CUSTOMER SPENDING PATTERN ANALYSIS WITH MARKET BASKET ANALYSIS TO PRODUCE PRODUCT STRATEGY AND PRICE BUNDLING AT KOPI SOE MEKARWANGI BANDUNG

Anthonio Joshua
Jurusan Magister Manajemen, Telkom University Bandung, Indonesia
Email: budi@untx.ac.id
*Corespondence: budi@untx.ac.id

ABSTRACT: Coffee industry in Indonesia will always grow significantly. With the return of consumptions in coffee shops and take away coffee shops after the pandemic, Kopi Soe Mekarwangi Bandung as one of the players in Bandung’s coffee industries hope to experience increases in sales and profit. But what happened was the contrary, for in January 2022-January 2023, Kopi Soe Mekarwangi experienced a decline in their sales and profit. Based on the data gained from the International Coffee Organization and Toffin, coffee shops should be increasing their sales in that period. To get a deeper knowledge about the research object, an interview with the owner of Kopi Soe Mekarwangi Bandung was done and it was found that they have one fundamental marketing problem in the term of their bundle. For their bundling strategy, the basis of their decision is either (1) introducing new products, or (2) boosting slow moving products. Based on the literature and journals, it was found that the best basis for marketing strategies should be the customer spending pattern. The customer’s spending pattern can be seen in their transactions and can be analyzed using data mining techniques such as market basket analysis. It’s hoped that the result of this mining can be used to determine the best bundling strategies for Kopi Soe Mekarwangi Bandung in the future.

Keywords: customer’s spending pattern, product bundling, price bundling, market basket analysis

INTRODUCTION
The development of technology has had an impact on all aspects of human life, including in the fields of business and marketing. Interactions and transactions through digital platforms such as cashier applications or websites generate data sets called big data. Big data is large and complex data, cannot be processed with ordinary database management devices (Maryanto, 2017). The use of big data can provide many benefits for businesses, such as helping to make the
right decisions based on data, understanding market trends and consumer desires, and planning strategies based on consumer behavior. Business owners who are able to analyze and utilize big data well can design bundled products that are more targeted and effective. *Knowledge discovery in database* is the process of discovering new information from various data sources, including steps such as data preparation, data cleansing and pre-processing, data mining, and data visualization (Maksood & Achuthan, 2016). A number of previous studies have proposed algorithms or *methods of big data analytics* to produce promos and product variations in the form of effective bundles. Some of the studies in the *Scopus database* include research by Birtolo et al. (2013) who proposed the *Intelligent Bundle Suggestion and Generation System* (IBSAG). This method considers the limitations of merchants in selling difficult products and adapts them to consumer transaction patterns. Another study by Do, Lauw, and Wang (2015) proposed a *Matching Based Algorithm* and *Greedy Algorithm* to create bundles with *maximum revenue* by considering the willingness to pay consumers. However, the study did not consider the relationship between products or consumer spending patterns. Research by Young & Law (2022) proposes a *Competition-Aware Bundling Algorithm* to find bundles with *maximum expected revenue*, assuming competitors also have the same product and inventory. Although creating bundles under competitive conditions, this method also does not consider the relationship between products. Based on these studies, the most effective method to create the *best product and price bundle* from consumer spending patterns is *Market Basket Analysis*.

*Market Basket Analysis* or *Association Rule Mining* is a branch of data mining science in knowledge discovery in database used to understand the purchasing patterns of goods by consumers (Ramadana, Satyahadewi, and Perdana, 2022). This *Market Basket Analysis* method is done by analyzing consumer spending habits and looking for relationships between several items that are often purchased together in the shopping basket (Gunadi and Sensuse, 2012). The results of *Market Basket Analysis* are valuable as a basis for analyzing shopping patterns and consumer preferences, which become important in the creation of product bundles that will be offered by companies. Previously, research to create product recommendations using *Market Basket Analysis* (MBA) has been carried out in various industrial sectors. For example, Suhandi & Gustriansyah (2021) use the MBA method to provide product recommendations in printing companies, while Widyadhini, Wibawa, and Ardiantino (2021) use MBA to provide product recommendations in
fertilizer companies, and Rizky, Sembiring, and Maulana (2022) use the MBA method to provide product recommendations in coffee shops with a menu number of under 30 products. However, no research has been found that combines product recommendations from Market Basket Analysis with determining the right reservation price to create product bundles and prices in coffee shops. Based on the description above, it is known that Kopi Soe Mekarwangi Bandung has the potential to gain a competitive advantage over its competitors because it has adopted cashier digital database technology since 2018 and has big data that can be utilized. This study aims to utilize big data by using Market Basket Analysis to recognize consumer spending patterns and create product recommendations. Furthermore, these product recommendations will be developed by considering the determination of the right reservation price to create product bundles and prices that are attractive to consumers. Therefore, this study is entitled "Customer Spending Pattern Analysis with Market Basket Analysis to Produce Product Strategy and Price Bundling at Kopi Soe Mekarwangi Bandung."

