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Product Recommendation Information System Using the Apriori Algorithm on Sales Transaction Data of Shoe Store X

Devie Hartanti[1], Candra Mecca Sufyana[2], Ratnanto Aditiarno[3].
[1]Information Systems, Piksi Ganesha Polytechnic, Bandung, Indonesia, devi.hartanti@gmail.com
[2]Information Systems, Piksi Ganesha Polytechnic, Bandung, Indonesia, candra86mecca@gmail.com
[3]Computerized Accounting, Piksi Ganesha Polytechnic, Bandung, Indonesia, ratnanto@gmail.com

Corresponding Author: candra86mecca@gmail.com[2]

Abstract: The advancement of information technology has encouraged retail business owners to utilize transaction data as a basis for business decision-making, particularly in determining sales strategies and product recommendations. Shoe Store X possesses continuously growing sales transaction data; however, this data has not yet been optimally utilized to identify customer purchasing patterns. This study aims to design a product recommendation information system using the Apriori algorithm applied to the sales transaction data of Shoe Store X. The Apriori algorithm is used to discover patterns of relationships between products based on support and confidence values, thereby generating association rules that reveal the tendency of products to be purchased together. The research method employed includes the collection of sales transaction data, analysis of system requirements, system design, implementation of the Apriori algorithm, and testing of the recommendation results. The system developed is expected to help the store provide product recommendations to customers, formulate promotional strategies, arrange product placement, and improve sales effectiveness. The result of this research is an information system capable of processing transaction data into more targeted and user-friendly product recommendation information for store owners. With this system, Shoe Store X can utilize historical sales data as a basis for more effective, efficient, and data-driven decision-making.

Keywords: Information System, Product Recommendation, Apriori Algorithm, Transaction Data, Sales, Shoe Store.

INTRODUCTION

The development of information technology has had a major influence on business activities, particularly in the management of sales data in the retail sector. Every transaction that occurs in a store generates data that can be used as a source of information to support decision-making. Transaction data does not merely function as a sales record, but can also be analyzed to identify customer purchasing patterns, frequently demanded products, and combinations of products that are often purchased together. Information systems have become an essential part of helping organizations transform data into information that is useful for management (Laudon & Laudon, 2020). In the retail business, such as shoe stores, the need for

information systems is becoming increasingly important as business competition intensifies. Shoe stores are not only required to provide a wide range of products, but must also be able to understand customer needs and habits. Sales transaction data can provide insight into the types of shoes most frequently purchased, the brands in demand, the sizes most often sold, and complementary products that have the potential to be recommended to customers. According to Turban et al. (2018), the utilization of information technology in business can help companies improve operational efficiency and support strategic decisions.

A problem that frequently occurs in small- and medium-scale stores is that sales transaction data has not been utilized optimally. Sales data is generally used only to determine the quantity of items sold and total revenue, without further analysis to identify customer purchasing patterns. As a result, promotional strategies, product placement, and product recommendations are still largely determined based on the store owner's estimation. In fact, transaction data that is properly analyzed can produce more objective information that is beneficial for business development (Han, Kamber, & Pei, 2012).

One approach to processing sales transaction data is to apply data mining techniques. Data mining is a process for discovering patterns, relationships, or important information from large collections of data. This technique can be used to help business owners understand customer behavior based on stored historical data. According to Han et al. (2012), data mining plays an important role in discovering new knowledge from data so that it can be used to support decision-making. Within data mining, one of the methods widely used to analyze customer purchasing patterns is association rule mining. This method aims to discover relationships among items within a transaction. In the retail sector, this method is often used in market basket analysis, namely the analysis of sets of products frequently purchased together by customers. With this method, store owners can identify customer purchasing tendencies, for example, customers who purchase sports shoes are also likely to purchase socks or shoe-care products (Larose & Larose, 2015).

The Apriori algorithm is one of the most popular algorithms in association rule mining. This algorithm is used to discover frequent itemsets, or sets of items that frequently appear in transaction data. Agrawal and Srikant (1994) explained that the Apriori algorithm works by searching for combinations of items that satisfy a minimum support value, and then forming association rules based on the confidence value. Support is used to determine how frequently a product combination appears across all transactions, while confidence is used to determine the strength of the relationship between products. Applying the Apriori algorithm to a shoe store's sales transaction data can help generate more accurate product recommendations. Such recommendations can be used by store owners to offer additional products to customers based on previous purchasing patterns. For example, if the data shows that customers who purchase formal shoes frequently purchase shoe polish, the system can recommend shoe polish to customers who purchase formal shoes. According to Kusrini and Luthfi (2009), association rules can help uncover patterns of relationships among items, making them useful for developing sales strategies.

A product recommendation information system offers a solution that combines transaction-data management functions with Apriori algorithm analysis. This system not only stores sales data but also processes that data into recommendation information that can be utilized by store owners. With a product recommendation information system in place, the analysis process is no longer performed manually but is computerized, making it faster, more effective, and more accurate. Ricci, Rokach, and Shapira (2015) stated that recommender systems can help users find relevant products or information based on specific data patterns. For Shoe Store X, a product recommendation information system using the Apriori algorithm is expected to help improve the effectiveness of its sales strategy. The results of the system's analysis can be used to determine which products are suitable for joint promotion, to create

bundling packages, to arrange product layout, and to manage stock based on customer purchasing tendencies. Accordingly, this system can serve as a tool that helps store owners make more focused and data-driven business decisions.

Based on the foregoing description, research entitled "Product Recommendation Information System Using the Apriori Algorithm on Sales Transaction Data of Shoe Store X" is considered important to conduct. This study aims to design an information system capable of processing sales transaction data into product recommendations through the application of the Apriori algorithm. The system developed is expected to help Shoe Store X understand customer purchasing patterns, improve service, support promotional strategies, and enhance business competitiveness through the utilization of information technology.

