

Analysis of Menu Design in the Food and Beverage Industry using the BCG Matrix Method

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Abstract. The restaurant menu has long been seen as a crucial marketing tool for influencing patron behavior and driving revenue. The benefits of an appealing menu are extolled by menu designers, who cite several facts and statistics that are unrelated but "show" that menu design has an impact on sales. Many previous researchers have proved the significant benefits of menu designs. However, areas about how to design a menu for a restaurant in practice have been sparse. Therefore, the research objective of this paper is to analyze how to design and redesign a menu. The research method is as follows: first, some data about cost, menu price of each menu item, and the numbers of menu items sold in a sample small-sized restaurant are collected, and then the profits and gross profit% of each item are analyzed and calculated, followed by applying the Boston Consulting Group (BCG) growth-share Matrix to categorize menu items. After that, a menu is redesigned combined with menu design principles. The concluding discussion addresses the successful results of menu redesign for the sample restaurant and the broad and future suggestions for menu redesign.

Keywords: Menu redesign; BCG Matrix; Menu Design Principles.

1. Introduction

The menu outlines a strategic marketing plan and serves as the first impression for a consumer [1]. The menu is a key 'provider-to-consumer' communication medium within the food service providers. It is paramount to utilize the full potential they offer to not only trigger consumer choice but also to architect this choice [2]. Therefore, the menu is one of the determinants of sales and profitability of a restaurant.

The fundamental goal of menu design is to sell products that the restaurateur wants to move, according to many earlier forms of studies, which have focused on concerns of product placement on a menu page. The purpose of this paper is to how a menu can be resigned and re-engineered in terms of menu contents, layout, and physical characteristics to enhance its popularity and increase restaurant profits. To carry out the research, a small-sized restaurant is sampled. Data regarding the number of menu items sold, cost, and menu price are collected, according to which gross sales and gross profit per menu item are calculated. Then, based on the Boston Consulting Group (BCG) growth-share Matrix and applied with menu design principles, some changes to menu item's content, layout, and physical characteristics are made, and a new menu is redesigned, after which a pro-test of changes in menu items selection, profitability and popularity are carried out.

2. Case Description

Li Yuan Xiang Restaurant is a small-sized and casual restaurant set up in 1998, lying north of Renmin Street, Chengdu, Sichuan Province. In the past 20 years, Li Yuan Xiang Restaurant has become popular in Chengdu and earned many prizes in food and beverage. The restaurant focuses on providing delicate western food in the American style and inventing various kinds of food. The menu type of the tri-panel folded menu is a la Carte menu, on which the menu items are listed and priced separately. The meal is arranged as a set menu (standard menu), providing the same assortment of menu items every day. In terms of menu contents, there are three soups, ten appetizers, seven dinner entrees, and four desserts, the pricing color of which is the same, and there is no descriptive copy

(some names of the menu items do not describe the item accurately). Also, the sequence of each category and menu item is just based on the sequence of the capital letter, which makes customers confounded and difficult to categorize the different dishes and spend much time searching for the wanted ones from disorganized plates. In terms of layout, the restaurant put what they have on the menu at the arbitrium without paying attention to the natural eyesight of human beings. Due to this, the restaurant cannot sell what they want to sell (profitable and popular products) purposefully, since customers are not led to focus on these products.

Moreover, the menu is only twenty inches wide and long, and the menu copy is set in only an 8-point type, which is too small to read clearly. Many customers have ignored some critical information and get dissatisfied. In terms of physical characteristics, there are no different boxes, decorative borders, colors, or other graphics that are essential to draw customers' attention. Because of this, many dishes that are expected to be noticed by customers for more sales cannot fail to catch eyes.

Due to the poor design of the menu, there has been a long-term phenomenon in the restaurant that many customers choose some items that are not profitable or even unavailable, and many customers claim confusion about the menu items. Also, the restaurant's mission is to achieve 'Three highs', including high quality, high sales, and high profitability. The restaurant is famous for its high quality, while the other two highs are not achieved. Moreover, the menu also has the greatest impact on how sales and profitability are planned. The menu is a restaurant's entire and initial representation for patrons. The menu lists the products and their prices in order to encourage enough sales for a profit. 80 percent of first-time diners and up to 50 percent of returning diners, according to research by the Foodco Corporation, are unsure of what to order. As a result, the menu has a significant impact on both sales and profitability. To ensure repeat business, high sales volume, and a healthy profit, the restaurant's problematic menu needs to be updated and developed. This will involve modifying the pricing structure, appearance, physical qualities, and layout based on categorizing all of the menu items into four groups.

