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# ALGORITHM ANALYSIS TO DETERMINE THE ORDER OF GOODS AT THE COMPANY PT. SAGAMI INDONESIA MEDAN

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## Abstract

### Article Info

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The amount of competition in the business world, especially in the electronics industry, requires developers to find a strategy that can increase product orders at electronic companies. With daily printing activities, the data will increase over time. The data not only serves as an archive for the company, the data can be utilized and processed into useful information for increasing product orders. The data not only serves as an archive for the company, the data can be utilized and processed into useful information for increasing product orders. A priori algorithm is a market basket analysis algorithm that is used to generate association rules. Association rules can be used to find a relationship or cause and effect. Association rules can be generated with a priori algorithm. An a priori algorithm that aims to find frequent itemsets is run on a set of data. Market basket analysis is one of the techniques of data mining that studies consumer behavior in buying goods simultaneously at one time. The purpose of this research is to analyze product order data to form a pattern of itemsets combination using a priori algorithm, to form rules with association rules, to implement data mining by using Tanagra 1.4 tools. Stages of this research method have several stages including literature study, field research (field research), analysis, discussion of analysis based on the method used,

Keywords: Data Mining; Association Rules; Apriori Algorithm; Knowledge; Market Basket Analysis

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## 1. Introduction

The amount of competition in the business world, especially in the electronics industry, requires developers to find a strategy that can increase product orders at electronic companies. With daily printing activities, the data will increase over time. Therefore, every company must have a good data processing system so that the data generated from these transactions can be useful to be made into a monthly or annual report. The data not only serves as an archive for the company, the data can be utilized and processed into useful information for increasing product orders.

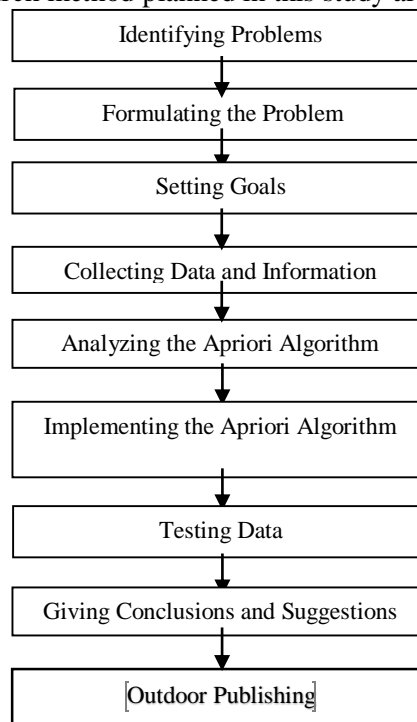
Data mining is a process that employs one or more computer learning techniques (machine learning) to analyze and extract knowledge automatically. Knowledge Discovery in Databases is the application of scientific methods to data mining. In this context data mining is one step of the KDD process. (Source: Fajar Astuti Herawati, 2018: 3). The a priori algorithm is the most famous algorithm for finding high frequency patterns. Formation of candidate itemset, candidate k-itemset is formed from the (k-1)-itemset combination obtained from the previous iteration. One way of the a priori algorithm is the pruning of candidate k-itemsets whose subsets containing k-1 items are not included in the high-frequency pattern with length k-1. Calculation of support from each candidate k-itemset. Support from each candidate k-itemset is obtained by scanning the database to count the number of transactions