METHOD

The research method used in this study is a descriptive method with a quantitative approach. The descriptive method is used to describe the problems that occur in the sales transaction data management process at Shoe Store X, particularly in the utilization of transaction data to generate product recommendations. The quantitative approach is used because this research processes sales transaction data in the form of product item data, which is analyzed using the Apriori algorithm based on *support* and *confidence* values. The object of this research is the sales transaction data of Shoe Store X. This transaction data is used to identify customer purchasing patterns, particularly the relationships between products that are frequently purchased together. The results of this analysis are then used as the basis for building the product recommendation information system. This system is expected to help the store owner determine promotional strategies, product placement, sales packages, and product recommendations for customers.

The data collection techniques used in this study include observation, interviews, documentation study, and literature review. Observation was conducted by examining the sales transaction process and product data management running at Shoe Store X. Interviews were conducted with the store owner or employees to obtain information regarding the obstacles faced, system requirements, and the product recommendation process that has been carried out so far. Documentation study was conducted by collecting sales transaction data, product lists, product categories, and sales reports. Meanwhile, the literature review was conducted by studying theories related to information systems, data mining, association rule mining, the Apriori algorithm, and product recommendation systems. The research stages began with problem identification, data collection, transaction data analysis, application of the Apriori algorithm, system design, system implementation, system testing, and drawing conclusions. In the problem-identification stage, the researcher analyzed the initial condition of transaction data management at Shoe Store X, which had not yet been optimally utilized to generate product recommendations. Subsequently, the collected transaction data was processed so that it could be used in the Apriori algorithm computation process.

The process of applying the Apriori algorithm was carried out by forming itemsets from the sales transaction data, determining the minimum *support* and minimum *confidence* values, calculating the frequency of item occurrence, forming *frequent itemsets*, and generating association rules. The *support* value is used to determine how frequently a product combination appears across all transactions, while the *confidence* value is used to determine the strength of the relationship between products. Association rules that satisfy the minimum *support* and *confidence* values are then used as the basis for product recommendations. The result of the Apriori algorithm analysis process is a set of association rules, for example, if a customer purchases product A, the customer is likely to also purchase product B. This rule is subsequently implemented within the product recommendation information system. Accordingly, the system built not only functions to store transaction data but is also able to

generate product recommendation information that can be used by the store owner in business decision-making.

Information System Development Method

The information system development method used in this study is the Waterfall method. The Waterfall method was chosen because it has systematic, structured, and sequential stages, making it suitable for use in developing the product recommendation information system. The stages of the Waterfall method consist of requirements analysis, system design, system implementation, system testing, and system maintenance. The first stage is system requirements analysis. In this stage, user and system requirements were identified based on the results of observation and interviews. The system's functional requirements include product data management, transaction data management, the Apriori algorithm computation process, the display of *support* and *confidence* results, the formation of association rules, and the presentation of product recommendations. The system's non-functional requirements include ease of use, access security through login, data-processing speed, and structured data storage.

The second stage is system design. In this stage, the system process flow, database design, and user interface design were carried out. The system design can be depicted using the Unified Modeling Language (UML), such as *use case diagrams*, *activity diagrams*, *sequence diagrams*, and *class diagrams*. The database design was created to store user data, product data, transaction data, transaction details, itemset results, *support* values, *confidence* values, and product recommendation results. The third stage is system implementation. In this stage, the system design is translated into a web-based application. The system was developed so that users can input product data, manage sales transactions, run the Apriori algorithm computation process, and view product recommendation results. Implementation of the Apriori algorithm was carried out by processing transaction data to generate *frequent itemsets* and association rules based on the predetermined minimum *support* and *confidence* values.

The fourth stage is system testing. Testing was carried out to ensure that the system operates in accordance with user requirements. The testing method used is *black box testing*, namely testing that focuses on the system's functions without examining the structure of the program code. Testing was performed on the login feature, product data management, transaction data management, the Apriori computation process, the display of recommendation results, and the analysis result reports. In addition, testing was also conducted by comparing the system's computation results with manual calculations to ensure that the *support*, *confidence*, and association-rule values generated were accurate. The final stage is system maintenance. Maintenance is carried out after the system has been implemented so that it continues to operate properly and can be further developed as needed. Maintenance may include error correction, product data updates, security enhancement, development of reporting features, and the addition of sales-data visualization features. With the Waterfall development method, the process of building the product recommendation information system could be carried out in a directed manner, resulting in a system that suits the needs of Shoe Store X.

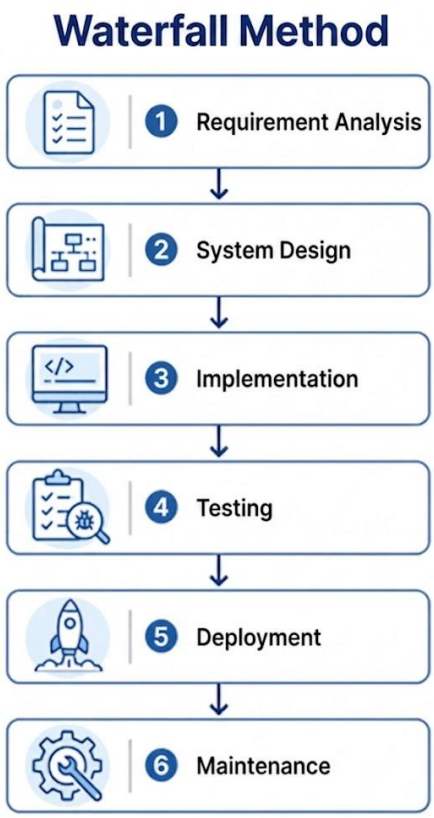

Figure 1. Waterfall Method

RESULTS AND DISCUSSION

The application of the Apriori algorithm in this study was used to discover patterns of relationships between products based on the sales transaction data of Shoe Store X. The Apriori algorithm works by searching for combinations of products that frequently appear together in transactions, and then forming association rules based on *support* and *confidence* values. The *support* value indicates the frequency of occurrence of a product combination across all transactions, while the *confidence* value indicates the strength of the relationship between the purchased product and the recommended product. The formulas used in the Apriori algorithm computation are as follows.

