



## Arrangement of Item Layout and Shopping Package Recommendations in Niki Laris Swalayan Using Double FP-Growth and Profit Percentage Value

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### ABSTRACT

The retail industry is an industry that has very high competition. The number of retail businesses has increased, which has led to heightened competition among retail companies. Competition between retail companies is centered on consumers' struggle, which is one of the main pillars in the company's survival. Niki Laris Swalayan also faces this competition. This competition requires management to innovate in service to consumers. One of the management strategies to maintain customer loyalty is to provide good service. This strategy is deemed less impactful for Niki Laris Swalayan. New strategies are needed to make a big impact. Recommendations for the layout of goods and recommendations for shopping packages are considered to have a big impact on increasing customer satisfaction and making these consumers loyal. Currently, Niki Laris Swalayan conducts product layout and promotions based solely on feelings and promos from distributors. We will use the Double FP-Growth method and the Percentage of Profit Value in recommending the layout of goods and recommendations for this shopping package. This method is considered to provide optimal results. The combination of these two methods will be evaluated by distributing questionnaires to consumers and internally to provide an overview of the changes that have occurred before and after the implementation of the recommendations given. After implementing the recommendations of this study, the results obtained are that there are positive changes after implementing the recommendations for the layout of the goods and the recommendations for the shopping packages given. This method proved to be more optimal than the

method previously applied by the management of Niki Laris Swalayan.

**Key words:** Association Rule, Products Layout, FP-Growth, Product Bundling

### 1. INTRODUCTION

The retail industry is all business activities related to selling goods or services directly with end consumers. This business has very high competition [1], [2]. One example of highly competitive retail industry is a supermarket. The rapid emergence of Swalayan has resulted in high competition for consumers.

Consumers are one of the most critical pillars in the survival of a retail industry business [3], [4]. With the increasing number of retail industries that have sprung up, consumers have many choices to shop. Some of the factors influencing consumers to shop in retail are an excellent layout of goods and promotions in the retail industry.

Niki Laris Swalayan is one of the Swalayan that compete in this competitive retail industry. From very high competition, Niki Laris Swalayan has reduced turnover due to fewer consumers who shop. The management of Niki Laris Swalayan wants to improve the layout of goods and make promotional shopping packages to increase consumers who shop at Niki Laris Swalayan. Arranging the layout of goods and promoting this shopping package is one of the marketing strategies that apply the CRM concept implemented by Niki Laris Swalayan.

This study uses transaction data at Niki Laris Swalayan, which will be processed using Double FP-Growth and Profit Percentage Value. This method is used to generate layout arrangements for shopping packages and promotional items. FP- Growth is the first used for item layout recommendations. Second FP Growth and Profit Percentage Value for shopping package promotion recommendations. The results of this method will be evaluated using a questionnaire and using the t-test to test the hypothesis.

## 2. LITERATURE REVIEW

Several researchers have conducted several studies on the topic of arranging the layout of goods and shopping packages. In 2011, a study combined the a priori algorithm with  $u\_gain$  and  $w\_gain$  and produced association rules that were more effective than the a priori algorithm [5]. In 2016, a study combined a priori algorithm with a utility weight score to determine a shopping package [6]. In 2017, a study used a priori algorithm to arrange the layout of goods and successfully recommended that items that were close together were related items [7]. In 2018, a study used the VMBA method to determine the order of transactions used to determine consumer habits in doing business [8]. In 2020, a study used the double association rule to complete the layout of goods and recommendations for shopping packages at Swalayan [9].

### 2.1 Data Mining

Data mining, also known as knowledge discovery in database (KDD), is an activity that includes active use of historical data to find regularities, patterns, or relationships in large data sets. The output from data mining can be used for future decision making [10].

### 2.2 Association Rule

Association Rule is a technique in data mining used to look for relationship patterns in data or databases. Pattern search in association rule is a search for patterns that often appear simultaneously [11].

