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APPLICATION OF DATA MINING TO DETERMINE PRODUCT ADMINISTRATION USING APRIORI ALGORITHM

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ABSTRACT

Product Arrangement is a way of arranging products to attract consumers. Product arrangement is also known as display. But in fact there are still many entrepreneurs who have not paid attention to the arrangement of their products. So that many consumers are not interested in buying products because the arrangement is less attractive which makes the company's income does not increase. Therefore researchers have a solution to solve the problems that exist in the shop. That is, with the application of data mining to determine the arrangement of products using a priori algorithm, the results can be used as a company guide to determine the display of goods and as a guide to promote goods that are less sold to participate or sell quickly. Based on the results of the trials that have been carried out, it is known that the a priori algorithm is used to help determine the product structuring solution from the sales data of Warung Sayur Segar products so that it can later be used as a consideration in determining an effective structuring and sales strategy.

Keywords*: Data Mining, Apriori Algorithm, Product Arrangement*

1. Introduction

Product Arrangement is a way of structuring products to attract consumer interest. Product arrangement is also called display. But in fact there are still many entrepreneurs who have not paid attention to the arrangement of their products. So that many consumers are not interested in buying products because of the less attractive arrangement that makes the company's income does not increase. Tarigan's research also explains that companies must understand what consumers are interested in determining which items are needed by consumers (Tarigan, 2017).

Based on the above problems, researchers conducted research with a concept such as a mini market called Warung Sayur Segar which sells various kinds of raw vegetable products. In addition to raw vegetable

products, Warung Sayur Segar also sells fresh seasoning products, fruits, fresh fish, fresh chicken meat, fresh beef, and others.

Data Mining is a term used to extract knowledge in a database. According to Kusrini and Lutfi (2009), Data Mining is a term used in the database. One method that exists in data mining is a priori algorithm. The a priori algorithm includes the types of association rules for data mining. Rules of association or association rule mining is the method used to find associative autran between item combinations. Examples of associative rules that we can apply in everyday life are application in supermarkets. Supermarket owners can find out how likely a buyer is to buy instant noodles along with sausages. With the information or knowledge obtained, if instant noodles and sausages are known that both are often bought together, the supermarket owner can make the placement of the two products close together so the buyer will easily take both products and the self-owner gets higher profits after applying the association rules.

Based on the description above, the researcher has a solution to solve the problems that exist in the shop. Namely with the application of data mining to determine product arrangement using a priori algorithm, the results can be used as company guidelines to determine the display of goods and as a guideline for promoting goods that are not sold well so they can be sold or sold quickly. In addition, customer satisfaction and profits obtained by the company can be maximized and the risk of loss of unsold products will decrease.

2. SYSTEM PLANNING

A. FLOWCHART

Figure 2.1 is a system flowchart that describes the flow of the a priori algorithm method system that is applied to the program.

