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Implementation of the Apriori Method in Consumer Purchasing Patterns at PT. Ouzen Anugerah Indonesia

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Abstract

The rapid growth of the cosmetics industry has created intense competition among retail companies, including PT. Ouzen Anugerah Indonesia, which faces challenges in understanding consumer purchasing behavior due to the lack of systematic data analysis. This study aims to analyze consumer purchasing patterns and identify frequently purchased product combinations using the Apriori algorithm as a data mining technique. The research employed a descriptive quantitative approach based on 5,000 sales transactions recorded between January and December 2024, consisting of transaction IDs, dates, and purchased product lists. Through the Apriori algorithm, the study generated association rules that reveal relationships among products, represented by support and confidence values. The results show that several cosmetic items exhibit strong associative relationships, indicating consistent consumer purchasing tendencies that can be utilized for cross-selling strategies, promotional bundling, and inventory optimization. These findings highlight the effectiveness of data mining in transforming raw transaction data into actionable insights that support data-driven business decision-making. The study contributes theoretically by reinforcing the application of association rule learning in medium-scale retail contexts and practically by providing a framework for developing marketing and operational strategies based on data analysis. The research also suggests that future studies integrate broader datasets and additional variables, such as consumer demographics and temporal factors, to enhance analytical depth and model generalization.

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1. Introduction

Data mining, often described as data or knowledge discovery, refers to the process of extracting hidden and previously unknown patterns from large datasets and converting them into useful information for decision-making. This process involves analyzing data from various perspectives and summarizing them into insights that support strategic and operational decisions (Han et al., 2022). In the business context, data mining plays a vital role in identifying customer preferences, predicting future trends, and improving marketing efficiency. According to Kotu and Deshpande (2020), data mining

techniques such as classification, clustering, and association rule mining enable organizations to explore historical data for better decision support. Among these techniques, association rule mining has become a widely applied approach in the retail industry to identify product purchase patterns and develop data-driven marketing strategies (Larose & Larose, 2016). This method allows businesses to understand which items are frequently purchased together, helping them design targeted promotional campaigns and optimize product placement. The implementation of data mining thus not only enhances decision quality but also provides competitive advantages in highly dynamic market environments where consumer behavior changes rapidly (Tan et al., 2019).

PT. Ouzen Anugerah Indonesia, a cosmetics retail company, faces challenges in managing and utilizing its sales transaction data effectively. Every day, the company processes numerous consumer purchases that result in large volumes of data stored in databases. However, these data have so far been used only for administrative reporting purposes rather than being analyzed for strategic insights. This underutilization of data limits the company's ability to identify consumer purchasing patterns and develop targeted marketing initiatives (Adawiyah, Defit, & Sumijan, 2024). As competition in the cosmetics sector intensifies, businesses are increasingly required to leverage data analytics for understanding market behavior and improving decision-making. Without analytical tools, decision-making tends to rely solely on intuition or managerial experience, which can lead to inaccurate forecasts and suboptimal marketing performance (Han et al., 2022). The absence of a structured system to analyze transaction data further constrains PT. Ouzen Anugerah Indonesia in identifying best-selling products, determining appropriate stock levels, and recognizing cross-selling opportunities. Hence, implementing data mining techniques, particularly the Apriori algorithm, is essential to extract valuable information from transactional data that can support evidence-based marketing and inventory management decisions.

The cosmetics industry continues to grow rapidly, both nationally and globally, driven by increasing consumer awareness of beauty, self-care, and skin health. This growth creates new opportunities but also challenges for retail companies to accurately predict and respond to changing consumer preferences (Afisyah, Winata, & Syahputra, 2021). PT. Ouzen Anugerah Indonesia, operating in this highly competitive environment, struggles to identify which cosmetic products sell best and how different products interact in purchasing behavior. The company's current approach, which lacks systematic analysis of transaction data, results in fluctuating product sales and inefficient inventory planning. Therefore, it is necessary to adopt a data-driven analytical framework to identify product associations and frequently purchased itemsets (Adawiyah et al., 2024). The Apriori algorithm, a well-known data mining technique for association rule learning, can provide valuable insights into consumer behavior by identifying products that tend to be purchased together. By applying this algorithm, companies can optimize product placement, design promotional bundles, and enhance marketing effectiveness. Prior research in the retail sector has demonstrated that Apriori can significantly improve understanding of customer preferences, leading to increased sales performance and improved decision support (Han et al., 2022; Kotu & Deshpande, 2020).

Several studies have explored the use of the Apriori algorithm for analyzing purchasing patterns and market basket data in the retail sector. For instance, Adawiyah et al. (2024) applied Apriori in a healthcare retail setting to identify combinations of products purchased together, which improved the company's inventory management and promotional strategies. Similarly, Afisyah et al. (2021) demonstrated that Apriori-based association analysis could reveal strong correlations among products in fashion retail stores, leading to more effective marketing programs. Previous research has also highlighted that the Apriori algorithm is particularly effective in medium-scale enterprises due to its simplicity, interpretability, and efficiency in identifying frequent itemsets (Tan et al., 2019). These studies collectively underscore the value of using Apriori for uncovering hidden patterns in consumer transactions. Building upon these findings, this study applies the Apriori algorithm to 5,000 sales transactions recorded at PT. Ouzen Anugerah Indonesia between January and December 2024 to identify frequent product combinations and derive actionable insights for managerial decision-

making. The analysis is expected to reveal dominant itemsets that can serve as the foundation for developing data-based business strategies, thereby enhancing organizational competitiveness.

