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Inventory-based Business Strategy using FP-Growth at PT. Pinus Merah Abadi, Kendal Regency

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Abstract

This study aims to analyze inventory optimization using the Frequent Pattern Growth (FP Growth) algorithm, in relation to business strategy and/or accounting information systems, which a knowledge gap in previous research is as described above is the lack of knowledge about the application of the FP Growth algorithm in inventory optimization. This study was based on one year of sales and inventory data from a snack and beverage company, as a case study employing private data. A total of 3,370 transaction data samples were processed using RapidMiner data mining with FP growth algorithm. The results of both methods showed that the inventory level must be sufficient and produced two categories, namely large stock and small stock. The findings of this study indicated that the company has closely optimized its inventory since there were some products that were not involved in the association rules of sales.

Keywords: FP Growth, Association rules, Inventory, Business strategic, knowledge

Introduction

According to a report by the United States Department of Agriculture (USDA) titled "Indonesia: Food Processing Ingredients, April 2023," retail sales of packaged food and beverages in Indonesia were estimated to have reached $40.11 billion or approximately Rp601.65 trillion in 2022 (assuming an exchange rate of Rp15,000 per US dollar). The data was sourced from Euromonitor International as follows. (https://databoks.katadata.co.id/datapublish/2023/04/26/makanan-dan-minuman-kemasan-kian-laris-penjualannya-naik-tiap-tahun).

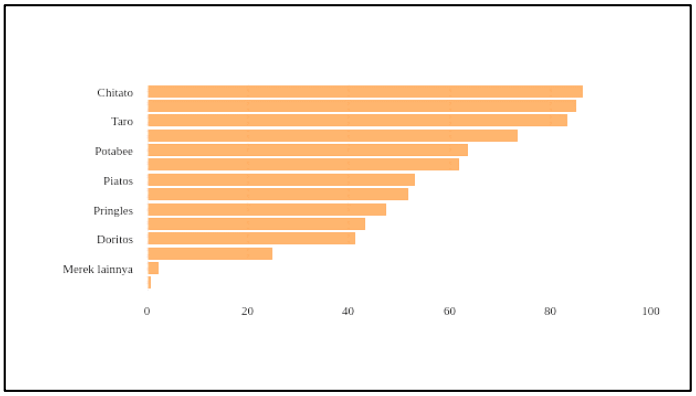


Figure 1. Retail sales of packaged food and beverages in Indonesia, 2023

According to a report by the United States Department of Agriculture (USDA) titled "Indonesia: Food Processing Ingredients, April 2023," retail sales of packaged food and beverages in Indonesia increased annually since 2018 as seen in the graphic. The growth rate in 2022 was estimated to be 11.9%. The expansion of convenience stores that mostly sell local products has contributed to the expansion of processed food distribution throughout Indonesia.

USDA also predicts that sales of packaged food and beverages in Indonesia will continue to increase in line with changes in consumer habits. Currently, more and more Indonesians are consuming processed and packaged foods, such as frozen foods, processed fruits and vegetables, as well as various potato chips and snacks. The processed food market is expected to grow as more women work in urban areas and have little time to prepare food for their families. According to the USDA report, the largest processed food and beverage company in Indonesia in 2022 was PT Indofood Sukses Makmur Tbk. The research shows that people are becoming more aware and focused on the snacks they consume, especially when enjoying them alone at home, as 67% of those surveyed said they enjoy snacks more when alone. (https://kumparan.com/kumparanfood/kebutuhan-camilan-orang-indonesia-meningkat-60-persen-selama-pandemi-1uxrZjl9TFK/3).