### 2.3 Support

Support is a value that shows the percentage of all transactions that occur that contain certain itemsets [11]. The value of an item's Support is obtained by the formula in (1) and (2) [11]:

$$Support(A) = \frac{\sum Transaction A}{\sum Transaction} \quad (1)$$

$$Support(A, B) = \frac{\sum Transaction (A \cap B)}{\sum Transaction} \quad (2)$$

### 2.4 Confidence

Confidence is the value of the comparison between the support value of the item contained in the association rule and

the value of the support item that preceded it [11]. To find the value of confidence  $A \rightarrow B$  obtained by the formula in (3) [11].

$$Confidence = \frac{\sum Transaction (A \cap B)}{\sum Transaction A} \quad (3)$$

### 2.5 Lift Ratio

Lift Ratio is a value that shows the measure of the strength of the association rule. Lift Ratio values greater than 1 indicate a benefit from this rule. The higher the Lift Ratio value, the greater the strength of the association [11]. To find the value of Lift Ratio obtained by the formula in (4) and (5) [11].

$$Confidence Benchmark = \frac{\sum Transaction consequent}{\sum Transaction} \quad (4)$$

$$Lift Ratio = \frac{confidence}{benchmark confidence} \quad (5)$$

### 2.6 FP-Growth

The FP-Growth algorithm is a development of the a priori algorithm. This development lies in the scanning of the database and the accuracy of its rules. FP-Growth is more beneficial because it only scans the database once or twice, while a priori needs to do repeated database scanning [12].

Frequent itemset excavation using the FP-Growth algorithm will generate a data tree structure or called FPTree. The FP-Growth method can be divided into three main stages, namely:

1. The conditional pattern base generation stage.
2. The FP-Tree conditional generation stage.
3. The frequent itemset search stage.

### 2.7 Profit Percentage Value

The simple association rule method only describes the existence of a product in a transaction. The method of association rule with a binary basis which describes the existence of a product, whether or not it exists in one transaction. The simple association rule method ignores the quantitative information associated with an attribute on the product. One unused attribute in a simple association rule is one of the advantages of a product. The value of the profit percentage of a product will be used as an additional variable in the formation of the association rule. The profit percentage value is calculated by the formula shown in equation (6).

$$Profit Percentage Value = \frac{E Profit}{E Capital} \quad (6)$$

### 2.8 Evaluation

Evaluation is an activity of collecting, managing, and presenting data included in a decision-making process regarding a program that is or has been implemented [13]. In

another sense, evaluation is one of the activities to provide information that can be used to make decisions [14].

Product evaluation is the compilation of values regarding programs that are or have been implemented [13]. In other terms, program evaluation is a unit or activity unit that aims to collect information about the realization or implementation of a policy that occurs in an organization that involves a group of people for decision making [14].

Evaluation can be done by several methods, one of which is a questionnaire. The questionnaire is a data collection technique that can be done directly or indirectly through a form containing questions given to individuals, groups, or organizations. The purpose of this questionnaire is to collect data that will be processed into information from respondents [15]. Several scales used to take scores from the questionnaire, one of which is the Likert scale. The Likert scale is used to measure people's attitudes, opinions, and perceptions about social phenomena [16]. The Likert scale can be used to assess the success of a policy or program.

**Population and Samples**

The population is an area or area consisting of objects or subjects with specific qualities and characteristics determined by the study. The population is not only people but also objects and objects [16].

The sample is part of the number and characteristics of the population. Sample selection is required to represent a predefined population [16].

**Hypothesis**

The hypothesis is a temporary answer to the study's problem formulation, where the researcher in an interrogative sentence has stated the problem statement. The hypothesis is temporary because the answers given are only based on relevant theories, not yet based on empirical facts obtained through data collection. When research is quantitative, hypotheses are used, while qualitative research does not formulate a hypothesis [16].

