

## Determining Marketing Strategy to Support Customer Relationship Management with the Apriori Algorithm

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### Abstract

Business competition has forced companies to be more selective in implementing their marketing strategies. The increasingly rapid development of technology is an aspect that can be utilized to achieve ease of doing everything. The development of this technology can have a good impact on business people. Customer Relationship Management (CRM) is one of the business strategies to fulfill the goals of the store. To fulfill this goal, the author analyzes sales transaction data using tools such as data mining. Data mining is part of analytical Customer Relationship Management (CRM) which is used to find patterns in data. By applying the Apriori Algorithm or Association Rule to achieve this business strategy. The Apriori algorithm is a method for finding relationship patterns between one or more items in a dataset. By using sales transaction data at the Rahmat Electronics Store, you can find out which products are in high demand by customers every time they shop at the Rahmat Electronics Store. The results of applying the Apriori Algorithm or Association Rule use Minimum Support 5% and Minimum Confidence 50% ..

Keywords: Customer Relationship Management, Apriori Algorithm, Strategy, Marketing.

### 1. Introduction

In line with developments in information technology, developments in the world of marketing have also become one of the main factors for companies in improving their product marketing systems. As time goes by, small and large companies are starting to develop their products by getting to know information technology. The world of sales uses information technology to help carry out sales or product marketing activities at the company.

Customer Relationship Management (CRM) is a process or strategy implemented by companies that is used to interact with customers and also to track customer information [1]. CRM can also be interpreted as a type of management that specifically discusses theories regarding handling relationships between a company and its customers with the aim of increasing the company's value in the eyes of its customers [2]. CRM has several stages, including getting new customers (acquire), retaining customers (enhance) and increasing customer loyalty [3]. The benefits of implementing CRM can certainly encourage customer loyalty, reduce costs, increase operational efficiency, and increase revenue [4].

With the existence of a CRM system, it is hoped that business people can know the steps or ways to serve consumers, so that consumers feel satisfied so that the profits they earn will increase, because if consumers are satisfied with our service, then consumers will

*JCSITech is licensed under a Creative Commons 4.0 International License. automatically buy again. , or even become a regular customer for our business.*

On the other hand, the problem that will be solved at the Rahmat Electronics Store is knowing what products are purchased a lot or that are in high demand by consumers simultaneously or not simultaneously. Therefore, the method for analyzing consumer shopping mindsets uses the Apriori algorithm. The Apriori algorithm is a method for finding relationship patterns between one or more items in a dataset. In this research, the results of the a priori algorithm can be used for consideration in creating marketing strategies. The association method can be used to provide product recommendations automatically based on the buyer's transaction history stored in the database [5].

Rahmat Electronics Shop is a shop located in the West Pasaman area which is trying to expand its marketing area with the help of the internet to introduce its products. And able to compete with other electronics stores by keeping up with the times.

In previous research on customer relationship management (CRM) systems

using the a priori algorithm association method to determine product recommendations, the results show that the application of the association method using the a priori algorithm shows success in determining product recommendations based on transaction history, by taking 5 product samples and 7 transaction histories in one member, it produces 2 recommendation rules

with a support value of 42.8% and confidence 75% [6].

Previous research on the application of *association rules for cross selling* elements in *customer development* information systems found that Association rules are a method in data mining that can produce several patterns that can be used as a cross selling sales strategy in recommending a product to customers. The minimum support values used are 9% and 60% which results in 3 rules which will later be recommended to customers via email [7].

Research on the implementation of the a priori algorithm to determine student satisfaction with online sim services at Widyagama Malang University shows that applications built using the a priori algorithm can minimize problems that occur in the a priori algorithm and can optimize processing time in searching for service satisfaction patterns [8]. Research on the implementation of data mining on sales of clothing products with an a priori algorithm shows that by using this algorithm, shop owners can find out the tendency of combinations of clothing products that are often sold at the same time, so that shop owners can organize the layout of clothing products in a good and orderly manner so that buyers or employees can find them. and pick up clothing products quickly. The rule that applies is if you buy KA-701 and KK-201 and SP-2001, then buy ST-651. Support and Confident values are calculated until 4 combination items are obtained to obtain the best-selling transaction associative rule output [9].