The objective of this study is twofold: first, to identify and analyze frequent product combinations from sales transaction data using the Apriori algorithm, and second, to provide strategic recommendations for PT. Ouzen Anugerah Indonesia in formulating data-driven marketing, inventory, and promotional decisions. From a theoretical perspective, this research contributes to the field of data mining by demonstrating how association rule learning can be adapted to medium-scale cosmetic retail businesses in Indonesia. From a practical perspective, the findings are expected to support management in optimizing product layout, bundling promotions, and improving stock management. The scientific contribution of this study lies in bridging the gap between theoretical applications of data mining and their practical implications in real-world retail contexts. Ultimately, the application of the Apriori algorithm in this research will help PT. Ouzen Anugerah Indonesia transition from intuition-based to data-driven decision-making, thereby increasing operational efficiency, enhancing customer satisfaction, and strengthening its competitiveness in the growing cosmetics market (Larose & Larose, 2016; Tan et al., 2019).

2. Research Methodolgy

This research uses a quantitative approach. Quantitative research is a type of research that uses numerical data or numbers to analyze phenomena and answer research questions. This research typically aims to test hypotheses, measure relationships between variables, or identify patterns or trends. Data can be collected through surveys, experiments, observations, or existing statistical data. Quantitative research often uses statistical analysis techniques to process and draw conclusions. In this study, data collected from PT. Ouzen Anugerah Indonesia amounted to 5,000 sales transactions during the period January–December 2024.

Quantitative research aims to gain an understanding of how something is constructed, how it is built, or how it works. Quantitative research is generally driven by a hypothesis, which is formulated and rigorously tested, with the goal of proving it incorrect. The quantitative aspect emphasizes that measurement is fundamental because it provides the link between observation and the formalization of models, theories, and hypotheses. The outcome of quantitative research is the development of models, theories, and hypotheses related to natural phenomena. This research aims to obtain insights into consumer purchasing patterns at PT. Ouzen Anugerah Indonesia.

System development can involve constructing a new system, replacing an existing system entirely, or improving an existing system. Each stage must be completed before proceeding to the next to avoid repetition. The Fishbone framework system development methodology is shown in Figure 1.1:

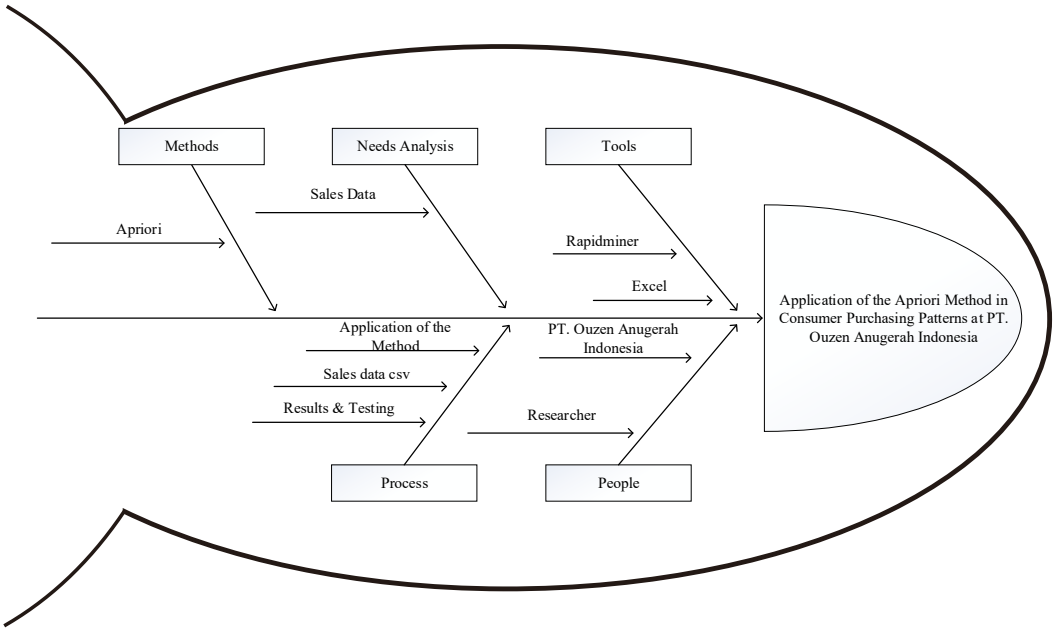

Figure 1. Fishbone Framework

The following is an explanation of Figure I.1 of the Fishbone research framework that will be implemented by the researcher in the Application of the Apriori Method to Consumer Purchasing Patterns at PT. Ouzen Anugerah Indonesia:

1. Methods
   This stage can be considered the method testing stage on the system used by the author. Several testing methods were used in this writing, namely Algorithm method testing is the process of evaluating Apriori's performance in identifying Consumer Purchasing Patterns at PT. Ouzen Anugerah Indonesia in the dataset.
2. Needs Analysis
   System requirements are analyzed through data collection that will be used as initial data to support system design and input data from the system for the assessment process. The initial data supporting the system design includes the process of determining criteria and compiling a hierarchy of factors that influence the assessment. The input data used in this case is data on the products most in demand by consumers.
3. Tools
   Contains specifications of the tools used, components, test equipment, and a block diagram of the equipment to be designed.
   a. Specification *Software*
      1) Rapidminer
      2) Microsoft Excel 2021
   b. Specification *Hardware*
      1) i5-11400H
      2) NVIDIA GeForce RTX 3050
      3) RAM 16GB
      4) SSD 512GB

4. Process
   This stage can be considered the final stage in the use of an application. After the results and system testing are completed, the system is ready for use by users.
5. People
   The system for determining consumer purchasing patterns at PT. Ouzen Anugerah Indonesia, which often appears simultaneously, has passed the process stage and is ready for use. It is possible that this system will undergo changes once it is used by users.

