Development of Menu Engineering Calculators to Improve Menu Evaluation Capabilities on Cost Control Learning

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Abstract. The tourism business is not only about how businesses provide the best experience to customers but also about achieving long-term profitability. A tourism business person should have the skills and knowledge to manage the financial aspects of the tourism business, especially in the field of Food and Beverage. This ability is to be achieved through the Cost Control Course, especially on the topic of Menu Engineering. In learning Menu Engineering at the Bali State Polytechnic Tourism Department, students still evaluate the menu manually which has a high probability of calculation errors and takes a long time to work on. This research is intended to develop a learning media, namely the spreadsheet-based menu engineering calculator. The research design used was a quasi-experimental design with a pretest-posttest control group design. The experiment was conducted by taking 2 groups of students, namely the control group and the experimental group. The results of this study showed that the experimental group had greater learning outcomes compared to the control group. This is because, in the experimental class, students evaluate menus using menu engineering calculators that are easier to understand, more effective and efficient than the manual method carried out by the control group.

Keywords: Cost Control, Learning Media, Menu Engineering Calculator

1 Introduction

Food and Beverage Services is one of 13 types of tourism businesses recognized in Indonesia. Food and beverage service businesses can be in the form of restaurants, cafes, catering services, and bars/taverns *(UU Nomor 10 Tahun 2009 tentang Kepariwisataan*).

The restaurant business is different from other businesses in the service sector. Restaurants are businesses that combine art and tradition, operational mechanisms and marketing experience, service philosophy, and the concept of forming potential audiences (Gheribi, 2017). Cost control has a crucial role in the performance of a company, especially restaurants. Good performance can be achieved if the company

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and employees jointly control costs in operations (Akeem, 2017). To advance the business, cost control is carried out as a series of processes to strengthen the potential and resources owned, so that the restaurant business can plan the process and find the right strategy (Hermida & Aráuz, 2023).

Menu engineering as one of the topics in learning cost control, is one of the components that need to be evaluated, which includes analyzing the profitability and operational efficiency of the menu. Menu engineering is an alternative method that analyzes the dishes offered by a restaurant, allowing the restaurant to determine the financial profitability and popularity of the dishes offered so that they can be corrected, improved, and maintained (Hermida & Aráuz, 2023).

In the operation of a restaurant, the menu is the driver of purchasing and production decisions (Taylor & Brown, 2007). Menus in the context of restaurants are seen as a list of food and beverages offered by restaurants to customers that reflect the expectations and needs of customers (Ozdemir & Caliskan, 2014). The menu is essential in the Revenue Management of a restaurant (Thompson, 2010). Previous research explained that variations on the menu have a significant influence on purchasing decisions (Erisca & Ismayuni, 2023; Handayani et al., 2021). Others discuss menu design which has four main dimensions, namely the position of menu items, menu item descriptions, menu item labels, and menu card characteristics, where the design of the menu has the most potential effect on the items ordered by customers (Ozdemir & Caliskan, 2014).

Previous studies tend to discuss how to conduct menu engineering in a restaurant or cafeteria, and then the results of the evaluation are used to register marketing strategies that should be taken by management so that restaurant profitability increases (Ardiansyah, 2020; Gusti et al., 2018). Several other studies explore the integration of menu engineering using various financing methods (Linassi et al., 2016; Fang & Rubin, 2014). Other research discusses the design of a variable financing-based menu engineering information system that has been conducted in Surabaya (Saputra, 2021). Then there is research on the design and development of a cost-control learning model based on a material control system, which explains that, using a system-based learning model, students gain a deeper learning experience, with a more effective and efficient work process (Yulianthi & Komala, 2022). However, there has been no research on the development of a Spreadsheet-based Engineering Menu Calculator. For students who will be working in the industry, it is important to have the ability to evaluate menus. Learning how to evaluate menus through cost control learning is one way that can be done. However, students often experience difficulties in applying cost control concepts to menu evaluation. The lack of tools that facilitate menu calculation and analysis can be an obstacle to understanding and applying cost control concepts effectively.