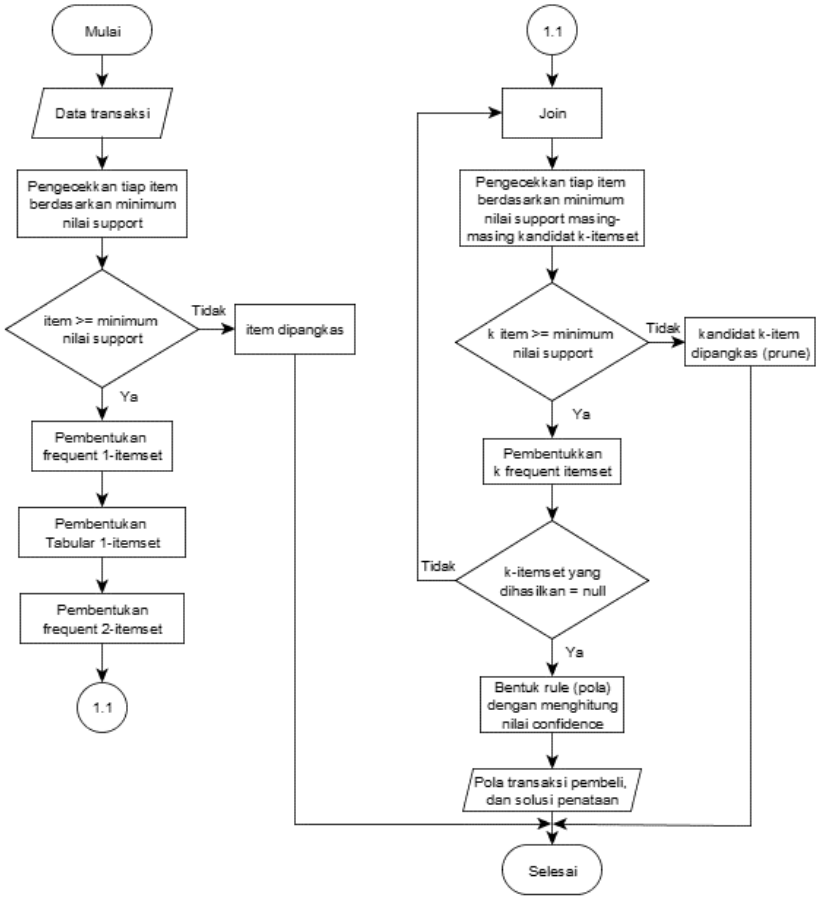

Figure 2.1 Flowchart of the Apriori Algorithm System

The flow in Figure 2.2 explains that Product Ranking is started from entering Sales Data into the program. Then the data is imported into the database. Then the next process is carried out, namely the process of calculating an item, that is if there is data in data A four times and then there is data B (A, A, A, A, B), then the program will count items one by one and if there is the same data then the data is not raised but is put together with the same data. So the program will display A with the number three (3) and B with the number one (1). After going through the above process, the program issues the product ranking table.

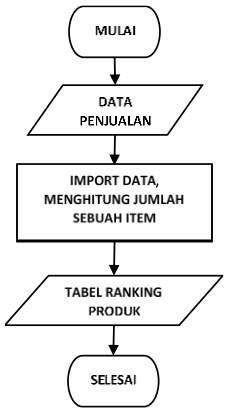

Figure 2.2 Product Ranking System Flowchart

The flow in the system for obtaining a structuring solution explains the process of form rule (pattern) by calculating the value of confidence in the figure 2.1 of a priori algorithm system flowchart. The flow starts then there is the input data in the form of the last k-itemset, which is the result of the last loop and there is no looping again. The k-itemset data is then calculated using the confidence search formula, namely by calculating the total items purchased at once divided by how many transactions bought the first or antecedent item. For example If you buy A then buy B, then how to calculate the value of confidence is if the number of If buy A then buy B there are 3 transactions, while the number of transactions that buy A is as many as 4 transactions, then the formula becomes 3/4 x 100% = 75% . After the process occurs, the results appear in the form of confidence values and also a structuring solution.

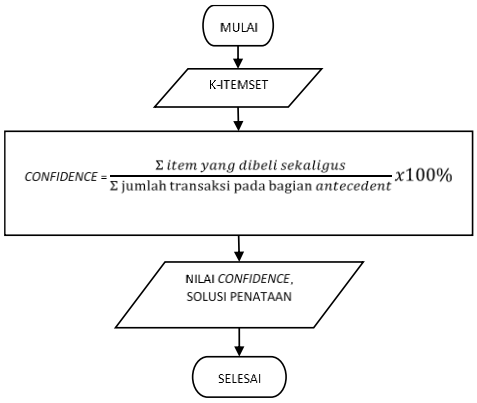

Figure 2.3 Flowchart of the Acquiring Solution Solution System

The program flowchart explains the course of the progam. The program is run by the Shop Admin.

