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MENU ENGINEERING FOR DECISION MAKING IN THE HOSPITALITY INDUSTRY: EVIDENCE FROM SALES AND CONTRIBUTION MARGIN ANALYSIS

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ABSTRAK

Penelitian ini mengkaji kinerja item menu di Restoran Maya at Sailendra, JW Marriott Hotel Jakarta, dengan menggunakan pendekatan rekayasa menu. Penelitian ini dilatarbelakangi oleh kebutuhan akan alat bantu berbasis data untuk meningkatkan profitabilitas menu serta pengambilan keputusan operasional di industri perhotelan yang sangat kompetitif. Metode deskriptif kuantitatif digunakan dengan memanfaatkan data sekunder mengenai harga jual, biaya bahan baku, dan volume penjualan. Kinerja menu dievaluasi melalui Margin Kontribusi (CM), Persentase Komposisi Menu (MM%), Margin Kontribusi Rata-rata (ACM), dan Komposisi Menu Rata-rata (AMM%), dilanjutkan dengan klasifikasi ke dalam kategori star, plowhorses, puzzles, dan dog. Hasil penelitian mengidentifikasi Sarson Da Saag dan Paneer Tikka Masala sebagai item star, sedangkan Tandoori Roti dan Laccha Paratha diklasifikasikan sebagai item plowhorses. Penelitian ini menunjukkan bahwa integrasi CM, MM%, ACM, dan AMM% memberikan kerangka kerja yang objektif untuk klasifikasi menu serta mendukung pengambilan keputusan strategis terkait penetapan harga, promosi, dan optimalisasi menu.

Kata kunci: Margin Kontribusi, Industri Perhotelan, Rekayasa Menu, Komposisi Menu, Manajemen Restoran

ABSTRACT

This study examines the performance of menu items at Maya at Sailendra Restaurant, JW Marriott Hotel Jakarta, using a menu engineering approach. The study was motivated by the need for data-driven tools to improve menu profitability and operational decision-making in the highly competitive hospitality industry. A quantitative descriptive method was employed using secondary data on selling prices, food costs, and sales volumes. Menu performance was evaluated through Contribution Margin (CM), Menu Mix Percentage (MM%), Average Contribution Margin (ACM), and Average Menu Mix (AMM%), followed by classification into stars, plowhorses, puzzles, and dogs. The findings identified Sarson Da Saag and Paneer Tikka Masala as star items, while Tandoori Roti and Laccha Paratha were classified as plowhorses. The study demonstrates that integrating CM, MM%, ACM, and AMM% provides an objective framework for menu classification and supports strategic decisions regarding pricing, promotion, and menu optimization.

Keywords: Contribution Margin, Hospitality Industry, Menu Engineering, Menu Mix, Restaurant Management.

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1. INTRODUCTION

The hospitality industry, particularly the restaurant sector, faces increasingly intense competition and rapidly changing customer preferences. Restaurants are required not only to provide high-quality food and services but also to implement strategic management approaches that improve operational efficiency and profitability. In this context, menu planning has evolved into an important managerial tool for evaluating menu performance and supporting business sustainability. One analytical approach widely applied in restaurant management is menu engineering, which systematically evaluates menu items based on profitability and customer demand (Ivanenko, 2025).

Menu engineering focuses on two main indicators: contribution margin (CM) and menu mix (MM%). Contribution margin reflects the profitability generated by each menu item after deducting food costs, while menu mix indicates menu popularity based on sales volume. The integration of these two indicators allows restaurant managers to assess menu performance from both financial and customer preference perspectives (Hendrawan et al., 2024).

This approach classifies menu items into four categories: stars, plowhorses, puzzles, and dogs. Menu items categorized as stars have high profitability and high popularity, making them strategic products to maintain. Plowhorses are highly popular but provide lower profit margins, requiring operational cost control or pricing adjustments. Puzzles indicate high profitability but low customer demand, suggesting a need for stronger promotion and better menu positioning. Meanwhile, dogs represent menu items with low profitability and low popularity and are often considered for modification or elimination (Kwong, 2005).

Recent studies have shown that menu engineering has evolved beyond traditional profitability analysis, integrating quantitative and multi-criteria decision-making approaches to improve analytical accuracy and managerial effectiveness (İPEK, 2024). In addition, quantitative techniques such as data envelopment analysis have expanded the scope of menu engineering into more comprehensive performance evaluation models (Choi et al., 2009).