Research on inventory management is important because inventory has a direct impact on a company's sales profitability (Deri et al., 2023; Nurwahyuningsih et al., 2021; Setiawan et al., 2022). Research on inventory management is still relevant today, and for several reasons. One reason is to optimize profits (Listiani & Wahyuningsih, 2019), , another is to control costs, which is crucial for companies because inventory has a direct impact on company costs (D. Kurniawan et al., 2022), Inventory management is intended to optimize costs and maintain the quality of stored goods to prevent operational disruptions (Sitorus & Suseno, 2023). Another reason is to minimize shortages or excess inventory, inventory management can be done with the right method to minimize shortages or excess inventory (Chusminah et al., 2019), finally, purchasing in larger quantities can reduce storage or shipping costs (Anggun Pastika Sandi & Vina Widya Ningsih, 2022).

Research on inventory management has focused on optimizing or predicting inventory levels, as follows. Previous research by (Anggun Pastika Sandi & Vina Widya Ningsih, 2022; Annisa Siti Habibah, Arip Solehudin, 2022; D. Kurniawan et al., 2022; Yetty et al., 2022) has identified products and product combinations that form the basis for determining inventory

levels. These researchers used the FP Growth algorithm to extract associations from a set of sales history data and support inventory management analysis. The FP Growth algorithm has an extraction concept that facilitates dataset understanding and provides information to support business decision-making. The use of the FP Growth algorithm makes it easier for sellers to serve customers in purchasing the products they want.

Other relevant research on inventory management by (Atmika, et al., 2023; Lucyana hutahaean et al., 2020; Mulyani et al., 2021; Nurhidayanti & Kurniawati, 2022; Simbolon, 2019) has provided inventory information to address the problem of excess inventory and poor customer service. Usage of the Frequent Pattern Growth (FP Growth) algorithm to identify association rules through manual or automated calculations, as demonstrated by the use of the RapidMiner application (Listiani & Wahyuningsih, 2019; Nurdiyansyah & Akbar, 2021; Pramesti, 2021; Ramdhan et al., 2022; Syakir et al., 2022; Taufik Hidayat et al., 2023) to produce frequently purchased concentration to help manage inventory to avoid stockouts in the company (Listiani & Wahyuningsih, 2019; Nurdiyansyah & Akbar, 2021; Pramesti, 2021; Ramdhan et al., 2022; Syakir et al., 2022; Taufik Hidayat et al., 2023).

Some benefits of using the FP-Growth algorithm for optimizing inventory of goods as a business strategy are as follows. Firstly, it has increased operational efficiency. Companies can increase operational efficiency by optimizing inventory and avoiding excessive storage costs using the FP-Growth algorithm (Mulyani et al., 2021). Secondly, it has improved customer satisfaction. Companies can better meet customer demand and improve customer satisfaction by knowing their customer behavior patterns (B. Kurniawan, 2023). Thirdly, it has increased sales. Companies can increase sales by knowing consumer behavior patterns and organizing promotions and store layouts more efficiently (Hartono & Fitrianah, 2020). Fourthly, it has improved prediction accuracy. The FP-Growth algorithm can help companies predict inventory and arrange product layouts more efficiently (Hartomo et al., 2020). Finally, it has improved decision-making. Companies can make better choices about inventory fulfilment strategies by knowing consumer behaviour patterns (Ismarmiaty & Rismayati, 2023).

The use of the FP-Growth algorithm can help companies increase operational efficiency and optimize inventory (Hotmida et al., 2022; B. Kurniawan, 2023; Salu et al., 2022). This argument and previous research lead to the focus of this study on inventory optimization that analyzes inventory using the FP Growth approach, in relation to business strategy and/or accounting information systems, which is a knowledge gap in previous research as described above is the lack of knowledge about the application of the FP Growth algorithm in inventory optimization.

Literature Review

Procurement of Goods and Services

Inventory is a current asset in the form of goods or supplies intended to support a company's operational activities, as well as items intended for sale and/or delivery in the context of serving the public (SAK, 2014; 2017:179). It was noted that inventory management

is crucial for companies to ensure more effective and efficient cash flow and to provide accurate stock reports, thus avoiding future issues (Manik, 2023)

Procuring merchandise for a company is a critical initial step in starting a business. It allows suppliers to understand the specific items needed by the company. Companies typically follow a method of procuring goods once a month to prevent inventory discrepancies that may arise due to mismatched needs between the company and consumers.