In learning menu engineering, some students use calculators, while others use the MS. Excel application. This has implications for student understanding, accuracy of calculations and decision-making, and efficiency of time used. Based on this background, this study proposes the development of a spreadsheet-based “Menu Engineering Calculator” as a solution to improve menu evaluation skills in cost control learning. The hypothesis proposed in this study is that there are differences in student

learning outcomes in menu evaluation material using spreadsheet-based menu engineering calculator compared to those using manual methods. Then, spreadsheet was chosen as the platform because of its flexibility in performing complex calculations and providing clear visualization of the results.

2 Methodology

This research was conducted for 6 months by involving 2 informants. In addition to these informants, at the experimental stage with a quasi-experimental design, involving 60 students of the Bali State Polytechnic Tourism Business Management Study Program who took the Cost Control Course. Data collection methods were carried out using interviews and observations. The experimental results were then tested using the T-test, with the notation as follows.

$$T = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{S_p^2[1/n_1 + 1/n_2]}} \quad (1)$$

Hypothesis used:
Ho: there is no difference in student learning outcomes in evaluating menus using manual methods compared to using the menu engineering calculator.
Ha: there is a difference in student learning outcomes in evaluating menus using manual methods compared to using the menu engineering calculator.

3 Result and Discussion

3.1 Design of Menu Engineering Calculator

At the design stage, starting with conduct interviews with practitioners from the hospitality industry to find out the role of menu engineering in today's food and beverage industry and to get input on the features that must be present in the calculator. Based on the results of interviews with 2 practitioners from the hospitality industry, namely Mr. I Wayan Karta, General Manager of The 101 Bali Fontana Seminyak, and Mr. Nengah Sudiarta, Resident Manager of Mercure Bali Legian, obtained information that currently menu engineering is very necessary to be applied so that menu evaluation can be carried out, wherewith menu evaluation, hotel management can control stock and also determine the right promotional steps for its menus. After obtaining the results of the analysis, and getting menus with categories of Dogs, Stars, Plowhorses, and Puzzles, then the results are informed to the Chef for further Chef together with management determines the right strategic steps for the sale of the menu.

The interview also stated that the features of the menu engineering calculator include: food cost, selling price, number of servings sold, margin contribution, menu mix, profitability which can be seen in the margin contribution category, and also popularity which can be seen in the menu mix category. Researchers also added features of menu engineering categories and menu sales strategies that can be applied.

After recording all the features that need to be provided on the menu engineering calculator based on the results of previous observations and interviews and referring to Saputra (2021), the next step is to design the menu engineering calculator flowchart. The flowchart used in making the menu engineering calculator is presented in Figure 1.