containing all items in the candidate k-itemset. This is also a feature of the a priori algorithm where it is necessary to calculate by scanning the entire database as many as the longest k-itemset. Set the high frequency pattern. The high-frequency pattern containing k items or k-itemsets is determined from candidate k-itemsets whose support is greater than the minimum support. If no new high frequency pattern is found, the whole process is stopped. If not, then k is added by one and returns to part 1. (Source: Kusriani, 2017: 87-91). This is also a feature of the a priori algorithm where it is necessary to calculate by scanning the entire database as many as the longest k-itemset. Set the high frequency pattern. The high-frequency pattern containing k items or k-itemsets is determined from candidate k-itemsets whose support is greater than the minimum support. If no new high frequency pattern is found, the whole process is stopped. If not, then k is added by one and returns to part 1. (Source: Kusriani, 2017: 87-91). This is also a feature of the a priori algorithm where it is necessary to calculate by scanning the entire database as many as the longest k-itemset. Set the high frequency pattern. The high-frequency pattern containing k items or k-itemsets is determined from candidate k-itemsets whose support is greater than the minimum support. If no new high frequency pattern is found, the whole process is stopped. If not, then k is added by one and returns to part 1. (Source: Kusriani, 2017: 87-91).

## 2. Method

### 2.1 Rules

The following stages of the research method planned in this study are as follows:



## 3. Results and Discussion

### 3.1 Data requirements

#### A. Problem analysis

In this stage, explaining the process of how to analyze the determination of the order level at PT. Sagami Indonesia Medan. Order data analysis is carried out after the data is collected and in accordance with the needs of this system, therefore to produce conclusions based on this data analysis. Data analysis was carried out based on a priori algorithm technique with several predetermined steps. The data taken is product order transaction data from 2016 to December 2017 at PT. Sagami Indonesia Medan.

Table 1  
List of Goods Orders 2016 to 2017

No	Name of goods	Amount
1	Home Electronics	800
2	Smartphones.	3000
3	Car Audio	4500
4	LED Lighting	600

The process of forming C1 or called 1 itemset with a minimum amount of support = 55% With the following formula. From the combination of 2 itemsets that have been found, it can be seen the magnitude of the support and confidence values of the candidate association rules as shown in the table below:

Table 2  
Association Rules

Rule	Confidence
<i>If you order Household Electronics, you will order a Smartphone</i>	9/10 90%
<i>If you order Home Electronics, you will order Car Audio</i>	7/10 70%
<i>If you order Home Electronics, you will order an Audio Sensor</i>	2/10 20%
<i>If you order a Smartphone, you will order Car Audio</i>	7/11 63.63%
<i>If you order a smartphone, you will order LED lighting</i>	2/11 18.18%
<i>If you order a smartphone, you will order a sensor</i>	2/11 18.18%

The final association rules are ordered based on the specified minimum support and minimum confidence, which can be seen in the table below:

Table 3  
Final Association Rules

Rule	Support	Confidence
<i>If you order Household Electronics, you will order a Smartphone</i>	55%	90%

So, based on the table above, the most ordered items are Home Electronics and Smartphones. By knowing the most ordered items, the company can find out which items are most ordered.

#### B. Implementation

The a priori implementation in this study uses the Tanagra application for testing. Step 1. Make tabular format on Ms. Excel worksheet.

Table 4  
Tabular Data With Ms.Excel

Month	Home Electronics	Smartphone	Car Audio	LED Lighting	Sensor
1	1	1	1	0	0
2	1	1	1	0	0
3	1	1	1	0	0
4	1	1	0	0	1

5	1	1	0	0	1
6	1	1	1	0	0
7	0	1	1	1	0
8	1	1	0	0	0
9	1	1	1	0	0
10	0	1	0	1	0
11	1	1	1	0	0
12	1	0	1	0	0

The tabular format is saved on a Microsoft Excel worksheet. Microsoft Excel is the database for tabular data storage, with Save as type being Excel 97-2000 Workbook. Microsoft Excel will be connected to tanagra. Open the Tanagra Application on the laptop or computer that has been installed. This step is taken to open and start using tanagra to be able to find min.Support and min.Confidence. To start using tanagra, select file New. New is selected because it will be connected to a newly created database or one that has not been stored in tanagra. Then a display like the following will appear, then click the folder in the dataset. Here's a picture of how it looks.