Procurement of Goods and Services There were specific procedures that companies needed to follow to ensure the proper and appropriate procurement of goods and services. These procedures included:

1. Analyzing Company Needs This process was typically carried out by the procurement team to ensure that the company's needs were met and that no money was wasted. The requirements for merchandise could be determined by studying the sold item sets, which guided how much needed to be available. The use of data mining helped identify these item sets 1.
2. Management Approval The results of the data mining analysis were presented to management to obtain approval through written documents, signaling the start of the procurement process.
3. Conducting Tenders The procurement management team initiated tenders with suppliers and vendors. The procurement team sought vendors or suppliers that aligned with the company's needs, focusing on quality and competitive pricing.
4. Analyzing Suppliers and Vendors The evaluation included assessing the vendor's experience and determining the suitability of their offerings for the company's requirements.

If the procurement of goods did not align with the company's needs, it resulted in excessive stockpiling within the company, leading to expired items in the warehouse. Expired goods in the company's warehouse caused significant losses for the company. Therefore, the procurement of goods or provision of products was carried out in accordance with the company's needs and consumer requirements (Raisa et al., 2023).

Optimization of Merchandise Inventory

The process of effectively and efficiently managing merchandise stock is known as optimizing merchandise inventory. Companies used the following strategies to optimize their merchandise inventory:

a. ABC Analysis: ABC analysis categorized merchandise based on value and sales volume. Companies identified the most crucial merchandise items and managed their inventory more effectively (Pratiwi & Saifudin, 2021)
b. Economic Order Quantity (EOQ): EOQ was a tool used to determine the ideal quantity of items to be ordered, aiming to reduce inventory costs. Companies considered ordering costs, storage costs, and demand quantity when calculating EOQ (Setiawan et al., 2022; Yani, 2023)

c. Big Data Analysis: Big data analysis was used to predict customer demand and manage merchandise inventory accurately. Companies discovered patterns and trends in customer demand and adjusted merchandise inventory more precisely using big data analysis (Boyko & Mykhailyshyn, 2022; Narvekar & Syed, 2015)

Companies reduced inventory costs by implementing these strategies to efficiently and effectively manage merchandise inventory (Prasetyo et al., 2022).

Benefits of Using the FP-Growth Algorithm for Merchandise Inventory Optimization

a. Improved Operational Efficiency: Companies enhanced operational efficiency by optimizing merchandise inventory and avoiding excessive storage costs using the FP-Growth algorithm (Mulyani et al., 2021)
b. Enhanced Customer Satisfaction: Companies better met customer demands and improved customer satisfaction by understanding customer behavior patterns (Anggun Pastika Sandi & Vina Widya Ningsih, 2022)
c. Increased Sales: Companies boosted sales by understanding consumer behavior patterns and managing promotions and store layouts more efficiently (Hartono & Fitrianah, 2020)
d. Enhanced Prediction Accuracy: The FP-Growth algorithm aided companies in predicting inventory stock and arranging item layouts more efficiently (Hartomo et al., 2020)
e. Improved Decision-Making: Companies made better choices regarding inventory fulfillment strategies by understanding consumer behavior patterns (Ismarmiaty & Rismayati, 2023)

