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Menu Engineering Analysis: An Industrial Reference For Tourism Students

I Gede Wiwin Suyasa
Ambarrukmo Yogyakarta Tourism College
Email: wiwin.visionplanner@gmail.com

Sarrah Jessica Hidayat
Ambarrukmo Yogyakarta Tourism College
Email: sarrah_jessica@yahoo.com

*Author correspondence: wiwin.visionplanner@gmail.com**

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ABSTRACT

This research paper examines the classification of the menu items at Essier restaurant, located within The Vasini Boutique Hotel in Bali, Indonesia, using the Menu Engineering Analysis methodology. Through the use of Tables and Matrices, the study presents the findings derived from a qualitative approach of analyzing sales volume and contribution margin data of menu items from January to December of the corresponding year. The study identifies 31 menu items and their classification mapping, which shows that the majority of the items are classified as Dogs (35.48%), followed by Stars (32.26%), Plough Horses (22.58%), and Puzzles (9.68%). This study highlights the significance of periodic menu engineering analysis by the Essier Restaurant Management to improve sales and restaurant profitability. In conclusion, the menu engineering method is an effective tool for ensuring the popularity and profitability of the restaurant's menu offerings.

Corresponding Author:
I Gede Wiwin Suyasa,
Email: wiwin.visionpplanner@gmail.com

INTRODUCTION

Food & Beverages (F&B) in the Tourism Industry is the most exciting and challenging fields. After almost a decade of losing its prestige, where many hotels had eliminated their F&B outlets, the business climate and consumer consumption patterns are raising the culinary passion and culinary service to the stage again. However, it must be admitted that the restaurant industry is a risky business. Some studies have found that up to 25% of new restaurants fail before the first year, and the percentage of failures is even more significant within five years (Valen, 1887).

Lately, restaurants within hotel operations vary in style, from a simple, familiar, millennial-contemporary, characterized by an open kitchen with Postmodern decoration, and service is closely related to Gatget and up fusion-tech culinary. However, the excitement and

creativity of F&B Service have clear common threads to the menu. The menu reflects the restaurant image, which describes the dishes that customers will enjoy in a distinctive and appetizing style, and the menu distinguishes one restaurant from another. Essier Resto is an all-day dining restaurant at the Vasini Smart Boutique Hotel poolside at Jalan WR Supratman, Tohpati, Denpasar Bali, Indonesia. The decoration of this restaurant is designed in such a way, starting from the selection of wall color accents, colors and furniture layouts, and counter bars to swimming pool backgrounds, creating an artistic modern minimalist impression. Essier menu presents east-meet-west culinary. The menu's cover is an elegant dark color, designed with vector bakery ornaments, pastries, fruits, vegetables, dairy products, ice cream, and other related ornaments.

Figure 1. Front cover and back cover of Essier Restaurant menu book

The Essier Restaurant's menu grouped the items into eight according to type and taste. This grouping is intended to assist consumers in making choices according to their wishes and entice the customer to try other exciting dishes with vivid pictures of dishes. The grouping is as follows:

a. Part 1. Appetiser & Soup, which consists of 5 menu items
b. Part 2. The Vasini's Signatures, consisting of 5 Menu Items
c. Part 3. Balinese Food, consisting of 5 menu items
d. Part 4. Indonesian Food consists of 6 menu items
e. Part 5. Asian &; International Food, consists of 7 menu items
f. Part 6. Dessert, consists of 7 items menus
g. Part 7. Side dish, consists of 2 items
h. Part 8. Cook with the chef, for guests who want certain dishes that are not on the regular menu.

Figure 2. Part 1 of the Menu

Figure 3. Part 2 of the Menu

Figure 4. Part 3 of the Menu

Figure 5. Part 4 of the Menu

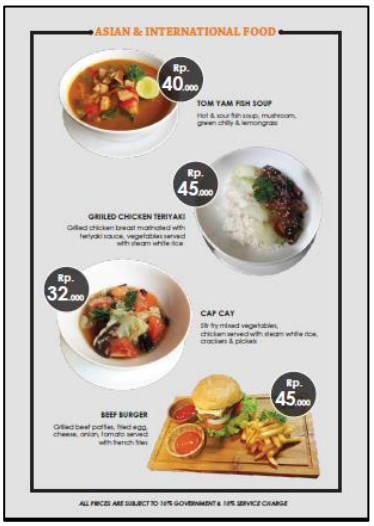


Figure 6. Part 5A of the Menu

Figure 7. Part 5B of the Menu

Figure 8. Part 6A of the Menu

Figure 9. Part 6B of the Menu

Figure 10. Part 7 and Part 8 of the Menu

Considering the layout and presentation techniques, and images displayed in the menu, all menu items offered are so interesting and appetizing to taste them.

Therefore, we are interested in knowing the position of each menu compared to one another, which menu contributes the most, and which menus need attention to be more salable and profitable, by applying Menu Engineering formula according to menu classification at Essier Restaurant of The Vasini Smart Boutique Hotel, Bali, Indonesia. This study positively contributes to the development of Essier Restaurant related to the evaluation of the contribution of each menu item and its profit. We limited the study to data available at Essier Restaurant from January to December 2022 by applying the menu engineering analysis. This paper can be

useful as a main reference for the student and academic institution in comprehending how the menu engineering analysis works, while for industry professional, the manual data analysis approach of this study can be considerably friendly to follow, and will produce a Menu Engineering Analysis report to determine the quadrant of menu items. This is a critica to the success of restaurant operations.

LITERATURE REVIEW

A menu engineering analysis is an approach used in evaluating menu items to determine whether items that have a high profit have sold. The analysis in the form of four boxes describes the menu categories that have been analyzed from the group ratings contained in the Menu mix. What determines the profitability of a menu is not a percentage of its cost but is the contribution margin of the menu item. Another determining factor is the number (volume) of menu items sold [2]. Menu development will always be needed; It is an ongoing and dynamic operational process as the menu should be dynamic and should not be "freeze by time". Menu development is an evolutionary process of continuous development and improvement [3]. Menu is the main determinant of the success or failure of a Food & Beverages Operation; Menu Engineering is a widely used approach in evaluating menus [4].

