisfaction increases by 0.666 units. The coefficient value for the reverse logistics variable is 0.464, meaning that a one-unit increase in reverse logistics will increase consumer satisfaction by 0.464 units or 46.4%. Furthermore, the R value (correlation coefficient) is 0.876, signifying a very strong relationship between reverse logistics and consumer satisfaction. The R² value (coefficient of determination) is 0.767, indicating that 76.7% of the variation in consumer satisfaction can be explained by reverse logistics in the model, while the remaining 23.3% is explained by other factors outside the model. With an R² of 0.767, the model is categorized as substantial, implying a very strong relationship between reverse logistics and consumer satisfaction. In the hypothesis testing, the $t_{\text{calculated}}$ value of 17.778 far exceeds the t_{table} value of 1.664. Thus, H_0 is rejected, and H_a is accepted, confirming that the relationship between reverse logistics and consumer satisfaction is highly significant.

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1. Introduction

Companies that sell skincare products have the potential to damage the environment because mass production is labor-intensive, uses raw materials that cannot be recycled, and generates hazardous waste. To reduce their impact on the environment, businesses should incorporate green marketing into their sustainable strategies [1]. The production, delivery to consumers, and disposal of goods and services through green marketing can reduce environmental damage such as the effects of global warming, non-degradable waste, and harmful pollutants [2].

There is a change in consumer shopping behavior driven by concern for environmental issues. 74% of consumers have or are willing to adjust their shopping preferences based on their impact on the environment. This change is most prevalent among Gen Z and Millennial shoppers, where more than half of consumers aged 45 and

below have adjusted their shopping habits. In contrast, only 45% of consumers aged 45 and above have done the same [3].

Reverse logistics, which involves returning products or packaging from consumers for recycling or reuse, is an integral part of green supply chains. Such programs not only reduce waste, but also create closer relationships between companies and consumers. The importance of understanding the impact of reverse logistics on consumer satisfaction has been supported by research such as that published in the *Journal of Cleaner Production* (2023), the study showed that 55% of consumers felt more satisfied when companies offered recycling or packaging return programs, and 48% of them felt more satisfied when they were given the option. Currently PT Nectars Natura Karya anticipates a packaging return program for recycling.

Based on the product sales, Tamanu Daycream is the highest selling product with 269 products sold. Followed by Facial Foam Citrus with 211 products sold and Seabuckthorn Daycream with 196 products sold which also show significant sales figures. Tamanu Daycream's sales figures are the highest, indicating the high consumer demand for this product. Therefore, Tamanu Daycream is the right choice as the object of research to find out how the influence of reverse logistics aspects on consumer satisfaction at PT Nectars Natura Karya.

Tamanu Daycream products are designed to soften the surface structure of the skin, treat sunburn symptoms, treat acne and eczema, and prevent premature wrinkles. This product is packaged in a 10ml travel size and is sold at Rp 88,200 in the marketplace. This product also managed to make its consumers satisfied, this is stated based on the ratings and reviews on the Tamanu Daycream sales product page, the rating obtained is 4.9 out of 5, reviews or reviews given by Tamanu Daycream consumers also show that they are satisfied with the quality of Tamanu Daycream products.

Making Tamanu Daycream as the focus of observation in this study is expected to provide a more comprehensive understanding of how reverse logistics aspects can affect consumer satisfaction on the products that consumers are most interested in. The selection of products with the highest sales also allows the company to identify and optimize the potential for improving reverse logistics aspects on products that make the largest contribution to the company's revenue.

People today are increasingly selective in choosing brands when buying goods or services. Indonesia, as a fast-growing country, shows an increasing demand for natural and eco-friendly skincare [2]. Environmentally friendly aspects influence consumer choice in choosing skincare. Consumers' environmental awareness and behavior are contributing to purchasing patterns that support sustainability. Consumers are increasingly concerned about the adverse effects of environmentally unfriendly skincare products [4]. around 73% of global consumers stated that they are willing to change their consumption patterns to reduce their negative impact on the environment. This awareness is a major factor driving changes in business strategies across industries, including cosmetics [5].

Companies in various sectors, including the cosmetics industry, are starting to show their commitment to sustainability by creating environmentally friendly products. This commitment is important because a McKinsey report shows that products with sustainability labels tend to have higher growth rates than conventional products. PT Nectars Natura Karya is committed to producing natural and sustainable skincare products [6], this phenomenon is in line with the growing trend of green consumerism, where more and more consumers are concerned about environmental issues and tend to choose products that are more friendly to nature [7]. The company's focus on natural ingredients and sustainability reflects consumer preferences for attributes such as safety, product performance, and natural ingredients in eco-friendly skincare products [2]. Similar to PT Yagi Natural Indonesia, PT Nectars Natura Karya implements environmentally friendly marketing strategies, including the use of organic ingredients, and promotional activities that emphasize an eco-friendly approach [8].

