

Employing Servqual and Statistical Process Control Tools in Enhancing University Cafeteria Services in the Philippines

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Abstract

Introduction: The quality of university cafeteria services significantly influences student satisfaction, health, and well-being, impacting daily routines and academic performance. In the Philippines, maintaining high standards in university cafeterias is essential for fostering a positive campus environment.

Objectives: This study aims to evaluate and enhance cafeteria services at the University of Science and Technology of Southern Philippines - Cagayan de Oro (USTP-CDO) using the SERVQUAL model, Statistical Process Control (SPC) tools and Cause and effect analysis.

Methods: A survey was conducted with 355 participants, comprising students, faculty, and staff. The SERVQUAL model assessed service quality across five dimensions: tangibility, reliability, responsiveness, assurance, and empathy. The survey results were analyzed using mean scores. SPC tools were employed such as Pareto analysis to identify critical factors affecting service quality, Individual and Moving Range (I-MR) charts, to monitor the stability and variability of key service processes, including ambiance, space, food quality, and cleanliness. Cause and effect were presented through Fishbone structure.

Results: The findings revealed significant dissatisfaction with the cafeteria's ambiance and space with specific issues such as poor ventilation and overcrowding identified as major concerns. While the food quality was generally rated positively, improvements in ambiance and space management were deemed necessary. The I-MR charts indicated that some processes were under statistical control, but there were areas with notable variations requiring attention.

Conclusion: Based on the results, targeted suggestions were formulated to address these challenges, including enhancing ventilation systems, increasing seating capacity, and optimizing layout. These improvements aim to create a more comfortable and satisfying dining experience for customers. This research provides a comprehensive framework for evaluating and improving cafeteria services using SERVQUAL and SPC methodologies. This combined approach aims to achieve higher service consistency, enhance customer satisfaction, and maintain high standards in university cafeteria services. This research provides valuable insights and a framework for other universities aiming to enhance their cafeteria services

Keywords: SERVQUAL, Statistical Process Control, Cafeteria, Pareto Analysis, Cause and Effect

1. Introduction

The quality of university cafeteria services plays a crucial role in shaping the overall campus experience, significantly impacting student satisfaction, health, and well-being. For students, faculty, and staff, the cafeteria is a primary source of nourishment, influencing their daily routines and academic performance. In the Philippines, where higher education institutions are diverse and numerous, maintaining high standards in cafeteria services is essential. High-quality cafeteria services contribute to a positive campus environment, fostering a sense of community and

supporting both physical and mental health. Furthermore, well-managed cafeteria services can enhance the university's reputation, attracting prospective students and faculty. Despite their importance, many university cafeterias struggle to maintain high service standards.

Common issues such as inconsistent food quality, poor ambiance, inadequate hygiene, and limited menu options negatively impact student satisfaction and hinder the educational experience. Previous studies have highlighted these problems: limited menu options can lead to decreased satisfaction and potential nutritional deficits [1]; significant hygiene issues have been noted [2]; inconsistent food quality

adversely affects meal satisfaction [3] and poor food quality and ambiance lead to dissatisfaction [4].

2. Objectives

This study aims to address the challenges by evaluating university cafeteria services in the Philippines using the SERVQUAL model and enhancing them through the application of Statistical Process Control (SPC). SERVQUAL, developed by Parasuraman, Zeithaml, and Berry (1988), effectively measures perceived service quality across dimensions such as tangibility, reliability, responsiveness, assurance, and empathy. It helps identify gaps between expectations and actual service, thereby prioritizing areas for improvement. Conversely, SPC focuses on monitoring and controlling processes through statistical methods, using tools such as control charts, process capability analysis, and Pareto charts to identify and reduce variations, ensuring processes operate at their full potential. Recent applications of SPC includes improving the quality of the weights of animal- feed bags [5], analyzing defects in a small-scale local shoes production company cost [6], and project monitoring in construction [7]. SQC techniques have been also employed to evaluate academic program performance rates [8], assess teaching quality assurance, identify low-performance courses for timely improvements [9], assessment on the performance of teacher education graduates in the licensure examination for teachers [10], and monitor and improve academic processes and outcomes [11].