This study focuses on Maya at Sailendra Restaurant at JW Marriott Hotel Jakarta, which specializes in Indian cuisine. The restaurant offers a variety of traditional Indian dishes prepared with authentic spices and cooking techniques. However, despite offering unique menu items, differences in sales performance and profitability among menu items indicate the need for a more systematic menu evaluation approach. This dependency heightens vulnerability to supply chain fluctuations and rising food costs, directly jeopardizing the establishment's contribution margin and making precise menu engineering an urgent managerial necessity in this sector. Therefore, this study applies menu engineering analysis to classify menu items by profitability and popularity.

Unlike previous studies that primarily focus on basic CM and MM% calculations, this research incorporates Average Contribution Margin (ACM) and Average Menu Mix (AMM%) as standardized benchmarks in the menu classification process. The integration of CM, MM%, ACM, and AMM% into a unified analytical framework represents the novelty of this study. It is expected to improve the objectivity and accuracy of managerial decision-making in menu management. Furthermore, this study provides practical insights for hospitality managers to optimize menu composition and sustainably improve restaurant business performance.

Menu engineering is widely used in restaurant management to evaluate menu performance based on profitability and customer demand. The method primarily combines two indicators: contribution margin (CM), which measures menu profitability, and menu mix (MM%), which reflects menu popularity based on sales volume (Tello et al., 2024). Through these indicators, menu items can be classified into four categories: stars, plowhorses, puzzles, and dogs, enabling managers to make strategic decisions regarding pricing, promotion, and menu design (Kwong, 2005).

Recent studies indicate that menu engineering significantly improves restaurant profitability and operational efficiency. (Ferdinand & Saputra, 2024) found that menu classification helps managers identify high-performing menu items and optimize sales strategies.

Similarly, Noone & Cachia emphasized that menu engineering should incorporate broader analytical approaches, including customer behavior and menu substitution effects, to enhance decision-making accuracy.

The development of quantitative and multi-criteria approaches has further expanded the applications of menu engineering. (Özgür Göde & Ekergİl, 2025) Introduced Time-Driven Menu Engineering, which integrates operational costs into profitability analysis, while İPEK highlighted the importance of data-driven approaches in menu evaluation. These findings demonstrate that menu engineering has evolved from a simple profitability tool into a more comprehensive managerial framework.

However, most previous studies focus primarily on basic CM and MM% calculations, without incorporating Average Contribution Margin (ACM) and Average Menu Mix (AMM%) as standardized benchmarks for menu classification. Therefore, this study integrates CM, MM%, ACM, and AMM% into a unified analytical framework to improve the objectivity and accuracy of menu classification in restaurant decision-making.

Assessing menu performance in dining establishments dedicated to niche ethnic culinary concepts, such as authentic Indian gastronomy, entails substantially greater complexity than evaluating conventional or multi-cuisine restaurants. Fine-dining ethnic venues within five-star hotel environments constantly navigate multifaceted operational hurdles, including severe cost volatility of premium imported ingredients, stringent flavor authenticity benchmarks, and highly specialized market segments. Consequently, menu engineering transcends its traditional role as a mere mechanical tool for calculating profitability; it functions as a critical strategic framework designed to optimize operational efficiency while safeguarding the premium gastronomic experience expected by luxury consumers.

The academic novelty of this study lies in its conceptual and methodological reconfiguration, wherein the Average Contribution Margin (ACM) and Average Menu Mix (AMM%) are established as standardized, objective benchmarking controls. Within the operational ecosystem of luxury hospitality, menu classification matrices are often skewed by the subjective biases of Food and Beverage executives, who predominantly evaluate product success based solely on absolute sales volumes. By simultaneously embedding these mean-based threshold values (ACM and AMM%) into a unified deterministic matrix, this research introduces an evaluation architecture that effectively eliminates such managerial subjectivities. Ultimately, this systemic approach empowers management to precisely dissect the genuine contribution margin structures of specialty dishes, particularly those heavily reliant on high-cost, import-dependent culinary commodities

2. RESEARCH METHOD

This study employs a quantitative descriptive research design to evaluate menu item performance using the menu engineering approach. This method is considered appropriate because it enables a systematic assessment of menu items using measurable financial and sales indicators. In the hospitality industry, menu engineering has been widely used as an analytical tool to support managerial decision-making, particularly to optimize menu composition and improve profitability (Ivanenko, 2025).