Reverse logistics is one of the key practices in sustainability efforts. Reverse logistics includes all activities related to managing the reverse flow of products, including recycling and waste management. This implementation not only supports the environment but also strengthens the company's relationship with consumers through social responsibility [9]. The following is the reverse logistics process at PT Nectars Natura Karya.



Fig.1. Reverse Logistics Process

Based on Figure 1, the reverse logistics process carried out at PT Nectars Natura Karya starts from consumers returning their empty packaging, the empty packaging is returned directly to the PT Nectars Natura Karya factory. After the empty packaging is received by PT Nectars Natura Karya, the company team directs the empty packaging that has been returned by consumers to a recycle disposal site or such as a collector who recycles.

According to data provided by the Plastic Pollution Coalition, the self-care and beauty industry worldwide produces more than 120 billion pieces of packaging every year. It is unfortunate that most of these bottles are not recyclable, leading to more waste in landfills. The composition of waste at the national level by type of waste in 2023, plastic is the second largest contributor after food waste at 18.77% based on the Directorate of Waste Management.

The Body Shop runs reverse logistics activities as a form of their commitment to environmental sustainability. One of the programs implemented is the return of empty packaging, otherwise known as Bring Back Our Bottle (BBOB). This program aims to encourage consumers to be more environmentally responsible by contributing to reducing the amount of waste that ends up in landfills. Based on journals and sources, packaging that can be returned is all products with plastic or glass containers, consumers who return empty packaging will get awards such as points as feedback from The Body Shop [10]. This is similar to what PT Nectars Natura Karya does, PT Nectars Natura Karya has an empty packaging return program and also provides a reward in the form of a shopping voucher worth IDR 120 thousand for every 40 empty packaging returned.

The most appropriate analysis method to be used in this research is Simple Linear Regression, this is because the research only involves one independent variable (reverse logistics) which is assumed to have a direct effect on one dependent variable (consumer satisfaction). Simple linear regression is used to model the linear relationship between two variables, so as to provide relevant results and clear interpretation of the effect of the independent variable on the dependent variable [11].

The Simple Linear Regression analysis method is considered appropriate for this research because it is simple and focuses on the direct effect of one variable on another without involving the relationship of mediating or moderating variables, as is usually analyzed using more complex methods such as SEM or Path Analysis. By using simple linear regression, this research can identify and explain the effect of reverse logistics on consumer satisfaction efficiently and purposefully.

Based on the background description, there are objectives to be achieved in this study, namely analyzing the effect of reverse logistics on consumer satisfaction of PT Nectars Natura Karya

2. Literature Review

A. Green Skincare Product

Green products are sustainable products that are designed and marketed by considering their impact on the environment. These products utilize environmentally friendly raw materials, minimize energy use during the production process, and can be recycled after use [12]. Green skincare products are skincare products that are made using natural ingredients without the addition of chemicals, artificial colors, or other synthetic ingredients. This type of cosmetics is often referred to as organic cosmetics. All ingredients used in these products are obtained from natural resources, such as plants or other natural materials [13].

B. Consumer Satisfaction

According to Tjiptono dan Chandra, consumer satisfaction refers to the extent to which the product or service provided is able to meet consumer expectations. [14]. In addition, Daryanto and Setyobudi reveal the emotional response that arises after consumers use the product, when their needs and expectations have been achieved [15].

The main goal of a business is to provide satisfaction for consumers. Consumer satisfaction brings a number of benefits, such as strengthening the relationship between the company and consumers, strengthening the basis for repeat purchases, and building consumer loyalty. In addition, consumer satisfaction can also generate word of mouth which provides great benefits for the company [16].

C. Reverse Logistics

Reverse logistics is a process that includes efficient and effective planning, implementation, and control in managing the flow of goods and information from the point of consumption back to the point of origin [9]. Reverse logistics primarily aims to recover the value of returned goods or manage them in a more environmentally friendly way. Effective and efficient management in reverse logistics has the ability to generate economic value as well as improve the company's image in the eyes of consumers and in product distribution. With the right efficiency, reverse logistics can create economic value through various activities, such as the reuse of salvageable goods, material recycling, repair, or remanufacturing for resale [17].

D. Data Analysis Method

Data analysis is a step taken after all data has been collected from respondents or other sources. This step involves grouping data based on variables and categories of respondents, tabulating data based on variables from all respondents, and presenting accurate and relevant data. Sugiyono stated that each variable in the study needs to be analyzed to answer the formulation of the problem that has been prepared, while the calculation process is carried out to test the hypothesis proposed [18].