Integrating SERVQUAL and SPC methodologies provides a comprehensive approach to service evaluation and improvement. SERVQUAL offers insights into customer perceptions, while SPC provides a systematic method for controlling and improving service quality. Additionally, employing cause and effect analysis within this framework helps in identifying the root causes of service quality issues. By constructing cause and effect diagrams, also known as fishbone or Ishikawa diagrams, the study can visually map out potential factors leading to problems in cafeteria services, such as poor food quality or inadequate hygiene. This analytical tool aids in pinpointing specific areas that require

intervention, thus complementing the findings from SERVQUAL and SPC.

By employing SERVQUAL and SPC, alongside cause and effect analysis, this study contributes to the existing body of knowledge in the Philippine context, distinguishing itself through its methodological rigor and application of advanced statistical tools. This combined approach aims to achieve higher service consistency, enhance customer satisfaction, and maintain high standards in university cafeteria services. This research provides valuable insights and a framework for other universities aiming to enhance their cafeteria services through data-driven approaches.

3. Methodology

3.1 Participants of the study

The target population for this study includes students, faculty, and staff of the University of Science and Technology of Southern Philippines - Cagayan de Oro (USTP-CDO) who dine at the university cafeteria. A total of 355 individuals participated in the study. The participants comprise of students, staff and faculty from different colleges, namely, Colle of Medicine (COM), College of Engineering and Architecture (CEA), College of Science and Technology Education (CSTE), College of Information and Technology (CITC), College of Science and Mathematics (CSM) and College of Technology (COT).

3.2 Evaluation of Service Quality using SERVQUAL Model

The SERVQUAL Model

In this study, five dimensions of the SERVQUAL methodology were chosen based on their effects on service processes and characteristics. These dimensions are tangibility, reliability, responsiveness, assurance, and empathy [12]. Tangibility referred to the physical aspects of the cafeteria that customers could see and touch, including the appearance of facilities, equipment, personnel, and ambiance. Reliability referred to the ability of the cafeteria to consistently provide the promised service accurately and dependably, encompassing factors such as accuracy, timeliness, and service consistency. Responsiveness referred to the willingness and readiness of the cafeteria staff to help customers and provide prompt service.

Assurance referred to the knowledge, courtesy, and ability of the cafeteria staff to convey trust and confidence to customers. Empathy referred to the caring and personalized attention the cafeteria provided to its customers.

3.3 Development of the Survey Questionnaires

Two types of questionnaires were sequentially developed to evaluate the quality of cafeteria services: one for service quality and one for Pareto analysis. The results from the service quality questionnaire were used to develop the questionnaire for Pareto analysis.

Questionnaire for Service Quality

The questionnaire for service quality was adapted from the study of [13] and customized to fit the context of this research. It was distributed over one week in the cafeteria, with each customer filling out the questionnaire only once to ensure unique responses. This questionnaire had two main segments:

1. Demographic Profile (Segments A and B): This segment collected information about the respondents' backgrounds.
2. Service Quality Assessment (Segments C): This segment contained 32 specific questions addressing factors impacting customer perception of cafeteria quality in relation to the five SERVQUAL dimensions: Tangibility (items 1-16), Reliability (items 17-20), Responsiveness (items 21-24), Assurance (items 25-28), Empathy (items 29-32).

Each question was rated on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). This scale aligned with the SERVQUAL methodology used to evaluate customer perceptions and expectations. The results from this survey questionnaire were analyzed using mean scores. The final part of this segment focused on identifying the most significant factors affecting cafeteria service quality from the customer's perspective. Customers were asked to choose the three most important questions out of the 32 provided. The results from this part were used to develop the questionnaire for Pareto using Pareto analysis.

Questionnaire for Pareto

This questionnaire has been prepared after analyzing the last segment of the Questionnaire for

Service quality using Pareto analysis. This questionnaire has three segments;

1. Food Chosen by the Customer: The part collects information about the food items purchased by the customer.
2. Service Quality Factors: The part focusing on the most significant questions that directly influence service quality.
3. Comments and/or Complaints: The third part provides space for customers to leave comments and/or complaints.