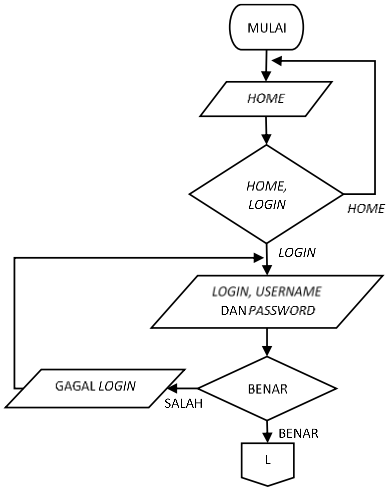

Figure 2.4 Flowchart Program (1)

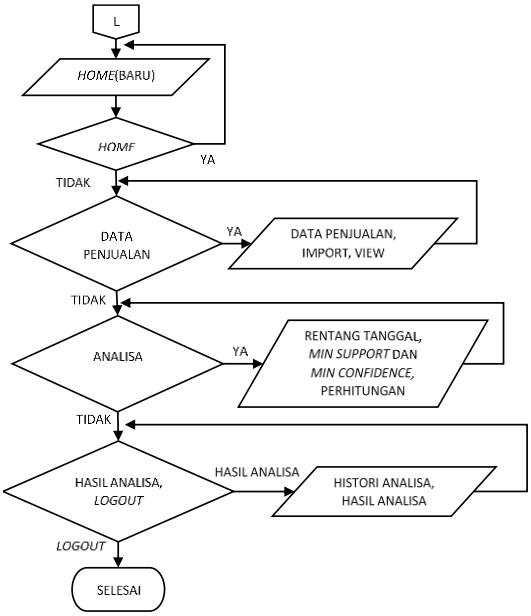

Figure 2.4 Flowchart Program (2)

B. Data Flow Diagram (DFD)

In Figure 2.6 it is illustrated that DFD Level 0 System has an External entity Shop Admin and System Process Determining Product Arrangement. Between them there are 5 (five) entries from the Shop Admin and 5 (five)

outputs from the System. Enter provided by the Shop Admin to the System is Login Data, Sales Data, Date Range, Min Support and Min Confidence, and History Calculation. While the output obtained by the Shop Admin from the System is Access Rights, View, Display Data, Calculations, and Analysis Results.

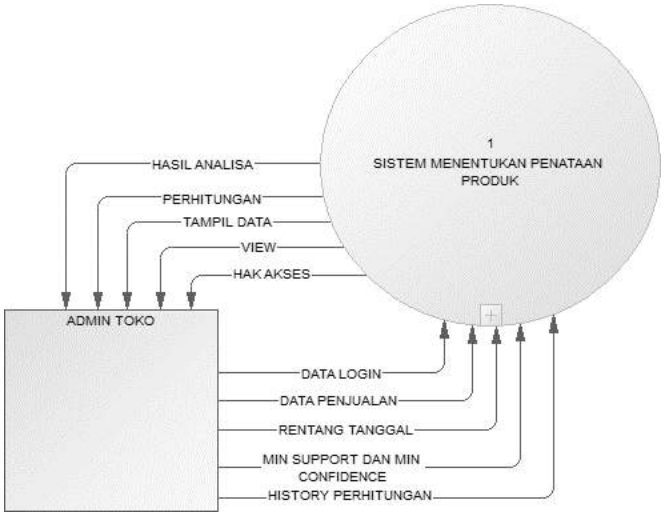

Figure 2.6 DFD Level 0 System

Figure 2.7 illustrates the flow of the DFD Level 1 System. Inside there are 1 (one) Calculation, and Calculation Results, and 7 (seven) Data Stores namely Users, Transactions, Process Log, Itemset1, Itemset2, Itemset3, and Confidence.

