

Identification of Product Bundling for Designing Digital Flyers Using Market Basket Analysis

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Abstract— Understanding consumer needs and maintaining consumer loyalty are strategies for achieving business success. To achieve this success, several actions can be taken, such as improving product quality, adding product variations, and providing attractive promotional offers. This research employs the apriori algorithm method to identify customer interest and purchasing patterns, aiming to devise a bundling promotion strategy for food and beverages and develop an optimal marketing approach. This research utilizes qualitative methods with Weng Coffee Signature as the research object, by utilizing primary data in the form of 4380 sales transaction records in January 2024. The results of the apriori method will be evaluated based on the support, confidence, and lift values. The analysis indicates that the suitable menu for bundling promotions is Lemon Punch with Chicken Pop and Lychee Yogurt with Chicken Pop. By using these bundling menus derived from customer purchasing patterns, it is hoped that Weng Coffee Signature can enhance its marketing through social media. The suggestion for further research is for Weng Coffee Signature to implement bundling promotions based on the findings obtained. This will allow researchers to determine if this strategy can be useful.

Keywords—*Apriori Method; Bundling; Business Retail Chain; Digital Promotion; Machine Learning; Market Business Analysis*

I. INTRODUCTION

In fierce business competition, knowing consumer needs and maintaining customer loyalty are strategies for achieving business success [1]. To accomplish this, improving product quality and adding product variations with attractive promotions can be effective. One approach to achieve this success is through sales data analysis. By formulating an accurate marketing strategy, it is expected to increase revenue in the face of ongoing competition. In facing this competition, it is necessary to have innovative marketing strategies [2], [3].

This research focuses on the Weng Coffee. Weng Coffee has been present in Pontianak since 1970, initially selling quality ground coffee favored by all segments of society. With the passage of time, Weng Coffee expanded its offerings by establishing a café in 2020 and now has several branches across Pontianak, West Kalimantan. This research will concentrate on the operations and strategies at the central branch, Weng Coffee Signature. The author chose Weng Coffee Signature as the object of research because this business is a famous family business located in Pontianak, which facilitates easier access to relevant information for the study. Weng Coffee Signature offers a diverse menu that includes foods, drinks, snacks, and desserts. This focus allows researchers to gain a deeper understanding of the operational dynamics and marketing strategies related to Weng Coffee Signature. To utilize this information and determine effective marketing strategies, existing sales transaction history data can be processed using machine learning techniques, one of which is the apriori algorithm method.

The apriori algorithm method is a data mining technique used to identify association patterns of concurrent product purchases in transactional datasets. In the context of bundling strategies, this method analyzes sales transactions and identifies product combinations frequently purchased together by consumers. This process involves searching for associations between items in transactions to find significant purchase patterns [4]. These association rules can be used to design more effective bundling packages to increase the value provided to consumers and boost product sales. Typically, transaction data collected for this purpose

is evaluated using metrics such as support, confidence, and lift to assess the strength of the association between a product category and the product items corresponding to that category [5]. Previous research has used the apriori method to identify consumer purchasing patterns and optimize product displays such as [6], [7], [8], [9], [10].

Related works. In [6], the authors apply the apriori algorithm to determine how to place bakery products that align with consumer interests based on the number of products sold. Additionally, this approach can assist in creating sales strategies based on purchasing patterns and help in minimizing stockouts. In [7], the author uses the apriori algorithm to identify purchasing patterns that simplify stock control and facilitate bundling promotions to increase product sales. In [8], the authors apply the apriori algorithm to study consumer purchasing patterns, which can be used to design marketing strategies, optimize product placement in supermarkets, and enhance customer satisfaction. In [9], the authors use the apriori algorithm to find combination patterns of food and beverage products purchased by consumers at a café, based on predetermined support and confidence levels. These combination patterns make it easier to determine which products to promote to stay competitive. [10] identify combinations of daily sales of fresh products in supermarkets using the apriori algorithm. By analyzing purchasing patterns, they can more accurately adjust the bundling strategy for fresh products to meet the diverse needs of consumers.

Contributions. In particular, all of these studies have demonstrated that apriori algorithms are effective in obtaining information related to purchasing patterns, which can be used to create marketing strategies, manage stock control, and optimize product placement. However, it should be noted that apriori algorithms generate a large number of itemset combinations, especially if the dataset contains many unique categories or items. Additionally, the determination of the support value is a crucial factor in the apriori algorithm. If the minimum support value is set too high, important itemsets with low frequency may be overlooked. Conversely, if the support value is too low, the algorithm may generate too many irrelevant itemsets. Apriori algorithms are relatively simple and intuitive, making them easier to understand and implement for beginners in data mining and pattern analysis [11].

When compared to the FP-Growth algorithm, FP-Growth is designed to find high-frequency patterns in large and complex datasets using a structure known as the FP-Tree (Frequent Pattern Tree). Building and maintaining an FP tree requires a deep understanding of algorithms and data structures [12]. Therefore, the researcher chose to use the apriori algorithm for this study because it is relatively simpler and easier to implement FP-Growth, reducing the time and effort required to set up and run the analysis.