3. Menu design

3.1 Calculations

3.1.1 Data Collection and calculations

Data regarding the number sold per menu item, cost of each menu item, and menu price are collected from the Sales and Marketing Department of the restaurant in the two months from 1st June 2020 to 31st July 2022. Based on the collected data, profit per menu item, total gross profit, and gross profit (percentage) are calculated. The computing formula is as follows:

Gross sales equal Sales volume multiplied by Menu Price

Profit per item equals Menu Price per item minus Cost per item

Total gross profit equals the Number sold multiplied by Gross profit per item

Profitability equals Total gross profit divided by Gross sales

The collected data and calculations as shown in Table 1.

Table 1. Three Scheme comparing

Menu item	Sales volume	Cost	Price	Gross sales	Gross profit	Total gross profit	Profitability
X1 House pickles	324	17.85	30	9720	12.15	3936.6	40.5%
X2 Chicken Soup	520	8.5	30	15600	21.5	11180	71.67%
X3 Country Vegetable Soup	382	16.92	30	11460	13.08	4996.56	43.6%
X4 Salat Olivier	402	20	35	14070	15	6030	42.86%
X5 Russian Beet Salad	798	16.6	20	15960	3.4	2713.2	17%
X6 Mixed Green Salad	108	29.5	35	3780	5.5	594	15.71%
X7 Caspian Sea Black Caviar	876	15	85	74460	70	61320	82.35%
X8 Salmon Caviar	401	34	70	28070	36	14436	51.43%
X9 Ukrainian Sweet& Sour White Fish	365	14.5	30	10950	15.5	5657.5	51.67%
X10 Schmaltz Herring	634	10.05	35	22190	24.95	15818.3	71.29%

X11 House Pickles	354	14.67	25	8850	10.33	3656.82	41.32%
X12 Grilled Vegetables with Herb Dip	369	21.78	40	14760	18.22	6723.18	45.55%
X13 Piroshki	425	26.5	35	14875	8.5	3612.5	24.29%
X14 Blinis	86	28.96	35	3010	6.04	519.44	17.26%
X15 Shashlik	176	22	110	19360	88	15488	80%
X16 Classic Chicken Kiev	128	67	75	9600	8	1024	10.67%
X17 Georgian Grilled Cornish Hen	600	12.45	21	12600	8.55	5130	40.71%
X18 Traditional Cabbage Rolls	329	30	65	21385	35	11515	53.85%
X19 Siberian Pelmeni	391	18	35	13685	17	6647	48.57%
X20 Trout	635	22	75	47625	53	33655	70.67%
X21 Seasonal fruits plate	403	25.2	45	18135	19.8	7979.4	44%
X22 Ice cream or sherbet	125	10	40	5000	30	3750	75%
X23 Black forest cake	123	27.5	30	3690	2.5	307.5	8.33%
X24 Grilled Salmon	365	34	75	27375	41	14965	55%

3.1.2 The degree of popularity and profitability

(1) Popularity. The degree of popularity of each menu item is determined by the calculated profitability. All these data are put into x-axis called Popularity (from left to right: low popularity to high popularity).

On the Popularity line, there is a midpoint which is a standard point for popularity, by which whether the degree of popularity of each menu item is high or low is determined. The standard point for popularity is determined by the arithmetic mean of all the numbers of menu items sold. The computing formula is as followed:

$$\alpha = \frac{\sum_{i=1}^{n=24} \text{Sales volume}}{24} \quad (1)$$

So, based on the computing formula, the standard point for popularity is equal to 388 items which means that the menu items those are sold for below 388 items are categorized as low popularity while those are sold for above 388 items are categorized as high popularity.

(2) Profitability. The degree of profitability of each menu item is determined by the collected number sold. All these data are put into y-axis called profitability (from bottom to top: low profitability to high profitability).