METHOD
This study aims to determine the variables of product bundle and price bundle based on consumer spending patterns without looking for relationships between variables, so the type of research is descriptive. The approach used is a deductive approach, which originates from general things and is applied to specific things, is formal, and emphasizes the structuring of reason. The strategy applied in this study is archival research, which involves searching and extracting information or evidence from the original archive. Transaction data of Kopi Soe Mekarwangi Bandung until January 2023 became the study population, with a total of 13,951 transactions. However, this study will use a sample of transaction data that occurred from January 2022 to January 2023 as many as 12,832 transactions, because previous data did not accurately reflect consumer spending patterns. The sampling technique used is purposive sampling, which is a sampling technique based on certain objectives. The data source consists of primary data in the form of interviews with the owner of Kopi Soe Mekarwangi Bandung and secondary data in the form of transaction data from Kopi Soe Mekarwangi Bandung. This research uses big data analytics-based data analysis techniques, which include steps such as data selection, data transformation, data cleaning and preprocessing, modeling, to making product and price bundling. The results of the analysis from this study will help determine the product strategy and price bundling that is suitable to be applied at
Customer Spending Pattern Analysis with Market Basket Analysis to Produce Product Strategy and Price Bundling at Kopi Soe Mekarwangi Bandung

Kopi Soe Mekarwangi Bandung in the future.

RESULT AND DISCUSSION
Data Selection and Transformation

Data selection is a stage where researchers download the dataset of Kopi Soe Mekarwangi Bandung transactions in the period January 2022-January 2023 in csv form. Data transformation is a process where the dataset is uploaded on the Google Collaborator platform using the Python programming language after previously researchers imported pandas and numpy packages for number processing. The data selection and transformation process can be seen in the following figure.

![Figure 1 Data selection](image)

The next process is a check of the upload process in Google Collaborator. This check can be done with a simple algorithm, which is to create a variable named data and attribute a csv reading of the dataset to that variable and give the data command. The process can be seen in the following figure.

![Figure 2 Data transformation checking](image)

Data Cleaning and Preprocessing

The process of data cleaning and preprocessing is the process of ‘cleaning’ data from rows or characters that can reduce the accuracy of the results. This process is divided into several stages, namely:

Null checking

The null checking process is a process to discard incomplete or empty data. To do this, researchers must see if there are empty data/rows in the dataset. The algorithm for doing this can be seen in the following figure.

![Figure 3 Null checking](image)

From the results of the algorithm above, we can know that columns such as Other Note (Optional), Served by, Customer, Customer Phone, and Reason of Refund have a lot of empty rows. In the Reason of Refund column, for example, out of 12,858 rows, there are only 26 rows that have content. Because the comparison between fill rows and blank rows is too one-sided, the columns
will be removed with the following algorithm.

**Figure 4** Dataset after null columns are deleted

Once it is confirmed that there are no more columns with empty rows, the researcher can proceed to the next stage.

**Character checking**

In the *Items* column, there are still transactions that have unnecessary characters such as 'x3' which refers to the frequency of purchases or *Full Refund*, *Partial Refund*, *Custom Amount*, *Change to*, *Take Away Charges* and *Extra* which does not refer to a particular product. These characters must be removed using the following algorithm.