3. Results and Discussion

The following are the results of the data selection process for the previous sales data:

Table 1. Data Selection Results

Date	Product
01/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , Pemutih Kulit Pria Perawatan Wajah, Paket 3 Kotak Sabun Muka Pria, Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat, Gel Pemutih Pria 5 Whitening Muka Mencerahkan, Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
01/03/2024	Colus Men Hydrabright , UV Defense, Gel Pemutih Pria 5 Whitening Muka Mencerahkan, Sabun Muka Pria Skincare Cowok, Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
01/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , Paket 3 Kotak Sabun Muka Pria, Pemutih Wajah Pria, COLUS MEN Sun Gel & Giga White Serum
2/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , UV Defense, Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat
2/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat, Gel Pemutih Pria 5 Whitening Muka Mencerahkan, Sabun Muka Pria Skincare Cowok, Pemutih Wajah Pria, Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
2/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Pemutih Kulit Pria Perawatan Wajah, Paket 3 Kotak Sabun Muka Pria, Pemutih Wajah Pria, COLUS MEN Sun Gel & Giga White Serum
2/03/2024	Colus Men Hydrabright , UV Defense, Kolagen Pria, Paket Skincare Pria, COLUS MEN Sun Gel & Giga White Serum , Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
3/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , UV Defense, Kolagen Pria, Pemutih Kulit Pria Perawatan Wajah, Sabun Muka Pria Skincare Cowok, Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
3/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Pemutih Kulit Pria Perawatan Wajah, Paket 3 Kotak Sabun Muka Pria, Pemutih Wajah Pria, COLUS MEN Sun Gel & Giga White Serum
3/03/2024	COLUS Salmon DNA Pemutih Badan Pria, UV Defense, Paket Skincare Pria, Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat, Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
04/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , Kolagen Pria, Pemutih Kulit Pria Perawatan Wajah, Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat, Pemutih Wajah Pria, COLUS MEN Sun Gel & Giga White Serum
04/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Colus Men Hydrabright , UV Defense, Paket 3 Kotak Sabun Muka Pria, Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat, Gel Pemutih Pria 5 Whitening Muka Mencerahkan, COLUS MEN Sun Gel & Giga White Serum , Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
04/03/2024	COLUS Salmon DNA Pemutih Badan Pria, UV Defense, Gel Pemutih Pria 5 Whitening Muka Mencerahkan, COLUS MEN Sun Gel & Giga White Serum , Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P
04/03/2024	COLUS Salmon DNA Pemutih Badan Pria, Paket Skincare Pria, Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P, Face Wash,

Date	Product
	Colus Men Galacto Essence Toner, Toner untuk Kontrol Minyak , Exfoliating toner Membersihkan Mencerahkan, Sabun Muka Organic Alami, Skin Barrier Repair

1. Itemset Formation

The following is the solution based on the data provided in Table III.2. The process of forming C1, also known as 1 itemset, with minimum support = 20% and minimum confidence = 20%, is carried out using the following formula:

$$Support = \frac{\text{Total Transaction A}}{\text{Total Transaction}} \quad (1)$$

So that,

Support COLUS Salmon DNA Pemutih Badan Pria = $\frac{42}{70} * 100$ = 60%

Support Colus Men Hydrabright = $\frac{15}{70} * 100$ = 21%

Support Pemutih Kulit Pria Perawatan Wajah = $\frac{16}{70} * 100$ = 23%

The calculation results from Iteration I can be seen in the table below:

Table 2. Support for each item

Product	Number of Occurrences / Total	Support
1. COLUS Salmon DNA Pemutih Badan Pria	42 / 70	60 %
2. Colus Men Hydrabright	15 / 70	21 %
3. Pemutih Kulit Pria Perawatan Wajah	16 / 70	23 %
4. Paket 3 Kotak Sabun Muka Pria	16 / 70	23 %
5. Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat	39 / 70	56 %
6. Gel Pemutih Pria 5 Whitening Muka Mencerahkan	35 / 70	50 %
7. Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	34 / 70	49 %
8. Paket Skincare Pria	12 / 70	17 %
9. Face Wash	13 / 70	19 %
10. Colus Men Galacto Essence Toner	18 / 70	26 %
11. Toner untuk Kontrol Minyak	26 / 70	37 %
12. Exfoliating toner Membersihkan Mencerahkan	24 / 70	34 %
13. Sabun Muka Organic Alami	15 / 70	21 %
14. Skin Barrier Repair	13 / 70	19 %
15. UV Defense	10 / 70	14 %
16. COLUS MEN Sun Gel & Giga White Serum	28 / 70	40 %
17. Kolagen Pria	15 / 70	21 %
18. Pemutih Wajah Pria	24 / 70	34 %
19. Sabun Muka Pria Skincare Cowok	25 / 70	36 %
20.Sunscreen Cowok	11 / 70	16 %
21.Triple White Active Booster Men	17 / 70	24 %
22. Colus Salmon DNA Hithion Perawatan Kulit Cerah	20 / 70	29 %
23. COLUS MEN Bright Side Up Ceramide Bar Soap	16 / 70	23 %
24. Whitening Muka Mencerahkan Paket	14 / 70	20 %
25. Colus Men Giga Triple White	6 / 70	9 %
26. Serum Wajah Kering Kotoran	15 / 70	21 %
27. Sabun Ceramide Pencerah Kulit Pria	7 / 70	10 %