Support Formula

Support(A) = (Number of transactions containing A / Total number of transactions) × 100%

Confidence Formula

Confidence(A → B) = (Number of transactions containing A and B / Number of transactions containing A) × 100%

In this illustrative application, sales transaction data comprising 10 transactions was used. The products analyzed consist of several product types commonly sold at shoe stores, namely Sneakers, Sports Shoes, Formal Shoes, Socks, Shoe Polish, and Shoe Cleaner.

Table 1. Sales Transaction Data

Transaction Code	Purchased Product Items
T01	Sneakers, Socks, Shoe Cleaner
T02	Sports Shoes, Socks
T03	Formal Shoes, Shoe Polish

T04	Sneakers, Socks
T05	Sports Shoes, Socks, Shoe Cleaner
T06	Formal Shoes, Shoe Polish, Socks
T07	Sneakers, Shoe Cleaner
T08	Sports Shoes, Socks
T09	Sneakers, Socks, Shoe Cleaner
T10	Formal Shoes, Shoe Polish

In this study, the minimum support value was set at 30% and the minimum confidence value at 60%. This means an item or item combination is considered to satisfy the criterion if it appears in at least 30% of total transactions, and an association rule is considered strong if it has a confidence value of at least 60%.

Formation of Itemset 1

The first stage is to calculate the number of occurrences of each product across all transactions.

Table 2. Calculation of Itemset 1

Product Item	Number of Occurrences	Support
Sneakers	4	40%
Sports Shoes	3	30%
Formal Shoes	3	30%
Socks	7	70%
Shoe Polish	3	30%
Shoe Cleaner	4	40%

Based on the results of the Itemset 1 calculation, all items satisfy the minimum support value of 30%. Therefore, all items can proceed to the stage of forming Itemset 2 combinations.

Formation of Itemset 2

The next stage is to form combinations of two products and calculate the support value of each combination.

Table 3. Calculation of Itemset 2

Item Combination	Number of Occurrences	Support	Remarks
Sneakers, Socks	3	30%	Satisfied
Sneakers, Shoe Cleaner	3	30%	Satisfied
Sports Shoes, Socks	3	30%	Satisfied
Sports Shoes, Shoe Cleaner	1	10%	Not satisfied
Formal Shoes, Shoe Polish	3	30%	Satisfied
Formal Shoes, Socks	1	10%	Not satisfied
Shoe Polish, Socks	1	10%	Not satisfied
Socks, Shoe Cleaner	3	30%	Satisfied

Based on the table above, the item combinations that satisfy the minimum support are:

1) Sneakers and Socks
2) Sneakers and Shoe Cleaner

3) Sports Shoes and Socks
4) Formal Shoes and Shoe Polish
5) Socks and Shoe Cleaner

Item combinations that do not satisfy the minimum support are not used in the next stage because their occurrence level remains low.

Formation of Itemset 3

The next stage is to form combinations of three products from the itemsets that satisfy the criteria.

Table 4. Calculation of Itemset 3

Item Combination	Number of Occurrences	Support	Remarks
Sneakers, Socks, Shoe Cleaner	2	20%	Not satisfied
Sports Shoes, Socks, Shoe Cleaner	1	10%	Not satisfied
Formal Shoes, Shoe Polish, Socks	1	10%	Not satisfied

Based on the results of the Itemset 3 calculation, there is no three-product combination that satisfies the minimum support of 30%. Therefore, the frequent-itemset formation process stops at Itemset 2.

Formation of Association Rules

After the frequent itemsets were obtained, the next stage is to form association rules. Association rules are formed from item combinations that satisfy the minimum support. Subsequently, the confidence value of each rule is calculated to determine the strength of the relationship between products.

Table 5. Confidence Calculation of Association Rules

Association Rule	Confidence Calculation	Confidence	Remarks
If Sneakers is purchased, then Socks is purchased	3 / 4 × 100%	75%	Satisfied
If Socks is purchased, then Sneakers is purchased	3 / 7 × 100%	42.86%	Not satisfied
If Sneakers is purchased, then Shoe Cleaner is purchased	3 / 4 × 100%	75%	Satisfied
If Shoe Cleaner is purchased, then Sneakers is purchased	3 / 4 × 100%	75%	Satisfied
If Sports Shoes is purchased, then Socks is purchased	3 / 3 × 100%	100%	Satisfied
If Socks is purchased, then Sports Shoes is purchased	3 / 7 × 100%	42.86%	Not satisfied
If Formal Shoes is purchased, then Shoe Polish is purchased	3 / 3 × 100%	100%	Satisfied
If Shoe Polish is purchased, then Formal Shoes is purchased	3 / 3 × 100%	100%	Satisfied
If Socks is purchased, then Shoe Cleaner is purchased	3 / 7 × 100%	42.86%	Not satisfied
If Shoe Cleaner is purchased, then Socks is purchased	3 / 4 × 100%	75%	Satisfied

Based on the confidence calculation results, the association rules that satisfy the minimum confidence of 60% are as follows.