On the Profitability line, there is a midpoint which is a standard point for profitability, by which whether the degree of profitability of each menu item is high or low is determined. The standard point for profitability is determined by each menu item's weighted mean of gross profitability. The computing formula is as follows:

$$\beta = \frac{\sum_{i=1}^{n=24} \text{Sales volume} * \text{profitability}\%}{\text{Total number sold}} \quad (2)$$

So, based on the computing formula, the standard point for profitability is equal to 50.34%, which means that the menu items whose gross profitability% is below 50.34% are categorized as low profitability. In comparison, those whose gross profitability% is above 50.34% are classified as high profitability.

(3) Develop a scatter plot. Based on the popularity and profitability, a scatter plot can be developed (shown in Figure 1)



Fig. 1 Cesscatter plot

3.1.3 Boston Matrix Model

The BCG matrix is a product portfolio analysis model developed by Bruce Doolin Henderson in 1970 for BCG in Boston [3] to assist organizations in making decisions regarding the allocation of resources and to enhance their management capabilities.

BCG Matrix has a two-dimensional four-celled grid (2*2 matrix). All the products can be divided based on two dimensions: the Relative Market Share (RMS), a measure of product strength (competitive advantage) in the market. The other one is the Market Growth Rate (MGR) which is a measure of market attractiveness which means the number of products sold [4].

All of the products are divided into four categories by BCG Matrix: Stars, Cash Cows, Question Marks, and Dogs. The position of the market share and growth markets are indicated by stars. According to Cash Cows, the products are in marketplaces with strong market share but limited growth. Question Marks represent changes in low-market-share, high-growth markets. Dogs demonstrate that market share and growth are in a peaceful position [5].

Since the restaurant is small-sized, Profitability represents RMS, and Popularity is used to represent MGR. Based on the calculations mentioned above and applying BCG Matrix, all 24 menu items of this restaurant can be categorized into four sections in terms of profitability and popularity: four Stars (high popularity; high profitability), three Cash Cow (high popularity; low profitability), two Question Marks (low popularity; high profitability) and four Dogs (low popularity; low profitability). And the remaining menu items, called Normal items, show the normal and non-prominent data, which means that the shown data has approximate value to the standard point of both popularity and profitability. Table 2 shows the category of the 24 menu items.

Table 2. Eye-pattern of m

Category	Menu items
Stars	Caspian Sea Black Caviar; Schmaltz Herring, Trout; Chicken Soup
Cash Cow	Piroshki; Russian Beet Salad; Georgian Grilled Cornish Hen
Question Mark	Shashlik; Ice cream or sherbet
Dogs	Classic Chicken Kiev; Black forest cake; Mixed Green Salad; Blinis
Normal Menu Item	The remaining menu items

3.2 Suggestions for a menu redesign

3.2.1 Strategies for menu items

Depending on BCG Matrix, there are different strategies for these four categories of products. For Stars, companies can use Hold Strategy which is to maintain the Stars and do nothing to preserve the proper position. For Question Marks, a Build Strategy can be used by companies that make further investments to build market share, such as promoting and turning the Question Marks into stars. For Cash Cows, companies can use Harvest Strategy to reduce the investment to maximize the profits of Cash Cows. For Dogs, Divest Strategy can be applied to sell or liquidate the business because companies can better allocate resources elsewhere. For instance, companies can remove Dogs and utilize the resources to invest in Stars [4,6].

For the 24 menu items of the restaurant, all the four strategies mentioned above are applied to the menu. The strategy for the Star menu items is to maintain them on the menu. For Cash Cow menu items, the process is to adjust, which is to reduce the cost by reducing the average menu item size to increase the gross profit% of the menu items (profitability). For Question Mark menu items, the strategy is to promote these menu items to increase the number of menu items sold (popularity). For Dog menu items, the process is to hide the products to avoid being ordered, since in a restaurant, canceling a menu item may result in customer dissatisfaction.

3.2.2 Principle for menu design

Copy, color, paper, typeface, layout, and other design elements can be used to develop a menu that can catch customers' attention to the menu items that a restaurant wants to sell, thus increase increasing sales [7-8].

Menu design can be divided into three parts: menu content, layout, and physical characteristics. And for each piece, there are different principles. For menu content, the content is expected to appear in the sequence of how the menu items are served: drinks, appetizers, and then desserts [9]. Also, the price of menu items needs to be weakened to avoid attracting customers to attend to the price. What is more, the elements of menu items need to be described clearly to help customers to know the details of items clearly, such as what the menu items are made up of and what elements are accompanied by the things.