In principle, Menu reengineering matriculation determines the XY coordinates of a menu item, where in this paper, X is the volume of the menu sold, and Y is the contribution margin. The volume of menus sold is also called popularity, where the popularity index is an index to determine the dividing line between popular and less popular menus. Contribution Margin (CM), in other words, is the difference between the selling price and its cost; while the Contribution Margin Index (CM Index) line is a dividing line drawn from the average margin value contribution; to sort out the menus that have a low CM and those that have a high CM. Another approach to menu engineering is applying the arithmetical formula, as shown in previous works on menu engineering analysis are shown below:

Table 1. Related Works

Authors & Year	Method	Advantages	Disadvantages
Imam Ardiansyah (2020) [5]	The Application of Menu Engineering Technique at The Den od Kalaha Restaurant Jakarta	Applying aritmatical formula, and less computational time	Step-by-step analysis for comprehensive learning was not included and no visual matriculation of the menu quadrant
Asnur (2020) [6]	À la Carte Menu Analysis through Menu Engineering Method at Red Lado Restaurant	Applying aritmatical formula, and less computational time	Step-by-step analysis for comprehensive learning was not included and no visual matriculation of the menu quadrant
Saraswati, N. K. A., *et al*., (2021) [7]	Menu Engineering on Main Course to Increase Sales	Applying tabulated data in identifying CM versus sales	Missing the arithmetical formula and no visual matriculation

The menu is vital in Food & Beverages (F&B) operations because it is the basis of the control process [2]. Basically, the Menu Engineering Analysis process utilizes information that is already available to classify menu items into four types [4], namely:

a. Star – menu items that are popular menu items with a high-profit margin
b. Plough Horses – menu items that have low-profit margins but are popular
c. Puzzles – menu items with high-profit margins but not popular
d. Dogs – menu items with low margins and unpopular

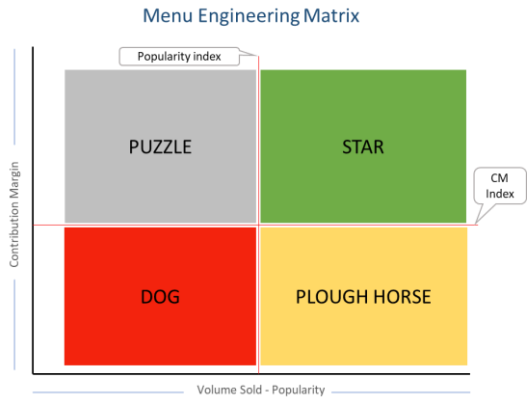


Figure 11. Four Category Matrix (https://www.netsuite.com/blog/menu-engineering-your-way-to-restaurant-profitability)

Jack D. Ninemeier (2018:67) tabulates the menu planner's considerations in structuring the menu. There are at least 21 points that need to be considered in the menu preparation; these considerations are grouped into three points of view of Consumers, Quality, and Taste.

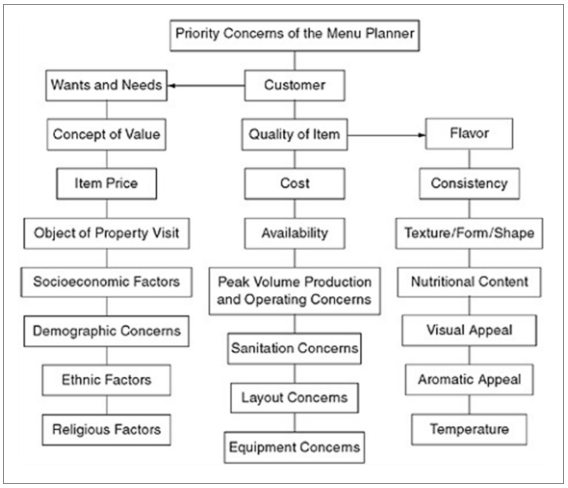


Figure 12. Priority Concerns of the Menu Planner

Along with the development of technology and the need to perform menu analysis quickly, a digital application has now been developed that can be downloaded and used by restaurant managers. A sample of this technology support is available at the eatapp sites https://restaurant.eatapp.co/free-menu-engineering-excel.

MENU ENGINEERING WORKSHEET

Menu Item	Amount Sold	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %
					$ -	$ -	$ -	$ -	
					$ -	$ -	$ -	$ -	
					$ -	$ -	$ -	$ -	
					$ -	$ -	$ -	$ -	
					$ -	$ -	$ -	$ -	
Total	0					$ -	$ -	$ -	

Figure 13. Menu Engineering worksheet aetapp (https://restaurant.eatapp.co/free-menu-engineering-excel)

MATERIAL & METODOLOGY

Data is collected by observing the menu of Essier Resto of The Vasini Smart Boutique Hotel, grouping them, and reviewing photos and sentences used to entice customers. Secondary data is obtained from printed documents and downloaded from the Point of Sales station of the property management system used at The Vasini. The number of menus listed in the Essier Restaurant menu, is thirty-seven (37) menu items, devided into 8 menu groups. i.e. Appetiser &; Soup; Vasini's Signature; Balinese; Indonesian; Asian &; International; Dessert; Side Order and cook together with chef. For the Cook Together with Chef group, because it only lists the basic ingredients, the author does not include it in the application of this Engineering Menu. Furthermore, the menu sold data that can be downloaded from the Point of Sales system of Essier restaurants is 31 menu items, identified six (6) menu items not included in the menu sold. The unsold menus are: Potatoes Leek Soup, Oxtail Fried Noodles, Urap Sayur, Assorted Jajan Pasar, Assorted Pudding, and Ice Cream. Thus, the menu included in the menu engineering analysis is 31 menu items.

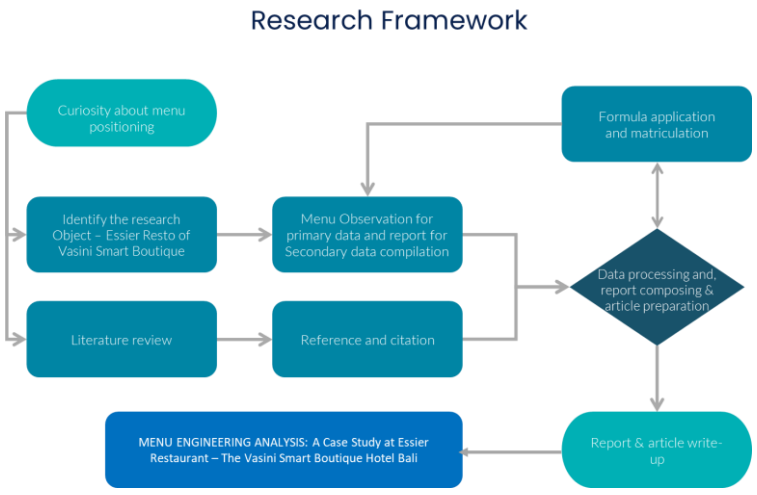


Figure 14. Research Framework

Data analysis is carried out in stages; after the data is collected and grouped, the author computes data with spreadsheets starting from the application of basic formulas, such as determining the mix menu and margins contribution, then continuing with the application of a more complex formula, then ended with conditional formatting. In this study, the data analysis techniques used are Menu Engineering arithmetical and scattered graphical formulas.