Table 6. Association Rules Satisfying the Criteria

No.	Association Rule	Support	Confidence
1	If Sneakers is purchased, then Socks is recommended	30%	75%
2	If Sneakers is purchased, then Shoe Cleaner is recommended	30%	75%
3	If Shoe Cleaner is purchased, then Sneakers is recommended	30%	75%
4	If Sports Shoes is purchased, then Socks is recommended	30%	100%
5	If Formal Shoes is purchased, then Shoe Polish is recommended	30%	100%
6	If Shoe Polish is purchased, then Formal Shoes is recommended	30%	100%
7	If Shoe Cleaner is purchased, then Socks is recommended	30%	75%

Interpretation of the Apriori Results

Based on the association-rule results, several customer purchasing patterns at Shoe Store X were identified. The rules with the highest confidence value are the relationships between Sports Shoes and Socks, Formal Shoes and Shoe Polish, and Shoe Polish and Formal Shoes, each with a confidence value of 100%. This indicates that every customer who purchased Sports Shoes in the transaction data also purchased Socks. In addition, customers who purchased Formal Shoes tended to purchase Shoe Polish. The association rule "If Formal Shoes is purchased, then Shoe Polish is recommended" has a support value of 30% and a confidence value of 100%. This means the combination of Formal Shoes and Shoe Polish appears in 30% of all transactions, and every transaction containing Formal Shoes is always accompanied by the purchase of Shoe Polish. Therefore, Shoe Polish can serve as the primary recommendation when a customer purchases Formal Shoes.

The rule "If Sports Shoes is purchased, then Socks is recommended" also has a confidence value of 100%. This indicates that Socks are a highly suitable complementary product to recommend to customers who purchase Sports Shoes. The store owner can leverage this pattern to create promotional packages or bundling strategies between Sports Shoes and Socks.

In addition, the rules "If Sneakers is purchased, then Socks is recommended" and "If Sneakers is purchased, then Shoe Cleaner is recommended" have a confidence value of 75%. This means customers who purchase Sneakers have a fairly high tendency to also purchase Socks or Shoe Cleaner. This result can be used as a basis for a cross-selling strategy to increase the value of sales transactions.

Application of the Apriori Algorithm in the Information System

The application of the Apriori algorithm in the product recommendation information system is carried out through several processes. First, the user inputs sales transaction data into the system. Transaction data consists of the transaction code, transaction date, and the list of products purchased by the customer. Second, the system groups products based on the transaction code to form transaction data ready for processing. Third, the system performs itemset calculations by counting the number of occurrences of each product and product combination. Fourth, the system compares the support value of each itemset with the predetermined minimum support value. Itemsets that satisfy the minimum support value are processed further, whereas itemsets that do not satisfy the minimum support value are eliminated.

Fifth, the system forms association rules from the frequent itemsets obtained. The confidence value of each association rule is then calculated. Rules that satisfy the minimum confidence value are displayed as product recommendation results. Sixth, the system displays the final results in the form of a list of product recommendations, support values, and confidence values. With the application of the Apriori algorithm in the information system, the process of analyzing customer purchasing patterns can be performed automatically. Store owners no longer need to perform manual calculations, as the system is able to process transaction data and generate product recommendations based on the patterns discovered.

Example of Product Recommendation Results in the System

Based on the results of the Apriori algorithm computation, the system can display product recommendations as follows.

Table 7. Example of Product Recommendation Results

Purchased Product	Recommended Product	Confidence
Sports Shoes	Socks	100%
Formal Shoes	Shoe Polish	100%
Shoe Polish	Formal Shoes	100%
Sneakers	Socks	75%
Sneakers	Shoe Cleaner	75%
Shoe Cleaner	Sneakers	75%
Shoe Cleaner	Socks	75%

These recommendation results can be used by the owner of Shoe Store X to support the sales process. For example, when a customer purchases Sports Shoes, the system will display a recommendation for Socks because it has a confidence value of 100%. When a customer purchases Formal Shoes, the system will recommend Shoe Polish because it has a very strong purchasing relationship. In this way, the system can help increase the opportunity for selling complementary products.

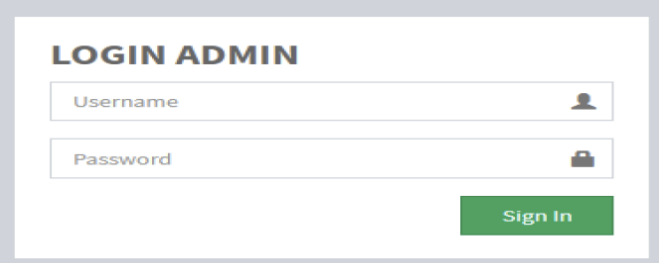

Figure 2. Login Page

The product management page illustrates the system's core feature for managing product data at Shoe Store X. On this page, users can view the list of available shoe products, such as sneakers, running shoes, futsal shoes, casual shoes, formal shoes, and sandals. Each product is displayed together with its name, image, weight, price, discount, stock, date added, and action buttons for editing or deleting product data.

This page serves as the central hub for managing master product data. The product data stored on this page is subsequently used in the sales-transaction process and in product-recommendation analysis. With the product management page, the store owner or admin can update product information more quickly and in a more structured manner. This helps reduce product-recording errors and facilitates the process of searching for product data.