Based on the existing explanation, research was carried out to determine marketing strategies to support customer relationship management at the Rahmat Electronics store by applying an a priori algorithm. With this research, it is hoped that it will make it easier for Rahmat Electronics stores to expand their marketing area

## 2. Research methodology

To help prepare this research so that the steps in solving the problem to be discussed can be arranged clearly, a framework structure is needed. The research framework is in Figure 1 below:

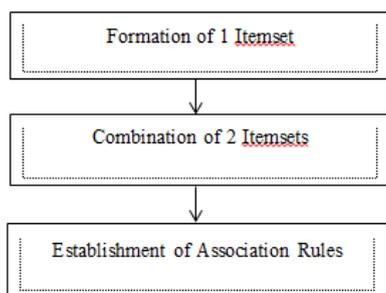


Figure 1. Research Framework

This stage looks for a combination of items that meet the minimum requirements of the support value in the database. The process of forming C1 or what is called 1 itemset with a minimum amount of support = 5% with the following formula:

$$Support(A) = \frac{\sum Transaksi\ mengandung\ A}{\sum Transaksi}$$

The process of forming C2 or what is called 2 itemsets with a minimum amount of support = 5% can be completed using the following formula :

$$Support(A \cap B) = \frac{\sum Transaksi\ A\ dan\ B}{\sum Transaksi}$$

After a high frequency pattern is found, then we look for an association rule that meets the minimum requirements for confidence by calculating the confidence of the associative rule  $A \rightarrow B$ . Minimum Confidence = 50%. The confidence value of rule  $A \rightarrow B$  is obtained from the following formula:

$$Confidence\ P(B|A) = \frac{\sum Transaksi\ A\ dan\ B}{\sum Transaksi\ A}$$

## 3. Results and Discussion

### 3.1 Data analysis

Analysis is carried out to obtain facts based on the research methods carried out. Data obtained from Rahmat Elektronik will be analyzed to obtain accurate data. The data used in this research is a real dataset, namely data on products sold and transaction data taken from the Rahmat Electronics Store. For research data, it can be seen in Table 1 below:

Table 1. Product Data

No	Category	Brand	Type	Price
1	AC Breeze	Daikin	STP15AV	3,025,000
2	AC Breeze	Daikin	STP25AV	3,150,000
3	AC Lite	Daikin	STV25AV	3,775,000
4	Split AC	Sharp	AH-A5UCY	3,100,000
5	Split AC	Sharp	AH-A7UCY	3,250,000
6	LED TV	Sharp	32DC11	2,500,000
7	LED TV	Polytron	PLD32V-	2,450,000
8	LED TV	Panasonic	PH32-	2,700,000
9	LED TV	LG	32LN550	2,550,000
10	Magic Com	Yong Ma	SMC7033	600,000
11	Magic Com	Yong Ma	SMC8033	600,000
12	Washing	Sharp	EST75NP	1,500,000
13	Washing	Sharp	EST85CR	2,000,000
14	Washing	Sharp	EST95CR	2,100,000
15	Washing	Lgp	9050R	2,500,000
16	Washing	Lgp	1400RT	3,250,000
17	Iron	Phillips	1172AR	300,000

No	Category	Brand	Type	Price
18	Iron	Phillips	1173AR	310,000
19	Iron	Miyako	EI-1009M	140,000
20	Iron	Maspion	AA110	150,000
21	Blender	Phillips	HR2222	650,000
22	Blender	Phillips	HR2213	700,000
23	Gas stove	Rinnai	RI522C	325,000
24	Gas stove	Rinnai	RI511C	300,000
25	Gas stove	Rinnai	RI522E	375,000
26	Gas stove	Rinnai	RI712A	525,000
27	Gas stove	Miyako	KG101C	175,000
28	Fan	Miyako	KAS-1606	250,000
29	Fan	Miyako	KAS1627	300,000
30	Fan	Cosmos	18PIV	140,000
31	Speaker	Polytron	PAS8E22	1,750,000
32	Speaker	Dat	DX122	3,750,000
33	Speaker	Lawega	3839	2,150,000
34	Refrigerator	Sharp	1 92ND	2,050,000
35	Refrigerator	Sharp	SJX197-NG	2,100,000
36	Refrigerator	Sharp	SJX197W-	2,150,000