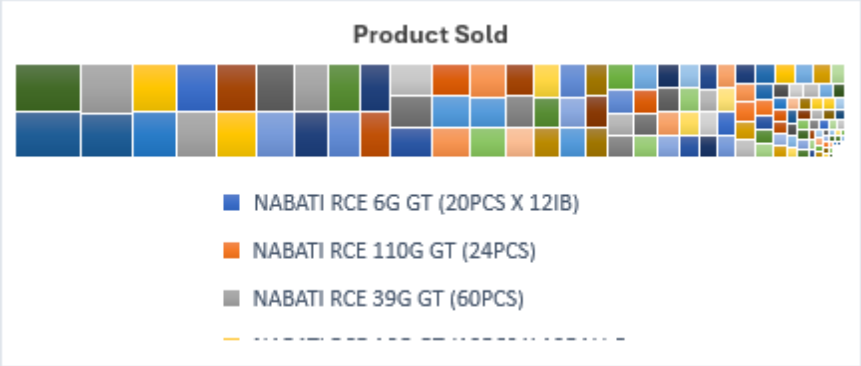
Using the FP-Growth algorithm can help companies improve operational efficiency and optimize inventory (Hotmida et al., 2022; B. Kurniawan, 2023; Salu et al., 2022)

Research Method

Research Design this research was classified as a quantitative descriptive study. Quantitative descriptive research is to describe, examine, and explain something that is studied as it is, and draw conclusions from phenomena that can be observed using numbers (Sugiyono, 2015). Quantitative descriptive research is research that only describes the contents of a variable in research, not intended to test a particular hypothesis. This research approach describes, examines, and explains a phenomenon with data (numbers) as it is, without intending to test a particular hypothesis (Sulistyawati et al., 2022).

The sales and inventory data collection method for packaged snacks and drinks was based on transactions during the year 2023. A total of 479,354 items were collected based on the company's stores or partners. This data was then grouped by each store and the items they purchased, resulting in 3,370 transaction data items. Some of the products that were frequently purchased by partners are as follows.

Table 1. Product Sold



The data that had been filtered was then counted for each product that was often purchased by the store, so that the number of items per item was obtained, which would be used for further analysis, namely FP Growth. The results of the FP Growth analysis obtained output in the form of sales patterns and determined the items that needed to be maintained in inventory.

The analysis technique used the FP Growth algorithm and association rules. FP Growth in Association rules requires a user-defined measure to set the limits of how far and how much output is desired. These measures are support, confidence, and lift ratio (Abhinav Rai, 2022).

The minimum support value is a parameter that determines the minimum frequency of an itemset to be considered frequent (Abhinav Rai, 2022; Triana et al., 2022). A higher minimum support value will result in fewer frequent itemsets being generated, while a lower minimum support value will result in more frequent itemsets being generated. The lower the minimum support value, the more itemsets are generated, which can cause slower execution time and higher memory usage (Mulyawan et al., 2020). This research used a minimum support value of 0.9 (90%) after testing various values from the obtained data, so it can be said that this minimum support value is optimal. The optimal minimum support value was obtained by evaluating the performance of the algorithm in terms of execution time, memory usage, and the quality of the resulting itemset (Hartono & Fitrianah, 2020).

The minimum confidence value is a parameter that determines the minimum level of confidence required for an association rule to be considered interesting (Triana et al., 2022; Wardani et al., 2023). Confidence is a measure of the strength of the relationship between two items in an itemset and is defined as the support ratio of the itemset containing both items to the support of the itemset containing only the antecedent item (Asana et al., 2020).

The higher the minimum confidence value, the fewer association rules are generated, while the lower the minimum confidence value, the more association rules are generated (Rachmania & Supriyanto, 2020). Minimum Confidence in FP-Growth, Association Rules is a parameter used to measure how often an association rule is found correctly in the transaction database (Agushinta & Putri, 2022; Porrmann et al., 2021; RapidMiner, 2019). FP-Growth, confidence is used to filter out insignificant association rules and only retain significant association rules (Istiqomah et al., 2022; RapidMiner, 2019), therefore, based on this explanation, the minimum confidence in this study was 0.5 (50%), which is the optimal confidence value after a series of tests on the research transaction data. The confidence value

can be set by the user and can be adjusted to the needs of the association analysis being performed (Zheng, 2022)