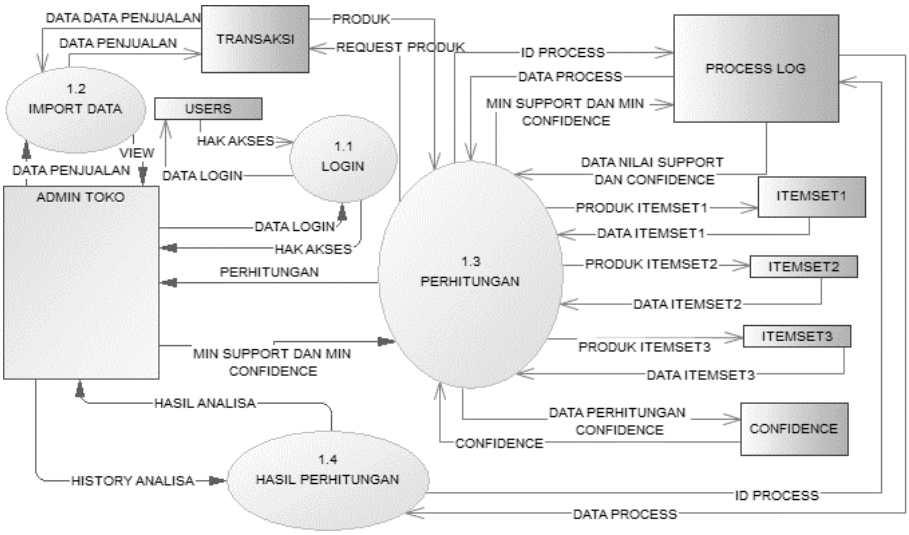

Figure 2.7 DFD Level 1 System

C. Entity Relationship Diagram (ERD)

Figure 2.8 is a database design or Entity Relationship Diagram (ERD) Database Program. In it there are seven tables consisting of four Fact type tables and three Dimension type tables. Called the Fact table because in it a transaction occurs and there are also attributes or entities that have something measured such as Amount, Amount_A, and Amount_B. While the Dimension table is a table that is the same as the master table, namely a table whose entries have not changed or remain. The following is an explanation per ERD table in table form.

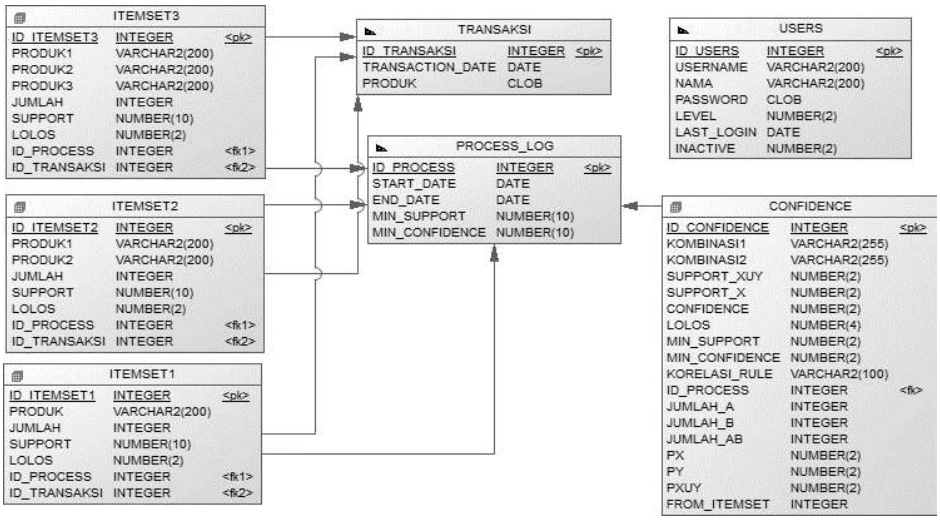

Figure 2.8 ERD Database Program

3. RESULTS AND DISCUSSION

A. SYSTEM IMPLEMENTATION

The results of the implementation of the Best Selling Product Selection system at Warung Sayur Segar Store consist of several pages, namely the Home page, Login, Home (new), Sales Data, Analysis, and Analysis Results. Following is the implementation of pages that can be accessed by users.

Figure 3.1 Implementation of a Home Page

Figure 3.2 Implementation of Login Pages

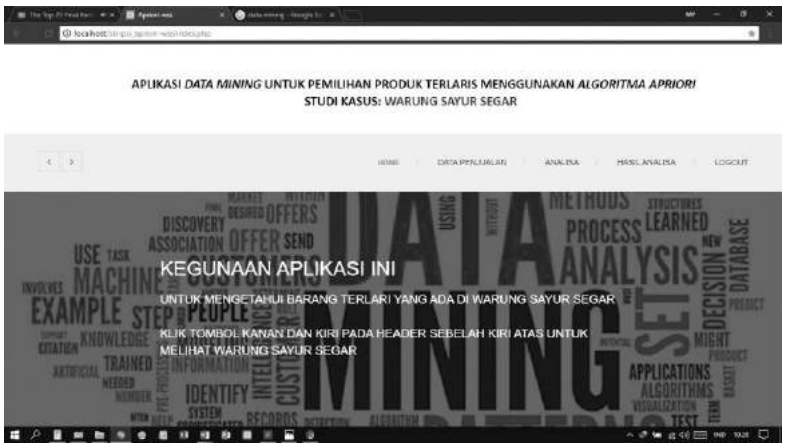

Figure 3.3 Implementation of a Home Page (new)