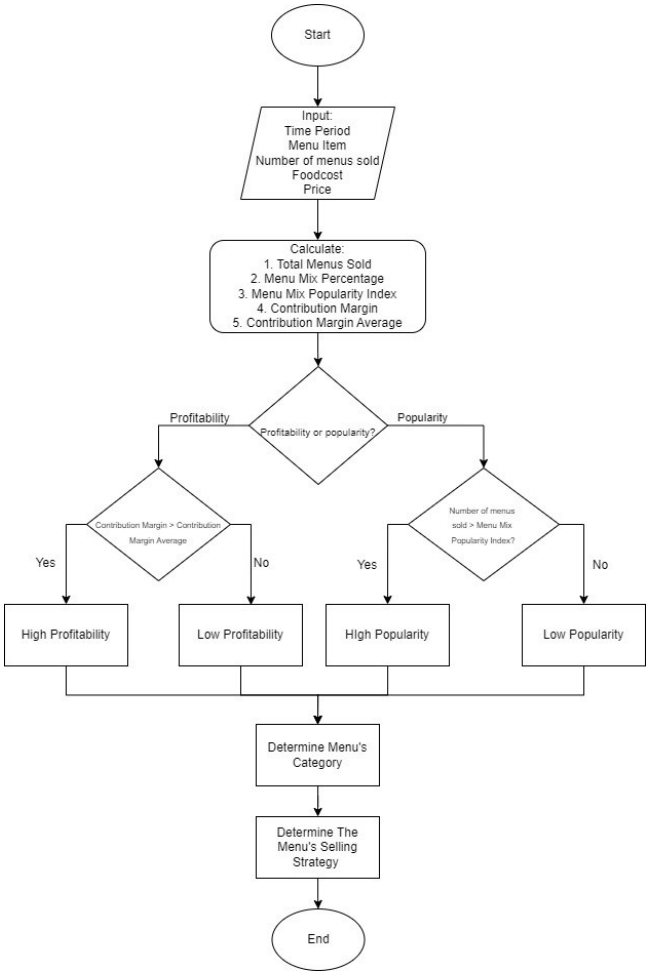

Figure 1. Spreadsheet-based menu engineering calculator design flowchart

The menu sales strategy used for each menu category, obtained based on the results of interviews with both practitioners, namely:

Dogs menu category, menu with low profitability and low popularity. The strategy applied to the Dogs menu category is to further analyze whether this menu should be retained or eliminated from the menu list, for example, a vegetarian menu. Some

restaurants have a policy to provide a minimum of 30% vegetarian menu, so if the vegetarian menu is included in the Dogs category, then the menu will be maintained. However, if it is not a vegetarian menu, it can be removed from the menu. If the Dogs menu is maintained, it will have an impact on raw material stock control. Raw materials must be used before the expiration date. For this reason, if there are raw materials that will expire in the next 3 months, they can be used in other menu items as additional ingredients, can also be given as free testers to customers, or can be used as add-ons at banquets or event meetings.

Plow horses menu category, menus with low profitability and high popularity. Plow horses menu usually occurs in menus that have high-priced raw materials. The sales strategy applied is to innovate the menu by adding other elements. It can increase the sales price but not reduce popularity. Another strategy that can be applied is to sell the menu at events, thus increasing sales volume.

Puzzles menu category, a menu with high profitability and low popularity. In the Puzzles menu category, strategies that can be applied include conducting promotional activities or providing discounts to increase sales levels.

Stars menu category, menu with high profitability and popularity. Menus with the stars category, even though they have performed very well, must still be maintained and even improved, by promoting the menu. It is also better if innovations are made on the menu to add other menu stars.

From the menu engineering calculator design flowchart, after being implemented on Google Sheets, the following Figure 2 of the menu engineering calculator is obtained.

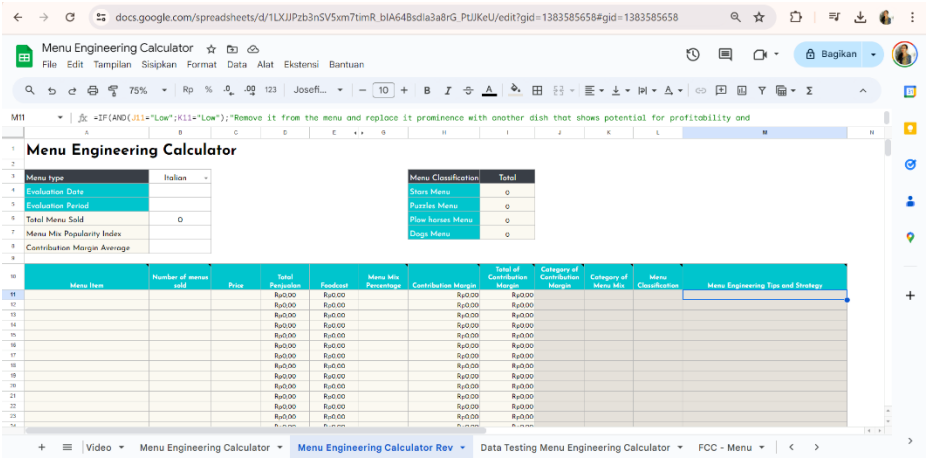

Figure 2. Display of menu engineering calculator

After the menu engineering calculator is developed, the next stage is the validation stage with experts. The validation stage was carried out using testing data, namely menu and sales data from Santa Fe Restaurant located in Amed Karangasem. The menu engineering calculator for testing data is presented in Figure 3.