The lift ratio is one of the matrices in data mining and association rule learning that is used to measure the performance of a targeting model or association rule in predicting or classifying cases as having a better response than the average population response(Anggun Pastika Sandi & Vina Widya Ningsih, 2022; RapidMiner, 2019). The lift ratio is calculated by comparing the target response to the average population response (Abhinav Rai, 2022; Solver, 2012). The higher the lift ratio, the more significant the relationship between the antecedent and consequent (Jorge & Brito, 2014; Nurarofah et al., 2023; Yogasuwara & Ferdiansyah, 2022). The results of the transaction data processing in this study generally showed that the lift ratio was greater than one (1.028-1.058), which means that the use of association rules is in line with the population average. The lift ratio can be used to compare the performance of a targeting model or association rule and help organizations decide whether to market a segment or not (Durneva, 2023).

Result/Findings

1. Data Processing

A total of 3,370 transaction data samples were processed using RapidMiner data mining with the FP Growth method. Numeric data was transformed into binomial data to match the characteristics of the FP Growth and association rules algorithms. Next, the second analysis calculation was processed as follows.

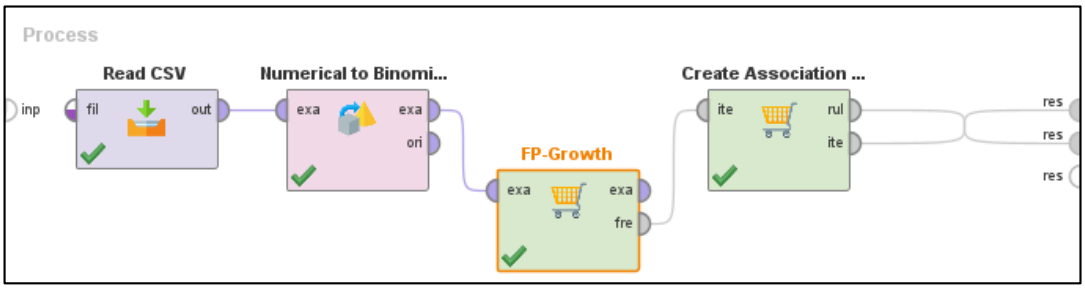


Figure 2 Data Mining FP Growth Process

The data was taken from a database using the read csv operator, then converted from numerical to binomial data to match the data characteristics for FP Growth analysis. The next step is to set the minimum support value in FP Growth to 0.9, Min item per itemset 1 (one), Max item per itemset 0 (Zero) to obtain more flexibility in obtaining optimal analysis results, Max Number of Itemset 20, and Min Number of Itemset 10. These numbers are the result of transaction data calculations, which are the average number of items most ordered and purchased by stores or partners, which is 14 items and a minimum order of 1 item. Create Association rules are set with a minimum confidence value of 0.5, and a minimum Lift value of 1.

2. Association rules

FP Growth is a data mining algorithm that is used to extract frequent itemsets from a large dataset. It is based on the divide-and-conquer approach and uses a tree structure to store the frequent itemsets. Association rules are then generated from these frequent item sets.

The sales pattern of the Company's products to partner stores is as shown in the following table which is produced from processing sales transaction data using the FP Growth and Association rules process in Figure 2 above.