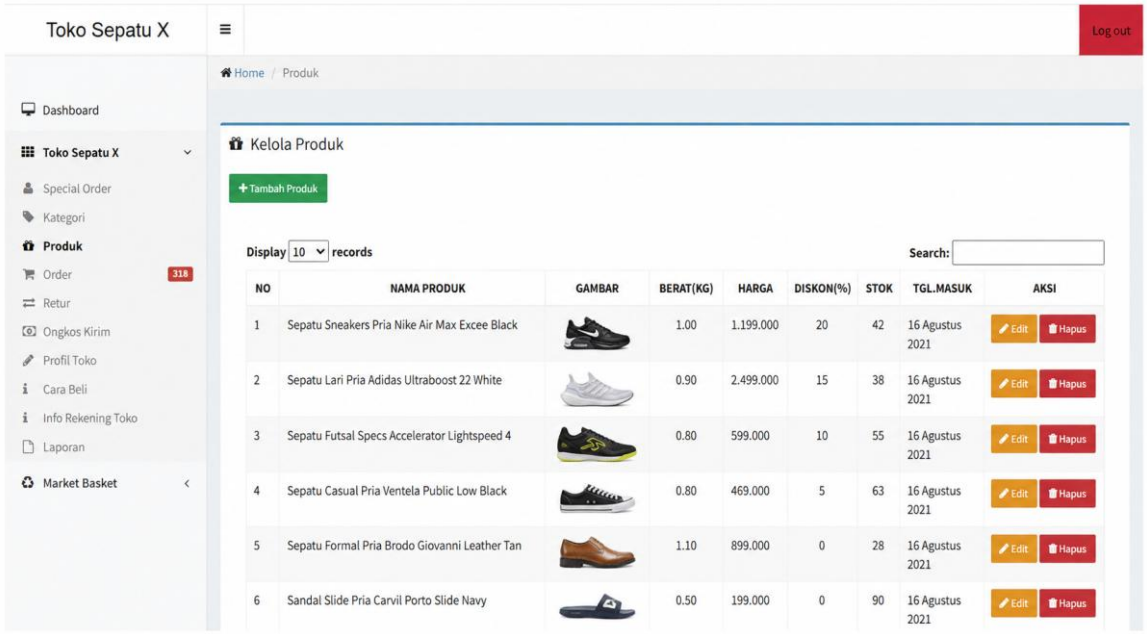

Figure 3. Admin Product Display

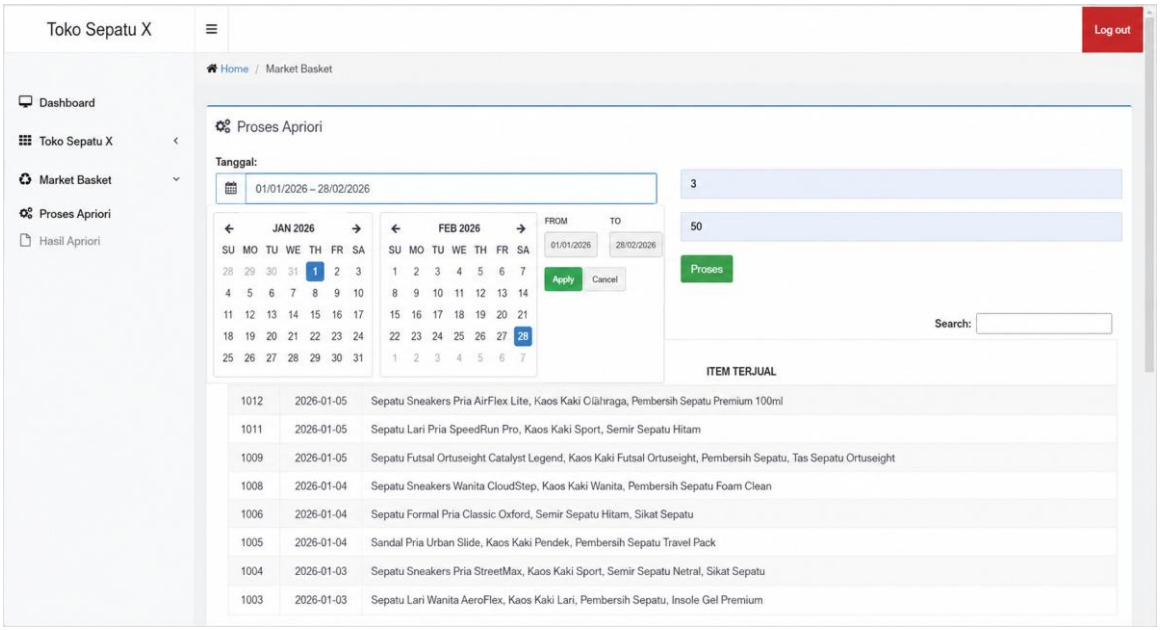

Figure 4. Apriori Process Display

The Apriori process page illustrates the feature used to run the analysis process on sales transaction data. On this page, users can specify the transaction date range to be analyzed, namely the period from January 2026 to February 2026. In addition, users can also set the minimum support and minimum confidence values as thresholds for forming association rules. This page is an important part of the recommendation system because the process of discovering customer purchasing patterns is carried out at this stage. Transaction data within a given period will be processed using the Apriori algorithm to find combinations of shoe products frequently purchased together. The minimum support value is used to filter frequently occurring product combinations, while the minimum confidence value is used to measure the strength of the relationship between products.

With this feature, users can adjust the analysis parameters as needed. For example, to generate more selective association rules, users can raise the minimum support and confidence

values. Conversely, to obtain a larger number of product-relationship patterns, users can lower these parameter values.