Since this study is also dedicated to facilitating the student's learning process, the discussion starts with an understanding that each menu is considered to have the same popularity potential; this means that each menu is expected to sell in equal proportions. Menu engineering assumes an item is popular if its unit sales reach 70 percent of the expected proportions. Thus, the popularity index of a menu item is determined at 70% of the expected popularity in a menu book [2]. For Example: if there are four menu items in a menu book, the popularity index is calculated with the formula of

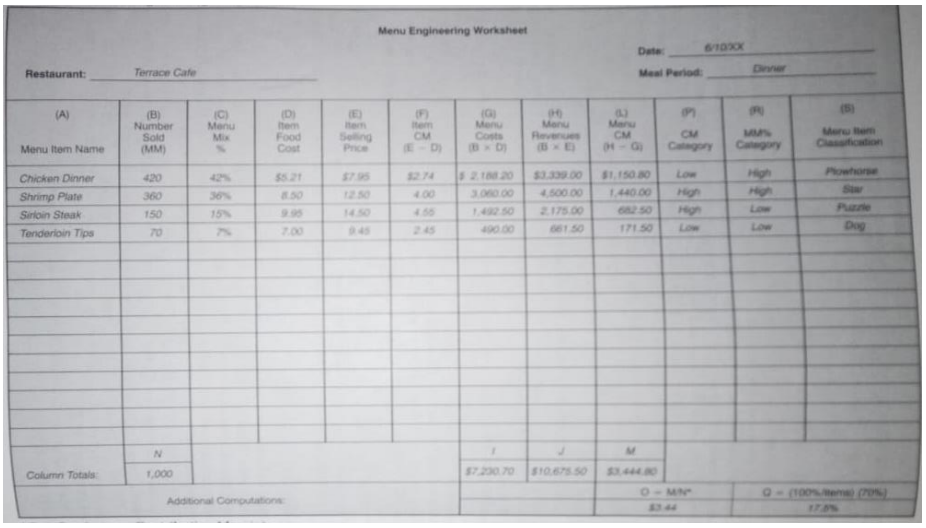
100%: 4 = 25,

then multiplied by 70%;

25 × 70% = 17.5;

therefore, the popularity index is 17.5. any menu items that sold above 17.5 or 18 portions within the determined periods are considered popular.

To facilitate understanding, the author combined the engineering worksheet menu from restaurant.eatapp.co with the menu engineering worksheet of Ninemeir (2018) book of Planning and Control for Food and Beverage Operations.



Menu Engineering Worksheet

Restaurant: Terrace Cafe

Date: 6/10/XX

Meal Period: Dinner

(A) Menu Item Name	(B) Number Sold (MM)	(C) Menu Mix %	(D) Item Food Cost	(E) Item Selling Price	(F) Item CM (E − D)	(G) Menu Costs (B × D)	(H) Menu Revenues (B × E)	(L) Menu CM (H − G)	(P) CM Category	(R) MM% Category	(S) Menu Item Classification
Chicken Dinner	420	42%	$5.21	$7.95	$2.74	$ 2,188.20	$3,339.00	$1,150.80	Low	High	Plowhorse
Shrimp Plate	360	36%	8.50	12.50	4.00	3,060.00	4,500.00	1,440.00	High	High	Star
Sirloin Steak	150	15%	9.95	14.50	4.55	1,492.50	2,175.00	682.50	High	Low	Puzzle
Tenderloin Tips	70	7%	7.00	9.45	2.45	490.00	661.50	171.50	Low	Low	Dog
	N					I	J	M			
Column Totals:	1,000					$7,230.70	$10,675.50	$3,444.80			
Additional Computations:								Q = M/N* $3.44		Q = (100%/items) (70%) 17.5%	

Figure 15. Menu Engineering Worksheet (Jack D, Ninemeir. 2018:88)

The author's adaptation was limited to column position and column headings write-up to facilitate data computing when it would be used to create scattered graphs. Therefore, the worksheet adaptation that the author will use to analyze the data is as follows:

MENU ENGINEERING WORKSHEET

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %	CM Category	MM% Category	Menu Items Classification

Figure 16. Adapted Form of Menu Engineering worksheet

The following is a description of the term used in Table 16:

a. Menu items: are the items contained in the Essier Restaurant menu
b. Amount sold: represents the Sales Volume of each menu item; Amount Sold data is obtained from the Essier Restaurant sales report for the period January - December 2022
c. Menu Mix (Percentage): This compares the Amount Sold per menu item with the total amount sold.
d. Menu Price: Is the price according to the menu (book of) the Essier Restaurant
e. Food Cost: This is the cost of the main ingredients per menu item according to the recipe. Food Cost data obtained from the Essier Restaurant sales report for the period January - December 2019
f. Food Cost (Percentage): compares Food Cost per menu item with the Selling Price per menu item.
g. Contribution Margin: The contribution Margin is compiled from each menu item; the Contribution Margin is obtained from the difference between Menu Price and Food Cost
h. Total Food Sales: Total Sales From each menu item. Total Food Sales are obtained by multiplying the amount sold by Menu Price.
i. Total Food Cost is the cost of each menu item multiplied by the amount sold.
j. Total Contribution Margin: The total margin of each menu item; The total Contribution Margin is obtained by multiplying the amount sold by the Contribution Margin.
k. Contribution Margin (Percentage): Comparison between the Contribution margin of each menu item and the Total Contribution Margin.
l. Contributor Margin Category (CMC): Categorizing Menu Items based on average Contribution Margin. CMC is said to be "High" if the Contribution Margin per menu item is above the average Contribution Margin; CMC is said to be "Low" if the Contribution Margin per menu item is below the average Contribution Margin
m. Menu Mix Category (MMC) is Categorizing menu items based on average Contribution Margin. MMC is said to be "High" if the Menu Mix is above the Popularity Index. MMC is said to be "Low" if the Menu Mix is below the Popularity Index.