This inquiry adopts a descriptive quantitative research architecture characterized by a deterministic, non-inferential framework. Such a methodological trajectory is deliberately chosen, given that menu engineering assessments grounded in the Kasavana and Smith paradigm do not seek to validate causal relationships among variables empirically or to extrapolate population traits via statistical hypothesis testing. On the contrary, this analytical technique operates by plotting the entire universe of empirical transaction records onto a two-dimensional matrix coordinate system. The spatial configuration of individual culinary items depends on an absolute comparison against designated empirical thresholds, specifically the Average Contribution Margin (ACM) and Average Menu Mix percentage (AMM%) parameters derived explicitly from the aggregate financial interactions of the dining venue throughout the observational timeframe.

Consequently, the rigorous validity of the resulting categorization is anchored in the precise fidelity of the establishment's secondary operational ledgers, rather than the validation of parametric assumptions.

The object of this research consists of 12 food menu items offered by Maya at Sailendra Restaurant, JW Marriott Hotel Jakarta. The study relies on secondary data obtained from the restaurant's operational sales records for the period of [insert start month/year–end month/year], including the selling price of each menu item, food cost, number of units sold per item, and total sales volume. These data are collected through documentation techniques, complemented by direct observation and a review of relevant literature. The use of operational data is essential in menu engineering analysis, as it reflects actual business performance and supports objective evaluation (Hendrawan et al., 2024)

The data analysis process is conducted through several stages based on the principles of menu engineering. First, the **contribution margin (CM)** is calculated by subtracting the food cost from the selling price of each menu item. This indicator represents the profit contribution from each item and is a fundamental measure of financial performance.

CM = Selling Price - Food Cost

A higher contribution margin indicates a greater ability of the menu item to contribute to overall profitability (Rahayu & Asnur, 2023).

Second, menu popularity is determined using the menu mix percentage (MM%), calculated by dividing the number of units sold for each menu item by the total number of units sold across all items, then converting the result to a percentage.

MM% = (Number of Menu Portions Sold / Total Sales of All Menu) x 100%

This measure reflects customer preferences and indicates how frequently a particular menu item is selected compared to others (Ferdinand & Saputra, 2024).

To establish an objective threshold for popularity, the Average Menu Mix (AMM%) was calculated following the classic menu engineering framework introduced by Kasavana and Smith (1982), using the equal-share method. Given that the restaurant offers 12 distinct Indian menu items, each item has an equal share of 8.33% (derived from 1/12 x 100%). This percentage serves as the definitive mathematical boundary dividing high-popularity and low-popularity items in the matrix analysis (Atmaja et al., 2023)

Based on the comparison between individual CM values and ACM, as well as MM% and AMM%, each menu item is then classified into one of four categories within the menu engineering matrix: **stars, plowhorses, puzzles, and dogs**. Menu items categorized as stars exhibit both high profitability and high popularity, making them key contributors to business success. Plowhorses, on the other hand, are highly popular but relatively unprofitable, indicating a need for cost control or pricing adjustments. Puzzles represent items with high profitability but low demand, suggesting opportunities for improved marketing strategies. Meanwhile, dogs are characterized by low profitability and low popularity, and are often considered for elimination or replacement (İPEK, 2024).

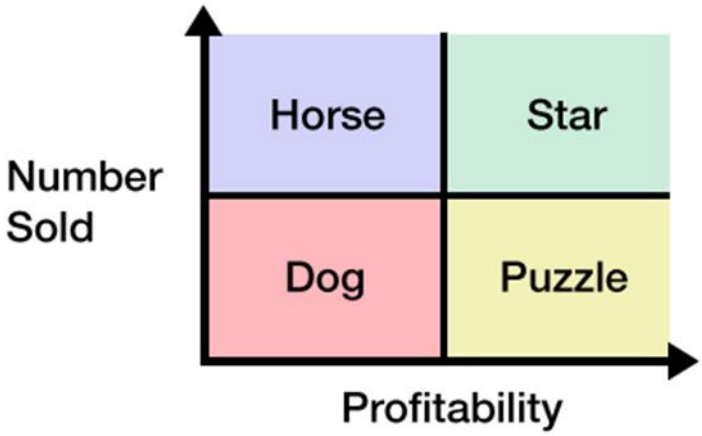


Figure 1. Menu Engineering Matrix

Furthermore, the classification results are visualized as a two-dimensional matrix, with the horizontal axis representing profitability and the vertical axis representing popularity. This visualization facilitates a clearer understanding of menu performance and supports more effective managerial decisions. The use of matrix-based analysis has been recognized as an efficient way to simplify complex data into actionable insights in restaurant management (Ivanenko, 2025)