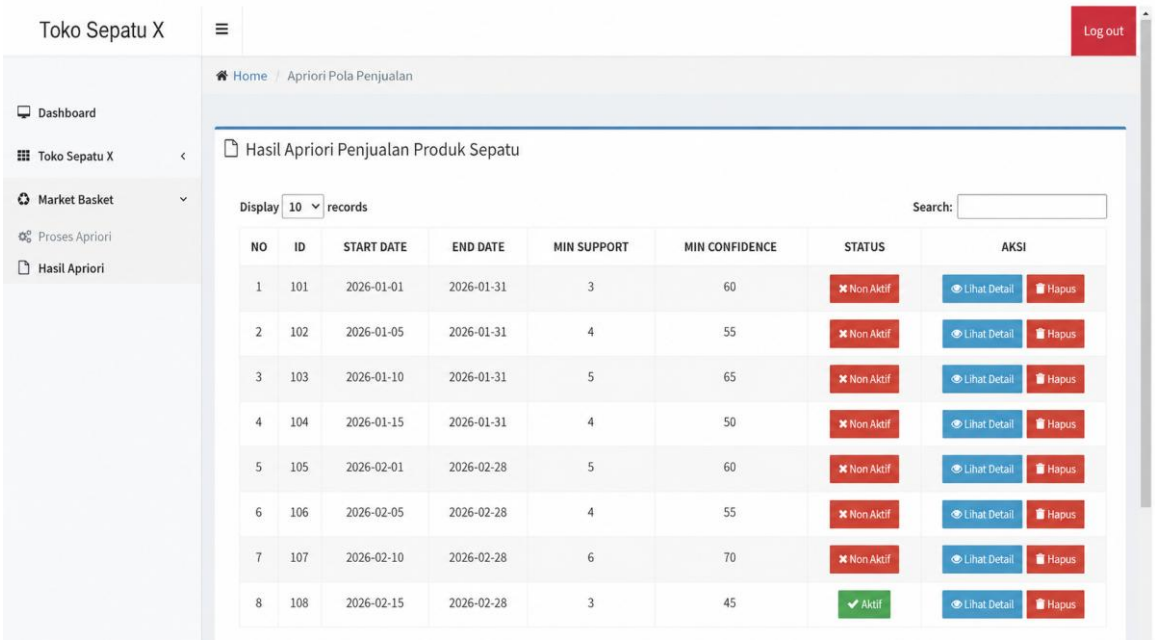

Figure 5. Apriori Results Display

The Apriori results page displays the list of analysis runs that the system has performed. This page contains information such as the process ID, start date, end date, minimum support value, minimum confidence value, process status, and an action button for viewing the analysis details. The data displayed on this page shows that the system stores the history of Apriori runs that have previously been executed. This feature is useful for users because analysis results can be reviewed again without having to repeat the computation. In addition, the active/inactive status indicates which analysis result is currently being used as the basis for the system's product recommendations. The Apriori results page also makes it easier for the admin to compare analysis results across different periods. For example, the analysis results for January 2026 can be compared with those for February 2026 to determine whether customer purchasing patterns have changed. Accordingly, the system functions not only as a computation tool but also as a medium for documenting sales-analysis results.