So, the results obtained from the table above are Itemset >= 20% as follows:

Table 3 Itemset Results

Produk
1. H COLUS Salmon DNA Pemutih Badan Pria
2. A Colus Men Hydrabright
3. J Pemutih Kulit Pria Perawatan Wajah
4. G Paket 3 Kotak Sabun Muka Pria
5. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat
6. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan
7. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
8. S Colus Men Galacto Essence Toner
9. T Toner untuk Kontrol Minyak
10. U Exfoliating toner Membersihkan Mencerahkan
11. W Sabun Muka Organic Alami
12. D COLUS MEN Sun Gel & Giga White Serum
13. I Kolagen Pria
14. M Pemutih Wajah Pria
15. L Sabun Muka Pria Skincare Cowok
16. Q Triple White Active Booster Men
17. R Colus Salmon DNA Hithion Perawatan Kulit Cerah
18. V COLUS MEN Bright Side Up Ceramide Bar Soap
19. AZ Whitening Muka Mencerahkan Paket
20. O Serum Wajah Kering Kotoran

2. Combining 2 Itemsets

The process of forming C2, also known as 2 itemsets, with a minimum support of 20%. This can be solved using the following formula:

$$Support = \frac{\text{Total Transaction A and B}}{\text{Total transaction}} \quad (2)$$

So that,

a. *Support* COLUS Salmon DNA Pemutih Badan Pria - Colus Men Hydrabright = $\frac{11}{70} * 100$ = 16 %
b. *Support* COLUS Salmon DNA Pemutih Badan Pria - Pemutih Kulit Pria Perawatan Wajah = $\frac{13}{70} * 100$ = 19 %
c. *Support* COLUS Salmon DNA Pemutih Badan Pria - Paket 3 Kotak Sabun Muka Pria= $\frac{9}{70} * 100$ = 13 %

The calculation results from Iteration II can be seen in the table below:

Table 4. Support for Each 2 Items

Product	Number of Occurrences / Total	Support
1. H COLUS Salmon DNA Pemutih Badan Pria - A Colus Men Hydrabright	11 / 70	16 %
2. H COLUS Salmon DNA Pemutih Badan Pria - J Pemutih Kulit Pria Perawatan Wajah	13 / 70	19 %
3. H COLUS Salmon DNA Pemutih Badan Pria - G Paket 3 Kotak Sabun Muka Pria	9 / 70	13 %

Product	Number of Occurrences / Total	Support
4. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat	25 / 70	36 %
5. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan	21 / 70	30 %
6. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	17 / 70	24 %
7. H COLUS Salmon DNA Pemutih Badan Pria - S Colus Men Galacto Essence Toner	10 / 70	14 %
8. H COLUS Salmon DNA Pemutih Badan Pria - T Toner untuk Kontrol Minyak	11 / 70	16 %
9. H COLUS Salmon DNA Pemutih Badan Pria - U Exfoliating toner Membersihkan Mencerahkan	16 / 70	23 %
10. H COLUS Salmon DNA Pemutih Badan Pria - W Sabun Muka Organic Alami	6 / 70	9 %
11. H COLUS Salmon DNA Pemutih Badan Pria - D COLUS MEN Sun Gel & Giga White Serum	18 / 70	26 %
12. H COLUS Salmon DNA Pemutih Badan Pria - I Kolagen Pria	14 / 70	20 %
13. H COLUS Salmon DNA Pemutih Badan Pria - M Pemutih Wajah Pria	15 / 70	21 %
14. H COLUS Salmon DNA Pemutih Badan Pria - L Sabun Muka Pria Skincare Cowok	8 / 70	11 %
15. H COLUS Salmon DNA Pemutih Badan Pria - Q Triple White Active Booster Men	9 / 70	13 %
16. H COLUS Salmon DNA Pemutih Badan Pria - R Colus Salmon DNA Hithion Perawatan Kulit Cerah	12 / 70	17 %
17. H COLUS Salmon DNA Pemutih Badan Pria - V COLUS MEN Bright Side Up Ceramide Bar Soap	8 / 70	11 %
18. H COLUS Salmon DNA Pemutih Badan Pria - AZ Whitening Muka Mencerahkan Paket	8 / 70	11 %
19. H COLUS Salmon DNA Pemutih Badan Pria - O Serum Wajah Kering Kotoran	11 / 70	16 %
20. A Colus Men Hydrabright - J Pemutih Kulit Pria Perawatan Wajah	4 / 70	6 %
21. A Colus Men Hydrabright - G Paket 3 Kotak Sabun Muka Pria	6 / 70	9 %
22. A Colus Men Hydrabright - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat	7 / 70	10 %
23. A Colus Men Hydrabright - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan	9 / 70	13 %
24. A Colus Men Hydrabright - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	7 / 70	10 %
25. A Colus Men Hydrabright - S Colus Men Galacto Essence Toner	3 / 70	4 %

