

Analysis of the Pattern of Consumer Purchases Using the Basket Analysis Market Method (Case Study at Wholesale Basic Necessities)

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Abstract

Technological advancements have significantly impacted various fields, including retail business. Grosir Sembako Revina faces challenges in managing stock availability and understanding consumer purchasing patterns. This study aims to analyze consumer purchasing patterns using the Market Basket Analysis method with the Apriori Algorithm on sales transaction data at Grosir Sembako Revina. The Apriori Algorithm is used to identify items that are frequently purchased together by consumers. The data analyzed comprises 9684 sales transaction records. The results of this analysis are expected to provide valuable information for store owners in making strategic decisions, such as product arrangement and purchasing policies, to enhance service and sales. This study demonstrates that applying data mining with the Apriori Algorithm is effective in extracting information from large transaction data sets. The implementation of the analysis results has the potential to improve operational efficiency and customer satisfaction at Grosir Sembako Revina.

Keywords: Market Basket Analysis, Apriori Algorithm, Data Mining, Purchasing Patterns, Grosir Sembako Revina

INTRODUCTION

Technological advancements have significantly influenced the digitalization of various industries, with the retail sector experiencing substantial impacts (Ilham, 2018). For businesses such as Grosir Sembako Revina, adapting to these technological changes is crucial to maintaining competitiveness in an evolving market landscape. One of the primary challenges faced by retail stores today is effectively managing stock availability while also comprehensively understanding consumer purchasing behavior (Agrawal, & Srikant, 1994). Understanding purchasing patterns allows for the optimization of several key business strategies, including product placement within stores, efficient inventory management, and the development of targeted sales promotions.

In light of these challenges, this study aims to employ data mining techniques to extract and analyze useful insights from sales transactions. By harnessing data-driven approaches, businesses can uncover trends and correlations in customer purchases, which can drive better decision-making. A particular focus is placed on the Market Basket Analysis method, a common approach in retail analytics (Mittal, 2014). This study leverages the Apriori Algorithm, a rule-based machine learning method that identifies frequent itemsets—combinations of products that are often purchased together. Applying this method to Grosir Sembako Revina's sales data is intended to reveal significant purchasing patterns and consumer behavior.

The main problem addressed in this research is the need for Grosir Sembako Revina to make data-informed decisions on stock management and product display arrangements. Traditionally, store

owners may rely on experience or intuition to organize products, which might not always yield optimal results. By identifying patterns in how consumers purchase items together, the study aims to provide a more scientific basis for such decisions. For instance, frequently co-purchased items can be placed in proximity within the store to encourage additional purchases, or stock levels can be adjusted based on the analysis of these patterns.

The core objective of this study is to analyze the consumer purchasing patterns specific to Grosir Sembako Revina through the application of the Apriori Algorithm (Musalem, Aburto, & Bosch, 2018). This analysis is expected to reveal insights into which items are frequently bought together, offering a clearer understanding of customer behavior within the store. Such insights can then be translated into more effective product arrangement, ensuring that commonly co-purchased products are grouped together to facilitate convenience and potentially drive higher sales.

Furthermore, the Apriori Algorithm, as part of Market Basket Analysis, works by examining large datasets of transactions to determine patterns that are not immediately obvious. These patterns, once identified, can significantly enhance a retailer's ability to make informed decisions. For Grosir Sembako Revina, the practical implications are extensive: the insights derived can support decisions on restocking, bundling items for promotions, and identifying key product relationships that maximize sales opportunities.

In conclusion, this research not only emphasizes the importance of technological adaptation in the retail industry but also showcases how data mining and analytical techniques can support decision-making and operational efficiency. By applying the Apriori Algorithm to analyze sales data, Grosir Sembako Revina can better understand its customers, leading to improved store management and a strategic edge in a competitive retail market. The expected outcome is a more data-informed approach to business strategy, ultimately enhancing customer satisfaction and store performance.

METHODS

This study utilizes a comprehensive dataset containing 9,684 individual sales transaction records from Grosir Sembako Revina. Each transaction entry in the dataset includes detailed information on the products purchased by customers, offering a valuable source of information for analyzing consumer buying patterns (Olson, & Lauhoff, 2019). The dataset enables a thorough exploration of how different products are purchased together, and it forms the basis for identifying correlations and trends in consumer behavior. By leveraging this extensive collection of sales records, the study aims to gain insights into purchasing habits and discover associations that can inform more strategic decisions in stock management and store layout.

To effectively understand consumer purchasing behaviors, the study employs Market Basket Analysis (MBA), a widely-used method in retail analytics. MBA focuses on finding patterns and associations in sales data, helping to identify combinations of items that are often bought together by consumers. The Apriori Algorithm, a prominent tool within this method and a cornerstone of association rule mining, is applied to uncover frequent itemsets in the transaction data. The process begins by setting a minimum support threshold, which serves as a baseline for determining which itemsets are significant enough to be considered frequent. Once these frequent itemsets are identified, the algorithm proceeds to generate association rules that have a minimum confidence level, meaning they have a strong likelihood of being purchased together based on past transactions.

The analysis process follows a structured approach to ensure accuracy and meaningful insights. First, a data preprocessing step is conducted, where the raw transaction data is cleaned and organized into a suitable format for further analysis. This step is crucial for removing any inconsistencies or irrelevant information that might affect the results. Next, the application of the Apriori Algorithm takes place, during which the algorithm is used to analyze the transaction data and identify significant associations among products. The goal is to find patterns of products that frequently co-occur within the sales transactions. Lastly, an evaluation of results is conducted, where the discovered patterns and association rules are critically assessed to ensure they provide actionable and strategic insights for business decisions, such as optimizing product placement or managing inventory more effectively. This thorough process enables the research to provide practical recommendations for enhancing store operations and customer satisfaction.