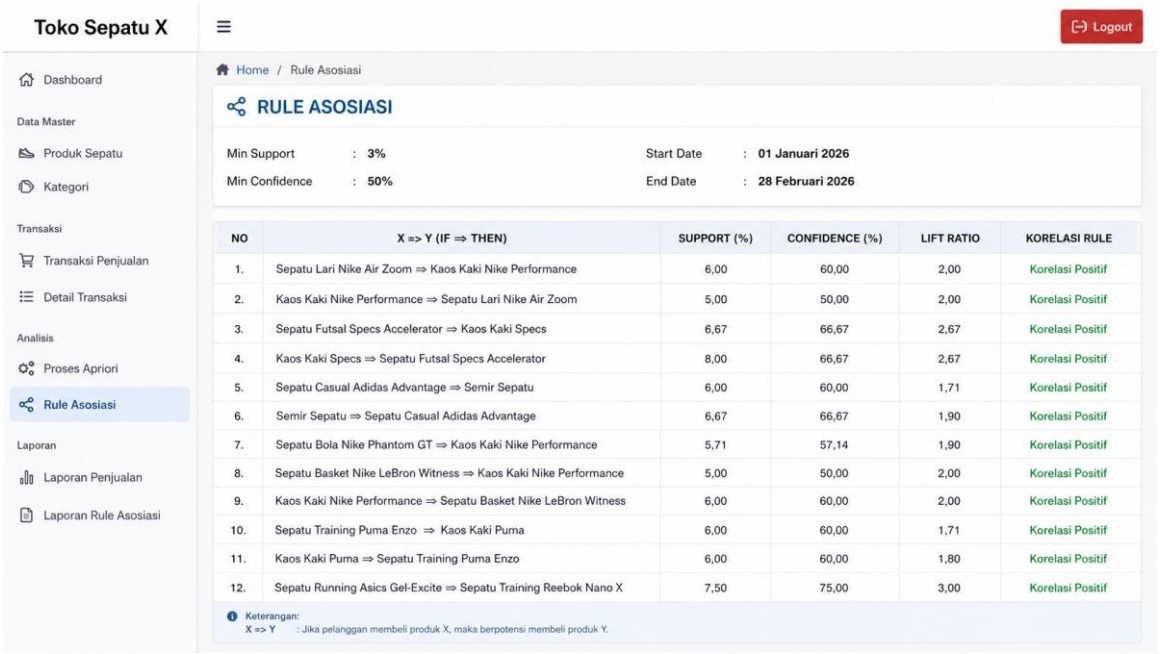

Figure 6. Detailed Apriori Results Display

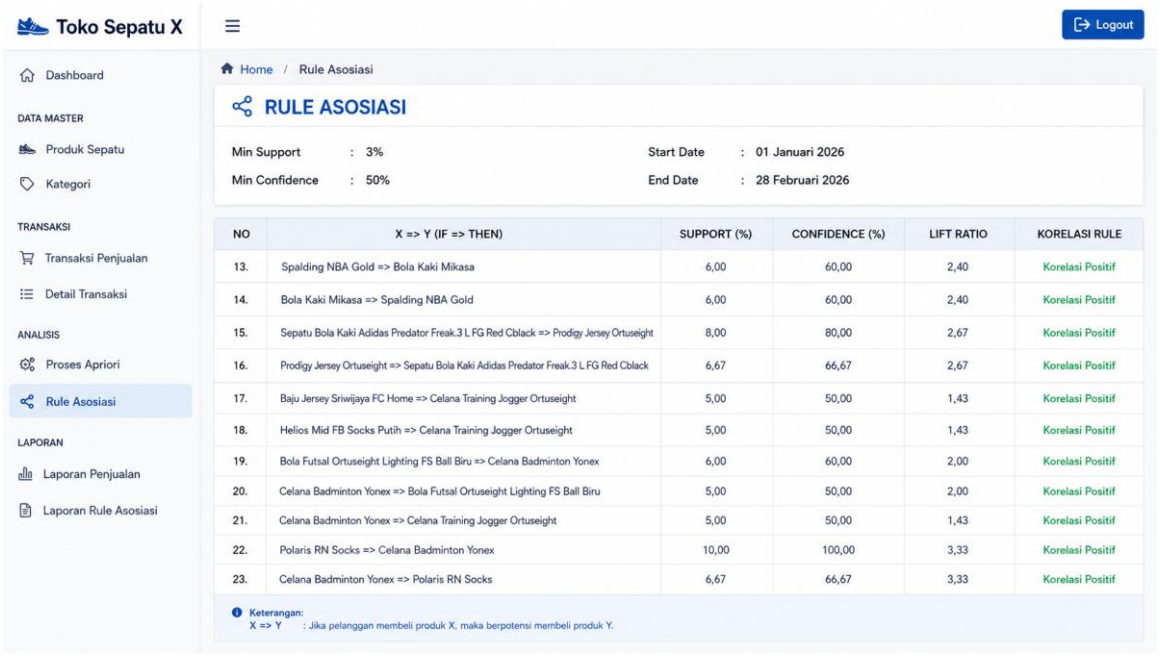

Figure 7. Continued Detailed Apriori Results Display

The association-rule page shows the final output of the Apriori algorithm process. On this page, association rules are displayed in the form of an X ⇒ Y relationship, meaning that if a customer purchases product X, the customer has a likelihood of also purchasing product Y. In addition, the table also displays the support value, confidence value, lift ratio, and rule correlation.

The confidence value indicates the degree of certainty regarding the relationship between products. The higher the confidence value, the stronger the likelihood that product Y will be purchased when product X is purchased. The lift-ratio value is used to measure the strength of the association between products. When the lift-ratio value is greater than 1, the relationship between products can be said to have a positive correlation. In the figure, all rules are labeled

"Positive Correlation," meaning that the products in question have a mutually supportive purchasing relationship.

The example association rules displayed represent the relationship between shoe products and supporting products such as socks, shoe polish, or other sports products. These results show that the system successfully identified customer purchasing patterns based on transaction data. This information can be used by the owner of Shoe Store X to develop promotional strategies, bundling packages, product recommendations, and stock management.

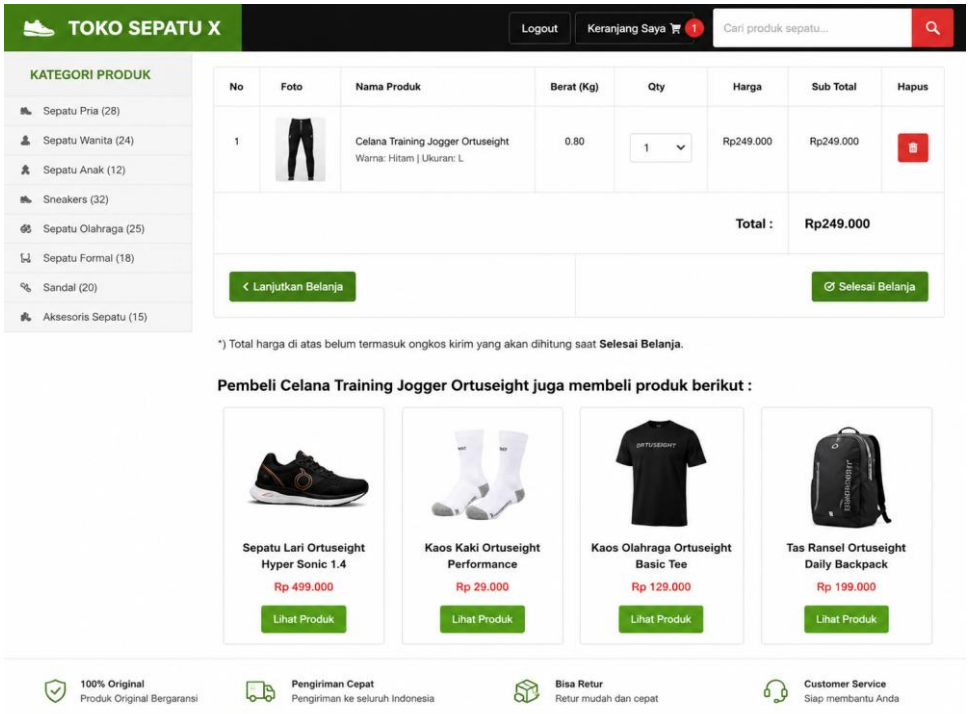

Figure 8. Apriori Recommendation Display

The shopping-cart page illustrates the application of the Apriori algorithm results on the customer side. On this page, a customer who adds a product to the cart will receive recommendations for other relevant products. For example, when a customer purchases a particular product, the system displays a recommendation section with the phrase "Customers who bought this item also bought the following products."

This recommendation feature is the result of applying the association rules obtained from the Apriori process. The recommended products are those that have a purchasing relationship with the main product based on previous transaction data. For example, a customer who purchases a sports shoe or sports trousers may be recommended complementary products such as socks, sports shoes, sports shirts, or sports bags.

