# Max-Miner Method in Improving Food Sales Strategy

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**Abstract:** Competition in the corporate world is currently very intense, especially in the retail business sector, one of which is the retail food business. Building a minimarket retail business, provides staple foods that are unavoidable using information technology to support the smooth sales of these products. The use of this information technology has become a necessity in the retail minimarket business world whose aim is to provide maximum profits and minimal losses with promotions that must be done in terms of providing the best service in a retail minimarket that must use the best business strategy, but sometimes the retail minimarket manager constrained in determining the sales strategy. One of the factors is the difficulty of producing an analysis related to the products sold. Therefore we need an analysis of the application of data mining so that product sales at retail minimarkets are increasing and service to consumers is getting better. In this design data mining and algorithms are used, namely market basket analysis and Max-Miner. By applying the Max-Miner method in the data mining process for sales strategies at retail minimarkets, it will produce rule associations that will become product recommendations that will provide a decision in sales strategy for the mini market.

**Keywords:** Market Basket Analysis, Max-Miner, Promotion, Product, Retail Business.

## INTRODUCTION

Competition in the business world at this time is very tight, especially in the retail business, one of which is the retail food business. The grocery retail business is one of the minimarket networks that provide basic needs and daily needs of the community. In building a retail business, retail minimarkets provide food staples that cannot be separated from using information technology to support the smooth sales of these products. There is no denying that the use of Information technology is a must nowadays, with a quick look. The goal is to provide maximum profit and minimum loss with promotions that must be carried out according to existing rules. With data mining techniques, the sales data set can be calculated quickly by placing the data in pairs (one package) based on the data available in the database. So that it can determine product sales recommendations better on the market retail mini market. Several inventors made several met, one of which is the Max-Miner method. The Max-Miner method is an association method that uses pruning based on a subset of frequencies, like the Apriori method, but also uses pruning based on a superset frequency. Max-Miner is an alternative method that can be used to determine the most frequently occurring data set (frequent item set) in a data set. (Utomo et al, 2019). Research conducted Pragantha et al on "Application of the Max-Miner Algorithm for Consumer Shopping Pattern Analysis (Caféloaja Case Study) conducted research on coffee drinks and snacks as objects. This research concludes that the Max-Miner method has succeeded in producing a combination of menus that are sold in small quantities and menus that are sold in large quantities so that the owner can reduce the amount of stock so that there is no waste and still get the same profit.(Pragantha et al, 2019).

## LITERATURE REVIEW

Based on database research (Sri et al, 2018) Data mining is a term used to describe the description of information retrieval from databases. Data mining is a planning method that includes collecting and using historical information to determined pattern regularity in large data sets.(Rifhodsqo & Wijaya, 2017).
According to W. J Staton, a product is a combination of both tangible and intangible characteristics, including color, price, reputation of the factory, the good name of the store selling it, and the factory and dealer services provided. to satisfy the buyer's desire. From the shari'ah perspective, the product (production) is very important. Product strategies are about determining the path and providing the right product to the target market to satisfy consumers while increasing the company's profits in the long run. As for the recommendation system, it is a

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system designed to predict an item according to the user's interest ,and which item will be recommended to the user.

According to Alma (Wulnadari, 2016), Promotion is a marketing skill to broadcast information, attract consumers and their product and remind them to buy product produced by the market.. significant In this study, the Max-Miner algorithm was first proposed by Robert J. published June 1998. This algorithm uses pruning based on a subset of frequencies, just like the Apriori algorithm, but also uses pruning based on the frequency superset.(Utomo et al, 2019).

## METHOD

In this study, a work procedure was made in this study aimed at outlining all the stages that will be carried out in research so that it is by the predetermined objectives. As for The steps to be carried out can be seen as shown below:
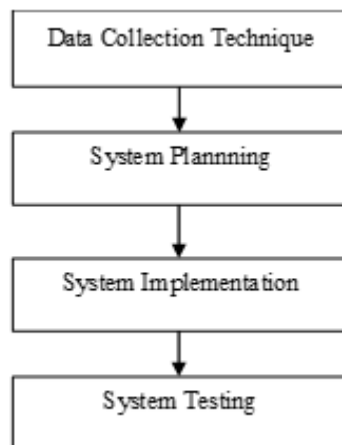


Figure 1. Work Procedure,

The types and methods of data collection are used by the authors to obtain data as study material in written research to make a data mining application design in determining sales strategies for retail mini market. The next step of design is the first step in product development and systems engineering.

### Data collection technique

The types and methods of data collection are used by the authors to obtain data as study material in research writing with the aim of designing data mining applications in determining sales strategies for retail minimarkets. In this case, the author uses data collection methods in the form of primary data sources (observations, interviews and system observations) and secondary data sources (documentation).

### System planning

Planning is the first step in the product development or system design phase. Design is the application of various techniques and principles to define a device, process or system in detail, enabling physical implementation.The system design phase in the study is the stage carried out by the researcher after collecting all the systems that need to be designed. The stages that will be carried out include research data design and max-miner flowchart design algorithms.

