



Sales Transaction Analysis at Barokah Minimarket With the Implementation of the Apriori Algorithm

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Abstract: Minimarket Barokah is a minimarket located in Rafflesia Hospital, Bengkulu City. Minimarket Barokah is owned by the Rafflesia Hospital Foundation Bengkulu. The sales focus or target market targeted by Minimarket Barokah is visitors from Rafflesia Hospital, families of patients, and employees of the hospital. Data mining, often also called knowledge discovery in database (KDD), is an activity that includes collecting, using historical data to find regularities, patterns or relationships in large data sets. The output of data mining can be used to improve future decision making. Apriori algorithm is the most famous algorithm for finding high frequency patterns. The Apriori algorithm can be used in the sales process by providing a correlation between sales data, in this case the food or drinks purchased will get a consumer purchase pattern. The minimarket can use this information to take actions that increase profits for the minimarket owner. It is expected that the barokah minimarket always updates transaction data gradually so that this application can provide sales information based on stock to the leadership.

Keywords: Application, Apriori, Sales, Transaction

Introduction

Sales transaction data has not been used optimally by minimarket owners so that sales results tend not to increase. This is because the processing method is still traditional and included in the complicated category, thus the need for a system that can help quickly and precisely.

Minimarket Barokah is a minimarket located at RS.Rafflesia, Bengkulu City. Minimarket Barokah is owned by the Rafflesia Hospital Foundation Bengkulu. The focus of sales or target market targeted by Minimarket Barokah is visitors from Rafflesia Hospital, families of patients, and employees of Rafflesia Hospital itself (Nabila, 2021a). For products offered or sold by Minimarket Barokah are such as various patient needs, food and beverages, and also medical devices. The data in Minimarket Barokah can be utilized better by using data mining. Transaction data at Minimarket Barokah in the form of excel data that is not maximally processed, this data is only used to record the expenditure of goods only (Llanos, 2024a). So that the purchase of stock items sometimes does not match the needs of consumers, which makes the stock accumulate.

Data mining, often called knowledge discovery in databases (KDD), is an activity that involves collecting, using historical data to find regularities, patterns or relationships in large data sets. The output of data mining can be used to improve future decision making. The a priori algorithm is the most famous algorithm for finding high frequency patterns. In order for sales data to be useful and useful, a data processing algorithm is needed. One of the data processing algorithms is the apriori algorithm. The output of the apriori algorithm is a pattern of sales transaction data or a pattern of product purchases made by consumers in supermarkets (Bai, 2019).

The Apriori algorithm can be used in the sales process by providing a correlation between sales data, in this case the food or drink purchased will get a consumer purchase pattern. The minimarket can use this information to take actions that increase profits for the minimarket owner. This research is expected to be able to optimize sales at Barokah Minimarket by using existing transaction data. By applying purchasing patterns using the a priori algorithm.

Table 1. Research Framework

Stage	Activities	Output
Stage 1	Review of journals, proceedings, and books	1. Concept of apriori algorithm for transaction data of minimarket barokah Rs Rafflesia 2. Concept of apriori algorithm and Use of apriori algorithm
Stage 2	Needs analysis based on stage 1 output Primary data collection to conduct interviews with the head of the barokah shop	1. Sales scheme 2. Sales transaction data per day 3. Number of items sold and stock items 4. Sales transaction rules in arranging goods
Stage 3	Application of the a priori method	Sales recommendations on transaction data minimarket barokah Rs Rafflesia
Stage 4	Conclusions and suggestions	Thesis document with the title apriori algorithm optimizing sales analysis on transaction data minimarket barokah Rs Rafflesia.

Methodology

The data collection techniques used by the author in this research are interview techniques, observation, and literature study.

Sales Transaction Procedure

To perform the sales application begins with the process of inputting goods, prices, and stock items. Then the system will look for a string match to be processed by the application (Rosliadewi, 2020). If each string is found, it will display as a whole and will provide sales transaction information.

The apriori data mining method is a data mining technique for finding association rules between a combination of items. Interestingness measures that can be used in data mining are:

1. Support, is a measure that shows how much dominance an item or item set has over the entire transaction.
2. Confidence, is a measure that shows the relationship between two items conditionally (based on a certain condition).