**Validity test**

The validity test is an instrument to assess that respondents' contents can be understood by respondents and can be used to calculate the correlation between each score of the instrument and the total score. The evaluation instrument is valid if the instrument can measure what will be measured appropriately [16]. To find out the value of the validity test is shown in the equation (7).

$$r_{xy} = \frac{n(\sum_{i=1}^n xy) - (\sum_{i=1}^n x)(\sum_{i=1}^n y)}{\sqrt{(n\sum_{i=1}^n x^2 - (\sum_{i=1}^n x)^2)(n\sum_{i=1}^n y^2 - (\sum_{i=1}^n y)^2)}} \quad (7)$$

To assess an instrument's validity by looking for a correlation

between the questions and the total score. If the instrument ( $r_{count}$ ) exceeds the  $r_{table}$  value with a significance of 5% then the instrument is valid.

**Reliability Test**

Reliability is an index that shows the extent to which the measuring instrument used can be trusted and relied upon[16]. In another sense, reliability is also defined as an indicator of the level of reliability or confidence in a measurement result. An instrument is called reliable if it has the same consistency of answers [17]. To find out the value of the reliability test is shown in the equation (8).

$$r_{11} = \left[ \frac{k}{(k - 1)} \right] \left[ 1 - \frac{\sum \sigma^2 b}{\sigma^2 t} \right] \quad (8)$$

To assess the reliability of the measuring instrument, it can be seen from the Cronbach Alpha value if it exceeds 0.6, the questionnaire is declared reliable, and if it is less than 0.6, then the questionnaire is declared unreliable.

**Normality Test**

The normality test is one of the instrument tests carried out to assess the distribution of data in a particular group of data or variables, whether the distribution of the data is normally distributed or not. The normality test results are important because they are related to choosing the right statistical test to use [18]. To find out the value of the reliability test is shown in the equation (9), (10) and (11).

$$T_3 = \frac{1}{D} \left[ \sum_{i=1}^k \alpha_i (K_{n-i+1} - x_i) \right]^2 \quad (9)$$

$$D = \sum_{i=1}^n (K_i - \bar{X})^2 \quad (10)$$

$$G = B_n + C_n + 1n \left( \frac{T_3 - d_n}{1 - T_3} \right) \quad (11)$$

The data is said to be normally distributed if the Shapiro-Wilk value is sig> 0.05. On the other hand, those that are generally not distributed have a sig <0.05.

**T-test**

The dependent sample t-test is the t-test for related groups, used in research where subjects or respondents are sampled twice to determine whether there are significant differences regarding the effects of a phenomenon [17]. To find out the value of the T test is shown in the equation (12).

$$t = \frac{x_{diff}}{s_{diff} / \sqrt{N}} \quad (12)$$

After the  $t_{count}$  value is known, it is compared with the  $t_{table}$  value. If the value of  $t$  is greater than  $t_{table}$ , the null hypothesis is rejected, and hypothesis one is accepted. If  $t$  count is smaller than  $t_{table}$ , then the null hypothesis is accepted, and hypothesis one is rejected.

### 3. PROPOSED METHOD

This research was conducted at Niki Laris Swalayan to arrange the layout of goods and manage shopping packages to increase customer satisfaction. The research steps to be carried out in this study are shown in Figure 1.

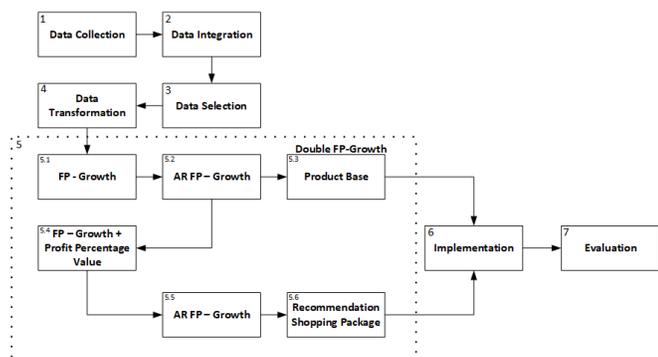


Figure 1: Proposed Method

Figure 1 is a picture that explains the steps to be carried out in this study. The first step is to collect transaction data at Niki Laris Swalayan. The data collected is transaction data with the data period from August 2018 to July 2019. The next step is data integration. At this stage, data sets are merged from several databases into one database. The next step is Data Selection. At this stage, the separation between used and unused datasets is carried out. The next step is Data Transformation. At this stage, changing the data that was previously transactional data is converted into tabular data/binary data. The next step is the data mining step.