Simple regression analysis is a statistical method that aims to describe the linear relationship between one independent variable (x) and one dependent variable (y). This method is applied to analyze the extent to which the independent variable affects the dependent variable, as well as predict the value of y based on the value of x [19]. According to Sugiyono, the simple regression equation can be formulated as follows [20]:

$$Y = a + bX$$

Description:

- Y : consumer satisfaction
- a : simple regression constant
- b : regression coefficient
- A. X : reverse logistics

3. Research Methodology

The method applied in this research is Simple Linear Regression, where quantitative data obtained from questionnaires will be used to test hypotheses between research variables, the data will be processed using IBM SPSS 26 software. The following are the steps taken by researchers to facilitate the research process and problem solving.

A. Problem Identification

The initial stages of the research began with identifying problems by looking at real conditions based on phenomena that occurred at PT Nectars Natura Karya. The problem is related to reverse logistics implemented by PT Nectars Natura Karya. Generally, research to assess or measure consumer satisfaction is measured in terms of product quality, product durability, and so on, but in this research consumer satisfaction is measured based on reverse logistics, this is because based on information from the Director of Operations of PT Nectars Natura Karya that the company needs reverse logistics to strengthen their branding as a company that is friendly and cares about the environment. Although there has been no research measuring consumer satisfaction with the quality of their products, the researcher considers consumers to be satisfied with the quality of products from PT Nectars Natura Karya, this is reinforced by the ratings and reviews of PT Nectars Natura Karya products in the marketplace, besides that based on interviews, the lack of complaints from consumers about their products makes PT Nectars Natura Karya consider measuring consumer satisfaction with the quality of their products not an urgency. Thus, the researcher aims to examine the effect of reverse logistics on consumer satisfaction.

B. Literature Study

Literature study is conducted to collect references that can support this research. The literature obtained includes theoretical foundations and methods relevant to the research, where this information comes from journals, books, websites, and other reliable sources. Some of the references used in this research are reverse logistics and consumer satisfaction.

C. Variable Identification

Variable identification is carried out to determine the variables that act as influencing factors and influenced variables. Variable identification is determined based on the results of the literature study. The following are the variables in this study.

TABLE 1
VARIABLE IDENTIFICATION

| No | Variable | Definition | Reference |
|----|-------------------|--|-----------|
| 1 | Reverse Logistics | Reverse Logistics refers to the process of flowing products or components back after use, for the purpose of repair, recycling, or reprocessing. In green supply chain management, | [21] |

| No | Variable | Definition | Reference |
|----|-----------------------|--|-----------|
| | | reverse logistics is used by companies as a tool to manage waste recycling, thus preventing environmental pollution. Reverse logistics provides significant benefits, especially in increasing the company's production output. | |
| 2 | Consumer Satisfaction | Consumer satisfaction refers to the feelings that arise after a person compares the performance of the product or service received with the expectations he has. High satisfaction can reduce the negative impact of unavoidable errors due to variations in the service delivery process. In another sense, consumer satisfaction is defined as a response to the fulfillment of consumer needs, where consumers assess whether the product or service has succeeded in meeting their needs and expectations. If the product or service matches consumer expectations, it can be considered that consumers are satisfied. | [22] |

There are several dimensions and indicators on the reverse logistics variable and the consumer satisfaction variable adopted from several references for use in this study, in adopting several dimensions and indicators for each variable, adjustments are made from each dimension and indicator to the activities carried out at PT Nectars Natura Karya. The following are the dimensions and indicators used in this study.

TABLE 2
DIMENSIONS AND INDICATORS OF VARIABLES IDENTIFICATION

| No | Variable | Dimension | Indicator | Reference |
|----|-----------------------|-----------------------------|------------------------|-----------|
| 1 | Reverse Logistics | Return Initiation | Product return request | [23] |
| | | Select Disposition | Recycling action | |
| | | Credit Consumer | Rewards for consumers | |
| 2 | Consumer Satisfaction | Expectations | Consumer expectations | [24] |
| | | Satisfaction Toward Quality | Service feedback | [25] |

D. Model Making

The following is a structural model based on previous research as a reference which is adjusted to the variables used in this study.