Regarding menu layout, the most desirable and profitable items should be placed where customers will notice them since those items are seen first by customers and are more likely to remain the longest in people's minds [1]. The most lucrative products should be located in the middle of the inside right page of the three-page menu, which means the prime place is the very middle of the pages (as shown in figure 2) [10]. Regarding physical menu characteristics, some appropriate eye-catching graphics, icons, and photographs can help highlight profitable and desirable menu items [1].

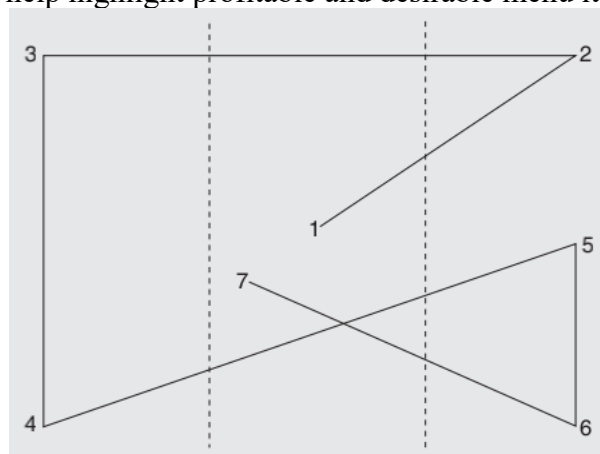


Fig. 2 Eye-pattern of menu

3.2.3 Suggestions based on a combination of BCG Matrix and menu design principle

There are changes in the redesigned menu, including menu content, layout, and physical characteristics.

(1) Menu content. As for the sequence, in the redesigned menu, the menu items appear in a series of starters, soups, salads, dinner entrees, and desserts, which is the sequence of how the menu items are served instead of putting them in an arbitrary line. Also, all the prices of the menu items are colored in light gray, which makes a sharp comparison with the names of menu items. In addition, detailed menu descriptions are demonstrated to help customers better understand the menu items.

(2) Menu layout and physical characteristics. Based on the four menu items categorized by BCG Matrix and the prime place for people to see from the menu design principle, the menu items are placed differently and with other physical characteristics on the new menu (as shown in Figure 3).

As for stars with high popularity and high profitability, since the strategy is to maintain them, the star menu items for each section are placed in the middle of each team to be observed by customers and ordered more. Also, to attract more attention from customers, the red stars, a designed graphic, refers to the menu items that are highly recommended. For example, Schmaltz Herring is one of the stars, so it is in the middle of the starters section.

As for cash cows with high popularity and low profitability, since the strategy is to reduce cost by downsizing the size per menu, the added phrase “for one” is presented beside these menu items, which is likely not only to attract customers’ attention but also to remind people of the size of the menu items.

As for question marks with low popularity and high profitability, since the strategy is to promote them, these products are also placed in the middle of each section to attract people’s attention and increase the likelihood of being ordered. For the extreme question mark-Shashlik, it is designed to be the Specials section on the menu which is plain on the most prime location of the menu and is on the very middle of the whole menu and with an icon showing the meat.

As for dogs with low popularity and low profitability are placed in the most ignorable places since the strategy is to hide them. For example, the Black forest cake is one of the dogs, so it is placed on the very bottom of desserts.