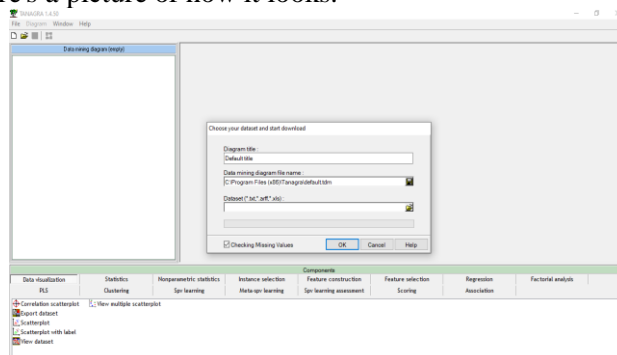


Figure 1. Connecting to the Database

Then a display like the following will appear, then change File type to Excel File (97 & 2000. " xls), because the saved database must be in the form of an Excel File.

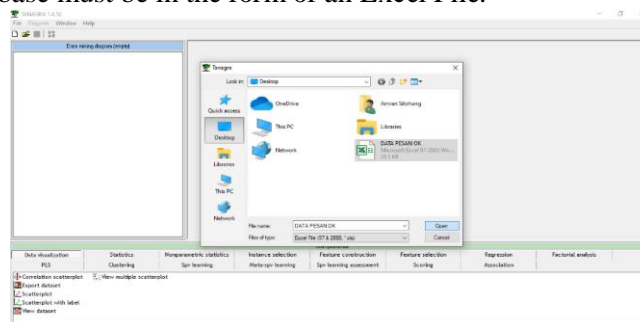


Figure 2. Database in document

Files saved in Excel format will be read immediately, then select the database to connect to tanagra. After the File name is filled, then click Open to connect the selected database to tanagra. Then an image like the following will appear. The dataset will be filled with the name of the database that was created and after clicking OK, the database and tanagra have been connected.

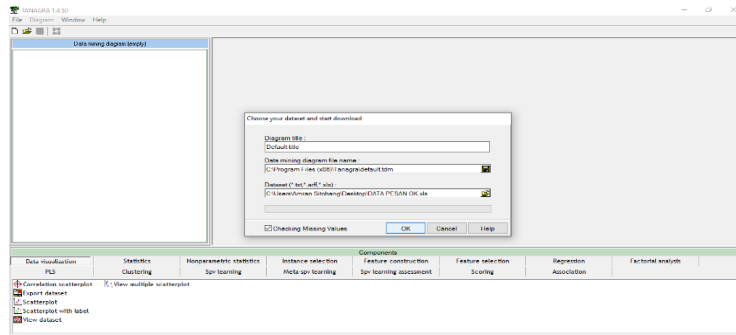


Figure 3. Connecting the Database

The display will appear if the database and tanagra are truly connected, the items in the database have been displayed.

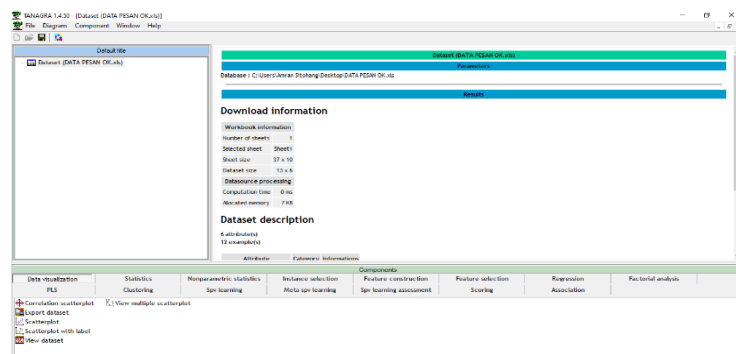


Figure 4. Display of tanagra connected to database

The icon is clicked to open the attribute column containing items from the database.