The novelty of this study lies in the integration of all key menu engineering indicators, CM, MM%, ACM, and AMM%, into a unified analytical framework. Unlike previous studies that often rely solely on basic profitability and sales metrics, this research introduces a more comprehensive and standardized approach by incorporating average-based thresholds as decision benchmarks. This enhancement improves the objectivity and accuracy of menu classification while providing a more reliable basis for strategic decision-making. In addition, applying this framework in a real restaurant setting provides practical value and demonstrates its applicability to addressing contemporary challenges in the hospitality industry.

3. RESULT AND DISCUSSION

3.1 Results

The menu mix analysis was conducted to determine the popularity level of each menu item based on sales volume. The results show that Laccha Paratha recorded the highest sales volume with 34 portions sold, followed by Tandoori Roti with 25 portions sold. These menu items obtained MM% values of 21.52% and 15.82%, respectively, indicating strong customer preference toward Indian bread-based menu items.

Meanwhile, Sarson Da Saag and Paneer Tikka Masala also demonstrated relatively high popularity levels with MM% values above the average menu mix threshold of 8.33%. In contrast, several menu items, such as Jeera Aloo, Dal Dhaba, Palak Paneer, Paneer Mukhni, and Khadai Paneer, recorded low sales, indicating lower customer demand.

Table 1. Data Menu Analysis

Menu Item	Volume Sales	Selling Price (Rp)	Food Cost (Rp)	Food Cost (%)	Contribution Margin (Rp)	Menu Mix (%)
Chicken or Vegetable Parda Biryani	8	220.000	57.200	26,00%	162.800	5,06%
Maya Tadka Vegetable	8	130.000	52.000	40,00%	78.000	5,06%
Paneer Tikka Masala	24	145.000	43.500	30,00%	101.500	15,19%
Tandoori Roti	25	40.000	12.000	30,00%	28.000	15,82%
Laccha Paratha	34	50.000	14.000	28,00%	36.000	21,52%
Makhanwali Fish Tikka	4	200.000	56.000	28,00%	144.000	2,53%
Jeera Aloo	10	145.000	46.400	32,00%	98.600	6,33%

Palak Paneer	9	145.000	47.850	33,00%	97.150	5,70%
Dal Dhaba	5	130.000	45.500	35,00%	84.500	3,16%
Sarson Da Saag	20	150.000	42.000	28,00%	108.000	12,66%
Paneer Mukhni	5	145.000	49.300	34,00%	95.700	3,16%
Khadai Paneer	6	145.000	47.850	33,00%	97.150	3,80%

The findings suggest that customers at Maya at Sailendra Restaurant tend to prefer menu items that are more familiar, lighter, and easier to consume alongside main dishes. Bread-based menu items such as Laccha Paratha and Tandoori Roti are likely to be perceived as complementary dishes that cater to a wider range of customer preferences.

The menu engineering analysis was conducted by comparing the Contribution Margin (CM) and Menu Mix percentage (MM%) of each menu item against the Average Contribution Margin (ACM) and Average Menu Mix (AMM%) benchmarks. Based on the calculation results, the ACM value was Rp 94,283.33, calculated as the simple arithmetic mean of the Contribution Margin of the 12 menu items (Table 1), while the AMM% benchmark was 8.33%. Using these benchmarks, the menu items were classified into four categories within the menu engineering matrix: stars, plowhorses, puzzles, and dogs.