The first data mining step is to use the first FP-Growth. FP-Growth is first used to recommend the arrangement of the layout of items with general categories of data categories. After that, a second FP-Growth is carried out and combined with the percentage of the profit value used to recommend shopping packages. After the rules for the layout of goods and recommendations for shopping packages have been formed, implementation and evaluation are carried out. The next step is evaluation. At this stage, evaluation is carried out by distributing questionnaires to consumers and management twice and given before and after implementation. This questionnaire is used to test which hypothesis is selected.

### 4. RESULT AND ANALYSIS

This section will discuss the steps that will be carried out in this research. Each step carried out will be described in this section.

### 4.1 Data Collection

The data used in this study are transaction data at Niki Laris Swalayan with the period August 2018 to July 2019. The transaction data obtained includes data from the goods table and transaction table. These tables have the structure shown in Tables 1 and 2.

Table 1: Product Table in Database

Product Id	Product Name	Purchase Price	Sell Price	Quantity
10038	HATARI VANILA 250/210	6000	7000	PCS
10209	FOX'S 90 MINTS/967	5563	6500	PCS
.				
.				
.				
10205	FREASTEAL MLT 900/016	7668	9000	BTL

Table 2: Transaction Table in Database

Transaction Id	Product Id	Sell Price	Qty	Total
3180801000 1	3415	13500	1	13500
3180801000 1	4425	5000	1	5000
3180801000 2	7435	17500	1	17500
.				
.				
3190301000 1	1205	5000	1	5000

Table 1 is a table that describes the items sold at Niki Laris Swalayan. The total number of items sold at Niki Laris Swalayan is 11,031 items. Table 2 is a table that describes the transactions that have occurred in detail.

### 4.2 Data Integration

The data integration process is carried out from the sales transaction data obtained from Niki Laris Swalayan. Data integration is done by combining general categories and specific categories of each item. General categories are used for recommendations on the layout of goods, while specific categories are used for recommendations for shopping packages. General category data and specific category data can be seen in the table 3 and 4.

Table 3: General Categories

General Category ID	General Category Name
1	Herbs
2	Processed Food
3	Snack
4	Processed Drink
5	Instant Drink
6	Medicines and Vitamins

**Table 4:** Specific Categories

Specific Category ID	Specific Category Name	General Category ID
21	Oil	1
27	Sardines	2
16	Snack	3
.		
24	Medicines	6

**4.3 Data Selection**

A data selection process is carried out at this stage, separating the data used in this study and the data not used. This research only examines the category of basic needs (daily needs), so all transactions that are not transactions containing staple goods are not used. The amount of data used and not used is shown in Table 5.

**Table 5:** Data Selection

Variable	Total Data
Number of Transaction Details Before Data Selection	182.276
Number of Transaction Details After Data Selection	148.145
Number of Items Before Data Selection	11.164
Number of Items After Data Selection	3.339

**4.4 Data Transformation**

At this stage, the transaction detail data, which was previously transactional data, is converted into boolean tabular data. This step was carried out twice. The first was to convert transactional data into tabular boolean data with general categories and the second with specific categories based on the results obtained in Single FP-Grown. Data Transformation changes are shown in Tables 6 and 7.