The support value of an item is obtained using the following formula:

$$\text{Support} = \frac{(\text{Number of transactions that contain confidence value})}{\text{Total transactions}}$$

The support value based on the confidence value can be seen in the table below:

Table 2. Sales Transaction Patterns

Transaction	Sales Transaction
1	Aqua, Chitato
2	LeeMineral, Potabee, Popmie, Aqua
3	Aqua, Potabee, Popmie, indomie
4	indomie, Aqua, Chitato
5	Aqua, LeeMineral, Potabee, Popmie
6	Aqua, Potabee, Popmie
7	Aqua, Sprite, Buah vita
8	Teh Botol, Buah vita

The table above is the number of transactions based on the category of goods by looking at the number of transactions made. So the k-itemset (k=1) is

Teh Botol = 6

Buah vita = 4

Sprite = 6

Aqua = 6

Coca Cola 3

It is clear that of the 8 sales transactions exemplified, there are 6 transactions that read the Teh Botol, 4 transactions read the Buah Vita item, 6 transactions read the Sprite item, 6 transactions read the Aqua item and 3 transactions read the Coca Cola item.

{Teh Botol, Buah vita} = 2

$$s(\text{Teh Botol} \rightarrow \text{Buah vita}) = 2/8 = 0.25 = 25\%$$

$$c(\text{Teh Botol} \rightarrow \text{Buah vita}) = 2/6 = 0.33 = 33\%$$

{Teh Botol, Aqua} = 5

$$s(\text{Teh Botol} \rightarrow \text{Aqua}) = 5/8 = 0.625 = 62.5\%$$

$$c(\text{Teh Botol} \rightarrow \text{Aqua}) = 5/6 = 0.83 = 83\%$$

Flowchart

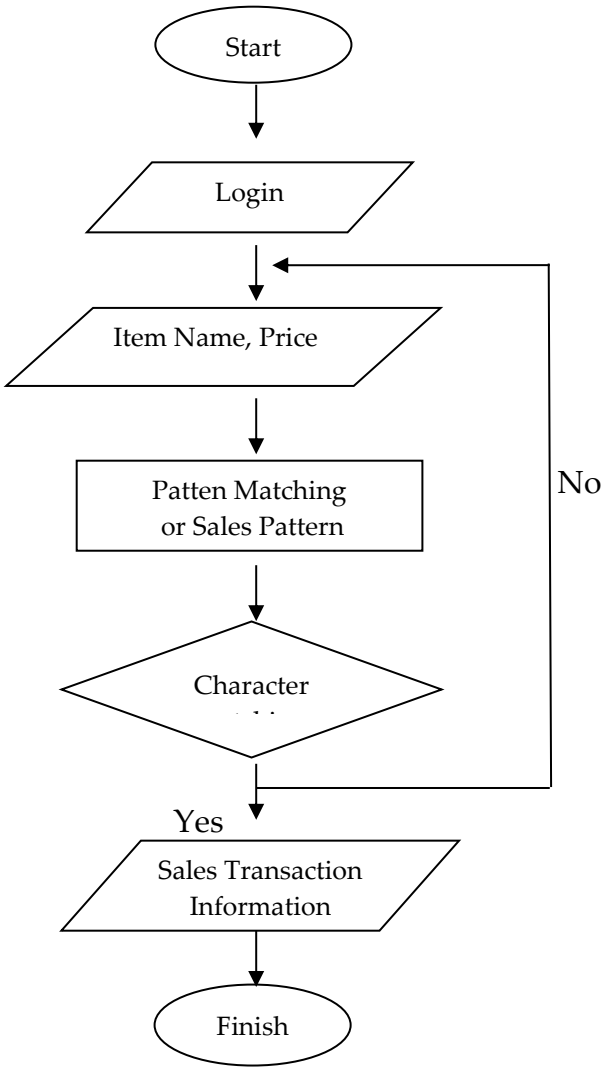


Figure 1. Flowchart

Diagram ERD

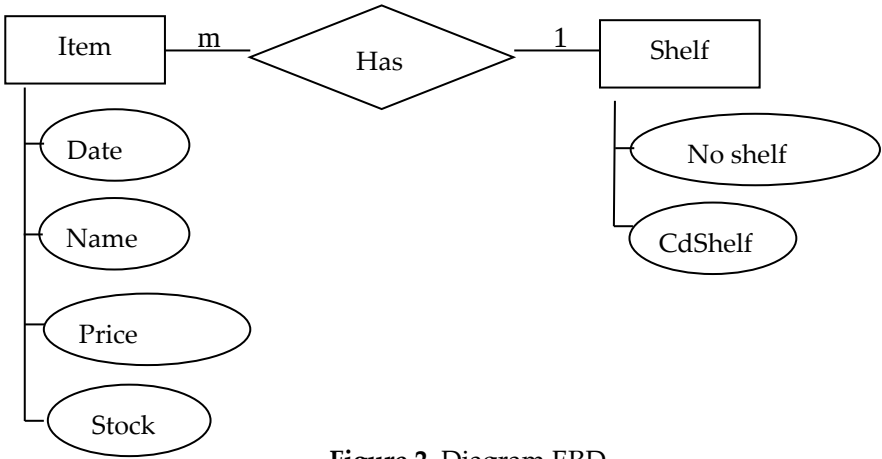