### System Deployment

The application is carried out after the data mining application design process uses Max-Miner method to determine sales strategies based on product purchasing patterns. The Web-based application with PHP Programming Language. After this application is completed, the user can enter sales data to form an association rule based on the density and support value of the object set and a minimum confidence level. Find out the buying pattern of selling and not selling products and the products recommended to consumers to determine the right strategy for buying and selling products in the retail mini market.

### System Test

System testing is intended to test the performance of the system and quickly and more effectively find out what steps the examiner should take in order to find out whether the system is running properly according to the purpose and design of the application. The system to be tested is in the form of sales data taken for 6 months

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starting from January-July 2021, which will be processed into a data set that will be calculated using Max-Miner calculations in finding support value and confidence values which will produce rules as product recommendations and results. of the research. Based on the test results, a research conclusion is obtained, which then provides a decision for the owner of the supermarket to determine the right sales strategy.

## RESULTS

In the data analysis stage, the first way is to calculate the frequency values of the item, then the author determines the minimum support (min_sup) which is 0.2 or 20% of the total number of finished product items whose support is below 0.2, Then it is not done. The second way is to set the support item value by showing the item set with the minimum support (The frequency of item occurrence) that has been previously determined. After getting the results of the first iteration, it will continue to search for 2 frequent items with the specified minimum value of the candidate items that have been obtained and then count the confidence and support value, **as long as** they must reach the specified minimum confidence and support values. If target on item frequency is below the minimum support value, the item must be removed or may not be included in the next calculation stage or in the item elimination category. Then the rules are obtained which can be used as information by the user. The following calculations in Max Miner method:

Finding the Support Item Value, The other way is to count the support values for each item, step to find the support item is the calculation step of Max Miner algorithm.

**Calculation Max Miner**
Description :
P = Probability
CT = Product Chitato
IO = Product Ichi Ocha
Total Transaction = 1000

a. At the initial stage, it is necessary to know the number of units of each item that has been combined in the transaction data containing each item then divided by the total number of

transactions.$(CT) = $ Probability of item $CT = \frac{\text{Number Of Transactions Containing CT}}{\text{Total Transactions}} = \frac{706}{1000}$

$P(IO) = $ Probability of item $IO = \frac{\text{Number of Transactions Containing IO}}{\text{Total Transactions}}$
$$= \frac{743}{1000}$$

b. Count amount transactions that containing combined from second purchased items simultaneously.

$reduced\ (IO \cap C)$ Prbability item $IO$ and $CT = \frac{\text{Number Of Transactions Containing CT and IO}}{\text{Total Transactions}}$

$$= \frac{589}{1000}$$

c. Calculates the support value from the sum number of the transactions consist of CT item with number of transactions containing IO items, then subtracted to all transactions containing both items purchased simultaneously.

Support $(CT => IO) = P(CT \cup IO) = P(CT) + P(IO) - P(CT \cap IO) = \frac{706}{1000} + \frac{743}{1000} - \frac{589}{1000} = \frac{860}{1000}$
$$= 0,86 \times 100\% = 86\%$$
Support $(C => IO) = 86\%$

d. Calculating the confidence value of the two items, namely:
Confidence from the combination of Chitato and Ichi Ocha products
$$\text{Confidence}(CT => IO) = P(CT | IO)$$
$$= \frac{\text{Number Of Transaction Containing CT and IO}}{\text{Transaction Amount CT}}$$
$$\frac{589}{706} = \times 100\%$$
$$\text{Confidence}(CT => IO) = 83\%$$
Confidence from combination on Ichi Ocha & Chitato products
$$\text{Confidence}(IO => CT) = P(IO | CT)$$
$$= \frac{\text{Number Of Transaction Containing IO and CT}}{\text{Transaction Amount IO}}$$
$$= \frac{589}{743} = 0,79 \times 100\%$$
$$\text{Confidence}(QT => CT) = 79\%$$

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From the calculation above, the value obtained is with the provisions of the values of minimum confidence and minimum support that obtained using Max-Miner method

Table 1. The Final Rules

| No | | Support | Confidence |
|---|---|---|---|
| 1 | If buy the product Chitato, then buy the product Ichi Ocha | 86% | 83% |
| 2 | If buy the product Ichi Ocha, then buy product Chitato | 86% | 79% |