Figure 5. To display Attributes

This display image aims to display the items that will be entered into the input field. The first step is to enter items from the attribute column into the input field by clicking on the items in the attribute column. Move the attribute to the input box by clicking the Home Electronics attribute. Then click the arrow, then the input field will be filled with Household Electronics. The arrow between the attribute column and the input field serves to enter items in the attribute column into the input field.

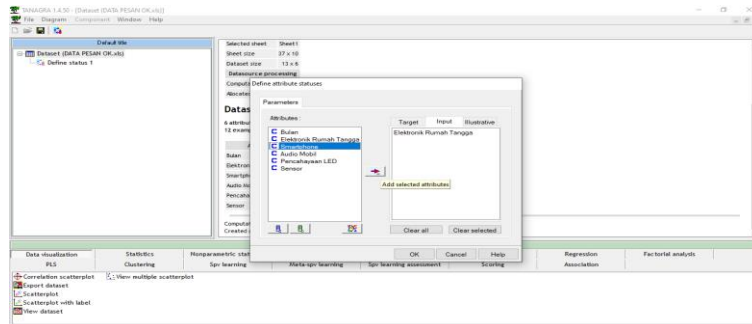


Figure 6. Attributes display in the Database and moving Attributes to the input box.

Fill in the input field with all the existing attributes in the same way as above. After all the items in the attribute enter the input field, click OK which serves to display the items that have been entered.

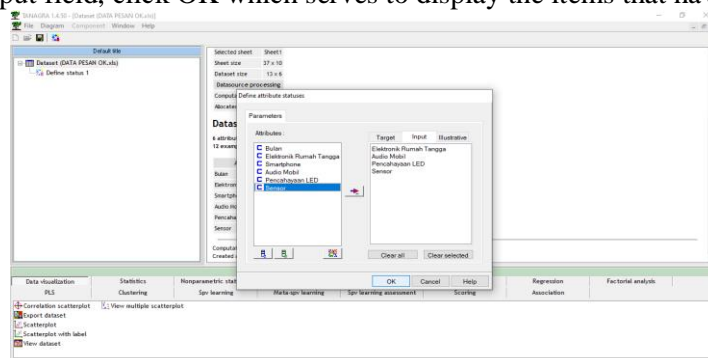


Figure 7. All Attributes have been moved.

Then a display like the following will appear indicating that the items were successfully entered into the input field.

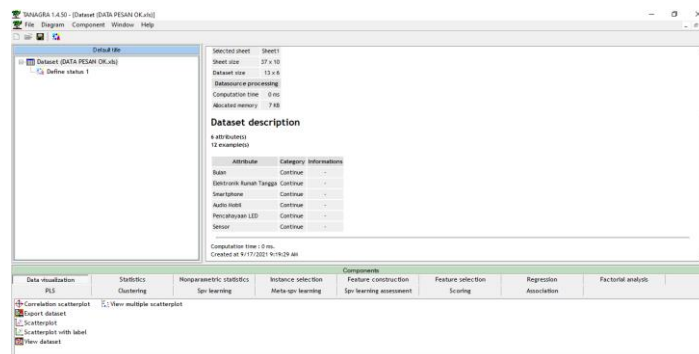


Figure 8. Display of attributes that have been moved

Then, click Association to start searching for frequent itemsets from the items that have been entered.

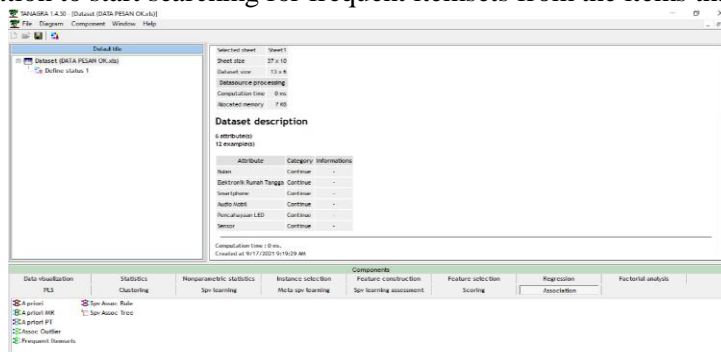


Figure 9. Starting to Use the Apriori Algorithm.