MENU		
opening time: 11:00a.m.—9:00p.m.		ENJOY IT
• 开胃菜 (Zakuski) - 乌克兰酸甜白鱼 (Ukrainian Sweet&Sour White Fish) 30.00 topped with shredded carrot & onion - 特色酸菜 (House Pickles) 25.00 Kosher-style original brine with coleslaw & lettuce - 香酥油煎蔬菜 (Grilled Vegetables with Herb Dip) 40.00 eggplant, zucchini, bell peppers, onion - 肉菜盒子 (Piroshki-Russia's famous stuffed buns) 55.00 various tasty fillings - meat, vegetarian, or mixed - 一人份 for one ★ 炸鱼配土豆鱼红菜 (Schmaltz Herring) 55.00 with coleslaw, red onion, hot potatoes ★ 里海黑鱼子 (Caspian Sea Black Caviar) 85.00 substantial & exquisite hors d'oeuvres platter 三文鱼鱼子 (Salmon Caviar) 70.00 red caviar with crepes, smoked salmon, lettuce - 酥馅饼 (Blinis) 35.00 with a savory meat & herb fillings & sour cream	• 汤 (Soups) - 红菜汤 (Traditional Ukrainian Borsch) 30.00 the aristocratic beet soup - with herbs & sour cream - 鸡汤云吞 (Chicken Soup with Pelmeni) 30.00 meat dumplings in a tasty broth with vegetables - 新鲜蔬菜汤 (County Vegetable Soup) 30.00 fresh market produce in a clear vegetable stock • 特选 (Specials) - 扒羊肉、猪肉或鸡肉任选其一 (主菜) 110.00 (Shashlik - Rasputin's Fabulous Sword Kebab) • 沙拉 (Salads) - 俄式土豆沙拉 (Salat Olivier) 35.00 Russian potato salad with greens & smoked sausage - 俄式红菜沙拉 (Russian Beet Salad) - 一人份 for one 35.00 - 什锦蔬菜沙拉 (Mixed Green Salad) 25.00 lettuce, tomato, coleslaw, bell peppers & croutons	• 主菜 (Dinner Entrees) - 正宗蔬菜卷 65.00 Traditional Cabbage Rolls, with a savory pork, beef or rice stuffing - 香扒三文鱼 (Grilled BC Salmon) 75.00 ★ 特制鲑鱼 75.00 Trout - Special House Recipe, deboned & stuffed with a couscous pilaf - 乔治亚扒鸡肉 21.00 Georgian Grilled Cornish Hen, aromatic & tender - a whole hen flat - fried under a brick - 一人份 for one - 西伯利亚水饺 35.00 Siberian Pelmeni - the Russian Tortellini, stuffed with a fine garlic, pork, beef mix - 传统黄油鸡卷 75.00 Classic Chicken Kiev, crisp-cooked white meat wrapped around herb lemon butter • 甜品 (Desserts) - 时令果盘 (Seasonal fruits plate) 45.00 - 精致雪糕或雪露 (Ice cream or sherbet) 40.00 - 黑森林蛋糕 (Black forest cake) 30.00
	★ 该菜品为主厨特别推荐 highly recommended	

Fig. 3 The new menu

3.3 Results of redesign menu

3.3.1 Changes in menu items selection

After reengineering the menu for the restaurant, a protest was carried out in the restaurant. The menu items selected by the 20 randomly chosen customers are documented in the test.

It shows that for Star menu items, 19 of the 20 customers choose one of the Star items. For Question Mark menu items, 17 of the 20 customers selected one of the Question Marks, which were ordered at a low rate in the past. For Dogs, just one of the 20 customers set after being hidden at the bottom of the menu.

3.3.2 Changes in profitability and popularity

The data about profits and the number of menu items sold are selected one month after the menu is redesigned. Changes from the conditions before the menu redesign are found in the profit and number sold.

For stars, the menu items sold have increased by 5%. For cash cows, the gross profit% has risen by 10%. For Question marks, the menu items sold have increased by 13%.

All these increasing changes have proved that the menu redesign is valuable and effective in increasing the profitability and popularity of the restaurant's menu items.

4. Summary

To sum up, menu redesign in terms of menu contents and layouts and menu items' physical characteristics is essential and helpful for a restaurant to increase profits and popularity. Some suggestions about redesigning or designing a menu for a restaurant is that first of all, the related data about cost, numbers of menu items sold, and menu price should be recorded and collected carefully, and profits should be calculated. And based on the data, menu items should be categorized into four types based on BCG Matrix; then, strategies specific to different categories of menu items should be used and applied with menu design principles. The general strategy is that Stars should be maintained; the menu item sizes of Cash Cows should be reduced to reduce cost; Question Marks should be promoted, and Dogs should be hidden. The last thing is to test and compare the status after redesigning menus.

This paper can be used as a reference for a restaurant to redesign its menu and shows the importance of menu design to a restaurant and the flexible application of BCG Matrix and menu design principles. At last, this paper has some shortcomings. First, the calculations of gross profits and gross profit% are only considered with the food cost, but not others like rent cost, labor cost, and the cost of processing raw materials. Also, in the protest, only 20 customers are surveyed, representing only a minimal number of customers, which means that the results may be in special exceptional cases. And the data collected after menu redesign only represents the conditions of one month which may not be representative. Therefore, further research is expected to consider as much as possible and increase the sample size in protest to make more effective and reliable research.

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