Thus, the table above shows that the results of the Itemset >= 20% and the first association formation with a confidence value >= 20% are as follows:

Table 5 Results of 2 Itemsets

Product
1. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat
2. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan

Product
3. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
4. H COLUS Salmon DNA Pemutih Badan Pria - U Exfoliating toner Membersihkan Mencerahkan
5. H COLUS Salmon DNA Pemutih Badan Pria - D COLUS MEN Sun Gel & Giga White Serum
6. H COLUS Salmon DNA Pemutih Badan Pria - I Kolagen Pria
7. H COLUS Salmon DNA Pemutih Badan Pria - M Pemutih Wajah Pria
8. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan
9. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
10. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - T Toner untuk Kontrol Minyak
11. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - D COLUS MEN Sun Gel & Giga White Serum
12. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - M Pemutih Wajah Pria
13. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - L Sabun Muka Pria Skincare Cowok
14. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - R Colus Salmon DNA Hithion Perawatan Kulit Cerah
15. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
16. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - T Toner untuk Kontrol Minyak
17. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - D COLUS MEN Sun Gel & Giga White Serum
18. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - T Toner untuk Kontrol Minyak
19. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - D COLUS MEN Sun Gel & Giga White Serum
20. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - L Sabun Muka Pria Skincare Cowok
21. T Toner untuk Kontrol Minyak - U Exfoliating toner Membersihkan Mencerahkan
22. D COLUS MEN Sun Gel & Giga White Serum - M Pemutih Wajah Pria

3. Formation of Association Rules for 2 Itemsets

After all high-frequency patterns are found, the next step is to find association rules that meet the minimum confidence requirements by calculating the confidence level of associative rules A and B. Minimum confidence = 20%.

$$Confidence\ P\ (B|A) = \frac{\text{Total transaction A and } B}{\text{Total transaction A}} \quad (3)$$

So that,

a. ***Confindence*** COLUS Salmon DNA Pemutih Badan Pria - Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat = $\frac{25}{42} * 100$ = 59.52 %
b. ***Confindence*** COLUS Salmon DNA Pemutih Badan Pria - Gel Pemutih Pria 5 Whitening Muka Mencerahkan = $\frac{21}{42} * 100$ = 50 %
c. ***Confindence*** COLUS Salmon DNA Pemutih Badan Pria - Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P = $\frac{17}{42} * 100$ = 40.48 %

The confidence values obtained for forming an association for two itemsets are as follows:

Table 6. Association Rules for Two Itemsets

Porduct	Number of Occurrences / Total	Confidence
1. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat	25 / 42	59.52 %
2. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan	21 / 42	50 %
3. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	17 / 42	40.48 %
4. H COLUS Salmon DNA Pemutih Badan Pria - U Exfoliating toner Membersihkan Mencerahkan	16 / 42	38.1 %
5. H COLUS Salmon DNA Pemutih Badan Pria - D COLUS MEN Sun Gel & Giga White Serum	18 / 42	42.86 %
6. H COLUS Salmon DNA Pemutih Badan Pria - I Kolagen Pria	14 / 42	33.33 %
7. H COLUS Salmon DNA Pemutih Badan Pria - M Pemutih Wajah Pria	15 / 42	35.71 %
8. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan	20 / 39	51.28 %
9. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	18 / 39	46.15 %
10. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - T Toner untuk Kontrol Minyak	17 / 39	43.59 %
11. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - D COLUS MEN Sun Gel & Giga White Serum	15 / 39	38.46 %
12. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - M Pemutih Wajah Pria	16 / 39	41.03 %
13. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - L Sabun Muka Pria Skincare Cowok	14 / 39	35.9 %
14. B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - R Colus Salmon DNA Hithion Perawatan Kulit Cerah	15 / 39	38.46 %
15. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	20 / 35	57.14 %
16. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - T Toner untuk Kontrol Minyak	14 / 35	40 %
17. C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - D COLUS MEN Sun Gel & Giga White Serum	16 / 35	45.71 %
18. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - T Toner untuk Kontrol Minyak	14 / 34	41.18 %
19. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - D COLUS MEN Sun Gel & Giga White Serum	16 / 34	47.06 %
20. E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - L Sabun Muka Pria Skincare Cowok	14 / 34	41.18 %
21. T Toner untuk Kontrol Minyak - U Exfoliating toner Membersihkan Mencerahkan	14 / 26	53.85 %
22. D COLUS MEN Sun Gel & Giga White Serum - M Pemutih Wajah Pria	14 / 28	50 %

4. Combination of 3 Itemsets

The process of forming C3, also known as 2 itemsets, with a minimum support of 20%. This can be solved using the following formula:

$$Support = \frac{\text{Total transaction A,B and C}}{\text{Total transaction}} \quad (4)$$