**Figure 5** Character checking process

The *Items column that has been cleaned up by the character checking process produces a new column named NewItems as follows.*

**Figure 6** Dataset after Character Checking

This *character checking process also reduces the number of transactions, because transactions that do not involve products (only transactions to add sugar/espresso for example) have been deleted. Thus, the number of the most recent rows of the dataset is as follows.*

**Figure 7** Number of rows in dataset after character checking

Once it is confirmed that there are no characters that do not refer to the product, the researcher can proceed to the next stage.

**Data transpose**

The format of the *NewItems table* must be changed to a table of the existence of *items* in each transaction with the following algorithm.

**Figure 8** NewItems table in each transaction
Customer Spending Pattern Analysis with Market Basket Analysis to Produce Product Strategy and Price Bundling at Kopi Soe Mekarwangi Bandung

From this transpose table, it can be known the relationship between items in each transaction, so the next stage that will be carried out is modeling with Market Basket Analysis and bundling pricing.

MODELLING
FP Growth Algorithm

In this study, frequent item sets will be created using the FP Growth algorithm. While to make a compilation of rules that are important and those that are not, the parameters used are support value (support value) and confidence value (confidence value). Previous research from Rizky, Sembiring, and Maulana (2022) used a minimum support of 50% and a minimum confidence value of 95%. But in processing, it was found that the magnitude did not produce the expected results.

Figure 9 Results of Frequent Item sets with 50% Minimum Support

According to Witten et al (2011), the next step that must be taken is to reduce the minimum support value by 5% to get 10 rules with 90% confidence to reach the minimum support value of 10%. However, the results of data processing with a minimum support value of 10% are as follows.

![Figure 10 Results of Frequent Itemsets with 10% Minimum Support](image)

The transaction data of the object of study is very compound and varied. So the next step that researchers do is to reduce the minimum value of support until a rule is obtained that has a minimum confidence value of 10%. Here are the results of the association rules algorithm using a minimum support of 0.5%.

![Figure 11 Frequent Item sets with Minimum Support value of 0.5%](image)

Bundling Strategy

It is known that the selling price of Es Kopi Soe Goela Merah is Rp 18.000,- and the selling price of Es Kopi Rum is Rp 21.000,-. While a detailed explanation
of the capital price for the two products is:

**Table 1 Capital Price Product Association Rules**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price (per unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown sugar</td>
<td>Rp 775,- (20 gr)</td>
</tr>
<tr>
<td>Cup</td>
<td>Rp 541,- (1 cup)</td>
</tr>
<tr>
<td>Regular milk</td>
<td>Rp 1.305,- (75 gr)</td>
</tr>
<tr>
<td>Liquid coffee</td>
<td>Rp 5,834,- (35 gr)</td>
</tr>
<tr>
<td>Ice</td>
<td>Rp 340,- (1 cup)</td>
</tr>
<tr>
<td>Sunbay milk</td>
<td>Rp 2,566,- (75 gr)</td>
</tr>
</tbody>
</table>

- **Total capital price for 1 cup:** Rp 11,361,-

**Iced Coffee Rum**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price (per unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rum</td>
<td>Rp 2,600,- (20 gr)</td>
</tr>
<tr>
<td>Cup</td>
<td>Rp 541,- (1 cup)</td>
</tr>
<tr>
<td>Regular milk</td>
<td>Rp 1,305,- (75 gr)</td>
</tr>
<tr>
<td>Liquid coffee</td>
<td>Rp 5,834,- (35 gr)</td>
</tr>
<tr>
<td>Ice</td>
<td>Rp 340,- (1 cup)</td>
</tr>
<tr>
<td>Sunbay milk</td>
<td>Rp 2,566,- (75 gr)</td>
</tr>
</tbody>
</table>

- **Total capital price for 1 cup:** Rp 13,186,-

From the two data above, the **profit margin** of both products can be determined by the following calculation:

<table>
<thead>
<tr>
<th>Product</th>
<th>Profit margin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red Goela Iced Coffee</strong></td>
<td>36.88%</td>
</tr>
<tr>
<td><strong>Profit margin Es Kopi Rum</strong></td>
<td>37.21%</td>
</tr>
</tbody>
</table>