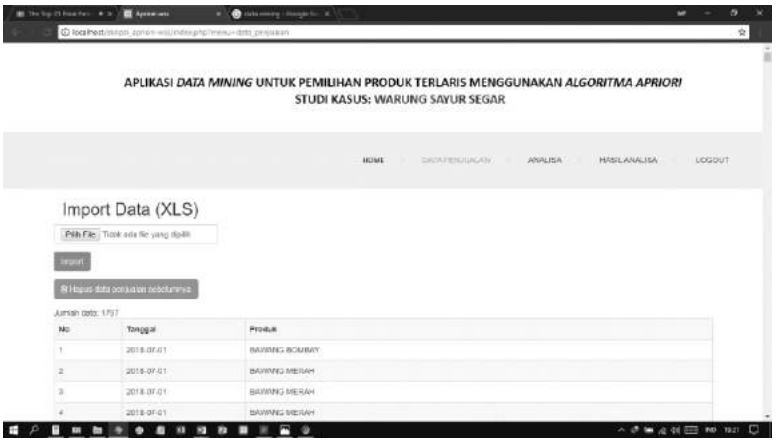

Figure 3.4 Implementation of Sales Data Pages

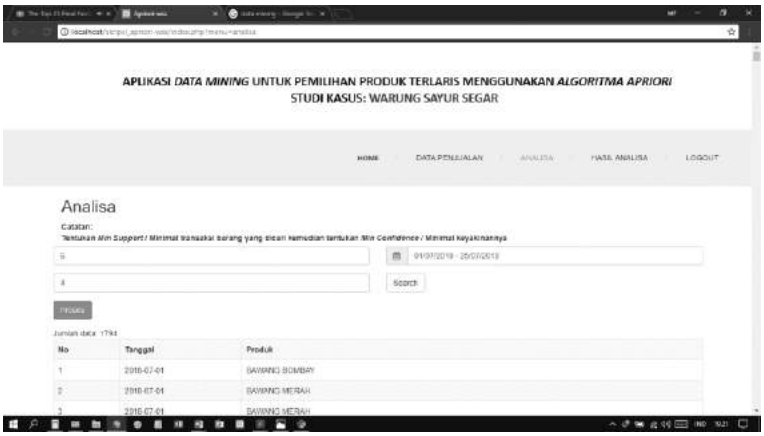

Figure 3.5 Implementation of Analysis Pages

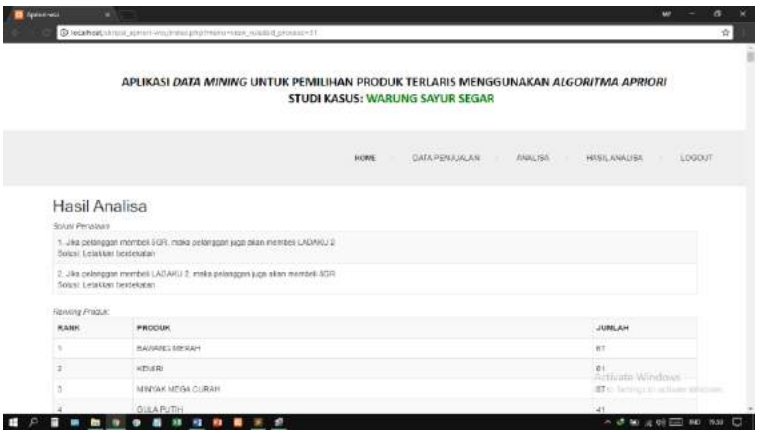

Figure 3.6 Implementation of Analysis Results Page

B. Calculation

Data obtained from the company is sales data in the form of an excel file in which there are several columns, namely columns No, Date, Note, Goods, Amount, Price, Discount, and Total Price. Following is the sales data table:

Table 3.1 Sales Data

NO	TANGGAL	NOTA	BARANG	JUMLAH	HARGA	DISKON	TOTAL HARGA
1	01/07/2018	PJ180701010	BAWANG BOMBAY	3	13,000	0	39,000
2	01/07/2018	PJ180701009	BAWANG MERAH	12	15,000	0	180,000
3	01/07/2018	PJ180701010	BAWANG MERAH	5	15,000	0	75,000
4	01/07/2018	PJ180701010	BAWANG MERAH	10	15,000	0	150,000
5	01/07/2018	RJ180701002	BAWANG MERAH	-8,15	22,000	0	-179,300
6	01/07/2018	PJ180701006	BUAH NAGA A	15	17,000	0	255,000
7	01/07/2018	PJ180701007	BUAH NAGA A	25	17,000	0	425,000
8	01/07/2018	PJ180701009	JAHE EMPRIT	3	10,000	0	30,000
9	01/07/2018	PJ180701010	JAHE EMPRIT	3	10,000	0	30,000
10	01/07/2018	PJ180701010	KECAP TJAPAR 140ML	10	4,250	0	42,500
11	01/07/2018	PJ180701008	KEMIRI	0,25	48,000	0	12,000
12	01/07/2018	PJ180701009	KETAN PUTIH B	10	13,000	0	130,000
13	01/07/20	PJ180701	KETAN	15	13,00	0	195,0

	18	010	PUTIH B		0		00
14	01/07/2018	PJ180701008	KETUMBAR BUBUK DESAKU	2	5,000	0	10,000
15	01/07/2018	PJ180701001	KRESEKLOS PUTIH A	3	30,300	0	90,900
16	01/07/2018	PJ180701010	KUNCI	1	6,000	0	6,000
17	01/07/2018	PJ180701010	KUNYIT	1	5,000	0	5,000
18	01/07/2018	PJ180701010	LAOS	0,5	4,000	0	2,000
19	01/07/2018	PJ180701009	LENTO BESAR	5	14,000	0	70,000
20	01/07/2018	PJ180701010	LENTO BESAR	5	14,000	0	70,000

Table 3.2 Sales Data Normalized

NO	TANGGAL	NOTA	BARANG	JUMLAH	HARGA	DISKON	TOTAL HARGA
1	01/07/2018	PJ180701010	BAWANG BOMBAY,BAWANG MERAH,BAWANG MERAH,JAHE EMPRIT,KECAP TJAPAR 140ML,KETAN PUTIH B,KUNCI,KUNYIT,LAOS, LENTO BESAR,	3	13,000	0	39,000
2	01/07/2018	PJ180701009	BAWANG MERAH	12	15,000	0	180,000

3	01/07/2018	PJ180701010		5	15,000	0	75,000
4	01/07/2018	PJ180701010		10	15,000	0	150,000
5	01/07/2018	RJ180701002	BAWANG MERAH	-8,15	22,000	0	-179,300
6	01/07/2018	PJ180701006	BUAH NAGA A	15	17,000	0	255,000
7	01/07/2018	PJ180701007	BUAH NAGA A	25	17,000	0	425,000
8	01/07/2018	PJ180701009	JAHE EMPRIT,KETAN PUTIH B,LENTO BESAR	3	10,000	0	30,000
9	01/07/2018	PJ180701010		3	10,000	0	30,000
10	01/07/2018	PJ180701010		10	4,250	0	42,500
11	01/07/2018	PJ180701008	KEMIRI,KETUMBAR BUBUK DESAKU	0,25	48,000	0	12,000
12	01/07/2018	PJ180701009		10	13,000	0	130,000
13	01/07/2018	PJ180701010		15	13,000	0	195,000
14	01/07/2018	PJ180701008		2	5,000	0	10,000
15	01/07/2018	PJ180701001	KRESEK LOS PUTIH A	3	30,300	0	90,900
16	01/07/2018	PJ180701010		1	6,000	0	6,000
17	01/07/2018	PJ180701010		1	5,000	0	5,000
18	01/07/2018	PJ180701010		0,5	4,000	0	2,000
19	01/07/2018	PJ180701009		5	14,000	0	70,000
20	01/07/2018	PJ180701010		5	14,000	0	70,000