Figure 2. Diagram ERD

System Testing Design

As for the system testing method carried out in this study, this test is a testing process to measure all attribute usability by application users. The questionnaire testing includes user convenience tests, namely:

a. User Ease Test Questions

No	User-friendliness	frequency of answer				
		SB	B	CB	KB	TB
1	Application Purpose					
2	System features					
3	Speed of system access time					
4	Suitability of information results to user needs					

Result and Discussion

The results of the analysis of sales transactions at the minimarket barokah raflesia hospital with the implementation of the apriori algorithm are as follows:

1. With the apriori algorithm can analyze sales on transaction data minimarket barokah Rs Rafflesia.
2. Can provide variable information used to get the pattern of visitors to the barokah minimarket Rs Rafflesia based on 1 variable, which is often purchased.
3. Can provide output information generated for stock availability recommendations by grouping frequently purchased with items that are rarely purchased (Kusumo, 2021).

Discussion

In using the RapidMiner 10.1.003 datamining application. The steps of testing the system with Rapidminer 10.1.003 software are as follows

1. Import data made in excel file

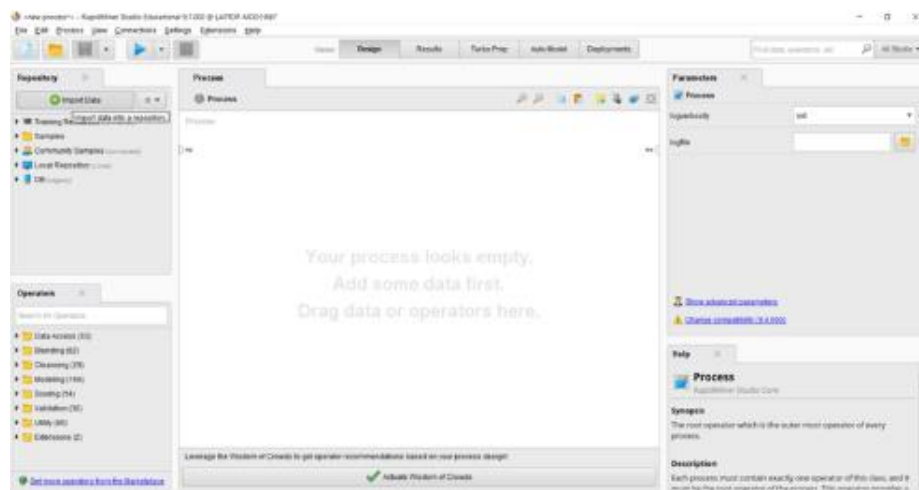


Figure 3. Import Data

In the picture above, data import is done from excel data by selecting DB then Import Data on the Rapidminer Dashboard. The data in excel can be seen as follows:

Sales Transaction	Aqua	Lee Mineral	Chitato	Potabee	Indomie	Popmie
1	1	1	0	1	0	1
2	1	1	0	0	1	0
3	1	1	0	0	0	1
4	0	0	0	1	1	1
5	0	1	0	1	1	1
6	1	1	0	0	0	1
7	0	1	1	1	0	0
8	0	1	1	1	0	1
9	0	0	1	1	1	0
10	1	1	1	0	0	1
11	1	0	1	1	0	1
12	1	0	0	1	1	0
13	1	0	1	1	1	0
14	1	1	0	1	0	0
15	0	1	0	0	1	1
16	1	1	0	1	1	1
17	0	1	1	0	1	1
18	0	1	1	0	0	1
19	1	0	1	0	1	1
20	1	1	1	1	1	0
21	0	0	1	1	0	1
22	1	0	0	1	1	0
23	0	1	1	1	1	0
24	1	1	0	0	0	1
25	1	0	0	1	1	1

The data will be inserted in table rows with range A:N

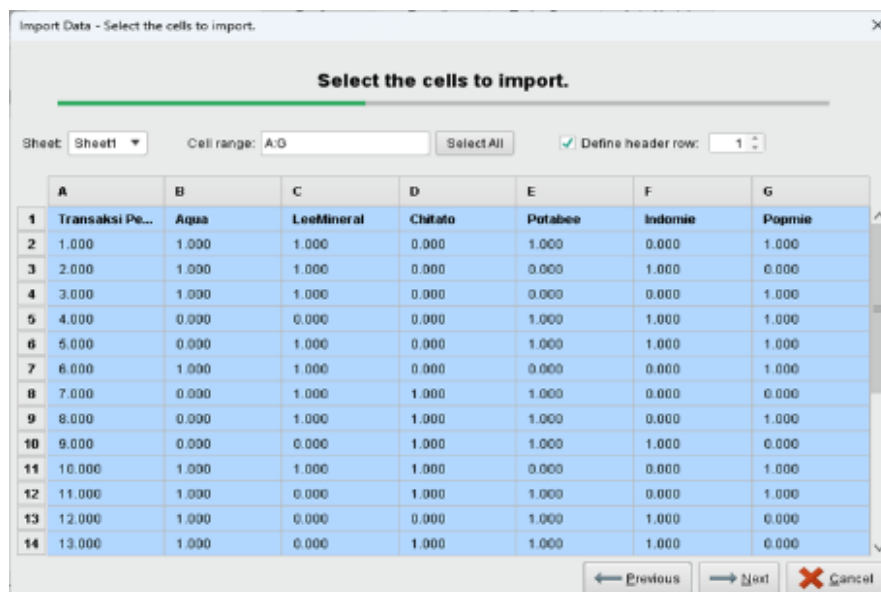


Figure 4. Variable Line

In the row variable, the value in excel will be inputted in the row with cell range = AN and Row header = 1.

1. Then the data made in excel will be converted to rapidminer 10.1.003 with the rules of cell range = AN and Row header = 1. The results of the data conversion can be seen in Figure 5.