### 2NF Data Normalization

The 2NF requirement is that partial "Functional Dependency " is not permitted on the primary key in a table. Functional Dependency is every non-key attribute that is functionally dependent on the primary key. The point is that at this 2NF normalization stage the table must be broken down based on the Primary Key, which can be seen in Table 2 below:

Table 2. 2NF Normalized Data

Product	Category	Brand	Type	Price
1	1	1	STP15AV	3,025,000
2	1	1	STP25AV	3,150,000
3	2	1	STV25AV	3,775,000
4	3	13	AH-A5UCY	3,100,000
5	3	13	AH-A7UCY	3,250,000
6	4	13	32DC11	2,500,000
7	4	11	PLD32V-	2,450,000
8	4	9	PH32-	2,700,000
9	4	5	32LN550	2,550,000
10	5	14	SMC7033	600,000
11	5	14	SMC8033	600,000
12	6	13	EST75NP	1,500,000
13	6	13	EST85CR	2,000,000
14	6	13	EST95CR	2,100,000
15	6	6	9050R	2,500,000
16	6	6	1400RT	3,250,000
17	7	10	1172AR	300,000
18	7	10	1173AR	310,000
19	7	8	EI-1009M	140,000
20	7	7	AA110	150,000
21	8	10	HR2222	650,000
22	8	10	HR2213	700,000
23	9	12	RI522C	325,000
24	9	12	RI511C	300,000
25	9	12	RI522E	375,000
26	9	12	RI712A	525,000
27	9	8	KG101C	175,000
28	10	8	6KAS-1606	250,000

Product	Category	Brand	Type	Price
29	10	8	KAS1627	300,000
30	10	15	18PIV	140,000
31	11	11	PAS8E22	1,750,000
32	11	2	DX122	3,750,000
33	11	3	3839	2,150,000
34	12	13	192 <sup>N.D</sup>	2,050,000
35	12	13	SJX197-NG	2,100,000
36	12	13	SJX197W-	2,150,000

Table 3. Category Data

Category Id	Category
1	AC Breeze
2	AC Lite
3	Split AC
4	LED TV
5	Magic Com Washing machine
6	Iron
7	Blender
8	Gas stove
9	Fan
10	Speaker
11	Refrigerator
12	Refrigerator

Table 4. Brand Data

Category Id	Category
1	Daikin
2	Dat
3	Lawega
4	Panasonic
5	LG
6	LGP
7	Maspion
8	Miyako
9	Phillips
10	Polytron
11	Rinnai
12	Sharp
13	Yong Ma
14	Cosmos

### 3.2 Apriori Algorithm

The association method using the Apriori algorithm is used to provide product recommendations based on the history of transactions carried out by customers .

#### 1. Formation of 1 itemset

Support table for each item in the context of data analysis or data mining. The table below describes the level of support for each item or item in the analyzed data set. Support level measures how often the item appears in the data set compared to the total entries in the data set. then the data obtained with the calculation results in Table 5 below

Table 5. Support for each item

Name of goods	Support	Percen	
AC Breeze Daikin STP15AV	4/155	0.0258	2.58%
AC Breeze Daikin STP25AV	4/155	0.0258	2.58%
AC Lite Daikin STV25AV	7/155	0.0452	4.52%
Sharp AH-A5UCY Split Ac	4/155	0.0258	2.58%
Sharp AH-A7UCY Split Ac	3/155	0.0194	1.94%