Table 3.3 Itemset 1

No	Item	Jumlah	Support	
1	BAWANG BOMBAY	1	5	Tidak Lolos
2	BAWANG MERAH	3	15	Lolos
3	JAHE EMPRIT	2	10	Lolos
4	KECAP TJAPAR 140ML	1	5	Tidak Lolos
5	KETAN PUTIH B	2	10	Lolos
6	KUNCI	1	5	Tidak Lolos
7	KUNYIT	1	5	Tidak Lolos
8	LAOS	1	5	Tidak Lolos
9	LENTO BESAR	2	10	Lolos
10	BUAH NAGA A	2	10	Lolos
11	KEMIRI	1	5	Tidak Lolos
12	KETUMBAR BUBUK DESAKU	1	5	Tidak Lolos
13	KRESEK LOS PUTIH A	1	5	Tidak Lolos

Table 3.4 Items 1 that pass

No	Item	Jumlah	Support
1	BAWANG MERAH	3	15
2	JAHE EMPRIT	2	10
3	KETAN PUTIH B	2	10
4	LENTO BESAR	2	10
5	BUAH NAGA A	2	10

Table 3.5 Itemset 2

No	Item1	Item2	Jumlah	Support	
1	BAWANG MERAH	JAHE EMPRIT	1	5	Tidak Lolos
2	BAWANG MERAH	KETAN PUTIH B	1	5	Tidak Lolos
3	BAWANG MERAH	LENTO BESAR	1	5	Tidak Lolos
4	BAWANG MERAH	BUAH NAGA A	0	0	Tidak Lolos
5	JAHE EMPRIT	KETAN PUTIH B	2	10	Lolos
6	JAHE EMPRIT	LENTO BESAR	2	10	Lolos
7	JAHE EMPRIT	BUAH NAGA A	0	0	Tidak Lolos
8	KETAN PUTIH B	LENTO BESAR	2	10	Lolos
9	KETAN PUTIH B	BUAH NAGA A	0	0	Tidak Lolos
10	LENTO BESAR	BUAH NAGA A	0	0	Tidak Lolos

Table 3.6 Itemset 2 that passes

No	Item1	Item2	Jumlah	Support
1	JAHE EMPRIT	KETAN PUTIH B	2	10
2	JAHE EMPRIT	LENTO BESAR	2	10
3	KETAN PUTIH B	LENTO BESAR	2	10

Table 3.7 Itemset 3

No	Item1	Item2	Item3	Jumlah	Support	
1	JAHE EMPRIT	KETAN PUTIH B	LENTO BESAR	2	10	Lolos

Table 3.8 Item 3 that passes

No	Item1	Item2	Item3	Jumlah	Support
1	JAHE EMPRIT	KETAN PUTIH B	LENTO BESAR	2	10

Table 3.9 Confidence of itemset 3

No	X => Y	Support X U Y	Support X	Confidence	Keterangan
1	JAHE EMPRIT, KETAN PUTIH B => LENTO BESAR	10	10	100	Lolos
2	KETAN PUTIH B, LENTO BESAR => JAHE EMPRIT	10	10	100	Lolos
3	LENTO BESAR, JAHE EMPRIT => KETAN PUTIH B	10	10	100	Lolos
4	JAHE	10	10	100	Lolos

5	EMPRIT => LENTO BESAR, KETAN PUTIH B KETAN PUTIH B => JAHE EMPRIT, LENTO BESAR	10	10	100	Lolos
6	LENTO BESAR => KETAN PUTIH B, JAHE EMPRIT	10	10	100	Lolos

Table 3.10 Confidence of itemset 2

No	X => Y	Support X U Y	Support X	Confidence	Keterangan
1	JAHE EMPRIT => KETAN PUTIH B	10	10	100	Lolos
2	KETAN PUTIH B => JAHE EMPRIT	10	10	100	Lolos
3	JAHE EMPRIT => LENTO BESAR	10	10	100	Lolos
4	LENTO BESAR => JAHE EMPRIT	10	10	100	Lolos
5	KETAN PUTIH B => LENTO BESAR	10	10	100	Lolos
6	LENTO BESAR => KETAN PUTIH B	10	10	100	Lolos

