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Improving the Layout Design of RUET Cafeteria for Increasing its Customer Satisfaction and Time Spend Analysis

Azmain Fayeq Bhuiyan, Ausmita Chowdhury, Md. Rasel Sarkar
Department of Industrial & Production Engineering,
Rajshahi University of Engineering & Technology, Rajshahi-6204
E-mail: azmainfayeq@gmail.com, ausmita.riya.ipe.45@gmail.com, rasel@ipe.ruet.ac.bd

Abstract

University cafeterias play a vital role in student life but often face challenges like congestion and long queues. This study aims to enhance customer satisfaction by analyzing the current layout and identifying areas for improvement at the Rajshahi University of Engineering & Technology (RUET) cafeteria. Key areas of focus include examining time-spending patterns, improving seating arrangements, and reducing waiting times. Using methodologies such as the Automated Layout Design Program (ALDEP) and systematic time studies, this research provides evidence-based recommendations for redesigning the cafeteria layout. The proposed layout incorporates customer feedback, enhances operational efficiency, and creates a more enjoyable dining experience. These findings can serve as a model for optimizing cafeteria management in academic settings.

Keywords: Cafeteria, Layout Design, Time Spend Analysis, ALDEP

1. Introduction

The cafeteria at Rajshahi University of Engineering & Technology (RUET) is a vital space for food and social interaction. It allows students and staff to take a break from their academic or administrative duties, enjoy a meal, and engage in informal discussions. The efficiency of the cafeteria largely depends on the satisfaction of its users, including students, faculty, and staff. Their happiness is influenced by factors such as food quality, service efficiency, and the physical environment. This study focuses on the cafeteria's layout design and the time-spending habits of its clients. A well-designed cafeteria layout can improve customer flow, provide comfortable seating, and create a pleasant atmosphere. Conversely, a poorly planned layout can lead to overcrowding and discomfort. Understanding customers' time-spending habits can reveal peak times, preferred meals, and average visit durations, offering insights for operational decisions like staffing, meal preparation, and layout adjustments. These findings can be served as a model for optimizing cafeteria management in other academic settings.

2. Problem Statement

The RUET Cafeteria's current layout design creates challenges for ensuring customer satisfaction. Observations have been made regarding improper dining conditions, inefficient use of available space, and overcrowding during peak times. Furthermore, there is a lack of detailed data regarding customer time spent practices. This study aims to investigate time spend patterns and space design in order to solve these issues and offer evidence-based solutions.

3. Objectives

To analyze the RUET cafeteria's layout, identify inefficiencies in space utilization, conduct time-spend analysis to determine peak usage and waiting times, highlight areas for improvement like seating and queue management, and propose an optimized layout using ALDEP.

4. Review of literature

Research by Üzeyir Kement et al. found that specific elements of a restaurant's atmosphere, such as spatial layout, employee factors, and window views, positively influence revisit intention, word-of-mouth intention, and willingness to pay more. The study suggests that restaurant managers should prioritize optimizing spatial arrangements, enhancing employee presentation, and utilizing scenic views to improve customer satisfaction and loyalty [1].

The research paper titled "Plant Layout Optimization using CRAFT and ALDEP Methodology," published in the Productivity Journal in 2016, demonstrates that while the CRAFT technique offers modest benefits, the ALDEP methodology significantly reduces material handling costs, suggesting its effectiveness in enhancing facility arrangements. This approach proved valuable in a case study at RMG Alloy Steel Company and is proposed for further use in various settings, including campus cafeterias [2].

In a 2019 study by Suhardini and Rahmawati, the integration of ALDEP and CRAFT techniques led to a 23% reduction in material handling costs and a decrease in manufacturing lead time. The combined use of these methodologies indicates a more efficient facility layout, applicable to settings like university cafeterias [3].