For analytical purposes, each menu is considered to have the same popularity potential; this means that each menu is expected to sell in equal proportions. Menu engineering assumes an item is popular if its unit sales reach 70 percent of the expected proportions. Thus, the popularity index of a menu item is determined at 70% of the expected popularity in a menu book. (Jack D. Ninemeier.2018:85). The Popularity Index formula is given as follow:

$$Popularity\ Index = \frac{\left(\frac{Total\ Amount\ Sold}{Numberof\ Menu\ Item} x70\%\right)}{Total\ Amount\ Sold}$$

Menu Item Classification: is the classification of each menu item by pairing the CMC and MMC of each. If CMC and MMC are categorized as "High," then that menu item is classified as STAR. If CMC is categorized as "High" while MMC is categorized as "Low," then menu items are classified as Puzzle. If CMC is categorized as "Low" while MMC is categorized as "High," then menu items are classified as Plow Horse. If CMC and MMC are categorized as "Low," the menu item is classified as DOG. The the data tabulation is then computed to determine the menu classification using conditional formatting to position the data on four quadrant matrices, referred to as Menu Engineering Matrix.

RESULTS AND DISCUSSION

Results

Based on the menu and the obtained data on the Essier restaurant Point of Sales (POS) device, the menu items (MI) grouping can be tabulated as follows:

		Menu Item
Appetiser & Soup	1	Caesar salad
	2	Garden salad
	3	Veg Spring roll
	4	Cilok Bakso
Signature	5	Nasi goreng Kunyit
	6	Bebek bakar Maknyus
	7	Nasi Campur istimewa
	8	Soto Koya
Balinese	9	Bebek goreng Garing
	10	Bebek Nyat nyat
	11	Ayam panggang Sambal Matah
	12	Gerang asem ayam
Indonesian	13	Nasi Goreng
	14	Sop Buntut
	15	Ayam lalapan
	16	Mie Kuah ayam
	17	Mie Goreng
	18	Gado-gado
Asian & Intl	19	Tom yam fish
	20	Chicken Teriyaki
	21	Cap cay
	22	Beef Burger
	23	Club Sandwich
	24	Calamary Salt pepper
	25	Fish & Chip
Dessert	26	Pisang Goreng
	27	Freash Fruit
	28	Apple Pie Roll
	29	Chocolate lava
Sides Order	30	Steam Rice
	31	French Fries

Figure 17. Tabulation Grouping of Menu Items

The application of the Menu Engineering formulation begins with data input to the adapted worksheet wich are column A, B, D and E.

A	B	C	D	E	F	G
Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin
Caesar salad	61		35.000	7.729		
Garden salad	43		35.000	7.920		
Veg Spring roll	81		29.000	10.757		
Cilok Bakso	17		25.000	6.818		
Nasi goreng Kunyit	242		68.800	14.992		
Bebek bakar Maknyus	27		69.800	19.036		
Nasi Campur istimewa	29		55.000	17.589		
Soto Koya	92		59.900	11.651		

Figure 18. Tabulation Step 1

The next step is to determine the value of Menu Mix Percentage (MM%), Food Cost Percentage (FC%) and Contribution Margin (CM).

- The MM is calculated by the number of MI sold devided by total Menu sold during the determined perionds which was 3,076; or in the form of the formula

  $nMM = nB$ / Total B

  Thus, the case of Caesar salad given as

  61 / 3,076 = 1.98%.

- The FC% is calculated by comparing Food Cost (E) with Menu Price (D); or in the formula

  $nF = nE / nD$

  Thus, the case of Caesar salad

  7.729 / 35000 = 22.8%

- The CM is calculated by subtracting Food Cost (E) from Menu Price (D); the case of Caesar salad

  35,000 – 7,729 = 27,271

A	B	C	D	E	F	G
Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin
Caesar salad	61	1,98%	35.000	7.729	22,08%	27.271
Garden salad	43	1,40%	35.000	7.920	22,63%	27.080
Veg Spring roll	81	2,63%	29.000	10.757	37,09%	18.243
Cilok Bakso	17	0,55%	25.000	6.818	27,27%	18.182
Nasi goreng Kunyit	242	7,87%	68.800	14.992	21,79%	53.808
Bebek bakar Maknyus	27	0,88%	69.800	19.036	27,27%	50.764
Nasi Campur istimewa	29	0,94%	55.000	17.589	31,98%	37.411
Soto Koya	92	2,99%	59.900	11.651	19,45%	48.249

Figure 19. Tabulation Step 2

The next stage is to determine Total Food Sales (ΣS), Total Food Cost (ΣC), Total Contribution Margin and Contribution Margin percentage (CM%), using the case of Caesar Salad.

A	B	C	D	E	F	G	H	I	J	K
Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %
Caesar salad	61	1,98%	35.000	7.729	22,08%	27.271				
Garden salad	43	1,40%	35.000	7.920	22,63%	27.080				
Veg Spring roll	81	2,63%	29.000	10.757	37,09%	18.243				
Cilok Bakso	17	0,55%	25.000	6.818	27,27%	18.182				
Nasi goreng Kunyit	242	7,87%	68.800	14.992	21,79%	53.808				
Bebek bakar Maknyus	27	0,88%	69.800	19.036	27,27%	50.764				
Nasi Campur istimewa	29	0,94%	55.000	17.589	31,98%	37.411				
Soto Koya	92	2,99%	59.900	11.651	19,45%	48.249				

Figure 20. Tabulation Step 3

a. ΣS is calculated by multiplying the amount Sold by Menu Price or in the formula

   $nH = nB \times nD$

   Thus

   61 × 35,000 = 2,135,000

b. The ΣC is calculated by multiplying the amount Sold by Food Cost or in the formula

   $nI = nD \times nE$

   Thus

   61 × 7,729 = 471,469

c. The ΣCM is calculated by multiplying the amount Sold by the Contribution Margin or in the formula

   $nJ = nD \times nG$

   Thus

   61 × 27,271 = 1,663,531

d. The CM% is calculated by comparing the Contribution Margin with Menu Price, or in the formula