**Table 6:** Transaction

Id transaction	Id product	Sell Price	Qty	Total
3180908001				
2	7693	13500	1	13500
1181014003				
3	7693	13500	2	27000
1181020004				
5	7693	13500	3	40500
1181024004				
5	7693	13500	4	54000
2181031003				
3	7693	13500	5	67500
4190121023				
8	7693	13500	2	27000
2190123011				
9	7693	13500	1	13500
4190123003				
1	7693	13500	4	54000

**Table 7:** Tabular Data

Id Transaction	Id General Category					
	1	2	3	4	5	6
1181005000						
7	0	1	0	0	0	0
1181005000						
8	0	0	0	1	0	0
1181006000						
5	0	0	0	1	0	0
1181006000						
7	1	1	0	1	0	0
1181006000						
8	0	0	0	1	0	0

**4.1 Single FP-Growth**

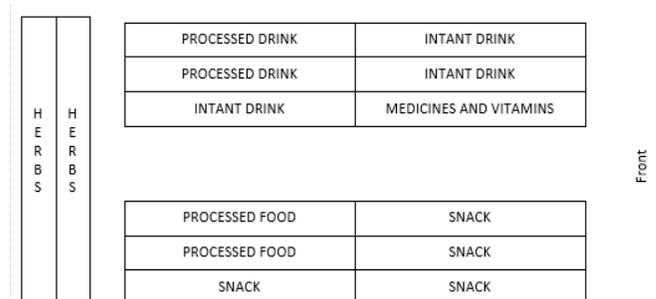
This stage an analysis using FP-Growth is used to see the interrelationships between product categories. FP-Growth requires a reference value that must exist, namely confidence and support. This stage using threshold support 22% and confidence 54%, this value is obtained by trial and error. The results of this stage produce 5 association rules which are shown in Table 8.

**Table 8:** Single FP-Growth

No	Antecedent	Consequence	Support	Confidence	Lift Ratio
1	Instant Drink	Processed Drink	0.28	0.54	1.4
2	Snack	Instant Drink	0.35	0.57	1.1
3	Processed Food	Snack	0.22	0.58	1
4	Instant Drink	Snack	0.35	0.68	1.1
5	Processed Drink	Instant Drink	0.28	0.73	1.4

**4.1 Product Layout Recommendation**

At this stage, the association rules formed from a single FP-Growth will be used as the basis for making recommendations for item layouts. The recommended item layout can be seen in Figure 2.



**Figure 2:** Item Layouts Recommendation

Figure 2 is the layout of the items generated from the association rules formed from the single FP-Growth. From the five association rules formed, there are three combinations, namely:

1. It was bringing items in the Instant Drinks category closer to Processed Drinks. The layout between the items in the Instant Drinks and Processed Drinks category is placed by placing the best-selling items at the end of each item shelf with the assumption that was getting to the middle of the shelf the less salable items from each category in the hope that it can increase sales of fewer items (impulse buying).

2. Bring items in the Snack category closer to Instant Drinks. The layout between the Snack and Instant Drink categories is placed by placing the best-selling items at the end of each item shelf, assuming that getting to the middle of the shelf, the less salable items from each category are in the hope of increasing sales of fewer items.

3. Bring items in the Snack category closer to Processed Foods. The layout between the items in the Snack and Processed Food category is placed by placing the best-selling items at the end of each item shelf with the assumption that the less salable items from each category are getting to the middle of the shelf in the hope that it can increase sales of less-selling items.

Of the three combinations, two categories have not been recommended in the items' layout, namely the Herbs with Medicines and Vitamins category. For recommendations on the layout of goods for the category of Medicines and Vitamins, it is placed on the front adjacent to Snacks and Soft Drinks because there are not enough Medicines and Vitamins available at Niki Laris and can be placed between Snacks and Instant Drinks. Meanwhile, the Herbs category's recommended item layout is placed on the back row because most items in this category have large dimensions and have quite some types of goods.

**4.1 Double FP-Growth**

At the Double FP-Growth stage, a mining process will be carried out based on specific categories. Specific categories are used in the second stage because if it is carried out in the first stage (Single FP-Growth), the results obtained cannot be used as a recommendation for the layout of the goods because it is possible that the recommendations for the layout of the goods will occur randomly besides that if the specific category is used for the first stage the item variables used too much. At this stage, the mining process is based on a particular category of association rules that have been formed from the mining process in Single FP-Growth. Of the five association rules formed, there are three general category combinations. The three combinations are shown in Table 9.