So far, sales transaction data has only been used for financial reporting and stock inventory management. Weng Coffee Signature has not utilized historical sales transaction data to identify customer interests and purchasing patterns. The promotional strategy is considered inadequate because it tends to focus only on beverage and dessert products. In addition, Weng Coffee primarily conducts organic marketing through social media, leading to insufficient dissemination of information about ongoing promotions. To address this issue, the researcher analyzed customer interests and purchasing patterns to determine an effective promotional strategy for bundling food and beverages. The goal is to develop the right marketing strategy through social media to broaden promotional information, attract more customers, and increase sales. Therefore, the researchers took the initiative to process and analyze data to overcome the gaps experienced by Weng Coffee Signature.

This paper consists of 4 main parts and is organized as follows: Section I is the introduction. In Section II we discuss the methodology, which focuses on the apriori algorithm. Furthermore, this section also discusses the dataset used in this research. In Section III, the numerical results in the form of tables and discussions are presented. Finally, in Section IV we will conclude the results with recommendations for a bundled food and beverages menu along with an appropriate marketing strategy.

II. RESEARCH METHODS

This research utilizes qualitative methods to evaluate the relationship between food and beverage bundling products that are suitable for bundling promotions based on customer interests and purchasing patterns. The primary data collection consists of historical sales transaction data from Weng Coffee Signature, totaling 4380 records from January 2024, allowing for further analysis. Weng Coffee Signature, located in Pontianak, West Kalimantan, Indonesia, was chosen as the research subject because it has not yet

implemented any food and beverage bundling promotions. Sales revenue is considered the dependent variable, while customer purchasing patterns and digital marketing are the independent variables.

The apriori method is an algorithm used to analyze data and understand customer purchase patterns among large datasets to increase revenue [13]. To perform this analysis, the collected sales data was cleaned in a spreadsheet to remove unnecessary information, resulting in a table with columns for receipt number, product category, and product name. The data was then processed and converted into product patterns for analysis using the software application.

The purpose of this data processing is to determine the interests and purchasing patterns of customers by analyzing the most frequently purchased product categories and product names. Additionally, it aims to create appropriate combinations of food and beverages to serve as a bundling promotion strategy. This process involves using support values to identify the most in-demand categories and product names. Confidence and lift values are also used to establish association rules and assess the validity of the resulting data. The support and confidence values are determined based on the average value of the existing data and other factors that can reflect the reality of the best-selling products. The support value measures the likelihood of a product appearing in transaction data. The confidence value measures the probability that a customer will buy product B after buying product A [14]. Lift indicates the strength of the resulting association rules [15]. The equations for the values of support, confidence, and lift are as follows:

$$\text{Support (A)} = \frac{\text{Transactions that contain A}}{\text{Total Transactions}} \quad (1)$$

$$\text{Confidence (A} \rightarrow \text{B)} = \frac{\text{Total transactions that contain A and B}}{\text{Total transactions that contain A}} \quad (2)$$

$$\text{Lift (A} \rightarrow \text{B)} = \frac{\text{Confidence (A} \rightarrow \text{B)}}{\text{Support(B)}} = \frac{\text{Support(A dan B)}}{\text{Support(A) x Support(B)}} \quad (3)$$

Analysis using the apriori algorithm method is carried out to produce new information in the form of patterns that can be applied in developing bundling promotion strategies. The obtained information will indicate which products can be used to create effective promotional strategies. This information will then be analyzed to develop a food and beverage menu bundling promotion plan that can be implemented at Weng Coffee Signature to increase sales.

III. RESULT AND DISCUSSION

Section Result. At this stage, data processing will be carried out using the apriori algorithm method through software. In this research, we set the minimum values of support and confidence based on the average values derived from the product categories and names. To examine customer interests and purchasing patterns at Weng Coffee Signature, the analysis focuses on product categories as well as menus from these categories, using sales transaction data from January 2024. With an average support of 7%, the researcher chose to use support worth $\geq 5\%$ to provide more options for product categories that can be further analyzed. This allows for the creation of more suitable food and beverage bundles. The results of this research indicate that out of the 22 categories analyzed, 8 categories meet the minimum support criteria that have been determined. The following table shows the support for products sold in Weng Coffee Signature.