So that,

a. ***Support*** COLUS Salmon DNA Pemutih Badan Pria - Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - Gel Pemutih Pria 5 Whitening Muka Mencerahkan = $\frac{12}{70} * 100 = 17$ %
b. ***Support*** COLUS Salmon DNA Pemutih Badan Pria - Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria P= $\frac{10}{70} * 100 = 14$ %
c. ***Support*** COLUS Salmon DNA Pemutih Badan Pria - Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - Exfoliating toner Membersihkan Mencerahkan= $\frac{8}{70} * 100 = 11$ %

Thus, the support values for the three itemsets are shown in the following table:

Table 7. Support Results for the Three Itemsets

Product	Number of Occurrences / Total	Support
1. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan	12 / 70	17 %
2. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	10 / 70	14 %
3. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - U Exfoliating toner Membersihkan Mencerahkan	8 / 70	11 %
4. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - D COLUS MEN Sun Gel & Giga White Serum	10 / 70	14 %
5. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - I Kolagen Pria	9 / 70	13 %
6. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - M Pemutih Wajah Pria	10 / 70	14 %
7. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - T Toner untuk Kontrol Minyak	7 / 70	10 %
8. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - L Sabun Muka Pria Skincare Cowok	5 / 70	7 %
9. H COLUS Salmon DNA Pemutih Badan Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat - R Colus Salmon DNA Hithion Perawatan Kulit Cerah	9 / 70	13 %
10. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat	12 / 70	17 %
11. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria	10 / 70	14 %
12. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - U Exfoliating toner Membersihkan Mencerahkan	7 / 70	10 %

Product	Number of Occurrences / Total	Support
13. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - D COLUS MEN Sun Gel & Giga White Serum	10 / 70	14 %
14. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - I Kolagen Pria	6 / 70	9 %
15. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - M Pemutih Wajah Pria	6 / 70	9 %
16. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - T Toner untuk Kontrol Minyak	6 / 70	9 %
17. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - L Sabun Muka Pria Skincare Cowok	3 / 70	4 %
18. H COLUS Salmon DNA Pemutih Badan Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan - R Colus Salmon DNA Hithion Perawatan Kulit Cerah	7 / 70	10 %
19. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat	10 / 70	14 %
20. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - C Gel Pemutih Pria 5 Whitening Muka Mencerahkan	10 / 70	14 %
21. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - U Exfoliating toner Membersihkan Mencerahkan	6 / 70	9 %
22. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - D COLUS MEN Sun Gel & Giga White Serum	7 / 70	10 %
23. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - I Kolagen Pria	3 / 70	4 %
24. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - M Pemutih Wajah Pria	4 / 70	6 %
25. H COLUS Salmon DNA Pemutih Badan Pria - E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria - T Toner untuk Kontrol Minyak	5 / 70	7 %

Thus, the table above shows that the results of the Itemset >= 20% and the first association formation with a confidence value >= 20% is that there is no itemset that has a support value >= 20%. Thus, the results of the association formed are as follows:

Tabel 8 Asosiasi

Decision
1. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat
2. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY C Gel Pemutih Pria 5 Whitening Muka Mencerahkan
3. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
4. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY U Exfoliating toner Membersihkan Mencerahkan
5. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY D COLUS MEN Sun Gel & Giga White Serum
6. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY I Kolagen Pria

Decision
7. IF BUY H COLUS Salmon DNA Pemutih Badan Pria THEN BUY M Pemutih Wajah Pria
8. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY C Gel Pemutih Pria 5 Whitening Muka Mencerahkan
9. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
10. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY T Toner untuk Kontrol Minyak
11. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY D COLUS MEN Sun Gel & Giga White Serum
12. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY M Pemutih Wajah Pria
13. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY L Sabun Muka Pria Skincare Cowok
14. IF BUY B Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Sabun Jerawat THEN BUY R Colus Salmon DNA Hithion Perawatan Kulit Cerah
15. IF BUY C Gel Pemutih Pria 5 Whitening Muka Mencerahkan THEN BUY E Colus Men Paket Sun Gel + Serum Skincare Pria Pemutih Wajah Pria Skincare Men Perawatan Wajah Pria
22. IF BUY D COLUS MEN Sun Gel & Giga White Serum THEN BUY M Pemutih Wajah Pria

From the display, an a priori test process is carried out, starting from the menu list, then the association results from the data will be obtained.

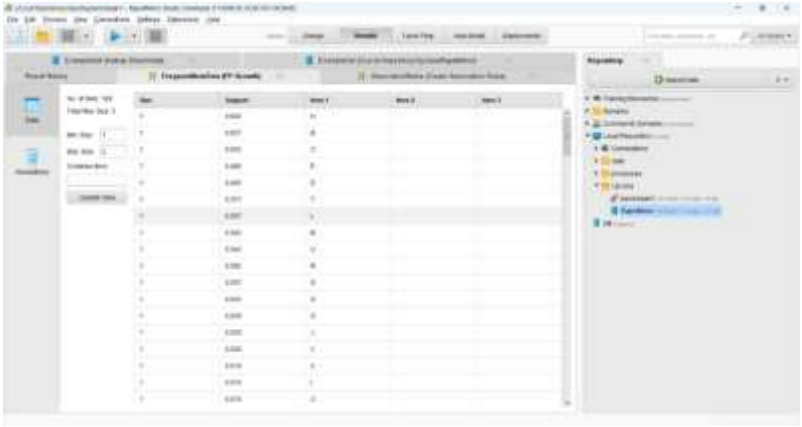

Figure 2. Apriori Analysis Results

Figure 2 shows that product H (COLUS Salmon DNA Men's Body Whitening) had a support value of 0.600 or 60%, followed by B (Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser Acne Soap) with a support value of 0.557 or 56%, and the other products.