Table 2 Sales Frquent Pattern of 2023

No	Premises	Conclusion	Support	Confidence	Lift
1	TIME BREAK RCO 16GR GT (20PC X 6BAL	NABATI RCO 39G GT (60PCS); NABATI RCE 16G GT (10PCS X 12BAL) R	0,911	0,945	1,036
2	TIME BREAK RCO 16GR GT (20PC X 6BAL	NABATI RCE 16G GT (10PCS X 12BAL) R	0,913	0,948	1,036
3	NABATI RCO 39G GT (60PCS)	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 39G GT (60PCS)	0,903	0,957	1,058
4	NABATI RCO 39G GT (60PCS)	NABATI RCE 39G GT (60PCS)	0,905	0,959	1,058
5	NABATI RCO 39G GT (60PCS)	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 39G GT (60PCS)	0,911	0,965	1,057
6	NABATI RCO 39G GT (60PCS)	NABATI RCE 16G GT (10PCS X 12BAL) R	0,912	0,967	1,057
7	NABATI RCE 6G GT (20PCS X 12IB)	TIME BREAK RCO 16GR GT (20PC X 6BAL	0,906	0,990	1,028
8	NABATI RCE 16G GT (10PCS X 12BAL) R	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 39G GT (60PCS)	0,911	0,995	1,046
9	NABATI RCE 39G GT (60PCS)	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 39G GT (60PCS)	0,903	0,996	1,046
10	NABATI RCE 16G GT (10PCS X 12BAL) R	NABATI RCO 39G GT (60PCS)	0,912	0,997	1,057
11	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 16G GT (10PCS X 12BAL) R	NABATI RCO 39G GT (60PCS)	0,911	0,997	1,057
12	NABATI RCE 16G GT (10PCS X 12BAL) R	TIME BREAK RCO 16GR GT (20PC X 6BAL	0,913	0,998	1,036
13	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 16G GT (10PCS X 12BAL) R	NABATI RCO 39G GT (60PCS)	0,903	0,998	1,058
14	NABATI RCO 39G GT (60PCS); NABATI RCE 39G GT (60PCS)	TIME BREAK RCO 16GR GT (20PC X 6BAL	0,903	0,998	1,036
15	NABATI RCE 39G GT (60PCS)	TIME BREAK RCO 16GR GT (20PC X 6BAL	0,905	0,998	1,036

No	Premises	Conclusion	Support	Confidence	Lift
16	NABATI RCE 39G GT (60PCS)	NABATI RCO 39G GT (60PCS)	0,905	0,998	1,058
17	NABATI RCO 39G GT (60PCS); NABATI RCE 16G GT (10PCS X 12BAL) R	TIME BREAK RCO 16GR GT (20PC X 6BAL	0,911	0,998	1,036
18	NABATI COATED KLP JMB 37G GT (12PCX	TIME BREAK RCO 16GR GT (20PC X 6BAL	0,902	0,998	1,036
19	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 16G GT (10PCS X 12BAL) R	NABATI RCE 16G GT (10PCS X 12BAL) R	0,911	0,984	1,046
20	TIME BREAK RCO 16GR GT (20PC X 6BAL); NABATI RCE 16G GT (10PCS X 12BAL) R	NABATI RCE 39G GT (60PCS)	0,903	0,984	1,046

Source: Processed Primary Data, 2023

The table above provided information that the sale of TIME BREAK RCO 16GR GT (20PC X 6BAL) was accompanied by the demand of NABATI RCO 39G GT (60PCS) and NABATI RCO 39G GT (60PCS) from the store, which was indicated by a support value of 0.911, meaning that there was a 91.1% chance of selling these products together. This situation was supported by the probability of sales certainty, which was indicated by a confidence value of 0.945 or 94.5%, and confirmed by the validity of the sales pattern (Lift value) of 1.036. These values were above the minimum threshold as mentioned earlier.

In other sales transactions, it was known that NABATI RCO 39G GT (60PCS) was sold together with TIME BREAK RCO 16GR GT (20PC X 6BAL) and NABATI RCE 16G GT (10PCS X 12BAL) R, with a support value of 0.911 (91.1%), a confidence value of 0.965 (96.5%), and a Lift value of 1.057. All of these values were above the minimum threshold, so the product sales transactions were considered valid. When a partner store ordered NABATI RCO 39G GT (60PCS) and NABATI RCE 16G GT (10PCS X 12BAL) R, the store also ordered TIME BREAK RCO 16GR GT (20PC X 6BAL). The probability of sales was indicated by a support value of 0.911 (91.1%), a confidence value of 0.998 (99.8%), and a Lift value of 1.036. These values indicated that the sales transaction was valid.

Other sales transactions also generally showed support, confidence, and Lift values above the minimum threshold. This situation indicated that the association rules of sales transactions were valid, or generally applied to the sale of the company's products from its partner stores, as patterned by these association rules. The illustration in Figure 3 summarized this argument and was above.