   $nK = nG / nD$

   Thus

   27.271 / 35.000 = 77.92%

A	B	C	D	E	F	G	H	I	J	K
Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %
Caesar salad	61	1,98%	35.000	7.729	22,08%	27.271	2.135.000	471.469	1.663.531	77,92%
Garden salad	43	1,40%	35.000	7.920	22,63%	27.080	1.505.000	340.560	1.164.440	77,37%
Veg Spring roll	81	2,63%	29.000	10.757	37,09%	18.243	2.349.000	871.317	1.477.683	62,91%
Cilok Bakso	17	0,55%	25.000	6.818	27,27%	18.182	425.000	115.906	309.094	72,73%
Nasi goreng Kunyit	242	7,87%	68.800	14.992	21,79%	53.808	16.649.600	3.628.064	13.021.536	78,21%
Bebek bakar Maknyus	27	0,88%	69.800	19.036	27,27%	50.764	1.884.600	513.972	1.370.628	72,73%
Nasi Campur istimewa	29	0,94%	55.000	17.589	31,98%	37.411	1.595.000	510.081	1.084.919	68,02%
Soto Koya	92	2,99%	59.900	11.651	19,45%	48.249	5.510.800	1.071.892	4.438.908	80,55%

Figure 21. Tabulation Step 4

Tabulation and computation of data up to these steps are able to show an overview of the position or classification of menus in the form of numbers, as follows:

MENU ENGINEERING WORKSHEET

		Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %
Appetise & Soup	1	Caesar salad	61	1,98%	35.000	7.729	22,08%	27.271	2.135.000	471.469	1.663.531	77,92%
	2	Garden salad	43	1,40%	35.000	7.920	22,63%	27.080	1.505.000	340.560	1.164.440	77,37%
	3	Veg Spring roll	81	2,63%	29.000	10.757	37,09%	18.243	2.349.000	871.317	1.477.683	62,91%
	4	Cilok Bakso	17	0,55%	25.000	6.818	27,27%	18.182	425.000	115.906	309.094	72,73%
Sinature	5	Nasi goreng Kunyit	242	7,87%	68.800	14.992	21,79%	53.808	16.649.600	3.628.064	13.021.536	78,21%
	6	Bebek bakar Maknyus	27	0,88%	69.800	19.036	27,27%	50.764	1.884.600	513.972	1.370.628	72,73%
	7	Nasi Campur istimewa	29	0,94%	55.000	17.589	31,98%	37.411	1.595.000	510.081	1.084.919	68,02%
	8	Soto Koya	92	2,99%	59.900	11.651	19,45%	48.249	5.510.800	1.071.892	4.438.908	80,55%
Balinese	9	Bebek goreng Garing	103	3,35%	75.000	27.146	36,19%	47.854	7.725.000	2.796.038	4.928.962	63,81%
	10	Bebek Nyat nyat	30	0,98%	75.000	25.465	33,95%	49.535	2.250.000	763.950	1.486.050	66,05%
	11	Ayam panggang Sambal Matah	185	6,01%	48.000	10.063	20,96%	37.937	8.880.000	1.861.655	7.018.345	79,04%
	12	Gerang asem ayam	51	1,66%	45.000	14.410	32,02%	30.590	2.295.000	734.910	1.560.090	67,98%
Indonesian	13	Nasi Goreng	1.120	36,41%	45.000	9.790	21,76%	35.210	50.400.000	10.964.800	39.435.200	78,24%
	14	Sop Buntut	156	5,07%	65.000	23.329	35,89%	41.671	10.140.000	3.639.324	6.500.676	64,11%
	15	Ayam lalapan	69	2,24%	45.000	14.297	31,77%	30.703	3.105.000	986.493	2.118.507	68,23%
	16	Mie Kuah ayam	303	9,85%	45.000	9.768	21,71%	35.232	13.635.000	2.959.704	10.675.296	78,29%
	17	Mie Goreng	163	5,30%	45.000	9.790	21,76%	35.210	7.335.000	1.595.770	5.739.230	78,24%
	18	Gado-gado	15	0,49%	35.000	12.386	35,39%	22.614	525.000	185.790	339.210	64,61%
Asian & Intl	19	Tom yam fish	150	4,88%	40.000	11.418	28,55%	28.582	6.000.000	1.712.700	4.287.300	71,46%
	20	Chicken Teriyaki	36	1,17%	45.000	12.272	27,27%	32.728	1.620.000	441.792	1.178.208	72,73%
	21	Cap cay	49	1,59%	32.000	11.366	35,52%	20.634	1.568.000	556.934	1.011.066	64,48%
	22	Beef Burger	151	4,91%	45.000	16.630	36,96%	28.370	6.795.000	2.511.130	4.283.870	63,04%
	23	Club Sandwich	120	3,90%	45.000	9.790	21,76%	35.210	5.400.000	1.174.800	4.225.200	78,24%
	24	Calamary Salt pepper	74	2,41%	48.000	15.317	31,91%	32.683	3.552.000	1.133.458	2.418.542	68,09%
	25	Fish & Chip	151	4,91%	55.000	18.138	32,98%	36.862	8.305.000	2.738.838	5.566.162	67,02%
Dessert	26	Pisang Goreng	184	5,98%	25.000	5.720	22,88%	19.280	4.600.000	1.052.480	3.547.520	77,12%
	27	Freash Fruit	51	1,66%	20.000	5.720	28,60%	14.280	1.020.000	291.720	728.280	71,40%
	28	Apple Pie Roll	25	0,81%	30.000	9.038	30,13%	20.962	750.000	225.950	524.050	69,87%
	29	Chocolate lava	13	0,42%	35.000	9.545	27,27%	25.455	455.000	124.085	330.915	72,73%
Sides Order	30	Steam Rice	105	3,41%	15.000	1.320	8,80%	13.680	1.575.000	138.600	1.436.400	91,20%
	31	French Fries	300	9,75%	25.000	9.783	39,13%	15.217	7.500.000	2.934.900	4.565.100	60,87%
		Total	4.196		44.682	11.689	26,16%	32.992	187.484.000	49.049.082	138.434.918	73,84%

Average Contribution Margin	32.992	
Average volume Sold	103	
Popularity Index	72	2,33%

Figure 22. Tabulation Step 5

Steps 6 is determining CM Category, *MM% Category* and *Menu Items Classification.* There are two techniques that will be applied to these three things. The first is a *spreadsheet formulation technique table*, and the second technique is using *Scattered Charts.*