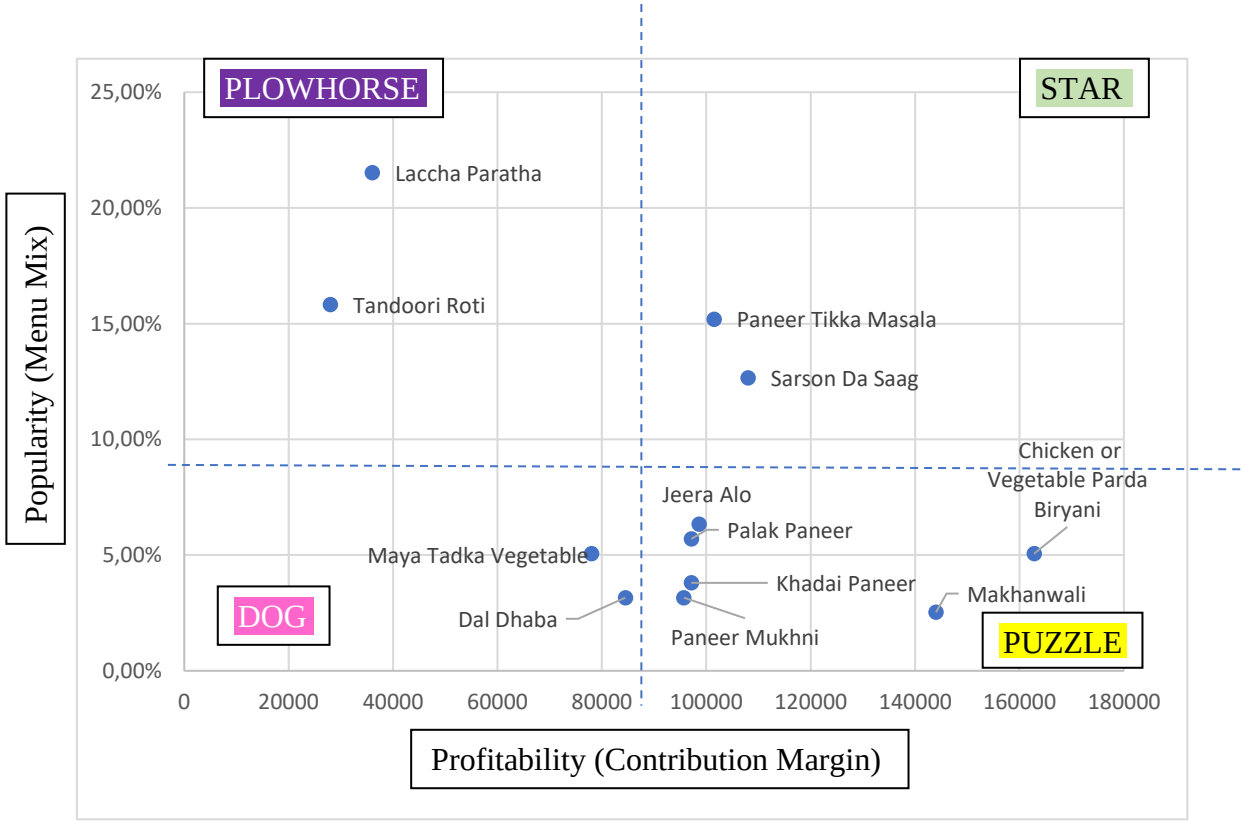


Figure 2. Result of Menu Engineering Matrix

Based on Figure 2, the results of the menu engineering matrix can be analyzed into four clusters, as follows:

3Star Category (High Profitability – High Popularity)

The star category consists of *Paneer Tikka Masala* and *Sarson Da Saag*. These menu items achieved both high contribution margins and high sales volumes, indicating strong customer preference and substantial profitability for the restaurant. *Paneer Tikka Masala* recorded a CM of Rp 101,500 with a MM% of 15.19%, while *Sarson Da Saag* generated a CM of Rp 108,000 and a MM% of 12.66%. These findings suggest that both menu items are key contributors to restaurant

revenue and should be maintained as signature dishes. Management is encouraged to strengthen promotional activities and maintain consistent food quality for these products.

Plowhorse Category (Low Profitability – High Popularity)

Tandoori Roti and *Laccha Paratha* were classified as plowhorse menu items because they were highly popular but relatively low-profitability. *Tandoori Roti* achieved a MM% of 15.82% with a CM of Rp 28,000, while *Laccha Paratha* showed the highest popularity level with a MM% of 21.52% but generated only Rp 36,000 in contribution margin. Although these menu items contribute significantly to total sales volume, their low profitability reduces their financial contribution to the restaurant. This condition indicates the need for managerial strategies such as portion standardization, gradual price adjustments, or ingredient cost optimization to improve profitability without reducing customer satisfaction.