Based on Table 1. The association Rules product on explains that support and confidence of each combination 2-item set. From the result calculation support on table rule, a final association obtained from the amount transaction contains A and B divided by total transactions. Whereas confidence obtained from the amount transaction contains A and B divided by the amount transaction contains A. The product of support that's what becomes the results end from the algorithm Max Miner. From the results of the last association rule can be concluded, the most widely sold snack in IDO supermarkets is Chitato
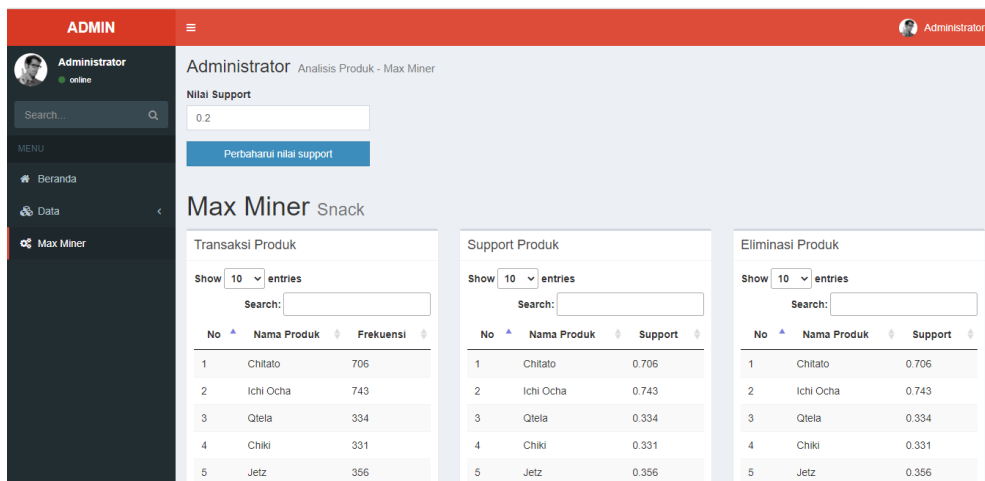
**System Implementation**



Fig 2. The Display of Max-Miner

In the menu display in Figure 2. Which is the Max-Miner view to see how the method works in the application. This display consists of the support value that will be input, then there are product transactions, product support, and product elimination. When we see the results of the listed calculations, we see the resulting rules. Here is the resulting screen.

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| No | Rule | Support | Confidence |
|---|---|---|---|
| 1 | Jika membeli **Chitato**,maka membeli **Ichi Ocha** | 0.589 | Chitato (0.8342776203966) Ichi Ocha (0.79273216689098) |
| 2 | Jika membeli **Chitato**,maka membeli **Qtela** | 0.216 | Chitato (0.30594900849858) Qtela (0.64670658682635) |
| 3 | Jika membeli **Chiki**,maka membeli **Chitato** | 0.211 | Chiki (0.63746223564955) Chitato (0.29886685552408) |
| 4 | Jika membeli **Chitato**,maka membeli **Jetz** | 0.211 | Chitato (0.29886685552408) Jetz (0.59269662921348) |
| 5 | Jika membeli **Chitato**,maka membeli **Indomilk** | 0.257 | Chitato (0.36402266288952) Indomilk (0.60328638497653) |
| 6 | Jika membeli **Chitato**,maka membeli **Club** | 0.252 | Chitato (0.35694050991501) Club (0.64285714285714) |
| 7 | Jika membeli **Chitato**,maka membeli **Fruitamin** | 0.273 | Chitato (0.38668555240793) Fruitamin (0.6626213592233) |
| 8 | Jika membeli **Chitato**,maka membeli **Maxicorn** | 0.226 | Chitato (0.32011331444759) Maxicorn (0.64022662889518) |
| 9 | Jika membeli **Ichi Ocha**,maka membeli **Qtela** | 0.232 | Ichi Ocha (0.31224764468371) Qtela (0.69461077844311) |
| 10 | Jika membeli **Chiki**,maka membeli **Ichi Ocha** | 0.225 | Chiki (0.6797583081571) Ichi Ocha (0.3028263795424) |

Fig 3. Final Rules Display

Display above is the display of association rules which is the final part of the calculation results using Max-Miner. 10 rules are generated from the iteration of the existing item combinations so that from these rules you can find out which products are often purchased together or the best-selling snack products based on the value of confidence and support in item combination.

## DISCUSSION

Based on research conducted at Swalyan IDO which produces a web-based computerized system that can make it easier for the store to see an increase in sales based on product recommendations generated by the system so that buyers also get convenience in choosing grocery products. This system provides recommendations for the best-selling products and placement of product patterns so that buyers also have no difficulty in finding the product pair they want to buy. And for products that are not selling well, it can be used as an evaluation by the store to take a sales strategy in the form of promoting products that are not selling well.

## CONCLUSION

Based on research and implementation carried out by the author it can be concluded that the following value is generated is:
By applying the association rules generated by the Max-Miner Algorithm (provided that the minimum support value is 0.2% and the confidence value is 40%), the recommendations with these rules appear as follows:
a.If you buy a Chitato product, then buy an Ichi Icha product.
b. If you buy Ichi Ocha products, you also buy Chitato products.
This research resulted in a web-based system for classifying products that can be recommended to be promoted based on a combination of Max-Miner items in retail minimarket sales. Based on research conducted that the Max-Miner Algorithm has been successful determine the sales strategy by looking for a combination of items from the most selling and unsold consumer purchases

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