Name of goods	Suppor	Percent	Name
Sharp 32DC11 LED TV	5/155	0.0323	3.23%
Led TV Polytron PLD32V-1850	4/155	0.0258	2.58%
Led TV Panasonic PH32-H400G	6/155	0.0387	3.87%
Led TV LG 32LN550	5/155	0.0323	3.23%
Magic Com Yong Ma SMC7033	15/155	0.0968	9.68%
Magic Com Yong Ma SMC8033	14/155	0.0903	9.03%
Sharp EST75NP Washing	7/155	0.0452	4.52%
Sharp EST85CR Washing	4/155	0.0258	2.58%
Sharp EST95CR Washing	6/155	0.0387	3.87%
LGP 9050R Washing Machine	5/155	0.0323	3.23%
LGP1400RT Washing Machine	4/155	0.0258	2.58%
Philips 1172AR iron	7/155	0.0452	4.52%
Philips 1173AR iron	16/155	0.1032	10.32
Miyako EI-1009M Iron	3/155	0.0194	1.94%
Maspion AA110 iron	6/155	0.0387	3.87%
Philips HR2222 blender	7/155	0.0452	4.52%
Philips HR2213 blender	10/155	0.0645	6.45%
Rinnai RI522C Gas Stove	2/155	0.0129	1.29%
Rinnai RI511C Gas Stove	1/155	0.0065	0.65%
Rinnai RI522E Gas Stove	8/155	0.0516	5.16%
Rinnai RI712A Gas Stove	7/155	0.0452	4.52%
Miyako KG101C Gas Stove	3/155	0.0194	1.94%
Miyako KAS-1606 Fan	3/155	0.0194	1.94%
Miyako KAS1627 Fan	6/155	0.0387	3.87%
Cosmos 18PIV Fan	9/155	0.0581	5.81%
Polytron PAS8E22 speakers	4/155	0.0258	2.58%
DAT DX122 speakers	4/155	0.0258	2.58%
Lawega 3839 speakers	3/155	0.0194	1.94%
Sharp 192ND refrigerator	3/155	0.0194	1.94%
Sharp SJX197-NG refrigerator	7/155	0.0452	4.52%
Sharp SJX197W-DW refrigerator	7/155	0.0452	4.52%

From the process of forming itemsets in table 5 with a minimum support of 5%, it can be seen which meets the minimum support standards, namely in Table 6 below:

Table 6. Support for each item

Name of goods	Support	Percent
Magic Com Yong Ma SMC7033	15/155	0.0968
Magic Com Yong Ma SMC8033	14/155	0.0903
Philips 1173AR iron	16/155	0.1032
Philips HR2213 blender	10/155	0.0645
Rinnai RI522E Gas Stove	8/155	0.0516
Cosmos 18PIV Fan	9/155	0.0581

## 2. Combination of 2 itemsets

The table below lists several combinations of items (itemsets) and describes the number of occurrences, level of support (support), and percentage of support for each combination in the analyzed data set. Then, from the results of forming 1 itemset, 2 itemsets will be created as in Table 7 below:

Table 7. Minimum Support 2 Itemset

Name of goods	Amount	Support	Percent
Magic Com Yong Ma SMC7033, Magic Com Yong Ma SMC8033	0	0/15	0%
Magic Com Yong Ma SMC7033, Philips Iron 1173AR	0	0/15	0%
Magic Com Yong Ma SMC7033, Philips Blender HR2213	0	0/15	0%
Magic Com Yong Ma SMC7033, Rinnai RI522E Gas Stove	0	0/15	0%
Magic Com Yong Ma SMC7033, Cosmos 18PIV Fan	8	8/15	0.05
Magic Com Yong Ma SMC8033, Philips Iron 1173AR	8	8/15	0.05
Magic Com Yong Ma SMC8033, Philips Blender HR2213	0	0/15	0%
Magic Com Yong Ma SMC8033, Rinnai RI522E Gas Stove	0	0/15	0%
Magic Com Yong Ma SMC8033, Cosmos 18PIV Fan	0	0/15	0%
Philips 1173AR Iron, Philips HR2213 Blender	0	0/15	0%
Philips 1173AR Iron, Rinnai RI522E Gas Stove	0	0/15	0%
Philips 1173AR Iron, Cosmos 18PIV Fan	0	0/15	0%
Philips HR2213 Blender, Rinnai RI522E Gas Stove	0	0/15	0%
Philips HR2213 Blender, Cosmos 18PIV Fan	0	0/15	0%
Rinnai RI522E Gas Stove, Cosmos 18PIV Fan	0	0/15	0%

From the combination of 2 itemsets with a minimum support of 5%, it can be seen that the combination of 2 itemsets that meet the minimum support standards can be seen in table 8 below:

Table 8. Minimum Support 2 Itemset Results

Name of goods	Amount	Support	Percent
Magic Com Yong Ma SMC7033, Cosmos 18PIV Fan	8/15	0.05	5.16%
Magic Com Yong Ma SMC8033, Philips Iron 1173AR	8/15	0.05	5.16%

Because there is no combination of 3 itemsets, a combination of 2 itemsets is sufficient for forming an association.