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %	CM Category	MM% Category	Menu Items Classification
Caesar salad	61	1,98%	35.000	7.729	22,08%	27.271	2.135.000	471.469	1.663.531	77,92%			
Garden salad	43	1,40%	35.000	7.920	22,63%	27.080	1.505.000	340.560	1.164.440	77,37%			
Veg Spring roll	81	2,63%	29.000	10.757	37,09%	18.243	2.349.000	871.317	1.477.683	62,91%			
Cilok Bakso	17	0,55%	25.000	6.818	27,27%	18.182	425.000	115.906	309.094	72,73%			
Nasi goreng Kunyit	242	7,87%	68.800	14.992	21,79%	53.808	16.649.600	3.628.064	13.021.536	78,21%			
Bebek bakar Maknyus	27	0,88%	69.800	19.036	27,27%	50.764	1.884.600	513.972	1.370.628	72,73%			
Nasi Campur istimewa	29	0,94%	55.000	17.589	31,98%	37.411	1.595.000	510.081	1.084.919	68,02%			
Soto Koya	92	2,99%	59.900	11.651	19,45%	48.249	5.510.800	1.071.892	4.438.908	80,55%			

Figure 23. Tabulation Step 6

In this stage, we will determine the CM category and MM% category. The author chooses to use a set of the following icons:


High


Approximate


Low

The *CM Category* is determined by calculating the value of the Average contribution margin *(ACM)* first, the way to calculate it is by deviding the Total CM with the number of menus sold or in the formula:

ACM = Σ J / Σ B

ACM = 138,434,918 / 4196

ACM = 32,992

This ACM is borderline, which means that if the CM of a menu item is equal to or greater than 32,992, it will fall into the "High" category; if it is smaller than 32,992 and equal to or greater than 32,000 will belong to the "Approximate" category, while those smaller than 32,000 will belong to the "Low" category. This parameter is set through the Conditional Formatting menu in the Excel spreadsheet program.

In determining the popularity of the menu, based on the compiled data, there is one menu that is too dominant, which is Fried Rice, with a gap of more than three times that of the others; the author decided not to Include the number of sold fried rice in the total number of menu items sold so that the popularity index becomes realistic. Based on the compiled data, there is one menu that is too dominant, which is Fried Rice, with a gap of more than three times that of the others, the author decided not to Include the number of sold fried rice in the total number of menu items sold, so that the popularity index becomes more realistic. The first step is to find the average volume sold, i.e., by dividing the total volume sold by the number of menus. In the case of this study, the amount of Fried Rice sold was deducted first from the totatl menu sold:

4,196 – 1,120 = 3,076.

Because Nasi Goreng is not included, the number of menu items becomes 30, and therefore, Average Volume Sold (AVS) is calculated by the formula:

AVS = (Total Amount sold – Amount sold fried rice) / 30

AVS = (4,196 – 1,120) / 30

AVS = 3,076 / 30 = 103.

Provided that the popularity index is 70%, then 103 x 70% = 72; or in percentage becomes 72: 3,076 = 2.33%. Thus, the author uses 2.33% as the Popularity Index (PI). If the PI of a menu item is equal to or greater than 2.33%, it will be in the high category; If it is smaller than 2.33% and equal to or greater than 2.28% it will belong to the close category, while those smaller than 2.28 will belong to the low category. Furthermore, this parameter is set through the Conditional Formatting menu on the excel program worksheet.

After doing conditional formatting on the worksheet, the Contribution Margin Value is entered into the CM Category column and the Mix Menu is entered into the MM% Category column.

Scattered Chart sonsidered as the simplest technique where the Absis is the volume sol or popularity and the ordinat is the contribution margin. The results can be seen on thefollowing table:

MENU ENGINEERING WORKSHEET

Menu Item	Amount Sold	Menu Mix	Menu Price	Food Cost	Food Cost %	Contribution Margin	Total Food Sales	Total Food Cost	Total Contribution Margin	Contribution Margin %	CM Category	MM% Category	Menu Items Classification
Caesar salad	61	1,98%	35.000	7.729	22,08%	27.271	2.135.000	471.469	1.663.531	77,92%	✗	✗	DOG
Garden salad	43	1,40%	35.000	7.920	22,63%	27.080	1.505.000	340.560	1.164.440	77,37%	✗	✗	DOG
Veg Spring roll	81	2,63%	29.000	10.757	37,09%	18.243	2.349.000	871.317	1.477.683	62,91%	✗	✓	PLOWHORSE
Cilok Bakso	17	0,55%	25.000	6.818	27,27%	18.182	425.000	115.906	309.094	72,73%	✗	✗	DOG
Nasi goreng Kunyit	242	7,87%	68.800	14.992	21,79%	53.808	16.649.600	3.628.064	13.021.536	78,21%	✓	✓	STAR
Bebek bakar Maknyus	27	0,88%	69.800	19.036	27,27%	50.764	1.884.600	513.972	1.370.628	72,73%	✓	✗	PUZZLE
Nasi Campur istimewa	29	0,94%	55.000	17.589	31,98%	37.411	1.595.000	510.081	1.084.919	68,02%	✓	✗	PUZZLE
Soto Koya	92	2,99%	59.900	11.651	19,45%	48.249	5.510.800	1.071.892	4.438.908	80,55%	✓	✓	STAR
Bebek goreng Garing	103	3,35%	75.000	27.146	36,19%	47.854	7.725.000	2.796.038	4.928.962	63,81%	✓	✓	STAR
Bebek Nyat nyat	30	0,98%	75.000	25.465	33,95%	49.535	2.250.000	763.950	1.486.050	66,05%	✓	✗	PUZZLE
Ayam panggang Sambal Matah	185	6,01%	48.000	10.063	20,96%	37.937	8.880.000	1.861.655	7.018.345	79,04%	✓	✓	STAR
Gerang asem ayam	51	1,66%	45.000	14.410	32,02%	30.590	2.295.000	734.910	1.560.090	67,98%	!	✗	DOG
Nasi Goreng	1.120	36,41%	45.000	9.790	21,76%	35.210	50.400.000	10.964.800	39.435.200	78,24%	✓	✓	STAR
Sop Buntut	156	5,07%	65.000	23.329	35,89%	41.671	10.140.000	3.639.324	6.500.676	64,11%	✓	✓	STAR
Ayam lalapan	69	2,24%	45.000	14.297	31,77%	30.703	3.105.000	986.493	2.118.507	68,23%	!	✗	DOG
Mie Kuah ayam	303	9,85%	45.000	9.768	21,71%	35.232	13.635.000	2.959.704	10.675.296	78,29%	✓	✓	STAR
Mie Goreng	163	5,30%	45.000	9.790	21,76%	35.210	7.335.000	1.595.770	5.739.230	78,24%	✓	✓	STAR
Gado-gado	15	0,49%	35.000	12.386	35,39%	22.614	525.000	185.790	339.210	64,61%	✗	✗	DOG
Tom yam fish	150	4,88%	40.000	11.418	28,55%	28.582	6.000.000	1.712.700	4.287.300	71,46%	✗	✓	PLOWHORSE
Chicken Teriyaki	36	1,17%	45.000	12.272	27,27%	32.728	1.620.000	441.792	1.178.208	72,73%	!	✗	DOG
Cap cay	49	1,59%	32.000	11.366	35,52%	20.634	1.568.000	556.934	1.011.066	64,48%	✗	✗	DOG
Beef Burger	151	4,91%	45.000	16.630	36,96%	28.370	6.795.000	2.511.130	4.283.870	63,04%	✗	✓	PLOWHORSE
Club Sandwich	120	3,90%	45.000	9.790	21,76%	35.210	5.400.000	1.174.800	4.225.200	78,24%	✓	✓	STAR
Calamary Salt pepper	74	2,41%	48.000	15.317	31,91%	32.683	3.552.000	1.133.458	2.418.542	68,09%	!	✓	PLOWHORSE
Fish & Chip	151	4,91%	55.000	18.138	32,98%	36.862	8.305.000	2.738.838	5.566.162	67,02%	✓	✓	STAR
Pisang Goreng	184	5,98%	25.000	5.720	22,88%	19.280	4.600.000	1.052.480	3.547.520	77,12%	✗	✓	PLOWHORSE
Fresh Fruit	51	1,66%	20.000	5.720	28,60%	14.280	1.020.000	291.720	728.280	71,40%	✗	✗	DOG
Apple Pie Roll	25	0,81%	30.000	9.038	30,13%	20.962	750.000	225.950	524.050	69,87%	✗	✗	DOG
Chocolate lava	13	0,42%	35.000	9.545	27,27%	25.455	455.000	124.085	330.915	72,73%	✗	✗	DOG
Steam Rice	105	3,41%	15.000	1.320	8,80%	13.680	1.575.000	138.600	1.436.400	91,20%	✗	✓	PLOWHORSE
French Fries	300	9,75%	25.000	9.783	39,13%	15.217	7.500.000	2.934.900	4.565.100	60,87%	✗	✓	PLOWHORSE
Total	4.196		44.682	11.689	26,16%	32.992	187.484.000	49.049.082	138.434.918	73,84%			

Average Contribution Margin	**32.992**	
Average volume Sold	**103**	
Popularity Index	**72**	2,33%
Q	**70,00%**	

Table 24. Completed Engineering Worksheet Menu

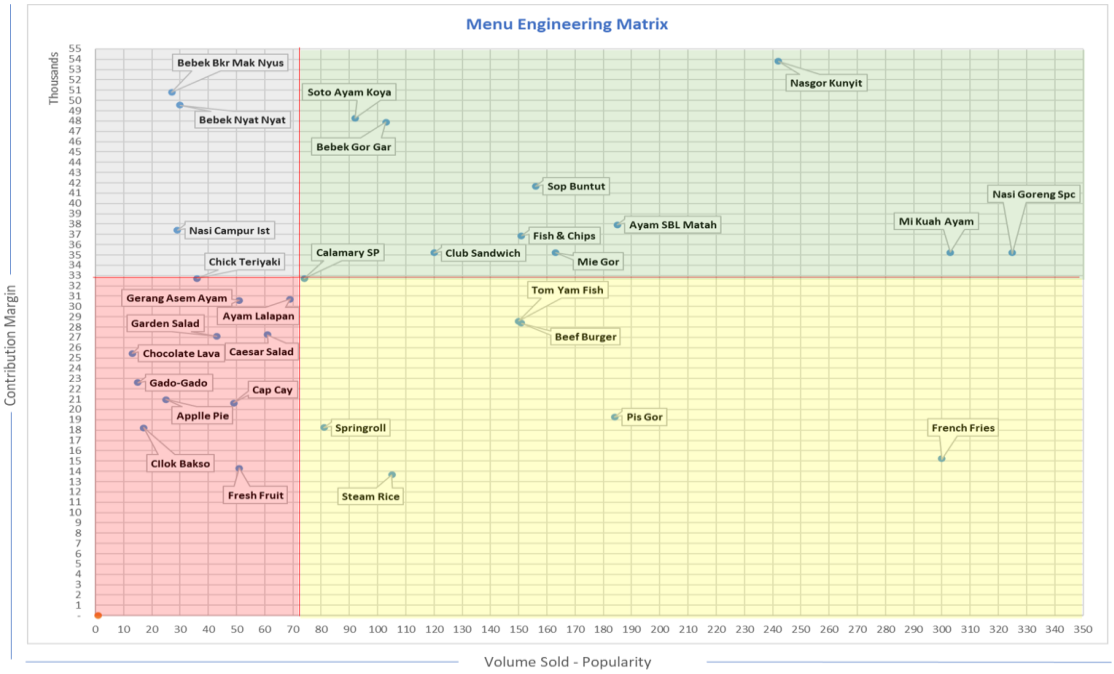


Figure 25. Menu Engineering Matrix - Classification

Discussion

The number of menus listed in the Essier Restaurant menu, is thirty-seven (37) menu items, devided into 8 menu groups. i.e., Appetiser &; Soup; Vasini's Signature; Balinese; Indonesian; Asian &; International; Dessert; Side Order and cook together with chef. For the Cook Together with Chef group, because it only lists the basic ingredients, the author does not include it in the application of this Engineering Menu. Furthermore, the menu sold data that can be downloaded from the Point of Sales system of Essier restaurants is 31 menu items, identified six (6) menu items not included in the menu sold. The unsold menus are: Potatoes Leek Soup, Oxtail Fried Noodles, Urap Sayur, Assorted Jajan Pasar, Assorted Pudding, and Ice Cream. Thus, the menu included in the menu engineering analysis is 31 menu items.