Assuming that the **reservation price for Red Goela Iced Coffee and Rum Iced Coffee products is the same as the product price in the past and the bundle pricing requirements that (1) do not exceed the total product price separately and (2) provide a profit margin that is not lower than the product profit margin
separately, the bundle price of Red Goela Iced Coffee and Rum Iced Coffee can be determined in range Rp 31,200,- to Rp 38,900,- with the following calculation:

**Table 4 Price comparison and profit margin of products before and after bundling**

<table>
<thead>
<tr>
<th>Products Before Bundling</th>
<th>Products After Bundling</th>
<th>Terms (1)</th>
<th>Profit Margin Before Bundling</th>
<th>Profit Margin After Bundling</th>
<th>Terms (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Sugar Iced Coffee</td>
<td>Brown Sugar Iced Coffee Rp 18,000,-</td>
<td>36.88%</td>
<td>36.88%</td>
<td>✓</td>
<td>36.88%</td>
</tr>
<tr>
<td>Rp 21,000,-</td>
<td>Rp 13,300,-</td>
<td>37.21%</td>
<td>0.85714286</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td><strong>Total Price</strong> Rp 39,000,-</td>
<td><strong>Bundling price Rp 31,300,-</strong></td>
<td>✓</td>
<td>37.73142</td>
<td>✓</td>
<td>37.737142</td>
</tr>
<tr>
<td>Brown Sugar Iced Coffee</td>
<td>Brown Sugar Iced Coffee Rp 17,950,-</td>
<td>36.88%</td>
<td>36,7075209</td>
<td>✓</td>
<td>37.21%</td>
</tr>
<tr>
<td>Rp 21,000,-</td>
<td>Rp 21,000,-</td>
<td>37.21%</td>
<td>37.21%</td>
<td>✓</td>
<td>37.21%</td>
</tr>
<tr>
<td><strong>Total Price</strong> Rp 38,950,-</td>
<td><strong>Bundling price Rp 73,917520</strong></td>
<td>✓</td>
<td>73.917520</td>
<td>✓</td>
<td>73.917520</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The results of processing transaction data of Kopi Soe Mekarwangi Bandung using Market Basket Analysis show that transaction data is very diverse, so the relationship between products is difficult to see with the minimum amount of support used previously. However, after setting the minimum support amount at 0.5%, it was found that the Red Goela Iced Coffee and Rum Iced Coffee products have a close relationship, with an average support of 0.88%. This means that out of 12,737 transactions, there were 112 transactions where both products were purchased simultaneously by consumers. This rule has an average confidence value of 14.73%, which means about 15 out of every 100 customers buy both products simultaneously. Based on these results, researchers apply the principle of bundle pricing from companies supported by theories from Kotler & Keller (2012: 402), namely (1) the bundle price does not exceed the total product price separately and (2) the bundle price provides a profit margin that is not lower than the product profit margin separately. Based on this principle, the price bundle price range for Goela Merah Iced Coffee and Rum Iced Coffee products is set between Rp 31,300 to Rp 38,950,-. With this price range, the research object can get a profit margin between 37.74% to 73.92%.
CONCLUSIONS

Based on transaction data and data processing, the following conclusions are obtained: 1). Using the MBA method, consumer spending patterns at Kopi Soe Mekarwangi Bandung for the period January 2022 to January 2023 are very plural. Of the 12,737 transactions, less than 10% had a strong product-to-product relationship. 2). Price bundling that can be created based on consumer spending patterns at Kopi Soe Mekarwangi Bandung for the period January 2022 to January 2023 is the bundling of Red Goela Iced Coffee and Rum Iced Coffee with a price range between IDR 31,300 to IDR 38,950. Both products were chosen to be used as bundling because they are two products that have the strongest relationship compared to other products. The selected price range also meets company policy and brings profit margins that are still profitable for the company.

REFERENCE


Customer Spending Pattern Analysis with Market Basket Analysis to Produce Product Strategy and Price Bundling at Kopi Soe Mekarwangi Bandung


Herawati, Fajar, A. 2013. Data Mining. (hlm. 3). Yogyakarta: CV ANDI OFFSET.


47 | Customer Spending Pattern Analysis with Market Basket Analysis to Produce Product Strategy and Price Bundling at Kopi Soe Mekarwangi Bandung