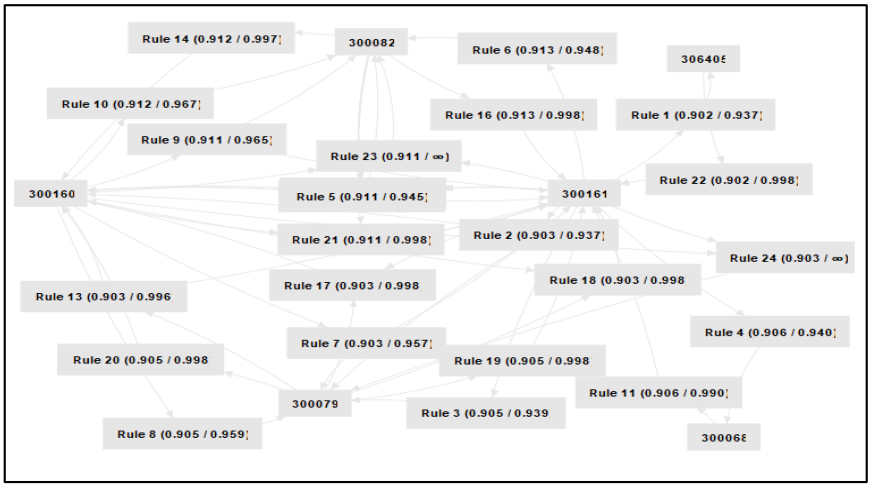


Figure 3 FP_Growth Tree

In terms of the inventory pattern described below, this was to examine the differences between sales patterns and the Company's merchandise inventory pattern.

Table 3 Product Inventory of 2023

Support	Item 1	Support	Item 2
0,963	TIME BREAK RCO 16GR GT (20PC X 6BAL)		
0,946	SIIP RCN 4G GT (20PCS X 12IB)		
0,943	NABATI RCO 39G GT (60PCS)		
0,935	LOTTE CHOCO PIE 26G (12PCS X 8IB)	0,913	NABATI RCE 16G GT (10PCS X 12BAL) R
0,928	NABATI RCO 6G GT (20PCS X 12IB)	0,906	NABATI RCE 6G GT (20PCS X 12IB)
0,927	NABATI COATED KLP 14G GT (12PC X 12)	0,905	NABATI RCE 39G GT (60PCS)
0,916	RICHESE MIE GORENG RICHICKEN LV3 77	0,902	NABATI COATED KLP JMB 37G GT (12PCX
0,915	NABATI RCE 16G GT (10PCS X 12BAL) R	0,912	NABATI RCE 16G GT (10PCS X 12BAL) R
0,915	NABATI RCE 6G GT (20PCS X 12IB)	0,905	NABATI RCE 39G GT (60PCS)
0,907	NABATI RCE 39G GT (60 PCS)		**Item 3**
0,904	TIME BREAK RCO EXT 36GR GT (10PCSX6	0,911	NABATI RCE 16G GT (10PCS X 12BAL) R
0,904	NABATI COATED KLP JMB 37G GT (12PCX	0,903	NABATI RCE 39G GT (60PCS)

Source: Processed Primary Data, 2023

The procurement of inventory was focused on the support value in determining the frequent Items Set that the company often purchased. The minimum inventory support value was 0.9 in the FP Growth analysis, and it turned out that there was a similar inventory pattern to the sales pattern, including products such as Time Break Rco 16gr Gt (20pc X 6bal), Nabati Rco 39g Gt (60pcs), Nabati Rco 6g Gt (20pcs X 12ib), Nabati Coated Klp 14g Gt (12pc X 12),

and so on. This was evidenced by the support value of each product above 0.9, namely between 0.902 - 0.963 or 90.2 – 96.3%, indicating that the shipment of goods from the supplier to the company in a series of products (items set) as in the table above. However, there were several other products such as Siip Rcn 4g Gt (20pcs X 12ib), Lotte Choco Pie 26g (12pcs X 8ib), and Richese Mie Goreng Richicken Lv3 77 that did not appear in the sales pattern analysis, so it can be said that these products were less favored by consumers.