From the data analysis that has been carried out, it is obtained that the menu items classified according to the results of the Menu Engineering Matrix are as follows:

a. The STAR category consists of ten (10) menus or 3 2.26% of the entire menu, consisting of: Fried Rice, Turmeric Fried Rice; Chicken noodle soup; Sambal Matah Chicken; fried noodles; Tail Soup, Fish & Chips; Club Sandwitch; Crispy Fried Duck and Soto Koya.
b. The Puzzle category consists of hree (3) menu or 9.68% of the entire menu, namely: Maknyus Duck; Nyat-nyat duck; Special Mixed Rice.
c. The Plough Horse category consists of seven (7) menus or 22.58% of the entire menu, namely: French Fires; fried bananas; Beef Burger; Tom Yam Fish; Steam Rice, Calamary, Salt & Pepper, and Spring Roll.
d. The Dog category, consisting of eleven (1 1) m enu or 35.48% of the entire menu, namely: Chicken Teriyaki; Chicken Racing; Green Salads; Caesar Salads, Chocolate Lava; A hodgepodge; Capcay; Apple Pie; Bakso Cilok and Fresh Fruit

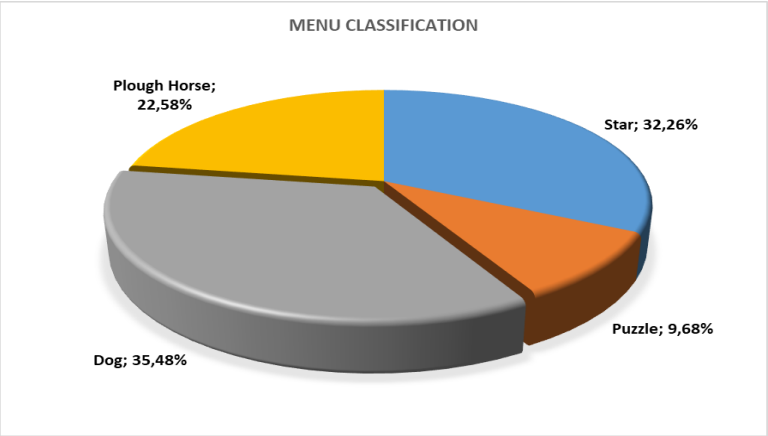


Figure 26. Classification Pie Chart menu

Menus classified into the STAR quadran are menus that can make the best contribution, this quadran identifies that menus included in this classification have contribution margins above ACM and have popularity above the Popularity Index (PI). The menus that need attention are those classified as Plough Horse, Puzzle and Dog. The menu classified as Plough Horse is a popular menu that has the potential to increase the value of its contribution margin or selling price to shift towards Star. Menus that are classified as Puzzle, are menus that are less popular, but have contribution margins above average, these menus have the potential to become stars with the application of suggestive selling techniques, point of internal merchandising or other promotional techniques. The menu in this Puzzle classification can also be pushed to plough horse first by lowering the contribution margin, then after popularity the contribution margin can be increased again to become a Star.

Meanwhile, the menu classified in the Dog quadrant is a menu that has the potential to increase its popularity by sharing ways, encouraged to become a pough horse first, to then be able to become a Star or be considered for updated recipes, even replaced if deemed necessary. Here is a discussion of Essier restaurants in diagram form.

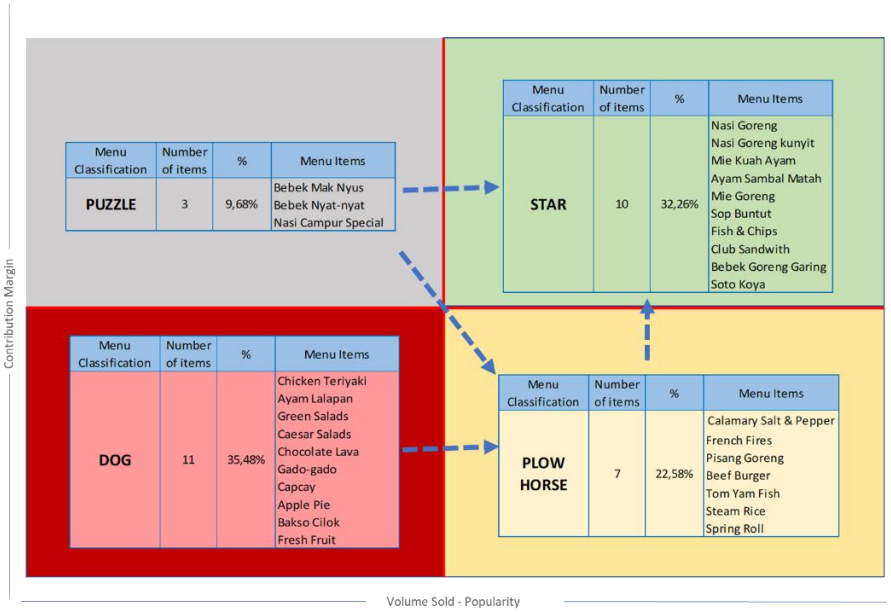


Figure 27. Discussion Diagram

CONCLUSION

Using the arithmetical and scattered charting technique, the Menu Engineering analysis of Essier restaurants can map each menu item's position into four Menu Engineering Matrix quadrans. From the arithmetical formula application, it was identified that 35.48% of the menu items were in the Dog classification, Star 32.26%, Plough Horse 22.58%, and Puzzle 9.68%.

Menus that need attention are menus that belong to puzzles, plow horses, and especially dogs. The dog menu category has the potential to increase popularity by pushing it into the plow horse category first to then become a Star or be considered for updated recipes, even replaced if deemed necessary.

SUGGESTION

Reviewing the Menu Engineering Matrix, the menu in the Puzzle classification, especially those close to the popularity index line, applying suggestive selling techniques, internal merchandising, or other promotional techniques, can be pushed to become a Star. Menus in the Plough Horse quadrant and away from the ACM line may be considered for increased contribution margin value. Menus in the DOG quadrant close to the popularity index line can be promoted to be pushed to Plough Horse, while menus far from PI and ACM can be considered for replacement. Essier Restaurant Management is recommended to regularly conduct menu engineering analysis to determine strategies and steps to increase restaurant sales and profitability. The menu engineering method is also very useful in ensuring that the menu available in the restaurant is popular and has a good contribution margin. Future research is expected to analyze the factors causing a menu's high or low popularity.

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