**Table 9:** General Category Combination

No	Antecedent	Consequence
1	Instant Drinks	Processed Drinks
2	Snack	Instant Drinks
3	Processed Food	Snack

The results of the rules for the association of Instant Drinks and Processed Drinks with threshold support of 12% and confidence of 56% are shown in Table 10.

**Table 10:** Double FP-Growth

No	Antecedent	Consequence	Support	Confidence	Lift Ratio
1	Tea	Instant Drinks	0.12	0.56	1.05
2	Instant Drinks	Sugar	0.31	0.57	1.38
3	Sugar	Instant Drinks	0.31	0.75	1.38

The results of the rules for the association of Snack and Instant Drinks with threshold support of 15% and confidence of 63% are shown in Table 11.

**Table 11:** Double FP-Growth

No	Antecedent	Consequence	Support	Confidence	Lift Ratio
1	Candy	Snack	0.15	0.63	0.7
2	Mineral Water	Snack	0.29	0.80	1
3	Instant Milk	Snack	0.31	0.84	1
4	Instant Drink	Snack	0.23	0.88	1

The results of the rules for the association of Processed and Snack with threshold support of 30% and confidence of 92% are shown in Table 12.

**Table 12:** Double FP-Growth

No	Antecedent	Consequence	Support	Confidence	Lift Ratio
1	Noodle	Snack	0.59	0.92	1
2	Sardines	Snack	0.41	1	1.05
3	Noodle, Sardines	Snack	0.30	1	1.05

**4.1 Profit Percentage Value**

Profit Percentage Value is the valuable profit from each association rule formed from the previous process. It can be seen in the Table 13.

**Table 13:** Profit Percentage Value

No	Antecedent	Consequence	Profit Percentage Value
1	Tea	Instant Drinks	15%
2	Instant Drinks	Sugar	12%
3	Sugar	Instant Drinks	12%
4	Candy	Snack	17.6 %
5	Mineral Water	Snack	16.4 %
6	Instant Milk	Snack	16.2 %
7	Instant Drink	Snack	15.6 %
8	Noodle	Snack	15.8 %
9	Sardines	Snack	16.5 %
10	Noodle, Sardines	Snack	15.9 %

Table 13 is the association rule resulting from the Double FP-Growth step and the Profit Percentage Value. The association rules will later be used for shopping package recommendations.

#### 4.1 Shopping Package Recommendation

The shopping package recommendation is determined from the profit percentage value, with a minimum profit percentage value of 15%. The profit percentage threshold of 15% is determined by discussion with the management of Niki Laris Swalayan. With a minimum profit percentage value of 15%, there are seven shopping package recommendations, which are shown in Table 14.

**Table 14:** Shopping Package Recommendation

No	Shopping Package
1	Tea, Instant Drinks
2	Candy, Snack
3	Mineral Water, Snack
4	Instant Milk, Snack
5	Instant Drink, Snack
6	Noodle, Snack
7	Sardines, Snack
8	Noodle, Sardines, Snack

Table 14 is a table that describes the combination of each product category that will be used as a shopping package recommendation. The strategy applied to compile this combination is by applying one product that is a superior product and another with a product that is under-selling to increase the sales of each product that is experiencing fewer sales. One example is Candy with Snack, items with the candy category are selected items that sell well and items with the category of snack items that are not selling well or vice versa.

#### 4.1 Evaluation

The result of single FP-Growth is a recommendation for item layout arrangement. The result from Double FP-Growth combined with the profit percentage value is a shopping package recommendation. To evaluate the results of this method, a questionnaire was used to test the hypothesis. There are several steps that will be taken for this evaluation.