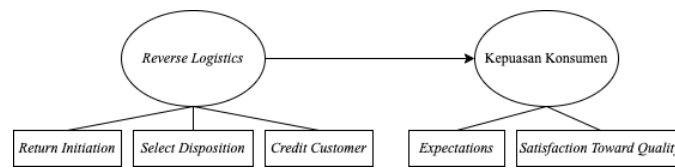


Fig. 2 Structural Model

Based on Figure 2, this research involves two types of variables, namely independent variables and dependent variables. Independent variables are variables that exert influence on other variables, while dependent variables are variables that receive influence from other variables. In this study, the independent variable is reverse logistics with the dimensions of Return Initiation, Select Disposition, and Credit Consumer, while the dependent variable is consumer satisfaction with the dimensions of Expectations and Satisfaction Toward Quality.

E. Hypothesis Generating

Effective and efficient reverse logistics management can create economic value, strengthen the company's positive image, and improve performance in the distribution chain [17]. Responsiveness in reverse logistics describes a company's ability to manage the returns process quickly and according to consumer needs, which includes efficient returns management, such as providing easy and fast authorization options. This responsiveness not only contributes to improving consumer satisfaction, but also supports the company's competitiveness. In order for the returns process to be effective, good collaboration between the marketing and logistics functions is required to ensure smooth credit management and settlement for consumers [26]. Based on this, the following hypothesis is proposed.

H₀: Reverse Logistics has no effect on consumer satisfaction

H_a: Reverse Logistics affects consumer satisfaction

F. Determination of Sample Size

The population in this study is 120 people, of which 120 people are considered end-customers because there is no reseller/reselling system at PT Nectars Natura Karya. From a population of 120 people, the Slovin formula was used to determine the number of samples to be used in the study. The Slovin formula is used because the population in this study has been identified [27].

$$n = N / 1 + N(e)^2$$

Description:

n : number of samples

N : total population

e : error tolerance limit (0.05)

Based on the Slovin formula, researchers obtained the minimum number of samples needed in this study, namely:

$$\begin{aligned}
 n &= N / 1 + N(e)^2 \\
 n &= 120 / 1 + 120(0.05)^2 \\
 n &= 120 / 1 + 0.3 \\
 n &= 120 / 1.3 \\
 n &= 92.307692
 \end{aligned}$$

Based on the results of the application of the Slovin formula, with a total population of consumers who buy Tamanu Daycream products of 120 people and the error tolerance limit used is 0.05, the minimum number of samples needed in this study is 92 people. The sampling technique used in this study is simple random sampling which is one of the sampling techniques from probability sampling, simple random sampling is used because there is no population segmentation in this study [28].

G. Questionnaire Design and Distribution

Data collection is done through distributing questionnaires to consumers who have purchased Tamanu Daycream products. The questionnaire is structured in the form of a statement with a Likert scale, where number 1 means "strongly disagree" and number 5 means "strongly agree" [29]. The selection of respondents was carried out using the simple random sampling method, because there were no differences in strata and other provisions used in the respondents of this study. The statements are made based on dimensions and indicators to be used in the questionnaire as a tool that describes how reverse logistics affects consumer satisfaction.

TABLE 3
STATEMENT FOR EACH DIMENSION

| Dimensions | Statement |
|-----------------------------|---|
| Return Initiation | I find it easy to find information about the procedure for submitting empty packaging returns |
| | I find the process of requesting empty packaging returns easy to do |
| | The team from PT Nectars Natura Karya responded quickly to my empty packaging return request |
| Select Disposition | I am satisfied with the recycling program for returned empty packaging |
| | I am confident that the empty packaging I return is directed to a disposal facility that can recycle it |
| | I support the recycling actions taken by PT Nectars Natura Karya |
| Credit Consumer | I feel that the shopping vouchers given are very profitable for me |
| | I am more motivated to return empty packaging because of the shopping voucher provided by PT Nectars Natura Karya |
| Expectations | PT Nectars Natura Karya's empty packaging return program has met my expectations of environmental stewardship |
| | I feel that PT Nectars Natura Karya's empty packaging return program is in line with its branding as a company that supports environmental sustainability |
| Satisfaction Toward Quality | I am satisfied with the responsiveness of PT Nectars Natura Karya's team in returning empty packaging |
| | I am satisfied with the responsiveness of the PT Nectars Natura Karya team in the process of claiming shopping vouchers after returning empty packaging |

H. Questionnaire Test

1. Validity Test

The validity test serves to assess the accuracy of the measuring instrument and can describe the concept or phenomenon being measured. The validity test is applied to assess whether a questionnaire is valid or not. A questionnaire is considered valid if the questions or statements contained in it can reveal what you want to measure. If the significance value is <5% (level of significance), it means that the statements are valid [20].

2. Reliability Test

The reliability test serves as a tool to assess the questionnaire which functions as an indicator of the variable. The questionnaire is considered reliable if a person's response to a statement remains consistent or stable over time. In this study, reliability testing was carried out using the Cronbach's Alpha formula [20].