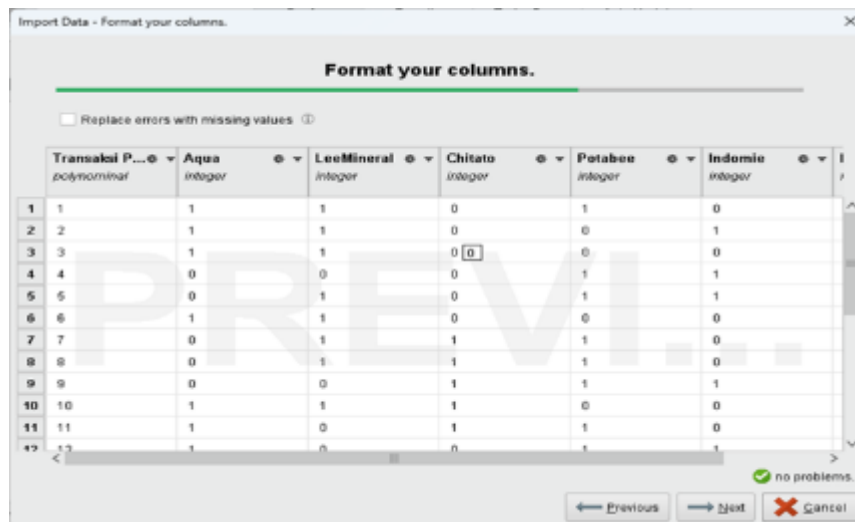


Figure 5. Data Conversion

2. Then the converted data will be stored in the localRepository DB in rapidminer. The results of data storage can be seen in Figure 6

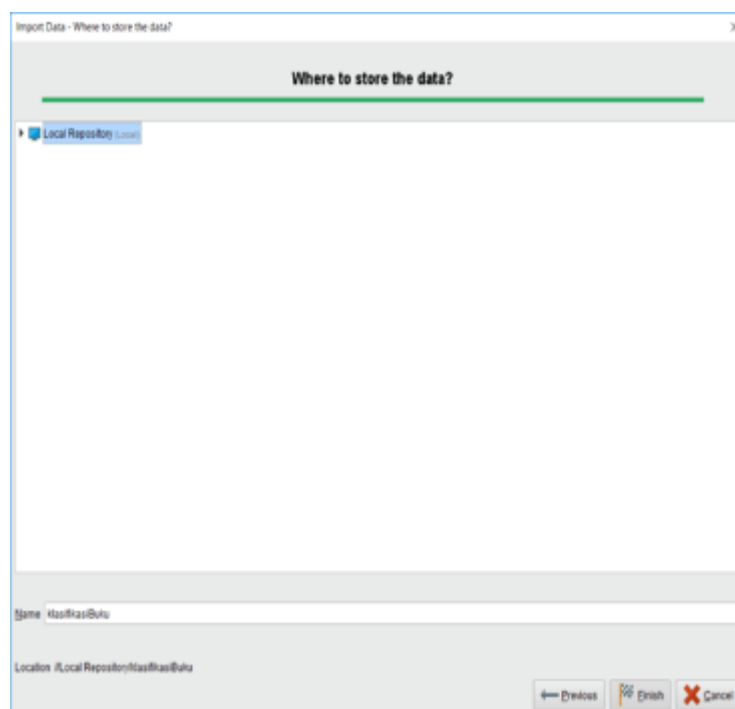
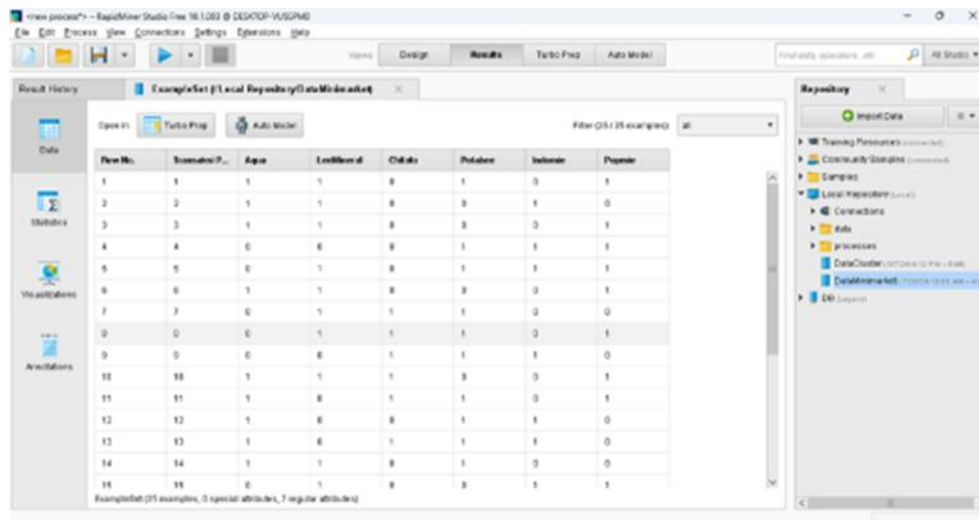


Figure 6. Storage Data

3. Then the results of the data conversion will appear on the result dashboard, as for the results of the result data can be seen in Figure 7.