Each customer is asked to rate each question according to their perception of the cafeteria's service quality using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The frequency of each question being chosen was tallied, and a Pareto chart was created to highlight the most significant factors affecting service quality from the customer's perspective. The Pareto analysis helped in prioritizing the key areas for improvement in the cafeteria services

3.4 Development of the Pareto Chart

A Pareto chart is a valuable tool in quality control and decision-making processes. It helps identify the most significant factors in a dataset, often following the Pareto principle (80/20 rule). This principle aids in prioritizing problems or causes for improvement by highlighting the most critical factors. In this study,

Measurement and Sorting of Data from Pareto Questionnaire

To measure the factors, a frequency distribution was utilized. The data were sorted in descending order based on frequency using Excel, with the most significant factors listed first from the result of Pareto questionnaire.

Calculation of Cumulative Percentage

The cumulative percentage for each factor was calculated by dividing the frequency of each factor by the total frequency and then multiplying by 100 to get the percentage. Starting with the percentage of the first (most significant) factor, each subsequent factor's percentage was added to the cumulative percentage of the previous factor. After computing the cumulative percentage, the Pareto chart was created using Excel.

3.5 Development of SQC Control Charts

A control chart, also known as a Shewhart chart or process-behavior chart, is a statistical tool used to

monitor, control, and improve the quality of processes over time [14]. It helps identify whether a process is stable (in control) or unstable (out of control) by detecting variations that may indicate problems or improvements. There are many kinds of control charts for variables which each them has individual application in process monitoring [15] has categorized them as, Average and range charts (x and R), Median and range charts (X and R), Average and standard deviation charts (X and S), Individual and moving range charts (X and MR), Run charts.

In this study, A total of 10 daily samples were used to analyze the processes. Each day's data consists of multiple individual measurements of service quality processes. The average of all measurements taken within a single day was calculated and considered as a sample for that day. This approach resulted in one representative value per day, used as an individual observation in subsequent control chart analyses. To monitor and analyze the process, two types of control charts were utilized: the Individual and Moving Range (I-MR) chart and the Moving Average chart.

Construction of Individual and Moving Range (I-MR) Control Charts

The I-MR chart was employed to analyze the process using all 10 samples together. This chart helps identify variations within the process by considering each day's average as an individual data point.

Computation of Individual Chart

Step 1: Calculation of Control Limits for the Individual Measurements (X) Chart

Sum all individual measurements and divide by the number of measurements

$$\bar{X} = \frac{\sum_{i=1}^m X_i}{m-1} \quad (1)$$

where X_i represents the i -th observation and m is the total number of measurements

Step 2: Calculation of Control Limits for the Individual Measurements (X) Chart

$$CL_x = \bar{X} \quad (2)$$

$$UCL_x = \bar{X} + 3_z \left(\frac{\overline{MR}}{d_2} \right) \quad (3)$$

$$LCL_x = \bar{X} - 3_z \left(\frac{\overline{MR}}{d_2} \right) \quad (4)$$

where CL represents the center line, UCL represents Upper control Limit and LCL represents lower control limit. The constants D_2 known as control chart factors, are typically 1.128.

Computation of Moving Range Chart

Step 1: Calculation of Moving Ranges- The moving range (MR) was calculated as the absolute difference between consecutive individual measurements:

$$MR = |X_{i+1} - X_i| \quad (5)$$

where X_i represents the i -th observation. This resulted in $m - 1$ moving range values, where m is the total number of measurements.

Step 2: Computation of Average Moving Range (MR-bar):

The average of the moving ranges (\overline{MR}) was computed as follows:

$$\overline{MR} = \frac{\sum_{i=2}^m MR_i}{m-1} \quad (6)$$

where MR_i represents the moving range between consecutive measurements, and m is the total number of measurements.

Step 3: Calculation of Control Limits for the Moving Range Chart

The control limits for the Moving Range chart were determined using the following formulas (Mitra, 1998).

$$CL_{MR} = \overline{MR} \quad (7)$$

$$UCL_{MR} = D_4 \cdot \overline{MR} \quad (8)$$

$$LCL_{MR} = D_3 \cdot \overline{MR} \quad (9)$$

where CL is the center line, UCL is the Upper control Limit and LCL is the lower control limit. The constants D_4 and D_3 , known as control chart factors, are typically 3.267 and 0, respectively.

Interpretation of the Control Chart Results

The constructed I-MR and moving average control charts were analyzed to identify any points outside the control limits and to detect patterns indicating potential process instability. Specifically, the charts were examined for:

Shifts: Sudden changes in the process level that remain constant over time. Points consistently fall above or below the centerline after the shift point.