I. Classical Assumption Test

1.

Normality Test

The normality test aims to check whether the data obtained is normally distributed in each variable. Data that is considered good is data that has a normal distribution in its residual values, so that data analysis can be carried out appropriately and validly. This residual test is very important to do before proceeding to simple linear regression analysis [30]. Some normality test methods that can be applied include the histogram test, normal P-Plot test, Chi Square test, Skewness and Kurtosis or Kolmogorov Smirnov test. [30].

2.

Linearity Test

The purpose of the linearity test is to determine whether the model specification applied is correct. Good data should show a linear relationship between the independent variable and the dependent variable. [31].

The linearity test is applied to evaluate whether there is a significant linear relationship between two variables. The regression model is considered good if the linear relationship between variables x (reverse logistics) and y (consumer satisfaction) is significant.

J. Simple Linear Regression Test

Simple linear regression is used to obtain a mathematical relationship expressed in the form of an equation between one independent variable (reverse logistics) and the dependent variable (consumer satisfaction), which involves only one independent variable.

K. Correlation Coefficient (R) dan Determination Coefficient (R^2) Test

Correlation coefficient test (R) is a test to determine how strong the relationship between variables is, while the determination coefficient test (R^2) is a test to determine how much the percentage of the independent variable (reverse logistics) affects the dependent variable (consumer satisfaction).

L. Hypothesis Test

In simple linear regression, the hypothesis test applied is the T test. The T test is a test for partial regression coefficients individually which aims to determine whether the independent variable (x) has an influence on the dependent variable (y) individually [32].

The T test is used to test whether an independent variable actually affects the dependent variable. In this study, researchers want to know whether if separately / partially, the independent variable (reverse logistics) still has a significant effect on the dependent variable (consumer satisfaction).

M. Analysis of Results

Based on the results of the tests that have been carried out, namely the questionnaire test which consists of validity and reliability tests, the classical assumption test which consists of normality test and linearity test, simple linear regression test, correlation coefficient test and determination coefficient, and hypothesis testing, namely the T test, the next step is to analyze how reverse logistics affects consumer satisfaction.

N. Conclusions and Suggestions

The last stage of this research is drawing conclusions and providing suggestions. Drawing conclusions aims to answer research objectives based on data processing and analysis of results. Recommendations in the form of suggestions will also be given to PT Nectars Natura Karya as a reference in an effort to improve the implementation of reverse logistics.

4. Result and Discussion

A. Validity and Reliability Test

1. Pearson Correlation Validity Test

The Pearson Correlation method is used to test the validity of a questionnaire by correlating the score of each question with the total score obtained from respondents. According to Ghozali, this method compares the $r_{\text{calculated}}$ value with the r_{table} value to determine whether the questionnaire is valid. The r_{table} value used is 0.1968 ($df = 96$; $\alpha = 5\%$), as the sample consists of 98 respondents. A questionnaire is considered valid if the $r_{\text{calculated}}$ value for each variable indicator is greater than the r_{table} value [33]. The following are the results of the validity test using Pearson Correlation.

TABLE 4
PEARSON CORRELATION VALIDITY TEST RESULTS

| Variable | Indicator | r_calculated value | r_table value | Description |
|---------------------------|-----------|--------------------|---------------|-------------|
| Reverse Logistics (x) | RI1 | 0.720 | 0.1986 | Valid |
| | RI2 | 0.864 | | Valid |
| | RI3 | 0.869 | | Valid |
| | SD1 | 0.838 | | Valid |
| | SD2 | 0.819 | | Valid |
| | SD3 | 0.681 | | Valid |
| | CC1 | 0.823 | | Valid |
| | CC2 | 0.862 | | Valid |
| Consumer Satisfaction (y) | E1 | 0.888 | 0.1986 | Valid |
| | E2 | 0.768 | | Valid |
| | STQ1 | 0.908 | | Valid |
| | STQ2 | 0.894 | | Valid |

All indicators in the Reverse Logistics (x) and Consumer Satisfaction (y) variables are declared valid because they meet the criteria for the value $r_{\text{calculated}} > r_{\text{table}}$. Therefore, the questionnaire is worth using for further analysis.

2. Cronbach's Alpha Reliability Test

After the validity test, the next step is to carry out a reliability test to assess the consistency and accuracy of the questionnaire [34]. Reliability testing is important because it will provide an idea of the extent to which the questionnaire that has been built has good reliability, where a Cronbach's Alpha value greater than 0.6 indicates the questionnaire is reliable, while a value below 0.6 indicates the questionnaire is unreliable [35]. Testing was carried out using 98 respondents with 2 variables and 12 statement indicators, 8 statement indicators for the reverse logistics variable and 4 statement indicators for the consumer satisfaction variable. Following are the results of the reliability test.