## 3. Establishment of Association Rules

These association rules can be used by businesses or retailers to optimize product placement in stores or to make product recommendations to customers based on discovered purchasing patterns. The level of confidence measures the extent to which the rule can be relied upon in predicting concurrent purchases between these products.

Table 9. Association Rule Discovery

No	Name of goods	Confidence	Percent
1	If you buy a Magic Com Yong Ma SMC7033 then buy a Cosmos 18PIV Fan	5.16/5.81	0.5333

No	Name of goods	Confidence	Percent
2	If you buy a Cosmos 18PIV fan then buy a Magic Com Yong Ma SMC7033	5.16/9.68	0.8889
3	If you buy a Magic Com Yong Ma SMC8033 then buy a Philips 1173AR iron	5.16/10.32	0.5714
4	If you buy a Philips 1173AR iron then buy a Magic Com Yong Ma SMC8033	5.16/9.03	0.5

Based on the search for confidence results obtained from calculating the combination of the 2 itemsets, it produces the following knowledge:

Table 10. Knowledge

No	Name of goods	Confidence	Percent
1	If you buy a Magic Com Yong Ma SMC7033 then buy a Cosmos 18PIV Fan	0.5333	53.33%
2	If you buy a Cosmos 18PIV fan then buy a Magic Com Yong Ma SMC7033	0.8889	88.89%
3	If you buy a Magic Com Yong Ma SMC8033 then buy a Philips 1173AR iron	0.5714	57.14%
4	If you buy a Philips 1173AR iron then buy a Magic Com Yong Ma SMC8033	0.5	50%

### 3.3 System Testing

Testing of the system is carried out to check, analyze and research whether the design is appropriate and achieves the targets previously designed. This also has the aim of seeing whether all commands, actions, output, input are functioning properly or not. The following are the results of the system design previously formed:



Figure 2. Customer Main Page

This page is the page that visitors use to register if they want to make a transaction. Here the user fills in the personal data form listed on the screen.

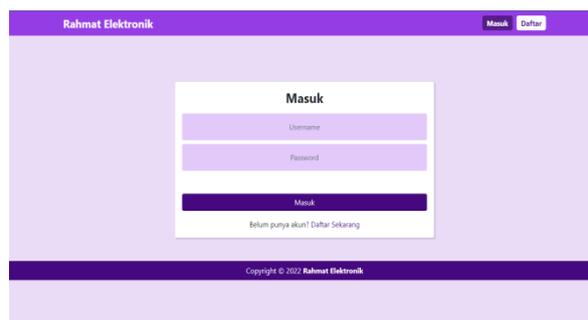


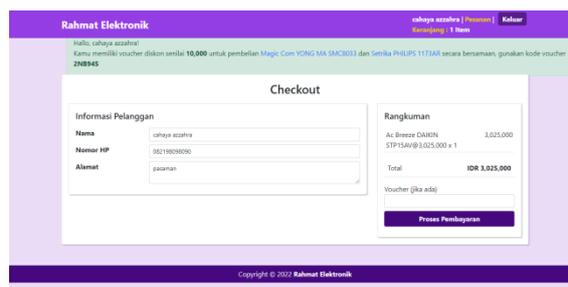
Figure 4. Customer Login Display

This page will appear if we select the login menu. Here we need to input the username and password that were previously registered to be able to enter and access the customer menu.



Figure 5. Cart Page View

If we press the basket button after filling in several items that we purchased, the product will automatically appear in that section of the basket. The image display above is a guide to the Andalusia LibrARy application, which will appear when the user accesses the instructions button.



If you continue the transaction, you will go to the checkout page. On this page we check our personal data and the product we want to buy.

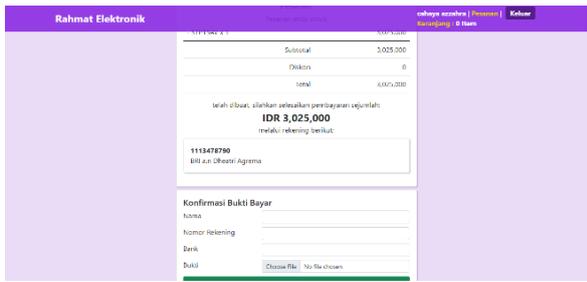


Figure 7. Payment Display Page

After checking the data and items to be purchased, we proceed to the payment page. Here we can see complete details about our order. We will also get payment account number information and are also asked to upload proof of payment.