Puzzle Category (High Profitability – Low Popularity)

The puzzle category includes *Chicken or Vegetable Parda Biryani*, *Makhanwali Fish Tikka*, *Jeera Aloo*, *Palak Paneer*, *Paneer Mukhni*, and *Khadai Paneer*. These menu items generated high contribution margins (above the ACM of Rp 94,283.33) but recorded relatively low popularity levels (below the AMM% threshold of 8.33%). *Chicken or Vegetable Parda Biryani* achieved a CM of Rp 162,800 with an MM% of only 5.06%, while Makhanwali Fish Tikka achieved a CM of Rp 144,000 with an MM% of 2.53%. Similarly, *Jeera Aloo* generated a CM of Rp 98,600 with a MM% of only 6.33%. *Palak Paneer* recorded a CM of Rp 97,150 with a MM% of 5.70%, *Khadai Paneer* achieved a CM of Rp 97,150 with a MM% of 3.80%, and *Paneer Mukhni* obtained a CM of Rp 95,700 with a MM% of 3.16%. These findings indicate that the menu items have strong profitability potential but are less preferred by customers. Therefore, management should improve menu visibility, menu descriptions, visual presentation, and promotional efforts to increase customer awareness and purchasing interest.

Dog Category (Low Profitability – Low Popularity)

Only two menu items were categorized as dogs because they demonstrated both low profitability and low popularity: *Maya Tadka Vegetable* and *Dal Dhaba*. *Maya Tadka Vegetable* recorded a CM of Rp 78,000 with a MM% of 5.06%, while *Dal Dhaba* recorded a CM of Rp 84,500 with a MM% of 3.16%. These menu items contribute minimally to overall restaurant performance and may negatively affect operational efficiency. Management should therefore evaluate the future viability of these products through recipe modification, menu redesign, bundling strategies, or possible menu elimination if performance does not improve over time.

The results indicate that Indian bread-based menu items are highly preferred by customers, as shown by the strong popularity of *Laccha Paratha* and *Tandoori Roti*. However, their relatively low profitability highlights the importance of balancing customer demand with operational cost efficiency. In contrast, menu items categorized as puzzles demonstrate strong financial performance but require improved marketing strategies to increase customer demand. The existence of several dog-category menu items also suggests that menu optimization is necessary to improve operational efficiency and maximize restaurant profitability. Overall, the findings confirm that menu engineering analysis provides valuable managerial insights for strategic menu planning, pricing decisions, and restaurant performance optimization in the hospitality industry.

3.2 Discussion

The results of this study demonstrate that menu engineering can serve as an effective managerial decision-making tool in restaurant operations. Using the classification matrix, restaurant managers can identify menu items to maintain, promote, modify, or eliminate. For star menu items, management should focus on maintaining food quality and strengthening promotional efforts. For plowhorse items, operational efficiency and pricing strategies should be improved to enhance profit margins. Puzzle menu items require marketing improvements to increase customer awareness and purchase intention, while dog menu items need further evaluation regarding their future viability within the menu. Furthermore, the integration of ACM

and AMM% as benchmark indicators contributes to a more objective classification process and minimizes the role of subjective managerial judgment. This finding supports previous studies suggesting that data-driven menu analysis improves operational effectiveness and strategic planning in the hospitality industry.

4. CONCLUSION

This study aimed to analyze menu item performance at Maya at Sailendra Restaurant, JW Marriott Hotel Jakarta, using a menu engineering approach that integrates Contribution Margin (CM), Menu Mix percentage (MM%), Average Contribution Margin (ACM), and Average Menu Mix (AMM%). The findings demonstrate that menu engineering is an effective decision-making tool for evaluating menu profitability and popularity in the hospitality industry. The analysis revealed that menu items such as *Sarson Da Saag* and *Paneer Tikka Masala* were classified as star categories because they achieved both high profitability and high popularity. Meanwhile, *Tandoori Roti* and *Laccha Paratha* were identified as plowhorse items due to their high sales performance but relatively lower contribution margins. Several menu items, including *Chicken/Vegetable Parda Biryani, Makhanwali Fish Tikka, Jeera Aloo, Palak Paneer, Paneer Mukhni*, and *Khadai Paneer*, were categorized as puzzles because they generated high profitability despite lower customer demand. In contrast, only *Maya Tadka Vegetable* and *Dal Dhaba* were classified as dogs due to low profitability and low popularity.

The integration of ACM and AMM% as benchmark indicators improved the objectivity and consistency of menu classification compared to traditional menu engineering approaches that primarily rely on basic CM and MM% calculations. These findings support previous studies indicating that data-driven menu analysis contributes significantly to optimizing restaurant profitability and the effectiveness of managerial decision-making (Noone & Cachia, 2020). Furthermore, this study contributes theoretically by developing a more comprehensive analytical framework for menu engineering and, practically, by providing managerial insights into menu pricing, product positioning, promotion strategies, and menu optimization in restaurant operations.

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