Table 1. Highest Sales Data by Weng Coffee Signature Product Category

Product Category	Support
Others	53%
Coffee Series	26%
Snacks	14%
Foods	13%
Milk Series	13%
Tea Series	6%
Choco Series	6%

Product Category	Support
Yogurt Series	5%

Then, the confidence and lift values are used to identify combinations of food and beverage product categories suitable for the bundling promotion strategy and to ensure data accuracy. Based on the results of the analysis, the following information was obtained:

Table 2. Bundling Category Weng Coffee Signature Products

Category 2	Category 1	Confidence	Lift
Foods	Others	50%	0,9
Snacks	Others	41%	0,8
Yogurt Series	Others	36%	0,7
Tea Series	Others	30%	0,6
Choco Series	Others	29%	0,6
Milk Series	Others	27%	0,5
Coffee Series	Others	24%	0,5
Tea Series	Coffee Series	24%	0,9
Milk Series	Coffee Series	23%	0,9
Choco Series	Coffee Series	23%	0,9
Snacks	Coffee Series	23%	0,9
Yogurt Series	Coffee Series	22%	0,8
Yogurt Series	Snacks	21%	1,5
Foods	Snacks	21%	1,5
Snacks	Foods	20%	1,5
Tea Series	Milk Series	18%	1,4
Choco Series	Milk Series	18%	1,4
Foods	Coffee Series	18%	0,7
Tea Series	Snacks	17%	1,2

From Table 2, 2 categories are suitable for a food and beverage bundling promotion strategy that aligns with customer interests and purchase patterns, customers who buy the Yogurt Series after buying Snacks and customers who buy the Tea Series after buying Snacks. The lift values obtained are greater than 1, indicating that these purchases are not made by chance. Therefore, further analysis was conducted to determine which bundling menu items are suitable based on the Yogurt Series, Tea Series, and Snacks categories for creating a bundling promotion strategy. There are 16 menu items with a minimum support of $\geq 3\%$, as follows:

Table 3. Highest Sales Data Menu Items for Bundling Category of Weng Coffee Signature Products

Menu	Product Category	Support
Lychee Tea	Tea Series	12%
Original Potatoes	Snacks	10%
Balado Potatoes	Snacks	8%
Tela Tela Balado	Snacks	7%
Lychee Yogurt	Yogurt Series	6%
Mango Tea	Tea Series	6%
Sausage	Snacks	5%
Bread	Snacks	5%
Telur Gulung	Snacks	4%
Mango Yogurt	Yogurt Series	4%
Tahu Cabe Garam	Snacks	4%
Chicken Pop	Snacks	4%
Lemon Punch	Tea Series	3%
Cheese Cake	Snacks	3%
Bakwan Goreng	Snacks	3%

Menu	Product Category	Support
Snack Platter	Snacks	3%

The combinations for food and beverage bundling menu derived from the category bundling products analysis are as follows:

Table 4. Weng Coffee Signature's Product Bundling Menu

Category 2	Category 1	Confidence	Lift
Chicken Pop	Original Potatoes	14%	1,4
Sausage	Balado Potatoes	13%	1,8
Sausage	Original Potatoes	13%	1,4
Mango Tea	Lychee Tea	13%	1,1
Bakwan Goreng	Tela Tela Balado	13%	1,8
Tahu Cabe Garam	Chicken Pop	12%	2,6
Chicken Pop	Tahu Cabe Garam	12%	2,6
Balado Potatoes	Sausage	10%	1,8
Tahu Cabe Garam	Tela Tela Balado	10%	1,3
Chicken Pop	Tela Tela Balado	9%	1,3
Lemon Punch	Chicken Pop	8%	1,9
Sausage	Tela Tela Balado	8%	1,1
Original Potatoes	Sausage	8%	1,4
Chicken Pop	Sausage	7%	1,3
Chicken Pop	Lychee Yogurt	7%	1,2
Snack Platter	Telur Gulung	7%	1,5

Section Discussion. The results in Table 4 show the menu combinations identified are the best-selling items according to customer interests and purchasing patterns at Weng Coffee Signature, which can significantly contribute to sales. The analysis shows that the combination of Lemon Punch with Chicken Pop has a lift of 1.9, and the combination of Chicken Pop with Lychee Yogurt has a lift of 1.2. A lift greater than 1 indicates a positive correlation (stronger association) and that these purchases are not made by chance. With these findings, it is hoped that Weng Coffee Signature can use this information to create a bundling promotion strategy. Promoting these bundles through Weng Coffee’s Instagram can help disseminate information more widely, potentially increasing sales and attracting new customers.



Figure 1. Weng Coffee Bundling Promotion Flyer

IV. CONCLUSION

By using the apriori algorithm method, this research serves as an important tool to discover the interests and purchasing patterns of customers at Weng Coffee Signature. This knowledge is valuable because it can be used to develop effective bundling promotion strategies to increase sales. The results of this research show that the appropriate categories for bundling promotional strategies are the Yogurt Series with Snacks and the Tea Series with Snacks. Further research on the menu items within these categories identified 2 suitable bundling promotion patterns, Lemon Punch with Chicken Pop and Lychee Yogurt with Chicken Pop. This selection is based on the support value for each product category and menu, according to predetermined criteria. With the bundling menu identified through consumer purchasing patterns, it is hoped that Weng Coffee Signature can implement paid marketing through social media. This strategy aims to inform consumers about ongoing promotions at Weng Coffee Signature, reach more consumers who can generate interest in visiting the cafe, and encourage the purchase of the predetermined bundling menu. The suggestion for further research is that Weng Coffee Signature should implement bundling promotions based on the findings obtained. This will allow researchers to evaluate whether this strategy is effective in reaching more consumers and increasing sales.

V. REFERENCES

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