The shipment of merchandise, namely snacks and drinks, by the head office as a supplier did not match the inventory information at its partner office. Thus, there was an opportunity for products that were sent to not necessarily sell as much and as often as products that were more popular with customers. This situation indicated that there was a lack of coordination between the head office and its partner. Products that were less favored by customers would add to the burden of shipping and storage costs, thus in the long run, it would harm the company on both sides.

Discussion

This research supported previous research by (Sitorus & Suseno, 2023), (Yetty et al., 2022), (Annisa Siti Habibah, Arip Solehudin, 2022), (D. Kurniawan et al., 2022), (Anggun Pastika Sandi & Vina Widya Ningsih, 2022), (Hartomo et al., 2020), (Junaidi, 2019), which identified products and product combinations that formed the basis for determining inventory. These researchers used the FP Growth algorithm to extract associations from a set of sales history data (association rules) and supported the analysis of merchandise inventory management.

The results of this research were similar to the research conducted by (Mulyani et al., 2021), (Nurhidayanti & Kurniawati, 2022), (Simbolon, 2019), dan (Tarigan et al., 2022), which provided inventory information to overcome the problem of excess inventory and poor customer service. The A priory algorithm was used to obtain 50 transaction data that were processed and met the minimum support of 12%, Confidence 50%, and Lift Ratio Ascent Ratio.

On the use of the RapidMiner application, researchers (Listiani & Wahyuningsih, 2019), produced a concentration of purchases that were often made for inventory that could help manage inventory to avoid stockouts in the company. Research by (Nurdiyansyah & Akbar, 2021), (Ramdhan et al., 2022), (Syakir et al., 2022), (Taufik Hidayat et al., 2023), dan (Widiastiwi & Tjhandra, 2019), discussed how to calculate the number of products using manual methods and tools such as RapidMiner. The results of both methods showed that the inventory level must be sufficient and produced two categories, namely large and small stock.

The relation between inventory management, strategic business, and accounting information systems was crucial for the effective operation of a company. Inventory management involved overseeing the flow of goods and services into and out of an organization. Strategic business decisions were informed by the data provided by inventory management and accounting information systems (Lijuan et al., 2023). These systems helped in cost control, performance measurement, and decision-making (Manik, 2023). For instance,

the implementation of an Inventory Information System (SIPB) may optimize inventory management and improved business sustainability. Furthermore, the integration of financial and non-financial information was necessary for decision-making in a Just-in-Time (JIT) business environment (Lin, 2019). Additionally, the design of an accounting information system may help in the quick calculation of merchandise inventory, leading to effective business operations (Andami et al., 2023). Therefore, the integration of inventory management, strategic business, and accounting information systems was essential for informed decision-making and efficient business performance.

Conclusion

The findings of this study indicated that the company has closely optimized its inventory since there were some products that were not involved in the association rules of sales. Hence, for business strategy, the company should consider inventory procurement along with its sales pattern, such as association rules, as a matter. Inventory optimization brings about some advantages such as efficient delivery cost, storage cost, and effective sales. RapidMiner is a software tool that was deployed by the company to find frequent patterns of growth and association rules of sales and product inventory in order to serve its customers just in time. The software has been proven by many companies to do so, as mentioned in the discussion above.

A recommendation for future studies is to use research data of sales and inventory for more than one year and deploy other data mining methods such as cluster method and classification method. Setting minimum support and confidence values with any number to compare the results of this study may broaden the insight of data mining academically and practically. This study was based on one year of sales and inventory data from a snack and beverage company, as a case study employing private data. Its findings were not comprehensive. The recommendation for the next study may use public data or private data from many companies in the same industry to approach empirical knowledge.

Declaration of conflicting interest

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