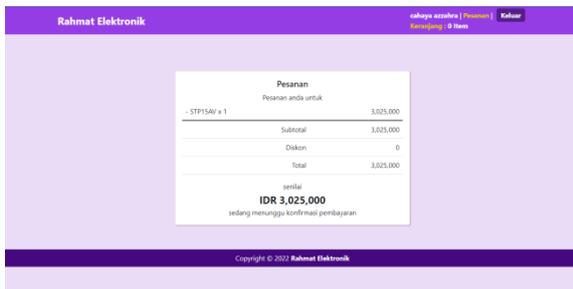
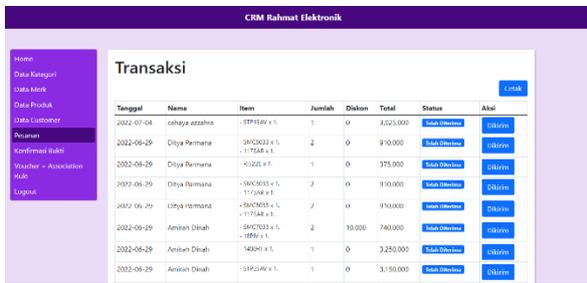


Figure 8. Order Page Display

On this page, customers can view orders by simply clicking on the order in the top menu.



On this page the admin can find out customer orders, where the admin can see the status of the order as received, confirmed, in process, or being packaged.

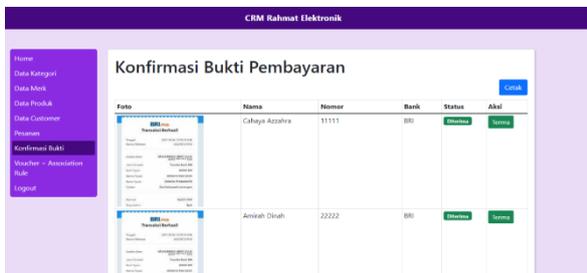


Figure 15. Display of Evidence Confirmation Page  
On this page the admin will check proof of payment that has been made by customers who have shopped, so that later the admin will receive incoming orders.

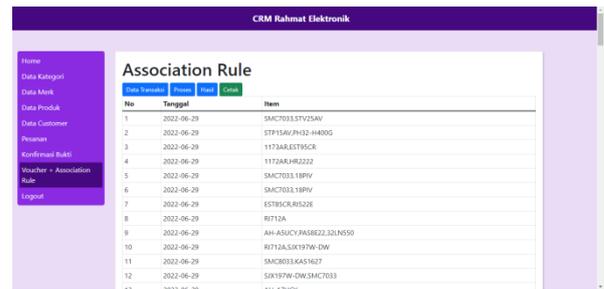


Figure 16. Association Rule Page Display

what products have been purchased by the customer from the start to the end of the transaction as well as the transaction date.

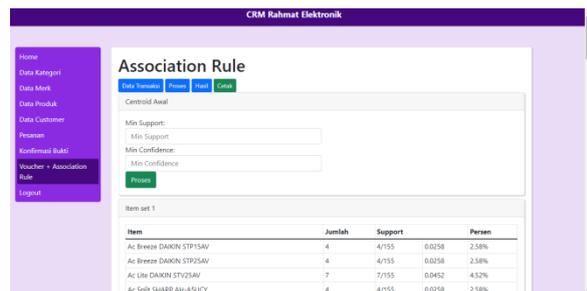


Figure 17. Association Rule (Process) page

On this page there is an initial centroid which will be filled with the minimum support and minimum confidence that we have determined. After entering the minimum support and minimum confidence, the admin will know which products are purchased a lot by customers and which products are purchased by quite a few customers individually or in groups.