Select frequent itemset, drag override define status 1 if not override define status 1, then frequent itemsets will not be found.

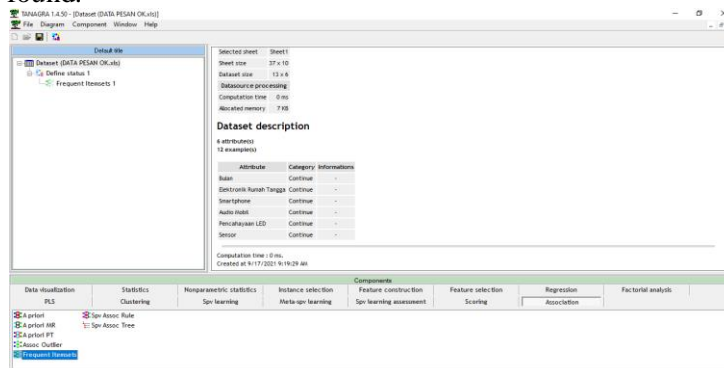


Figure 10. Starting Itemsets Formation.

Right click, select parameter to specify min.Support freequent itemsets from inputted items.

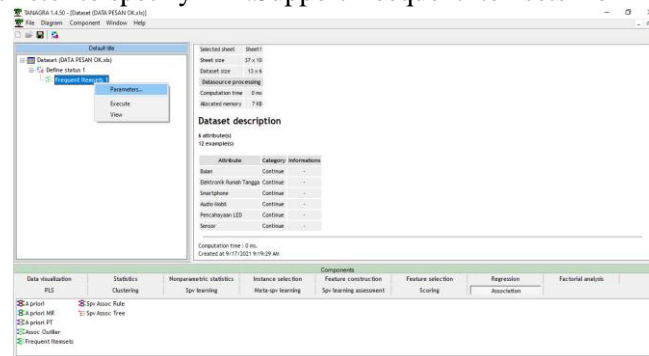


Figure 11. Start Determining Support.

Then change Min Support to 0.55 because the specified min.support is 55%. Then after changing min.support to 55% then click OK.

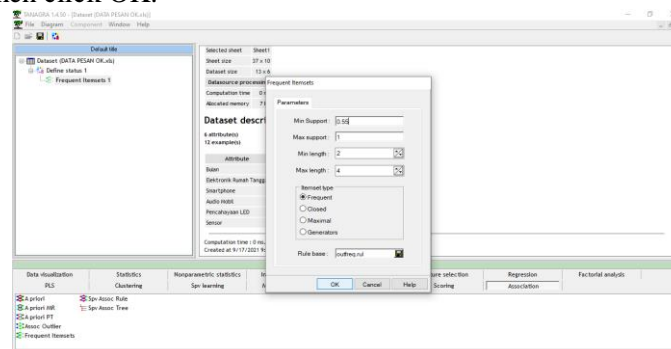


Figure 12. Done Determination of Minimum Support.

To process Frequent itemsets, right click on frequent itemsets, then click execute. Execute is selected to execute or process frequent itemsets that meet min.support.



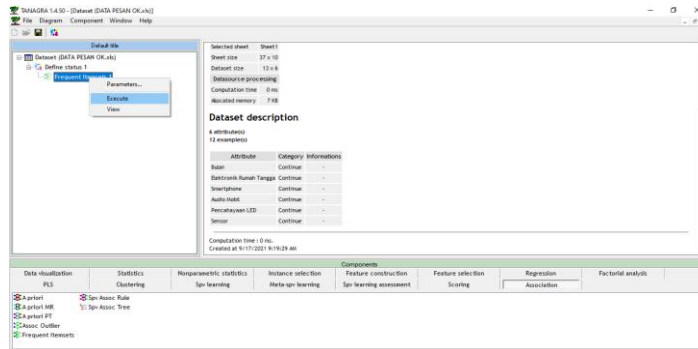


Figure 13. Options for Processing Itemsets.