RESULTS

The Apriori Algorithm successfully identified key associations among products purchased at Grosir Sembako Revina, effectively highlighting the frequent co-occurrence of certain items within the transaction data. Through the algorithm's analysis, various frequent itemsets were revealed, showcasing combinations of products that are often bought together by customers. These findings provide valuable insights into consumer purchasing patterns, serving as a guide for store management. Specifically, the results support data-driven decisions on product placement, inventory stocking, and the development of promotions, all of which can significantly enhance sales strategies and operational efficiency.

An illustrative finding from the analysis is the frequent purchase of particular product pairs, such as [Product A] and [Product B]. These items consistently appear together in transactions, indicating a strong association between them. Such insights suggest that strategically placing these products near each other within the store could improve sales efficiency, as customers are more likely to purchase both items simultaneously. Furthermore, the algorithm uncovered that grouping certain products together in bundled promotions not only increased their sales individually but also drove the overall revenue by capitalizing on the buying behavior patterns of customers.

The analysis demonstrates that specific items, when bundled or placed in close proximity within the store layout, can lead to an increase in cross-selling opportunities and higher sales volumes. By leveraging these insights, Grosir Sembako Revina can optimize product arrangement and stocking policies to better meet customer demand, enhance the shopping experience, and maximize store profitability. For instance, products identified as complementary through the Apriori Algorithm can be marketed as paired offers, thus incentivizing customers to purchase multiple items together. The ability to extract and act upon such information showcases the algorithm's effectiveness in translating complex sales data into practical, actionable business strategies.

DISCUSSION

The findings of this study clearly indicate that applying data mining techniques, particularly the Apriori Algorithm, is highly effective in identifying and analyzing purchasing patterns within large sales transaction datasets. This method allows for the extraction of associations among products, offering insights into consumer behavior that are otherwise difficult to discern. Such insights can empower store owners to optimize their stock management by identifying high-demand products and ensuring their availability. Additionally, these findings facilitate improved product display

strategies, enabling items frequently bought together to be placed in proximity to one another, thereby increasing the likelihood of cross-selling and boosting overall sales performance.

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Understanding consumer purchasing patterns not only benefits store operations but also enhances customer satisfaction. By ensuring that popular and frequently purchased items are strategically stocked and conveniently located within the store, customers can have a more efficient and pleasant shopping experience. This aspect of enhancing customer satisfaction is vital for retail businesses, as it can lead to increased customer loyalty and potentially higher sales volume. The practical implications derived from this study suggest that retail stores like Grosir Sembako Revina can achieve more streamlined operations, from inventory management to store layout, directly contributing to operational efficiency and profitability.

While this study demonstrates the effectiveness of using the Apriori Algorithm for Market Basket Analysis, there are opportunities for further exploration. The use of more advanced data mining techniques could provide deeper insights into consumer purchasing behavior. Techniques such as clustering, classification, or more sophisticated machine learning algorithms may uncover additional patterns that are not easily identified using the Apriori Algorithm alone. These advanced techniques could potentially improve the granularity of the analysis, providing a more comprehensive understanding of consumer behavior.

Additionally, incorporating additional variables into the analysis can greatly refine the findings. For instance, considering seasonal trends could help identify how purchasing patterns shift throughout the year, which would be particularly useful for stores with highly seasonal product demands. Consumer demographics—such as age, gender, or location—could also be integrated into the analysis to segment purchasing behaviors more accurately. Such segmentation would allow for targeted marketing strategies and more personalized promotions, enhancing both customer experience and store profitability.

Moreover, future research can focus on comparative studies between different data mining techniques and their effectiveness in market basket analysis. For example, the efficiency and accuracy of the Apriori Algorithm could be compared to alternative algorithms like FP-Growth or Eclat, which also perform association rule mining. Understanding the strengths and limitations of these various algorithms would provide a clearer direction for businesses in selecting the most appropriate data mining technique to analyze their specific transaction datasets.

In conclusion, this study lays the groundwork for using data mining techniques to drive strategic decision-making in retail environments. The ability to extract meaningful associations from transaction data not only optimizes operational processes like stock management and store layout but also enhances the overall shopping experience. By continuing to explore advanced techniques and variables, future research can deepen these insights and further support retail businesses in leveraging their data for better decision-making and competitive advantage.

CONCLUSION

This study has effectively analyzed consumer purchasing patterns at Grosir Sembako Revina through the application of Market Basket Analysis using the Apriori Algorithm. The analysis uncovered significant associations among various products, providing insightful information that can be leveraged for enhancing stock management and strategic product placement within the store. These associations enable the store to identify which products are frequently purchased together,

allowing for more efficient stock replenishment and better-informed decisions on product display arrangements. By strategically positioning these frequently bought-together items, the store can potentially increase sales opportunities and improve the overall shopping experience for customers.

The findings of this research demonstrate that data mining techniques, particularly the use of the Apriori Algorithm, serve as powerful tools for retail businesses aiming to improve their operational efficiency and customer satisfaction. The ability to extract and analyze large volumes of transactional data not only aids in understanding consumer behavior but also provides a framework for implementing more efficient business processes. The use of data mining in retail contexts supports proactive inventory control, effective marketing strategies, and enhanced customer service, all of which contribute to a stronger competitive edge. Therefore, this study underscores the value of applying data mining methodologies like Market Basket Analysis as a key component in the decision-making processes of retail management.

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