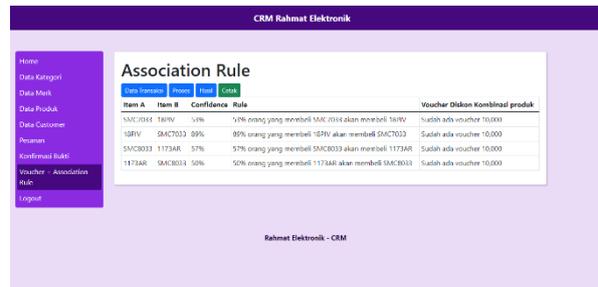


Figure 18. Association Rule Page (Results)

On this page the admin can see which products are purchased a lot by customers in groups/simultaneously, and where later the admin will activate discounts/vouchers on items that are purchased a lot by customers.

#### 4. Conclusion

After conducting this research, the author can draw the conclusion that the application of the Apriori Algorithm helps the Customer Relationship Management (CRM) strategy enable the Rahmat Electronics Store to improve its service and sales, making it easier for customers to shop at the store. Furthermore, by applying the Association Rule technique or Apriori Algorithm in Customer Relationship Management (CRM), Toko Rahmat Elektronik can utilize transaction data that was previously created manually and piled up in files that have been mixed with others to become very valuable information that can be utilized. And the application of the Association Rule is very useful in this system. Because, shop owners can find out what products many consumers buy simultaneously or not simultaneously. By inputting minimum support and minimum confidence, the system can immediately see the results of which products or goods are selling well or not. By using this, Rahmat Electronics Store can attract customers, retain existing customers and find new customers.

#### References

- [1] Ramadina, RR, Pudjiantoro, TH, & Santikarama, I. (2020). Development of a Customer Relationship Management (CRM) System Using the Apriori Algorithm Association Method. *Journal of Informatics and Software Engineering*, 2(2), 78. <https://doi.org/10.36499/jinrpl.v2i2.3539>
- [2] Wildyaksanjani, JP, & Sugiana, D. (2018). PT Angkasa Pura II (Persero) Customer Relationship Management (CRM) Strategy. *Journal of Communication Studies*, 6(1), 10. <https://doi.org/10.24198/jkk.v6i1.8754>
- [3] Warsela, M., Wahyudi, AD, & Sulistiyawati, A. (2021). Implementation of Customer Relationship Management to Support Marketing Credit Executives (Case Study: Pt Fif Group). *Journal of Information Technology and Systems*, 2(2), 78-87. <https://doi.org/10.33365/jtsi.v2i2.870>
- [4] Maulani, MA (2021). IMPLEMENTATION OF CRM (CUSTOMER RELATIONSHIP MANAGEMENT) IN THE FARMERS' GROUP PARTNERS PT. PERMANA EEL INDONESIA. *Journal of Accounting, Economics and Business Management*, 1(3), 17-24. <https://doi.org/10.55606/jaem.v1i3.3>
- [5] Mahdiana, D. (2016). Analysis and design of a goods procurement information system using object-oriented methodology: PT case study. *Indonesian League. Mkom Telematics*, 3(2), 36-43. <http://dx.doi.org/10.36080/telematikamkom.192>
- [6] Ramadina, RR, Pudjiantoro, TH, & Santikarama, I. (2020). The Customer Relationship Management (CRM) System Uses the Apriori Algorithm Association Method to Determine Product Recommendations. *ICT Journal: Information Communication & Technology*, 19(1), 50-59. <https://doi.org/10.36054/jict-ikmi.v19i1.143>
- [7] Monalisa, S., & Roza, AS (2021). Application of Association Rules for Cross Selling Elements in Customer Development Information Systems. *Techno. Com*, 20(3), 420-429. <https://doi.org/10.33633/tc.v20i3.4750>
- [8] Mubarak, I., Marisa, F., & Purnomo, D. (2017). Implementation of the Apriori Algorithm to Determine Student Satisfaction with Online SIM Services at Widyagama University, Malang. *Journal of Information Technology and Management*, 3(1). <https://doi.org/10.26905/jtmi.v3i1.1244>
- [9] Sinaga, ASR (2019). Implementation of Clothing Product Sales Data Mining Using the Apriori Algorithm. *IJAI (Indonesian Journal of Applied Informatics)*, 4(1), 23-29. <https://doi.org/10.20961/ijai.v4i1.37989>