Kisang Ryu and SooCheong (Shawn) Jang developed the DINESCAPE scale, designed to evaluate high-end restaurant dining environments based on six elements: Facility Aesthetics, Ambience, Lighting, Table Settings, Layout, and Social Factors. Although tailored for upscale restaurants, its principles can assist in improving dining spaces such as campus cafeterias, particularly when combined with the ALDEP approach [4].

The "Post-occupancy evaluation of a university student cafeteria" study at King Fahd University of Petroleum and Minerals utilized Post-Occupancy Evaluation (POE) to assess the cafeteria's effectiveness, focusing on the physical environment rather than food quality. Which included user feedback through surveys and discussions, highlights the importance of incorporating user input in evaluating and enhancing cafeteria facilities [5].

Lastly, research by Wonjae Lee and Carolyn U. Lambert found that discrepancies between expected and actual waiting times negatively impact service quality and customer happiness. It suggests improving the waiting environment and reducing actual waiting times through management strategies and simulation techniques [6].

5. Methodology

The Automated Layout Design Program (ALDEP) is implemented to generate optimized layout designs. ALDEP is chosen for its effectiveness in arranging departments based on closeness ratings, which aligns with the need for efficient seating arrangements and flow management. The input for ALDEP includes data collected from surveys and observations of customer behavior within the cafeteria. Additionally, a time study is conducted to analyze customer activities, waiting times, and peak usage hours. Data is systematically recorded during different periods of the day, using time-motion study techniques. This analysis provides insights into bottlenecks, such as queue congestion and service delays, which are critical for proposing improvements.

6. Data Analysis

First, a survey was conducted using a set of related questionnaires distributed to the customers of the RUET cafeteria and data from 160 respondents was collected. After that, a time study was performed, and the current layout of the RUET cafeteria (**Fig. 1**) was collected.

Findings from survey of questionnaires

1. Customers are mainly facing problem in
    i. Seating arrangement
    ii. Waste disposal facility
    iii. Food counter
    iv. Lack of reading zone
    v. Long waiting line
    vi. Delay in service
    vii. Congested area
2. Separate food collecting and cash collecting counter is necessary
3. Separate entry and exit points are needed
4. A separate reading zone is necessary
5. A vending machine is necessary

Findings from Time Study

1. Customers need maximum time only for food consumption from 10.50 AM to 1.20 PM.
2. Customers spend most of their leisure time from 2.30 PM to 5.30 PM.
3. The queue remains most crowded from 10.50 AM to 1.20 PM
4. Customers wait the most for receiving food from 10.30 AM to 10.50 AM

Present layout of the RUET cafeteria

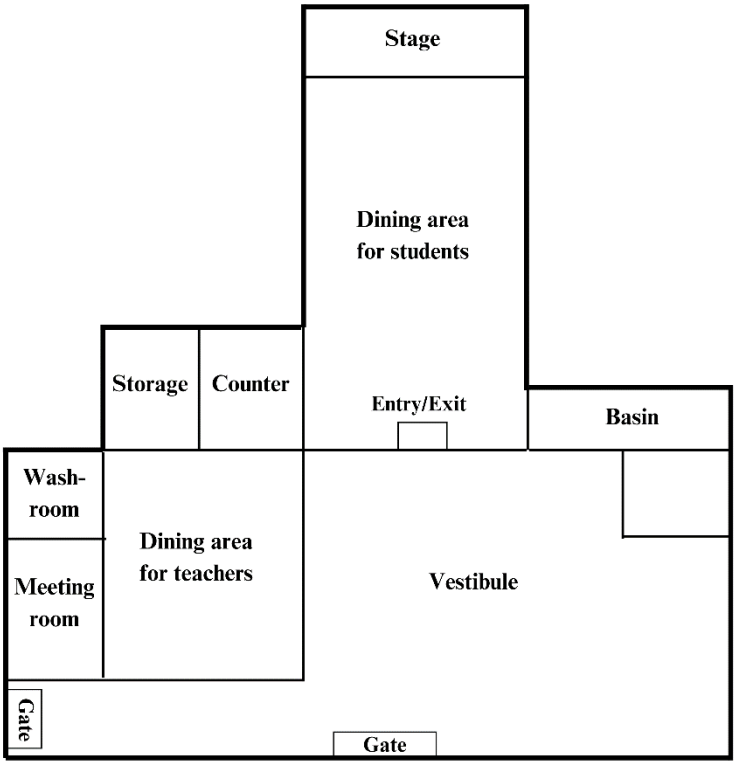

Fig. 1. Present layout of the RUET cafeteria.