The screenshot shows the 'Results' view in RapidMiner Studio. A table displays 15 examples with 8 attributes: Item No., Numerical (P...), Age, Location of, Chikita, Putak, Indone, and Popula. The table is filtered to show 25 examples.

Item No.	Numerical (P...	Age	Location of	Chikita	Putak	Indone	Popula
1	1	1	1	0	1	0	1
2	2	1	1	0	0	1	0
3	3	1	1	0	0	0	1
4	4	0	0	0	1	1	1
5	5	0	1	0	1	1	1
6	6	1	1	0	0	0	1
7	7	0	1	1	1	0	0
8	8	0	0	1	1	0	1
9	9	0	0	1	1	0	1
10	10	1	1	1	0	0	1
11	11	1	0	1	1	0	1
12	12	1	0	0	1	1	0
13	13	1	0	1	1	1	0
14	14	1	1	0	1	0	0
15	15	0	1	0	0	1	1

Figure 7. Result

- Sales transaction classification data is transferred to the rapidminer display using 4 operators, namely RetrieveDataMinimarket, Numerical to Binominal, FP-Growth, and Create Association Rule. The results of the data operator process can be seen in Figure 8 (Wang, 2017).

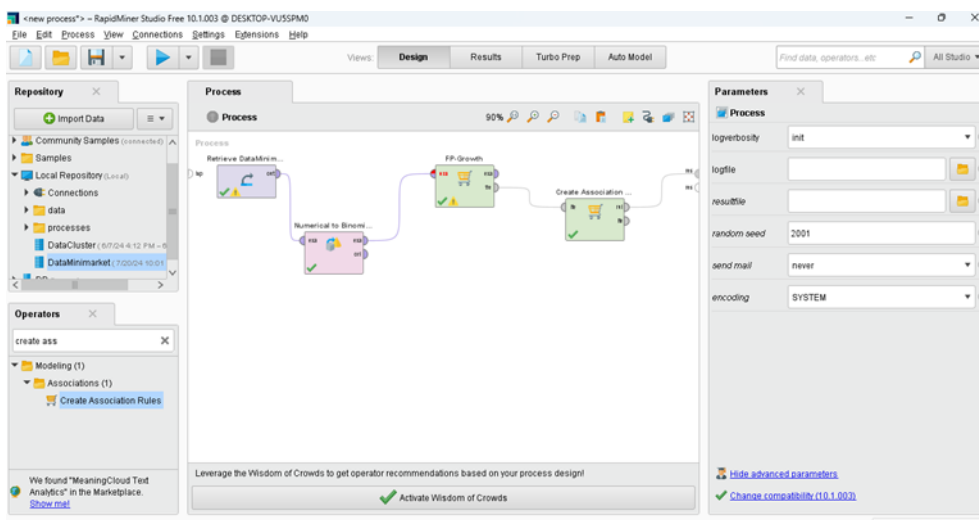


Figure 8. Operator View

Based on Figure 8 above, the explanation of the operations used in rapidminer is as follows:

1) Numerical to Binominal

The Numerical to Binominal operator converts numeric attribute types to binominal (binary) types. This operator not only changes the type of the selected attribute but also maps all the values of this attribute to the corresponding binominal value which has two possible values, namely 'true' or 'false' (Llanos, 2024b).