To view the results of Frequent Itemsets, right-click on Frequent itemsets then click View. View serves to see the results of the execution of itemsets that meet min.support.

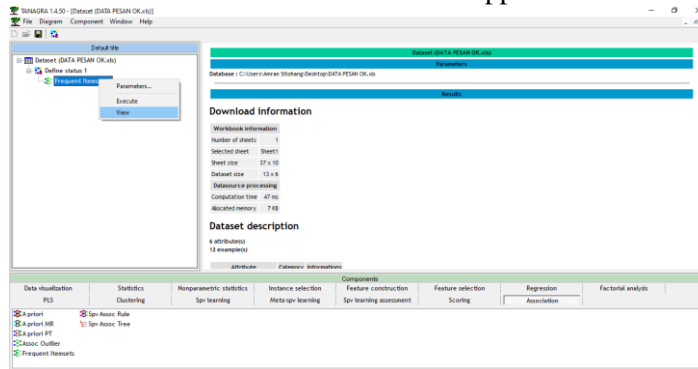


Figure 14. Options for Viewing Itemsets . Results

Then frequent itemsets will appear that meet Min Support.

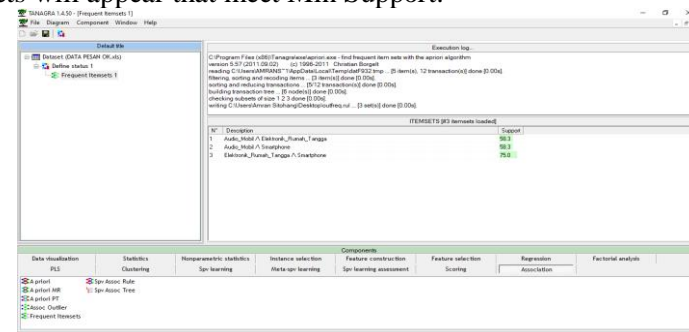


Figure 15. Results of the Formation of Itemsets.

To find the final association results, click Apriori and then drag override Define status 1 so that you can find items that meet min.support and min.confidence.

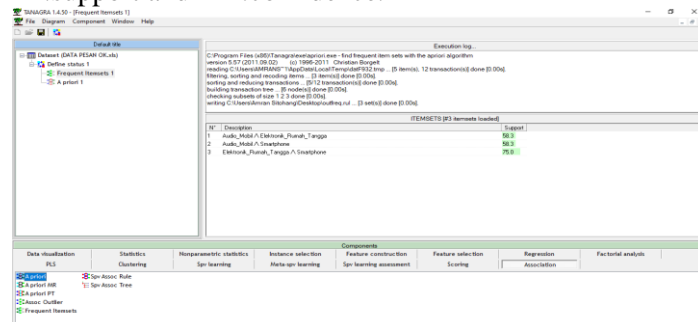


Figure 16. Options For Establishing Association Rules.



To process the final association, right-click on a priori, then click on parameters. Parameters function to determine min.support and min confidence to get the final association.

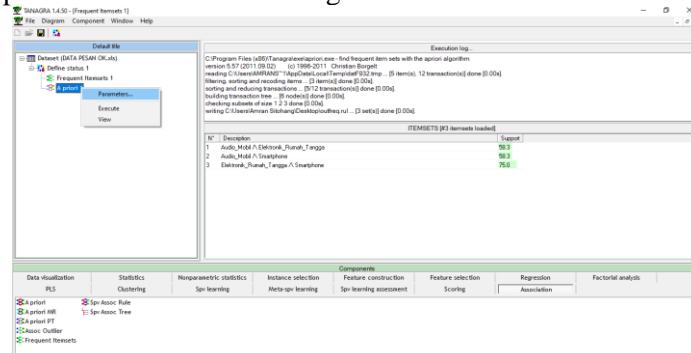


Figure 17. Options for Determining Support and Confidence

Then the following image will appear, then change the support to 0.55 and change the confidence to 0.90 to find the results of the final association, then click OK to close the parameter form.