Table 3.11 Association rules are formed

No	X => Y	Confidence
1	JAHE EMPRIT, KETAN PUTIH B => LENTO BESAR	100
2	KETAN PUTIH B, LENTO BESAR => JAHE EMPRIT	100
3	LENTO BESAR, JAHE EMPRIT => KETAN PUTIH B	100
4	JAHE EMPRIT => LENTO BESAR, KETAN PUTIH B	100
5	KETAN PUTIH B => JAHE EMPRIT, LENTO BESAR	100
6	LENTO BESAR => KETAN PUTIH B, JAHE EMPRIT	100
7	JAHE EMPRIT => KETAN PUTIH B	100
8	KETAN PUTIH B => JAHE EMPRIT	100
9	JAHE EMPRIT => LENTO BESAR	100
10	LENTO BESAR => JAHE EMPRIT	100
11	KETAN PUTIH B => LENTO BESAR	100
12	LENTO BESAR => KETAN PUTIH B	100

Table 3.12 Arrangement Solutions

1	If the customer buys JAHE EMPRIT, KETAN PUTIH B, then the customer will also buy LENTO BESAR. Solution: Place it adjacent
2	If the customer buysKETAN PUTIH B, LENTO BESAR, then the customer will also buy JAHE EMPRIT. Solution: Place it adjacent
3	If the customer buysLENTO BESAR, JAHE EMPRIT, then the customer will also buy KETAN PUTIH B. Solution: Place it adjacent
4	If the customer buysJAHE EMPRIT, then the customer will also buyLENTO BESAR, KETAN PUTIH B. Solution: Place it adjacent
5	If the customer buysKETAN PUTIH B, then the customer will also buy JAHE EMPRIT, LENTO BESAR. Solution: Place it adjacent
6	If the customer buysLENTO BESAR, then the customer will also buy KETAN PUTIH B, JAHE EMPRIT. Solution: Place it adjacent
7	If the customer buysJAHE EMPRIT, then the customer will also buy

	KETAN PUTIH B.
	Solution: Place it adjacent
8	If the customer buysKETAN PUTIH B, then the customer will also buy JAHE EMPRIT.
	Solution: Place it adjacent
9	If the customer buysJAHE EMPRIT, then the customer will also buy LENTO BESAR.
	Solution: Place it adjacent
10	If the customer buysLENTO BESAR, then the customer will also buy JAHE EMPRIT.
	Solution: Place it adjacent
11	If the customer buysKETAN PUTIH B, then the customer will also buy LENTO BESAR.
	Solution: Place it adjacent
12	If the customer buysLENTO BESAR, then the customer will also buy KETAN PUTIH B.
	Solution: Place it adjacent

4. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Based on the formulation of the problem in the research conducted by the researcher through the design and discussion in the previous chapters, the conclusions can be taken as follows:

1. The application of Data Mining to determine product arrangement using a priori algorithm is as follows:
   a) Obtain sales data from the research site. The sales data obtained is the original sales data from the research site.
   b) Normalize sales data according to system requirements. Namely by ignoring the contents of the column other than the

date column and item. Items are grouped according to the same note.

c) Applying the a priori algorithm to the application.

d) Enter normalized sales data into the application then begin the analysis process.

e) The results of the analysis are obtained by the emergence of calculations and structuring solutions.

2. Display the Product Rank as an application value added in the following ways:

a. The results obtained are product rankings by sorting the highest number of transactions to the smallest number of transactions.

b. Ranking The top product is the product that has the most number of transactions, the lower the transaction that occurs in the product is less. By knowing the number of transactions for each product, the user can determine the exact layout and price.

B. RECOMMENDATIONS

The author realizes that in the Application of Data Mining Applications for the Selection of the Best-Selling Products Apriori algorithms still have some disadvantages, for this reason, if the research wants to continue, the authors would like to give some suggestions regarding important parts to be discussed, namely:

1. For further research, it is expected that the determination of the value of min confidence can be determined automatically by the system. This is recommended so as not to confuse users and use applications more efficiently.
2. Based on the results of trials on 1000 sales data, the time taken is 30 minutes. For further research, it is recommended to use other algorithms that can overcome the weaknesses of a priori algorithm so that research becomes more perfect and the results of execution become faster.

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