2) FP-Growth

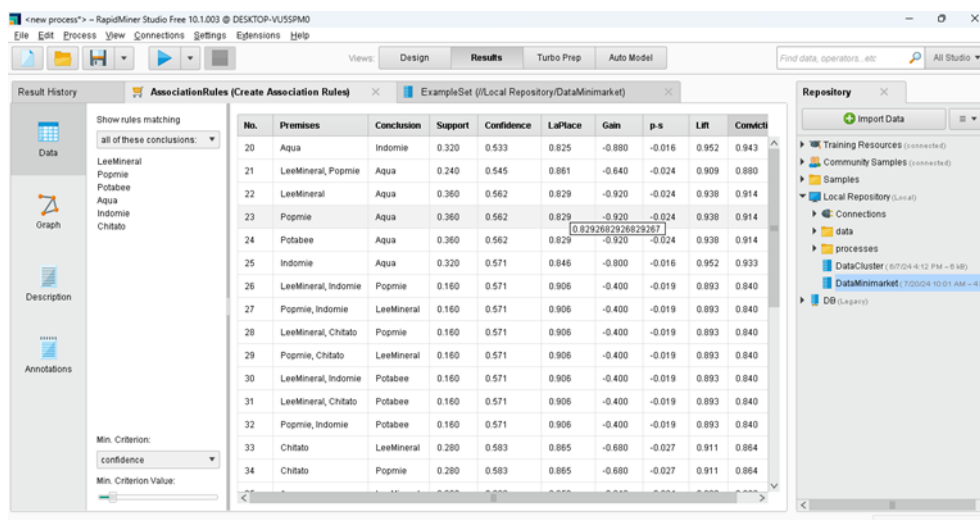
FP-Growth uses the product frequency pattern to form a tree data storage structure. This structure allows FP-Growth to access the original database less than the Apriori

algorithm, which requires a generate candidate step to ensure the frequent itemset formed is correct (Arcos, 2019).

3) Create Association

Association rules are if/then statements that help uncover relationships between seemingly unrelated data. An example of an association rule is “If a customer buys eggs, he has an 80% chance of also buying milk.” An association rule has two parts, the antecedent (if) and the consequent (then). The antecedent is the item (or itemset) found in the data. The consequent is the item (or itemset) found in combination with the antecedent (Ansari, 2019).

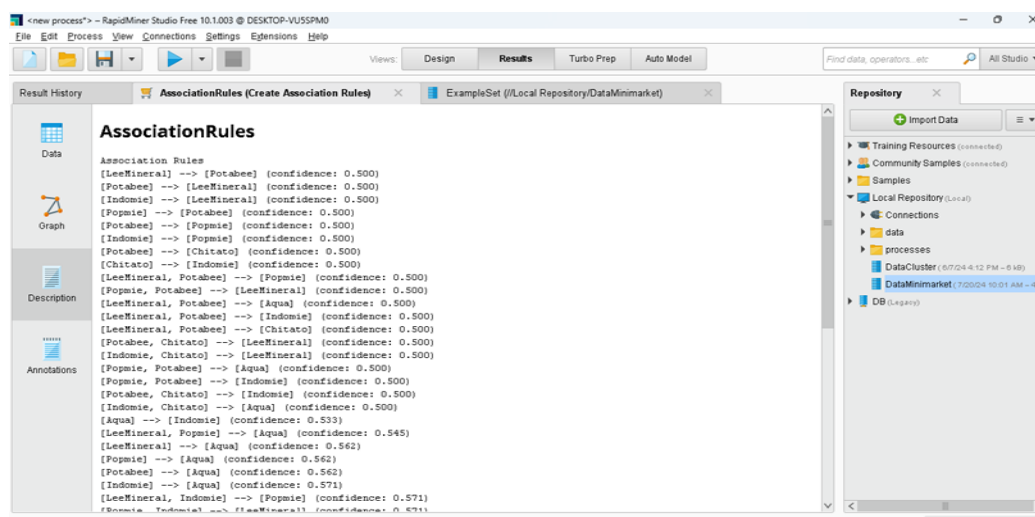
- The results of the confidence and support values based on the book variables and the number of borrowing transactions, as well as the results of the data conversion results based on the association rule can be seen in Figure 9.