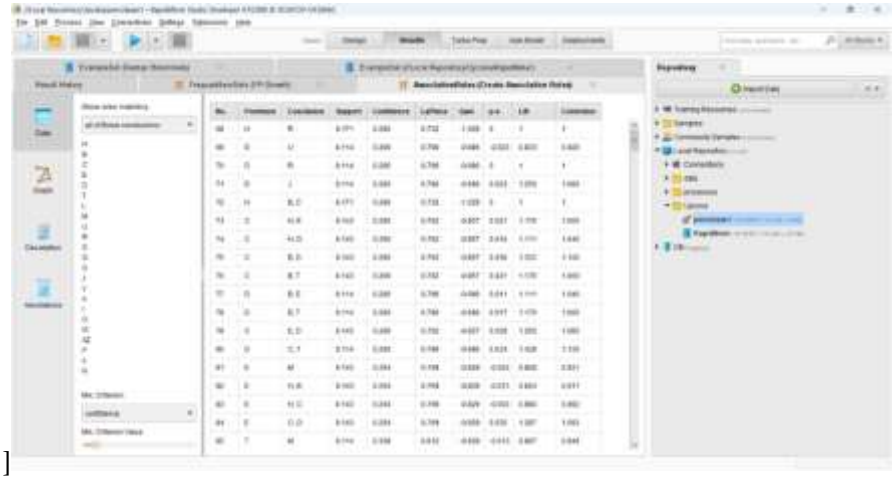

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Figure 3. Apriori Analysis Results (Continued)

The figure above shows information on support, confidence, lift, and conviction in the second figure 4. If the lift value is >1, the transactions have a positive relationship (A increases the likelihood of B occurring). If the lift value is 1, the transactions do not influence each other. If the lift value is <1, the transactions are negatively related (A decreases the likelihood of B occurring). As for the conviction value, the greater the conviction value, the stronger the causal relationship between A and B. If the conviction value is 1, there is no relationship between A and B.

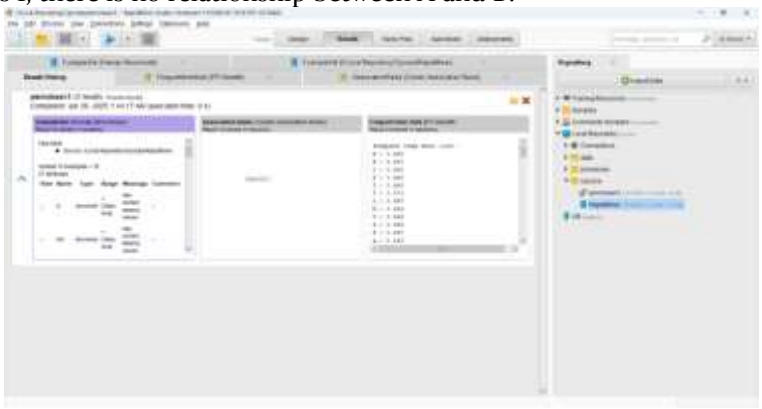

Figure 4. Results of Apriori Analysis (Continued)

a. Business Interpretation

Based on the analysis, 22 association rules were formed. Of these rules, the pattern with the highest level of support was the purchase of product H (Colus Salmon DNA Men's Body Whitening), followed by the purchase of product B (Colus Men Facial Wash Acne Salicylic Acid Gentle Cleanser), with a support value of 36%. Furthermore, the combinations H → C and B → C/E also showed quite high support values (29–30%). This pattern indicates that consumers tend to purchase body care products while also complementing them with facial care. In general, product H serves as the primary entry point, which then encourages consumers to purchase other products such as B, C, E, and D.

b. Future Management Decisions

Based on this interpretation, the management of PT. Ouzen Anugerah Indonesia can take the following strategic steps:

1. A bundling strategy, combining product H with product B, C, or E as a promotional package due to their strongest purchasing associations.

2. Product arrangement, placing product H close to products B, C, and E in both physical stores and online catalogs to increase cross-selling.
3. Stock management, maintaining the availability of product H and its complementary products, as unavailability of one or the other reduces the potential for package sales.
4. Thematic promotion, developing a "Comprehensive Care for Men" marketing process that emphasizes the combination of body care (product H) and facial care (products B, C, and E).
5. Customer segmentation, providing product recommendations based on purchasing patterns to consumers who purchase product H to encourage them to purchase other related products.

4. Conclusion

Based on the findings, this study concludes that the application of the Apriori algorithm in analyzing consumer purchasing patterns at PT. Ouzen Anugerah Indonesia effectively identifies frequent product combinations and reveals hidden associations within transactional data, thereby enabling data-driven decision-making in marketing, inventory management, and promotional strategy formulation. The research demonstrates that data mining, particularly association rule learning, serves as a powerful analytical framework for transforming raw transaction data into actionable business intelligence. Theoretically, these findings strengthen the empirical foundation of data mining applications in the retail sector by validating the Apriori algorithm's capability to extract meaningful relationships among items in medium-scale enterprises. Practically, the results offer managerial implications for implementing targeted cross-selling strategies, optimizing product placement, and improving stock control efficiency, which collectively enhance organizational competitiveness in the cosmetics industry. However, this study is limited by its use of a single dataset from one company and the focus on transactional attributes without integrating external factors such as customer demographics or temporal purchasing trends. Future research should address these limitations by employing larger and more diverse datasets, incorporating multi-dimensional variables, and comparing the performance of Apriori with other advanced association algorithms—such as FP-Growth or Eclat—to enhance model generalizability and robustness. By expanding these analytical dimensions, subsequent studies can contribute to the broader development of intelligent data-driven retail management systems that align with the evolving dynamics of consumer behavior and digital commerce.