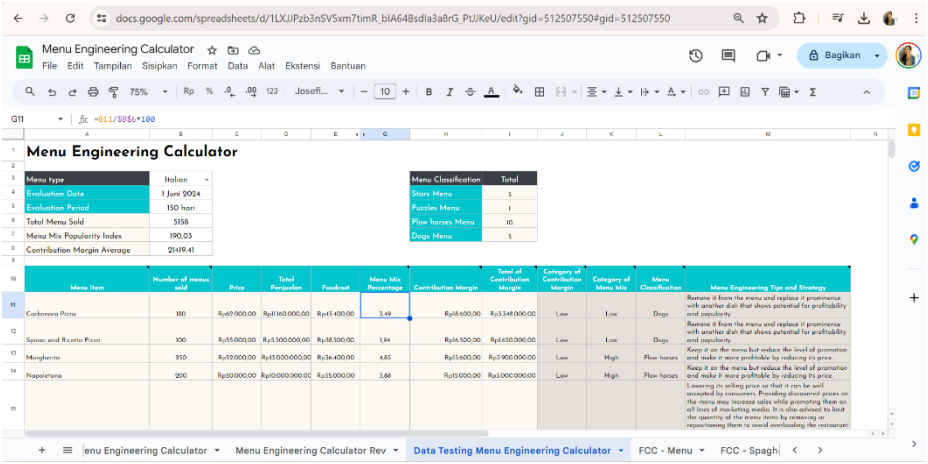

Figure 3. Display of menu engineering calculator using testing data

After validating the menu engineering calculator, it was found that all features, especially the features that use formulas on Google spreadsheet, have run well and give the right results.

3.2 The Application of The Menu Engineering Calculator in Improving Student Understanding of The Engineering Menu Material in Learning Cost Control

After the menu engineering calculator is built, it is then tested on student groups to determine the improvement of student abilities in menu evaluation material. Quasi-experimental design is used as a research design by taking 2 groups that will be given different treatments. This research design is similar to the pretest-posttest experiment design but with non-random sample groups. The samples in this experiment were 2 groups of students who took the Cost Control course, with each group consisting of 30 students. The first group, hereinafter referred to as the control group, received pretest treatment, then given the material manually, and asked to evaluate the menu manually. The second group, hereinafter referred to as the experimental group, also received a pretest as an initial treatment, which was then given learning material with the help of the menu engineering calculator. After that, the experimental group was asked to do a posttest using the menu engineering calculator.

The t-test results of the control group and the experimental group can be described as follows:

Comparative test of pretest and posttest scores of the control group. The hypotheses used in this test are:

Ho: There was no significant difference between the mean pretest and mean posttest in the control group.

Ha: There was a significant difference between the mean pretest and mean posttest in the control group.

Based on the analysis, the following results were obtained:

Table 1. Results of t-test between the pretest and post-test scores of the control group

Value	Mean	Difference	t-value	t-table
Pretest	61.10	10.667	-8.143	-2.000
Posttest	71.77			

Source: Data processed (2024).

With a difference in the mean scores of pretest and post-test of 10.667 points and a t-value that is smaller than the t-table or $-t_{(\alpha/2)}$, it can be said that Ha is accepted, the pretest and posttest scores for the control group are significantly different. The post-test value is greater than the pretest value. This shows that there is an increase in menu evaluation skills using the manual method.

Comparison test of pretest and posttest scores of the experimental group. The hypotheses used in this test are:

Ho: There was no significant difference between the mean pretest and mean posttest in the experimental group.

Ha: There was a significant difference between the mean pretest and mean posttest in the experimental group.