No.	Premises	Conclusion	Support	Confidence	Lift	Gain	p-s	Lift	Convict
20	Aqua	Indomie	0.320	0.533	0.825	-0.880	-0.016	0.952	0.943
21	LeeMineral, Popmie	Aqua	0.240	0.545	0.881	-0.640	-0.024	0.909	0.880
22	LeeMineral	Aqua	0.360	0.562	0.829	-0.920	-0.024	0.938	0.914
23	Popmie	Aqua	0.360	0.562	0.829	-0.920	-0.024	0.938	0.914
24	Potabee	Aqua	0.360	0.562	0.829	-0.920	-0.024	0.938	0.914
25	Indomie	Aqua	0.320	0.571	0.846	-0.800	-0.016	0.952	0.933
26	LeeMineral, Indomie	Popmie	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
27	Popmie, Indomie	LeeMineral	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
28	LeeMineral, Chitato	Popmie	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
29	Popmie, Chitato	LeeMineral	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
30	LeeMineral, Indomie	Potabee	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
31	LeeMineral, Chitato	Potabee	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
32	Popmie, Indomie	Potabee	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
33	Chitato	LeeMineral	0.280	0.583	0.885	-0.680	-0.027	0.911	0.864
34	Chitato	Popmie	0.280	0.583	0.885	-0.680	-0.027	0.911	0.864

Figure 9. Confidence and Support Results

- Then the minimarket association rule based on sales transactions can be seen in Figure 10.



No.	Premises	Conclusion	Support	Confidence	Lift	Gain	p-s	Lift	Convict
20	Aqua	Indomie	0.320	0.533	0.825	-0.880	-0.016	0.952	0.943
21	LeeMineral, Popmie	Aqua	0.240	0.545	0.881	-0.640	-0.024	0.909	0.880
22	LeeMineral	Aqua	0.360	0.562	0.829	-0.920	-0.024	0.938	0.914
23	Popmie	Aqua	0.360	0.562	0.829	-0.920	-0.024	0.938	0.914
24	Potabee	Aqua	0.360	0.562	0.829	-0.920	-0.024	0.938	0.914
25	Indomie	Aqua	0.320	0.571	0.846	-0.800	-0.016	0.952	0.933
26	LeeMineral, Indomie	Popmie	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
27	Popmie, Indomie	LeeMineral	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
28	LeeMineral, Chitato	Popmie	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
29	Popmie, Chitato	LeeMineral	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
30	LeeMineral, Indomie	Potabee	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
31	LeeMineral, Chitato	Potabee	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
32	Popmie, Indomie	Potabee	0.160	0.571	0.906	-0.400	-0.019	0.893	0.840
33	Chitato	LeeMineral	0.280	0.583	0.885	-0.680	-0.027	0.911	0.864
34	Chitato	Popmie	0.280	0.583	0.885	-0.680	-0.027	0.911	0.864

Figure 10. Result Association Rule

System Testing

This test is to measure all attribute usability by application users, namely:

a. User Ease

User-friendliness	Frequency of Answer				
	SB	B	CB	KB	TB
Application Purpose	10	4	2	0	0
System features	11	2	2	1	0
Speed of system access time	8	4	2	1	1
Suitability of information results with user needs	9	3	1	2	1
Number of answer frequencies	38	13	7	4	2

Description

Number of Statements:

- Very good (SB) = 38 statements
- Good (B) = 13 statements
- Fair (CB) = 7 statements
- Less Good (KB) = 4 Statements
- Not good (TB) = 2 statements

Total = 64 statements

Number of Respondents: 16 Respondents Calculation

- SB

$$\frac{38}{64} \times 100 = 59,4\%$$
- B

$$\frac{13}{64} \times 100 = 20,3\%$$
- CB

$$\frac{7}{64} \times 100 = 11\%$$
- KB

$$\frac{4}{64} \times 100 = 6,2\%$$
- TB

$$\frac{2}{64} \times 100 = 3,1\%$$

Conclusion

1. The conclusions that can be drawn from the apriori algorithm optimizing sales analysis on transaction data for minimarket barokah Rs Rafflesia, are as follows:
2. Can provide variables used to get the pattern of visitors to the barokah minimarket Rs Rafflesia based on 1 variable, which is often purchased (Nabila, 2021b).
3. Provide the resulting output for stock availability recommendations by grouping frequently purchased with items that are rarely purchased.
4. The rapid miner application using the apriori algorithm is also able to read the category of goods from the name of the item and the stock of the inputted item contains the same characters but different writing (Qisman, 2021).

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