This display demonstrates that the system is not only used by the admin for data analysis but can also provide direct benefits to customers. Product recommendations can help customers find complementary products that suit their needs. For the store owner, this feature can increase opportunities for additional sales through a *cross-selling* strategy.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the results of the research conducted, the product recommendation information system using the Apriori algorithm on the sales transaction data of Shoe Store X can help transform transaction data into more useful information. Sales data that was previously used only as an archive or transaction record can now be analyzed to identify customer purchasing

patterns, particularly the relationships between products frequently purchased together. The application of the Apriori algorithm within the system is able to generate association rules based on support, confidence, and lift-ratio values. These association rules are used as the basis for providing product recommendations to customers. With a rule such as "if a customer purchases product X, the customer is likely to purchase product Y," the system can provide more accurate, transaction-data-based product recommendations.

The system built has several core features, namely product data management, sales transaction management, the Apriori computation process, the display of Apriori results, association rules, and product recommendations on the shopping-cart page. These features demonstrate that the system functions not only as a data-recording medium but also as an analytical tool to support business decision-making. The product recommendation results displayed can help Shoe Store X improve its sales strategy, such as offering complementary products, creating bundling packages, arranging promotions, and implementing cross-selling strategies. In addition, the system can also help the store owner understand customer purchasing tendencies, so that decisions related to stock and marketing can be made more effectively.

Accordingly, the product recommendation information system using the Apriori algorithm is considered to be a viable solution for Shoe Store X in making more optimal use of its sales transaction data. This system is able to support the store's business processes, improve customer service, and help the store owner make data-driven decisions.

Recommendations

Based on the results of the research conducted, several recommendations can be offered for the further development of the system. First, the system should be developed using a larger volume of transaction data and a longer time period so that the resulting association rules become more accurate and representative of customer purchasing patterns. Second, the system could be enhanced with data-visualization features such as best-selling product charts, monthly transaction charts, and a sales dashboard. This feature would help the store owner read the analysis results more easily and quickly, enabling better decision-making.

Third, the product recommendation system could be developed for integration with a point-of-sale system or an online store. With such integration, the process of capturing transaction data could be carried out automatically without the need for manual data entry, making the system more efficient and practical to use. Fourth, future research could compare the Apriori algorithm with other algorithms such as FP-Growth or Eclat to determine the most effective method for generating product recommendations. This comparison is important so that the system can be developed using a faster algorithm suited to large volumes of transaction data. Fifth, the product recommendation feature could be made more dynamic by displaying recommendations in real time as customers select products. In this way, the system would not only benefit the admin but could also enhance the customer shopping experience and increase the potential for sales growth.

REFERENCES

Agrawal, R., & Srikant, R. (1994). Fast algorithms for mining association rules. Proceedings of the 20th International Conference on Very Large Data Bases, 487–499.

Agrawal, R., Imieliński, T., & Swami, A. (1993). Mining association rules between sets of items in large databases. Proceedings of the ACM SIGMOD International Conference on Management of Data, 207–216.

Amin, M., & Siahaan, A. P. U. (2016). Implementation of Apriori algorithm for analysis of consumer purchase patterns. International Journal of Scientific Research in Science and Technology, 2(4), 227–231.

Connolly, T., & Begg, C. (2015). Database systems: A practical approach to design, implementation, and management (6th ed.). Pearson.
Dennis, A., Wixom, B. H., & Roth, R. M. (2019). Systems analysis and design (7th ed.). Wiley.
Fayyad, U., Piatetsky-Shapiro, G., & Smyth, P. (1996). From data mining to knowledge discovery in databases. AI Magazine, 17(3), 37–54.
Han, J., Kamber, M., & Pei, J. (2012). Data mining: Concepts and techniques (3rd ed.). Morgan Kaufmann.
Hoffer, J. A., Ramesh, V., & Topi, H. (2016). Modern database management (12th ed.). Pearson.
Jogiyanto, H. M. (2005). Analisis dan desain sistem informasi: Pendekatan terstruktur teori dan praktik aplikasi bisnis. Andi.
Kadir, A. (2014). Pengenalan sistem informasi. Andi.
Kendall, K. E., & Kendall, J. E. (2014). Systems analysis and design (9th ed.). Pearson.
Kotler, P., & Keller, K. L. (2016). Marketing management (15th ed.). Pearson.
Kusrini, & Luthfi, E. T. (2009). Algoritma data mining. Andi.
Laudon, K. C., & Laudon, J. P. (2020). Management information systems: Managing the digital firm (16th ed.). Pearson.
Larose, D. T., & Larose, C. D. (2015). Data mining and predictive analytics (2nd ed.). Wiley.
Marakas, G. M., & O'Brien, J. A. (2013). Introduction to information systems (16th ed.). McGraw-Hill.
Pressman, R. S., & Maxim, B. R. (2020). Software engineering: A practitioner's approach (9th ed.). McGraw-Hill.
Ricci, F., Rokach, L., & Shapira, B. (2015). Recommender systems handbook (2nd ed.). Springer.
Romney, M. B., & Steinbart, P. J. (2018). Accounting information systems (14th ed.). Pearson.
Sharda, R., Delen, D., & Turban, E. (2020). Analytics, data science, & artificial intelligence: Systems for decision support (11th ed.). Pearson.
Sommerville, I. (2016). Software engineering (10th ed.). Pearson.
Sutabri, T. (2012). Analisis sistem informasi. Andi.
Tan, P. N., Steinbach, M., Karpatne, A., & Kumar, V. (2019). Introduction to data mining (2nd ed.). Pearson.
Turban, E., Pollard, C., & Wood, G. (2018). Information technology for management: On-demand strategies for performance, growth, and sustainability (11th ed.). Wiley.
Witten, I. H., Frank, E., Hall, M. A., & Pal, C. J. (2016). Data mining: Practical machine learning tools and techniques (4th ed.). Morgan Kaufmann.