Data analysis for ALDEP

To solve the layout by ALDEP, a relationship chart was made with the help of customers' interests and observation technique.

For Students Dining area:
Total Number of Departments: 3
Total area: 70 feet x 36 feet (2520 square feet)
Let 36 square feet = 1 block
Total block = 72 (12 x 6)

Table 1. List of all departments and their required area and number of squares (Students Dining area).

Department Number	Department Name	Number of Squares	Area (sq. ft.)
1	Students Seating	50	1800
2	Reading Area	10	360
3	Stage	10	360
Total:		70	2520

Table 2. REL Chart (Students Dining area).

	1	2	3
1	-	E	I
2	E	-	U
3	I	U	-

MDP Value = 4
Sweep width = 2

Table 3. Applying ALDEP algorithm and placing all the departments (Students Dining area).

1	1	1	1	1	1
1	1	1	1	3	3
1	1	1	1	3	3
1	1	1	1	3	3
1	1	1	1	3	3
1	1	1	1	3	3
1	1	1	1	2	2
1	1	1	1	2	2
1	1	1	1	2	2
1	1	1	1	2	2
1	1	1	1	2	2
1	1	1	1		

For Teachers Dining area:
Total Number of Departments: 3
Total area: 48 feet x 40 feet (1920 square feet)
Let 16 square feet = 1 block
Total block = 120 (12 x 10)

Table 4. List of all departments and their required area and number of squares (Teachers Dining area).

Department Number	Department Name	Number of Squares	Area (sq. ft.)
1	Teachers Seating	80	1280
2	Meeting Room	30	480
3	Teachers Washroom	10	160
Total:		120	1920

Table 5. REL Chart (Teachers Dining area).

	1	2	3
1	-	A	A
2	A	-	A
3	A	A	-

MDP Value = 4
Sweep width = 2

Table 6. Applying ALDEP algorithm and placing all the departments (Teachers Dining area).

1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	2	2	3	3
1	1	1	1	1	1	2	2	3	3
1	1	1	1	1	1	2	2	3	3
1	1	1	1	1	1	2	2	3	3
1	1	1	1	1	1	1	1	3	3

