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Decision Support System for Determining the Best-Selling Menu in a Cafe Using the Simple Additive Weighting (SAW) Method

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ABSTRACT

The rapid growth of the culinary industry, particularly cafés, requires business owners to make accurate decisions in determining the most popular menu items. In many cases, identifying best-selling menu items is still done manually based on estimation, which can lead to inaccuracies and poor decision-making. Therefore, a Decision Support System (DSS) is needed to assist in determining the best-selling menu items objectively and systematically. This study aims to design and implement a Decision Support System to determine the best-selling menu items in a café using the Simple Additive Weighting (SAW) method. The SAW method is chosen because it can evaluate multiple criteria with a simple and easy-to-understand calculation process. The criteria used in this study include sales quantity, price, customer rating, and serving time. Each criterion is assigned a different weight based on its level of importance. The result of this study is a system capable of ranking menu items based on the highest preference values. With this system, café owners can more easily determine sales strategies, improve service quality, and optimize business profits.

Keyword : Decision Support System, Simple Additive Weighting, Best-Selling Menu, Café, Decision Making

1. Introduction

The rapid development of the culinary industry, particularly in the café sector, has intensified competition among business owners to attract and retain customers. Cafés are required not only to provide a comfortable atmosphere but also to offer menu items that meet customer preferences. One of the key challenges faced by café management is determining which menu items are the best-selling and most favored by customers. This information is crucial for developing effective marketing strategies, managing inventory, and increasing overall profitability.

In practice, the process of identifying best-selling menu items is often carried out manually based on sales records or personal assumptions. Such approaches are prone to errors, subjectivity, and inefficiency, especially when dealing with large amounts of data and multiple evaluation criteria. Therefore, a systematic and computerized approach is needed to support decision-making in a more objective and accurate manner.

A Decision Support System (DSS) can be utilized to address this problem by processing relevant data and transforming it into useful information for decision-makers. DSS is designed to assist in solving semi-structured problems by incorporating data, models, and user-friendly interfaces. In this study,

the Simple Additive Weighting (SAW) method is applied as a decision-making model. The SAW method is widely used due to its simplicity, efficiency, and ability to rank alternatives based on multiple criteria.

The criteria considered in this research include sales quantity, price, customer ratings, and serving time. These criteria are selected because they represent important factors influencing customer preferences and operational performance in a café environment. By assigning appropriate weights to each criterion, the SAW method can generate a ranking of menu items based on their overall performance.

The objective of this study is to develop a Decision Support System that can assist café owners in determining the best-selling menu items accurately and efficiently. The expected outcome is a system that provides reliable recommendations, thereby helping business owners improve decision-making, enhance service quality, and optimize business performance..

2. Research Methods

This study employs a quantitative approach to develop a Decision Support System (DSS) for determining the best-selling menu items in a café using the Simple Additive Weighting (SAW) method. The research focuses on processing numerical data and applying a multi-criteria decision-making technique to generate objective and accurate results.

a) **Research Design**
The research is designed as a case study conducted in a café environment. It involves identifying problems, collecting relevant data, determining criteria and weights, applying the SAW method, and evaluating the results generated by the system.

b) **Data Collection Methods**
Data used in this study consist of primary and secondary data:

1. *Primary data* are obtained through direct observation of café operations and interviews with café owners or staff.
2. *Secondary data* are collected from sales reports, transaction records, and customer reviews.

The data include information related to menu items such as sales quantity, price, customer ratings, and serving time.

To standardize the scale of each criterion, use the formula:

$$r_{ij} \begin{cases} \dfrac{r_{ij}}{MAX(r_{ij})} \\ \dfrac{MIN\,(r_{ij})}{x_{ij}} \end{cases} =$$

Explanation:

1. r_{ij} = normalized value
2. x_{ij} = original value of alternative iii on criterion jjj
3. Benefit = higher value is better (e.g., sales volume)
4. Cost = lower value is better (e.g., preparation time)

While to calculate the final score of each alternative (menu item), use the formula:

$$V_i = \sum_{j=1}^{n} w_j . r_{ij}$$

Explanation:

1. V_i = preference value of alternative i
2. w_j = weight of criterion j
3. r_{ij} = normalized value
4. n = number of criteria

c) **Criteria Determination**
The decision-making process is based on several criteria, including:

1. Sales quantity (benefit)
2. Price (cost)
3. Customer rating (benefit)
4. Ingredients (cost)
5. Serving time (cost)

Each criterion is assigned a weight according to its level of importance in determining the best-selling menu.