**Hypothesis**, the hypotheses used in this evaluation are shown in Table 15.

**Table 15:** Hypothesis

	Hypothesis
H <sub>0</sub>	There is no difference in consumers' average satisfaction before and after the implementation of product layout recommendations and shopping package recommendations.
H <sub>1</sub>	There is a difference in consumers' average satisfaction before and after the implementation of product layout recommendations and shopping package recommendations.

**Questionnaire**, this questionnaire is a questionnaire with a Likert scale, for the contents of the questionnaire can be seen in table 16.

**Table 16:** Questionnaire

No	Question	SD	D	SA	A	STA
1	Often shopping at Niki Laris (min 1x / week)					
2	Trouble finding the product you are looking for					
3	There is an attractive promo					
4	Buying unplanned items					
5	Good service at Niki Laris					
6	Get items that match the promo					
7	It doesn't take long to shop					
8	Easy to find items					
9	Save on spending on shopping					
10	The layout of the items is neat and easy to find					

Note:

SD = Strongly Disagree      A = Agree  
 D = Disagree                      STA = Strongly Agree  
 SA = Simply Agree

**Sample and population**, the number of sample respondents in this study amounted to 30 people who are consumers at Niki Laris Swalayan and for a population of 47 people who are consumers of Niki Laris Swalayan.

At this stage of the evaluation, the questionnaire will be distributed to consumers before and after implementation. To make consumers who have filled out the questionnaire before implementation come back to fill out the questionnaire after implementation, a voucher worth Rp. 20,000.00 with a specific time. After the respondent's results are obtained, the hypothesis test will be carried out using the t test.

**Validity Test**, the results of the validity test conducted on sample respondents can be seen in Table 17.

**Table 17:** Validity Test

No	r <sub>count</sub>	r <sub>table</sub>	Result
1	0.618	0.361	Valid
2	0.413	0.361	Valid
3	0.461	0.361	Valid
4	0.575	0.361	Valid
5	0.558	0.361	Valid
6	0.604	0.361	Valid
7	0.394	0.361	Valid
8	0.362	0.361	Valid
9	0.426	0.361	Valid
10	0.362	0.361	Valid

Table 17 shows that all instruments are valid instruments.

**Reliability Test**, the results of the reliability test conducted on the sample respondents can be seen in Table 18.

**Table 18:** Reliability Test

Cronbach's Alpha	N of Items
0.636	10

Table 18 is a table that shows the reliability test value that exceeds 0.6, and it can be concluded that this questionnaire is a reliable and valid questionnaire.

**Normality Test**, The normality test is used to see whether the data is normally distributed or not. At this stage, the normality test is carried out at the time after and before application to the respondent population. The results of the normality test can be seen in Table 19.

**Table 19:** Normality Test

	P value
Before Implementation	0.112
After Implementation	0.123

Table 19 is the results of the normality test using the Shapiro-Wilk calculation, which shows the results exceed 0.05 which indicates that the data is normally spread,

**T-Test**, the T-test is used to test the hypothesis in this calculation using the dependent t-test with the results shown in Table 20.

**Table 20:** T-Test

	P value
Pre-Test	25.85
Post-Test	36.14
P-value	$< 2.2e^{-16}$

Table 20 is a table that describes the results of the t-test. The results of the t-test obtained p-value  $< 2.2e^{-16}$ . The P-value is less than 0.05, which indicates that  $H_0$  is rejected, and  $H_1$  is accepted.

## 5. CONCLUSION

Based on the Double FP-Growth method results and the percentage value of profit that recommends the layout of goods and recommendations for shopping packages, it can be applied at Niki Laris Swalayan. Arranging the layout of goods and recommendations for shopping packages can increase customer satisfaction, as evidenced by the T-test results, which results in a difference in the average satisfaction of consumers before and after implementing the product layout recommendations and shopping package recommendations.

Based on the analysis that has been done, several deficiencies can be developed in other studies. Therefore, for further research, it is recommended to use more complex transaction data, use more data that can improve the accuracy of association rules, a more diverse category of goods, and add new parameters to provide better results.

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