The results of the analysis of differences in the pretest and posttest scores of the experimental group are given in Table 2.

Table 2. Results of t-test between the pretest and post-test scores of the experimental group

Value	Mean	Difference	t-value	t-table
Pretest	62.53	17.9	-12.447	-2.000
Posttest	80.43			

Source: Data processed (2024).

The posttest score was greater than the pretest, with a difference of 17.9 points. The t-value is worth -12.447 which was smaller when compared to $-t_{(\alpha/2)}$, which means Ha accepted, that the two groups of values are significantly different. This shows that there was an increase in menu evaluation skills by experimental group students, where initially they obtained an average of 62.53. When they tried again using the menu engineering calculator, the average value increased significantly to 80.43.

Comparison test of pretest scores of the control group and experimental group.
The hypotheses used in this test are:

Ho: There was no significant difference between the mean pretest of the control group and the experimental group.

Ha: There was a significant difference between the mean pretest of the control group and the experimental group.

Table 3 shows the test results of the pretest scores of the control group and experimental group. Where with the difference in the average pretest value of the control group and the experimental group, which is 1.433 points, and t-value which was greater than t-tabel or $-t_{(\alpha/2)}$, Ha can't be accepted. It can be said that the pretest value in the control group is not significantly different from the pretest value in the experimental group.

Table 3. The t-test results between the pretest scores of the control and experimental group

Group	Mean	Difference	t-value	t-table
Control	61.10	1.433	-1.439	-2.000
Experiment	62.53			

Source: Data processed (2024).

This shows that the abilities of both control and experimental groups are the same, or not significantly different, with an average difference of 1.43.

Comparison test of post-test scores of the control and experimental group. The hypotheses used in this test are:

Ho: there was no significant difference between the mean posttest of the control group and the experimental group.

Ha: there was a significant difference between the mean pretest of the control group and the experimental group.

Table 4 shows the test results of the post-test scores of the control group and the experimental group. Where with the difference between the posttest value of the control group and the experimental group which is 8.667 points, and the t-value which was smaller than the t-tabel or $-t_{(\alpha/2)}$, means Ha accepted. It can be said that the post-test value in the control group is significantly different from the post-test value in the experimental group. The post-test value of the experimental group is greater than that of the control group. This implies that there is indeed an increase in evaluation scores, where the average score in the control group is 71.77, significantly different from the experimental group which is 80.43.

Table 4. The t-test results between the post-test scores of control and experimental group

Group	Mean	Difference	t-value	t-table
Control	71.77	8.667	-5.653	-2.000
Experiment	80.43			

Source: Data processed (2024).

4 Conclusion

The menu engineering calculator has been designed to be easy to use and easy to obtain by anyone. The features of the menu engineering calculator are Menu Mix Percentage, Menu Mix Popularity Index, Margin Contribution, Menu Mix Category to see the level of popularity, and Contribution Margin Category to see the level of profitability. An additional feature is the Engineering Menu category feature which groups each Menu Mix Category and Contribution Margin Category into 4 categories namely Dogs, Plow horses, Puzzles, and Stars. The menu engineering calculator is also equipped with a sales strategy feature for each menu category according to the results of interviews in the industry.

From the results of the experiments conducted, it appears that the use of this calculator can improve students' understanding of the concept of cost control, especially in terms of menu evaluation. The experiment showed that Ha was accepted for the comparison of pretest and posttest values in the control group, the comparison of pretest and posttest values in the experiment group, and the comparison of posttest scores in the control group and the experimental group. There was a real and significant difference in the pretest and posttest results in the control group with a difference of 10.667. Similarly, for the experimental group, the pretest and posttest results showed a significant difference, with a difference of 17.9. Then there is a real and significant difference in the post-test results of the two groups with a difference of 8.667. While the pretest results of the control and experimental groups with a difference of 1.433 did not show a real and significant difference. This means that there is an increase in the ability of students after using the Menu Engineering calculator compared to using the manual method.

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