References

Abidin, Z., Amartya, A. K., & Nurdin, A. (2022). Penerapan algoritma Apriori pada penjualan suku cadang kendaraan roda dua (Studi kasus: Toko Prima Motor Sidomulyo). Jurnal Teknoinfo, 16(2), 225. https://doi.org/10.33365/jti.v16i2.1459

Adawiyah, Q., Defit, S., & Sumijan. (2024). Penerapan algoritma K-Means clustering untuk mengelompokkan rekomendasi metode kontrasepsi berbasis machine learning di Puskesmas. Jurnal KomtekInfo, 300–305. https://doi.org/10.33365/j.komtekinfo.vxxi.xx

Ade Irma Amanda, S. M. A., Setiawan, D., & Trisnawati, L. (2023). Penerapan algoritma Apriori dalam menganalisis pola minat beli konsumen di coffee shop. JEKIN - Jurnal Teknik Informatika, 3(1), 25–32. https://doi.org/10.58794/jekin.v3i1.483

Afisyah, A., Winata, H., & Syahputra, Y. H. (2021). Implementasi data mining dengan metode FP-Growth untuk strategi promosi pada Toko Cool Kids Plaza Medan Fair. Jurnal Cyber Tech. http://ojs.trigunadharma.ac.id/index.php/j

Edy Prayitno, & Fakta Sari, D. (2022). Implementasi algoritma Apriori untuk pola kombinasi pembelian barang. Jurnal Cakrawala Ilmiah, 2(2), 691–696. https://doi.org/10.53625/jcijurnalcakrawalailmiah.v2i2.3812

Han, J., Kamber, M., & Pei, J. (2022). Data mining: Concepts and techniques (4th ed.). Morgan Kaufmann.

Hermiati, R., Asnawati, A., & Kanedi, I. (2021). Pembuatan e-commerce pada Raja Komputer menggunakan bahasa pemrograman PHP dan database MySQL. Jurnal Media Infotama, 17(1), 54–

66. https://doi.org/10.37676/jmi.v17i1.1317
Janis, J. W., Mamahit, D. J., Sugiarso, B. A., Rumagit, A. M., Elektro, T., Sam, U., & Manado, R. (2020). Rancang bangun aplikasi online sistem pemesanan jasa tukang bangunan berbasis lokasi. Jurnal Teknik Informatika, 15(1), 1–12. https://doi.org/10.35793/jti.15.1.2020.29023
Kotu, V., & Deshpande, B. (2020). Predictive analytics and data mining: Concepts and practice with RapidMiner (2nd ed.). Morgan Kaufmann.

Larose, D. T., & Larose, C. D. (2016). Discovering knowledge in data: An introduction to data mining (2nd ed.). Wiley.
Naldy, E. T., & Andri, A. (2021). Penerapan data mining untuk analisis daftar pembelian konsumen dengan menggunakan algoritma Apriori pada transaksi penjualan Toko Bangunan MDN. Jurnal Nasional Ilmu Komputer, 2(2), 89–101. https://doi.org/10.47747/jurnalnik.v2i2.525
Nisa, V. C., & Khasanah, F. N. (2023). Algoritma Apriori dalam identifikasi pola pembelian konsumen pada produk minuman. INFORMAL: Informatics Journal, 8(2), 156. https://doi.org/10.19184/isj.v8i2.41514
Rahmi, A. N., & Mikola, Y. A. (2021). Implementasi algoritma Apriori untuk menentukan pola pembelian pada customer (Studi kasus: Toko Bakoel Sembako). Information System Journal, 4(1), 14–19. https://jurnal.amikom.ac.id/index.php/infos/article/view/561
Rifania, V. S., Saniman, S., & Azlan, A. (2023). Penerapan algoritma Apriori dalam mencari pola pembelian konsumen. Jurnal Sistem Informasi Triguna Dharma (JURSI TGD), 2(2), 201. https://doi.org/10.53513/jursi.v2i2.5750
Rosmayati, I., Wahyuningsih, W., Harahap, E. F., & Hanifah, H. S. (2023). Implementasi data mining pada penjualan kopi menggunakan algoritma Apriori. Jurnal Algoritma, 20(1), 99–107. https://doi.org/10.33364/algoritma/v.20-1.1259
Surur, M., Saputro, H., & Azizah, N. (2022). Implementasi algoritma Apriori dalam menentukan pola pembelian (Cap N Chris Café & Resto Jepara) berbasis web. Journal of Information System and Computer, 2(2), 36–45. https://doi.org/10.34001/jister.v2i2.393
Tan, P.-N., Steinbach, M., Karpatne, A., & Kumar, V. (2019). Introduction to data mining (2nd ed.). Pearson.