7. Result

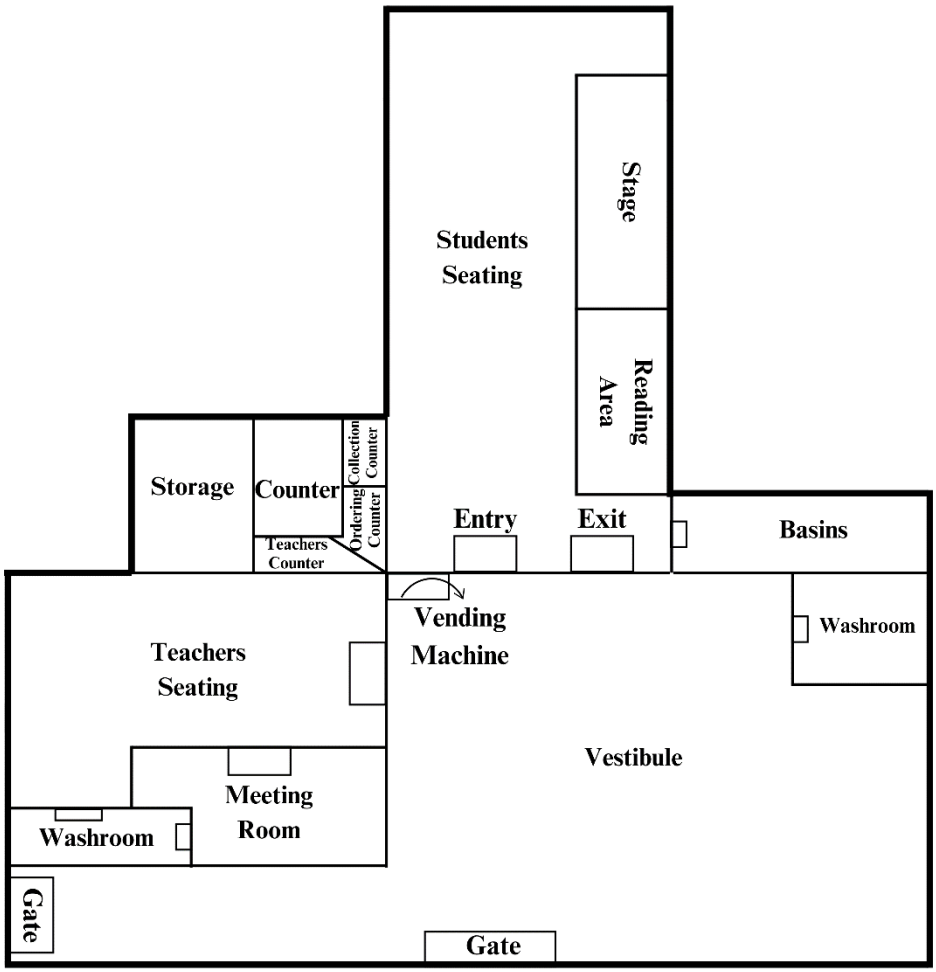

Fig. 2. Layout after implementing ALDEP considering customer requirements.

The current layout of the RUET cafeteria presents several issues, particularly during peak hours, where congestion leads to inefficiency and discomfort. To address this, implementing separate entry and exit points is recommended to optimize movement and reduce overcrowding. The existing layout also underutilizes space, resulting in inefficient seating arrangements. A redesign incorporating better seating configurations and clearer walkways could improve space usage. Additionally, long waiting times at counters are caused by poorly organized food collection and payment procedures. Introducing separate counters for these tasks can streamline operations and reduce delays. The seating capacity is also insufficient, making it difficult for customers to find available seats, which affects their overall comfort. Improving the seating layout to provide more space would enhance the dining experience. Lastly, the absence of amenities like vending machines and reading areas reduces the cafeteria's appeal. Adding these facilities would better meet customer needs and make the cafeteria more attractive. These changes are expected to enhance customer satisfaction and operational efficiency at the RUET cafeteria. With the help of relationship chart using ALDEP we designed the final layout (**Fig. 2**). And the findings from the time study reveal key patterns in customer behavior at the cafeteria. Customers require the most time for food consumption between 10:50 AM and 1:20 PM. During this period, the queue is also the most crowded. Additionally, customers spend the majority of their leisure time between 2:30 PM and 5:30 PM. The peak waiting time for receiving food is observed from 10:30 AM to 10:50 AM.

8. Conclusion

This study on the RUET Cafeteria's layout and time-spending patterns offers key insights into improving both customer satisfaction and operational efficiency. Understanding lunchtime dynamics enables effective staffing, while a designated reading area encourages productivity and leisure. The addition of a vending machine enhances convenience. These findings can serve as a model for optimizing cafeteria operations, not only at RUET but also at other institutions aiming to improve dining experiences. A well-designed layout, reducing crowding during peak times, providing diverse seating, and creating a pleasant ambiance are crucial for enhancing customer experience. By analyzing lunchtime behavior, the study offers practical guidance for staffing and menu design, contributing to a healthier and more productive academic environment at RUET. Future work could explore applying engineering principles to further optimize the cafeteria's functionality. Adopting an integrated design process that aligns layout design with the broader system design would enhance efficiency. Additionally, increasing the number of respondents in future studies could yield more comprehensive results, potentially offering better insights into customer needs and preferences.

9. References

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