TABLE 5
CRONBACH'S ALPHA VARIABLE X RELIABILITY TEST

| Cronbach's Alpha | N of Items |
|------------------|------------|
| 0.924 | 8 |

TABLE 6
CRONBACH'S ALPHA VARIABLE Y RELIABILITY TEST

| Cronbach's Alpha | N of Items |
|------------------|------------|
| 0.888 | 4 |

Based on Tables 5 and 6, both variables (reverse logistics and consumer satisfaction) have Cronbach's Alpha values which show very good reliability, namely $0.924 > 0.6$ for the reverse logistics variable and $0.888 > 0.6$ for the consumer satisfaction variable. Therefore, the questionnaire is worth using for further analysis.

B. Classical Assumption Test

1. Normality Test

The normality test is carried out to determine whether the residual or confounding variables in the regression model are normally distributed. One way to detect normal distribution in a model is through a P-Plot graph. The ideal regression model will show a normal data distribution, characterized by the distribution of data following the diagonal line on the normal distribution graph. Residuals are considered normally distributed if the points on the P-Plot graph are parallel to the diagonal line. Here is a P-Plot graph that illustrates it [36].

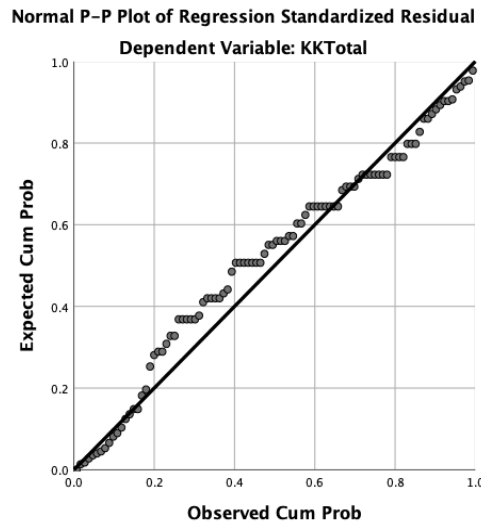


Fig. 1 P-Plot Graph

The P-P Plot graph in Fig. 10, most of the residual points appear to be around the diagonal line, both at the beginning, middle and end of the graph. With this, the residual distribution shows a pattern that is close to a diagonal line, therefore the residuals from the regression model meet the normality assumption. Because the normality test shows good results, the regression model used can be considered valid in terms of the residual normality assumption.

2. Linearity Test

The linearity test is carried out to determine whether there is a significant and linear relationship between the variables. This linearity test is carried out through the linearity test contained in the ANOVA table. The criteria for decision making in the linearity test is if linearity ≥ 0.05 , then there is no linear relationship. If linearity < 0.05 , then there is a linear relationship.

TABLE 7
ANOVA TABLE LINEARITY TEST RESULTS

| | Sum of Squares | df | Mean Square | F | Sig |
|--------------------------|----------------|----|-------------|---------|-------|
| Linearity | 543.971 | 1 | 543.971 | 300.832 | 0.000 |
| Deviation from Linearity | 24.181 | 18 | 1.343 | 0.743 | 0.757 |

Based on Table 7, it can be seen that the significance value for Linearity is $0.000 < 0.05$, with this the relationship between the two variables is significantly linear. The significance value for Deviation from Linearity is $0.757 > 0.05$, this indicates that there is no significant deviation from the linear relationship. Based on the results of the linearity test, the relationship between the reverse logistics variable and consumer satisfaction is significantly linear, apart from that there are no significant deviations, this shows that the relationship between the two is indeed consistent in a linear pattern.

C. Simple Linear Regression Test

The simple linear regression test aims to analyze the effect of reverse logistics on cosmetic products on consumer satisfaction at PT Nectars Natura Karya. Simple linear regression analysis was carried out with the help of IBM SPSS 26 software, meanwhile the confidence level used in simple linear regression calculations was 95% or with a significance level of 0.05 ($\alpha = 0.05$).

TABLE 8
SIMPLE LINEAR REGRESSION CALCULATION RESULTS

| Variabel X | B |
|------------|-------|
| Constant | 0.666 |
| RL Total | 0.464 |

Based on Table 8, the simple linear regression equation can be seen as follows:

$$Y = a + bX$$

$$Y = 0.666 + 0.464X$$

Based on the simple linear regression equation, it can be stated that the regression coefficient is constant at 0.666, indicating that if the reverse logistics variable is zero or fixed, it will increase consumer satisfaction by 0.666 units. The coefficient value of the reverse logistics variable is 0.464, indicating that if the reverse logistics variable increases by one unit, it will increase consumer satisfaction by 0.464 units or 46.4%.