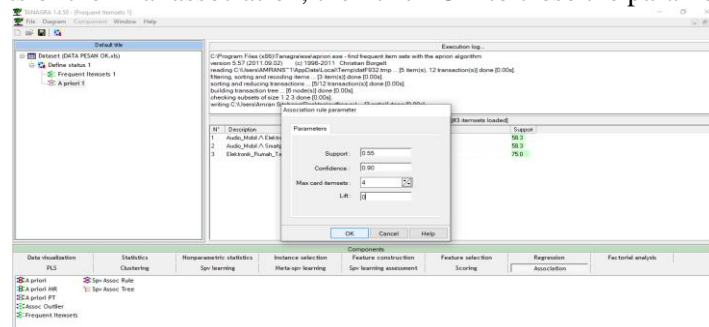


Figure 18. Display Form To Establish Support and Confidence.

To process the final association, right-click on Apriori, then click Execute. Execute is selected to execute or process the final association that meets min.support and confidence.

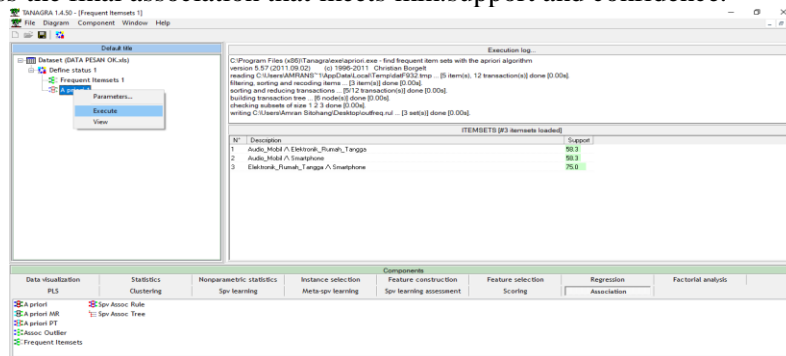


Figure 19. Options for Processing Final Associations.

To display the results of the final association, right-click on Apriori then click View, it will display the results of the final association.

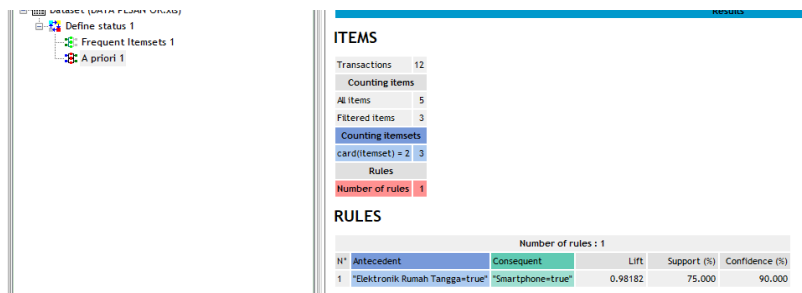


Figure 20. Final Association Results

After testing, the results obtained that meet min.support and min.Confidence, the results are Household Electronics, and Smartphones.

#### 4. Conclusions

Based on the research that has been done, the authors conclude that: Printed goods are the most ordered at the company PT. Sagami Indonesia Medan can be identified using the a priori algorithm, by looking at products that meet minimum support and minimum confidence, the most ordered items are household electronics and smartphones, but calculating support and confidence is difficult if the data is processed in large quantities. Apriori algorithms can help develop marketing strategies by providing advice to consumers. The implementation of the Apriori Algorithm in Tanagra begins with inputting monthly order data into a database in Ms. Excel, the more data, the more difficult it will be to create a tabular table.

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