d) **Application of the SAW Method**
The steps in applying the SAW method are as follows:

1. Construct a decision matrix based on the available data.
2. Normalize the matrix to convert different scales into comparable values.
3. Multiply each normalized value by its corresponding weight.
4. Calculate the preference value for each alternative by summing the weighted scores.
5. Rank the alternatives based on the highest preference values to determine the best-selling menu items.

e) **System Development**
The system is developed as a computer-based application that integrates data input, processing, and output. The system allows users to input data, process it using the SAW method, and display ranking results in an easy-to-understand format.

f) **Testing and Evaluation**
The system is tested using real or sample data to ensure its accuracy and functionality. The results are evaluated by comparing system outputs with actual conditions or expert judgment to determine the effectiveness of the DSS.

3. Results and Discussions

3.1 *Results*

This study produced a Decision Support System (DSS) that assists café owners in determining the best-selling menu items based on several predefined criteria. The method used is Simple Additive Weighting, which is known for its effectiveness in solving multi-criteria decision-making problems.

1. Criteria and Weight Determination

The criteria used in this study include:

Menu	C1 (Salaes)	C2 (Rating)	C3 (Price)	C4 (Time)	C5 (Ingredients)
A1	120	4.5	15000	5	4
A2	150	4.7	20000	7	5
A3	180	4.6	22000	6	5
A4	90	4.2	14000	4	4
A5	130	4.8	25000	8	3
A6	110	4.4	18000	6	4

The weights for each criterion are determined based on their level of importance, for example:

Menu	C1	C2	C3	C4	C5
A1	120/180 = 0.67	4.5/4.8 = 0.94	14000/15000 = 0.93	4/5 = 0.80	4/5 = 0.80
A2	0.83	0.98	0.70	0.57	1.00
A3	1.00	0.96	0.64	0.67	1.00
A4	0.50	0.88	1.00	1.00	0.80
A5	0.72	1.00	0.56	0.50	0.60
A6	0.61	0.92	0.78	0.67	0.80

2. Decision Matrix Normalization

The alternative data (food and beverage menu items) are normalized using the SAW method to standardize the scale across all criteria. This process produces relative preference values for each alternative.

3. Preference Value Calculation

After normalization, the final score is calculated by summing the multiplication results of the normalized values and their respective weights. The output is a preference score for each menu item.

4. Menu Ranking

Based on the calculation results, the system generates a ranking of menu items from the most recommended (best-selling) to the least preferred. Example results:

Ranking	Menu	Grade
1	A3	**0.903**
2	A2	**0.848**
3	A1	**0.809**
4	A4	**0.765**
5	A6	**0.747**
6	A5	**0.726**

The menu item with the highest score is identified as the best-selling item.

3.2 Discussions

1. Analysis of the SAW Method

The SAW method proves to be effective in producing objective and structured results for determining best-selling menu items. By considering multiple criteria simultaneously, the decisions become more accurate compared to conventional methods that rely solely on sales volume.

2. Influence of Criteria on Results

The sales volume criterion (C1) has the greatest influence on the final result due to its highest weight. However, other criteria such as customer satisfaction and profit also play important roles in balancing the decision, ensuring that it does not focus only on quantity but also on quality and profitability.

3. Advantages of the System

1. Speeds up the decision-making process
2. Reduces subjectivity of café owners

3. Easy to use and understand
4. Flexible in adding new criteria

4. Research Limitations

1. The data used are limited to a specific time period
2. Weight determination still depends on user subjectivity
3. External factors such as market trends or seasonal effects are not yet considered

5. Implications

This system can assist café owners in:

1. Determining sales strategies
2. Optimizing raw material inventory
3. Improving customer satisfaction through featured menu items

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4. Conclusion

Based on the research conducted, it can be concluded that the Decision Support System (DSS) developed using the Simple Additive Weighting method is effective in determining the best-selling menu items in a café. The system is capable of processing multiple criteria—such as sales volume, profit, customer satisfaction, and preparation time—in a structured and systematic manner, resulting in more objective and accurate decision-making.

The implementation of this method enables café owners to identify top-performing menu items more efficiently compared to conventional approaches. In addition, the system reduces subjectivity and supports data-driven strategies in menu management and business planning.

However, this study still has limitations, particularly in the determination of criteria weights and the scope of data used. Therefore, future research is recommended to incorporate more dynamic weighting methods and consider additional factors such as market trends and seasonal demand.

Overall, the proposed system proves to be a useful tool in supporting decision-making processes and has the potential to improve operational effectiveness and customer satisfaction in the café business.

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