D. Correlation Coefficient (R) dan Determination Coefficient (R²) Test

Correlation coefficient test (R) used to find out how strong the relationship between variables is, while the determination coefficient test (R²) is a structural model analysis used to measure how well independent variables influence the dependent variable in a model [37]. R² is an indicator that shows how accurate predictions are for the structure that has been built. The R² value ranges from 0 to 1, where values close to 1 indicate a high level of prediction accuracy. R and R² values can be categorized into three strength levels: ≥ 0.25 (weak), ≥ 0.50 (moderate), and ≥ 0.75 (substantial) [35]. The following are the results for the correlation coefficient and determination coefficient test.

TABLE 9
RESULTS OF CORRELATION COEFFICIENT (R) AND DETERMINATION COEFFICIENT (R²)

| | R | R-Square |
|---------------------|-------|----------|
| RL Total * KK Total | 0.876 | 0.767 |

Based on Table 9, the R value/correlation coefficient is 0.876, meaning that the relationship between the reverse logistics variable and the consumer satisfaction variable is very strong. Furthermore, it is known that the R² value is 0.767, which means that 76.7% of the variation in the consumer satisfaction variable can be explained by the reverse logistics variable in the model, the remaining 23.3% is explained by other factors outside the model. With R² of 0.767, it can be concluded that this model is in the substantial category, which means the relationship between the reverse logistics variable and consumer satisfaction is very strong.

E. Hypothesis Test

The t-test is used to measure the significance of the relationship between two variables. Before determining whether such a relationship exists, the first step is to identify the t_{table} value based on the degrees of freedom (df) = 98. This is done by considering the degrees of freedom and the predetermined two-tailed significance level, which corresponds to a 95% confidence level and a 5% statistical error rate ($\alpha = 0.05$). The t_{table} value for df = 98 is 1.664. If the t_{calculated} is greater than the t_{table} value (t_{calculated} > t_{table}), it indicates a significant relationship between the two variables. Below are the t_{calculated} values.

TABLE 10
T CALCULATED VALUE RESULTS

| | t |
|----------|--------|
| RL Total | 17.778 |

Based on Table 10, the t_{calculated} is 17,778 which is much greater than the t_{table}, namely 1,664. Therefore, **H₀** is rejected and **H_a** is accepted, so that the relationship between the reverse logistics variable and the consumer satisfaction variable in this research is very significant.

F. Discussion of Research Results

After completing the validity and reliability tests, the classical assumption test, the simple linear regression test, the correlation coefficient and determination coefficient tests, as well as the hypothesis test (t-test), a proper analysis of the existing problem needs to be conducted. The findings or calculations are explained according to real-world conditions and supported by relevant previous studies to provide a clear and well-rounded explanation.

The study on the impact of reverse logistics on consumer satisfaction at PT Nectars Natura Karya consists of a total of five dimensions across two variables—three dimensions for the reverse logistics variable (X) and two dimensions for the consumer satisfaction variable (Y). The dimensions for variable X include Return Initiation (with an indicator of submitting empty packaging returns), Select Disposition (with an indicator of recycling actions), and Credit Consumer (with an indicator of rewards for consumers). Meanwhile, the dimensions for variable Y include Expectations (with a service feedback indicator) and Satisfaction Toward Quality (with a consumer expectations indicator).

Referring to the results of the tests conducted using IBM SPSS 26, all indicators for both reverse logistics and consumer satisfaction variables are deemed valid, as confirmed by the r_{calculated} values being significantly greater than the r_{table} values. Additionally, the reliability of each variable also shows excellent results, indicating that the questionnaire is consistent and accurate. This is further supported by the Cronbach's Alpha value being greater than 0.6, demonstrating that the questionnaire is reliable.

The residuals of the regression model follow a normal distribution, meaning they fulfill the assumption of normality. Since the normality test produced favorable results, the regression model used can be considered valid regarding the assumption of residual normality. This is reinforced by the fact that most residual points on the P-Plot graph appear close to the diagonal line, whether at the beginning, middle, or end of the graph, indicating a residual distribution pattern that closely follows the diagonal line.

The relationship between reverse logistics and consumer satisfaction is also significantly linear, with no significant deviations. This is supported by the significance value for Linearity, which indicates that the relationship between the two variables is statistically significant and linear. Additionally, the significance value for Deviation from Linearity suggests that there are no significant deviations from a linear relationship. These results confirm that the relationship between the two variables is indeed consistently linear.

The relationship between reverse logistics and consumer satisfaction in this study is highly significant. This is confirmed by the rejection of the null hypothesis (H_0 : Reverse logistics has no impact on consumer satisfaction) and the acceptance of the alternative hypothesis (H_a : Reverse logistics affects consumer satisfaction). This conclusion is based on the $t_{\text{calculated}}$ value being significantly higher than the t_{table} value. Furthermore, this model falls into the substantial category, indicating a strong relationship between reverse logistics and consumer satisfaction. This statement is supported by the fact that 76.7% of the variation in consumer satisfaction can be explained by reverse logistics in the model, while the remaining 23.3% is influenced by other factors outside the model.

Based on the tests conducted, the findings align with previous research on The Impact of Reverse Logistics on Customer Satisfaction. That study stated that reverse logistics has a significant impact on customer satisfaction because it helps ensure a positive experience for customers when returning products. One of the most important effects of reverse logistics on customer satisfaction is the improvement of customer service. By offering return policies, companies can provide a better overall experience for consumers [38].

G. Managerial Implications

The analysis results indicate that reverse logistics has a significant impact on consumer satisfaction. Therefore, the company needs to integrate reverse logistics as part of its core business strategy to ensure a positive consumer experience. The first step to achieving this is simplifying the empty packaging return process, making it easily accessible to consumer. Implementing technology-based return services, such as a digital application that allows for real-time tracking of return statuses, can enhance consumer convenience. Additionally, the company must ensure that return locations are strategically distributed to be easily reachable, particularly in areas with high consumer volume.

Next, the company must ensure that the processing of shopping vouchers and responses to return requests or confirmations is swift and efficient. Excessive processing time can lead to a decline in consumer satisfaction. The company should regularly monitor its performance on the empty packaging return program using specific key performance indicators (KPIs), such as the average return processing time.

Beyond speed, the quality of consumer interaction during the reverse logistics process should also be a primary focus. The company should provide intensive training for consumer service staff responsible for handling returns to ensure they offer friendly, solution-oriented, and professional assistance. For instance, staff should be able to clearly explain the empty packaging return policy and provide satisfactory solutions in case of any issues. Effective communication will help reduce potential consumer frustration and strengthen brand loyalty.

Furthermore, the management of returned empty packaging should be optimized to create added value for the company. Eligible returned packaging can be inspected, refurbished, and reused for packaging purposes or repurposed into creative projects and other initiatives. This not only helps reduce product waste but also provides financial benefits for the company. On the other hand, damaged or unusable packaging should be responsibly managed, either through recycling or environmentally friendly disposal methods, reinforcing the company's image as a sustainability-conscious entity.

Beyond operational aspects, the company should actively communicate the advantages of its reverse logistics process to consumers. Marketing campaigns that highlight flexible and consumer-friendly packaging return policies can enhance brand appeal among both new and existing consumer. For example, the company could emphasize how its return process contributes to a risk-free shopping experience, thereby boosting consumer trust in the brand.

With this integrated approach, reverse logistics will not only serve as a support function in the supply chain but also as a strategic tool to enhance consumer satisfaction and strengthen long-term consumer relationships. A well-managed reverse logistics system will yield a significant competitive advantage for the company in an increasingly competitive market.

5. Conclusion

The core objective of this research was to analyze the effect of reverse logistics on consumer satisfaction at PT Nectars Natura Karya. The findings from the simple linear regression analysis strongly support a positive and significant relationship between the two variables. The regression model revealed that the reverse logistics variable explains a substantial portion of consumer satisfaction, demonstrating a very strong correlation ($R = 0.876$). Specifically, the coefficient of determination (R^2) indicated that 76.7% of the variation in consumer satisfaction can be attributed to the implementation of reverse logistics practices. The calculated t-value of 17.778 far exceeded the required critical value ($t_{table} = 1.664$), confirming that the alternative hypothesis (H_a) is accepted: reverse logistics has a positive and significant influence. Quantitatively, the equation $Y = 0.666 + 0.464X$ suggests that a one-unit increase in effective reverse logistics translates to a 0.464 unit increase in consumer satisfaction. These results underscore a crucial trend: modern consumers are increasingly factoring sustainability and corporate responsibility into their purchasing decisions. Successful management of reverse logistics dimensions—such as efficient product return requests, proactive recycling actions, and consumer rewards—is paramount. By implementing these effective practices, the company can build a positive brand image and foster enhanced consumer loyalty.

Based on these findings, it is recommended that PT Nectars Natura Karya maintains and continuously develops its reverse logistics programs to drive both environmental sustainability and further increases in consumer satisfaction. Future researchers are encouraged to expand the scope and incorporate additional variables, such as brand image and consumer loyalty, to gain a broader understanding of consumer satisfaction drivers.

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