Runs: Series of consecutive points all on one side of the centerline, suggesting a non-random pattern and potential change in the process.

Trends: Continuous movement of points in one direction over time, indicating gradual changes in the process

Grouping (Bunching): Points bunched closely together, showing little variation around a particular level, suggesting a lack of variation during certain periods.

If all points on the control chart fell within the control limits, the process was considered in statistical control. However, additional analysis was conducted to identify systematic patterns that might indicate the process was out of control. Identifying and eliminating the causes of these patterns can lead to process improvement [15].

3.6 Cause and effect analysis

A Cause-and-Effect Diagram is a tool that helps identify, sort, and display possible causes of a specific problem or quality characteristic. It graphically illustrates the relationship between a given outcome and all the factors that influence the outcome. This type of diagram is sometimes called an "Ishikawa diagram" because Dr. Kaoru Ishikawa, a Japanese quality control statistician, invented it (1943). The design of the diagram looks much like the skeleton of a fish. Therefore, it is often referred to as the fishbone diagram.

In this study, based on the complaints and suggestions from customers, it is evident that the ambiance of the cafeteria does not meet customer satisfaction. This dissatisfaction is closely linked to several factors: inadequate ventilation, excessive heat inside the cafeteria, and overcrowding, which further increases the heat. Additionally, the limited space available for diners is a critical issue that affects customer comfort. According to customer feedback, the cafeteria needs more space to accommodate diners comfortably. Given these issues, it is crucial to conduct a thorough investigation into the associated processes to identify the root causes of these problems. Therefore cause-and-effect diagram have been drawn for ambiance of the cafeteria and space.

3.7 Formulation of Possible Suggestions to address the identified Service Quality Issues in University Cafeteria Services

After problem analysis which involves collecting appropriate data and using those data with the problem-solving tools such as control charts and

cause-and-effect analysis. This section presents the possible suggestions to eliminate and improve the quality of services in the cafeteria. These suggestions are based on customer feedback and insights from relevant literature on enhancing cafeteria services.

4. Results and Discussion

This study aims to evaluate the quality of university cafeteria services in the Philippines using the SERVQUAL model and improve these services by applying Statistical Process Control (SPC).

4.1 Demographic Profile of the participants

Table 1 indicates that the majority of respondents are students (85%), while faculty and staff constitute smaller proportions (5% and 10%, respectively). The College of Science, Technology, and Engineering (CSTE) has the highest representation at 83%, closely followed by the College of Technology (COT) at 85%. The College of Management (COM) has the lowest representation at 33%.

In terms of year level, most respondents are in their 2nd year (40%) and 1st year (35%), with fewer students in the 3rd, 4th, and 5th years. The age distribution shows that the majority of respondents are between 20-34 years old (92%). Additionally, the gender distribution indicates a slightly higher number of female respondents (54%) compared to male respondents. From the same table most (43%) of the customers indicated that they were regular customers of the restaurant with 27% visiting the restaurant daily to eat.

4.2 Evaluation of Service Quality using SERVQUAL Model

Table 2 presents the mean satisfaction levels of various aspects of cafeteria services as rated by respondents. The mean values indicate the overall satisfaction level for each service, with higher values suggesting greater satisfaction. The data from table 2 indicates strong satisfaction in areas such as food quality (*items 1, 4, and 19*), staff service (*items 17,18,25,26, and 27*), and High levels of satisfaction are reflected in the willingness to recommend the cafeteria (5.4) and overall satisfaction with the services (5.4). These findings align with existing literature which highlights that high food quality and excellent service significantly enhance customer satisfaction and loyalty. For instance, a study on

customer satisfaction in fast food restaurants

Table 1: Demographic Profile of the participants

Variable	Category	Frequency	Percentage
Role in the university	Student	303	85%
	Faculty	18	5%
	Staff	34	10%
College	CEA	69	21%
	CITC	78	24%
	CSM	21	20%
	CSTE	100	83%
	COT	47	85%
	COM	6	33%
Year Level	1st	105	35%
	2nd	121	40%
	3rd	55	18%
	4rth	18	5%
	5th	4	1%
Age	under 20	19	5%
	20-34	328	92%
	34 and above	8	5%
Gender	Male	162	46%
	Female	193	54%
Frequency of visit to cafeteria	Daily	154	43%
	Once a week	132	37%
	days a month	34	10%
	Once a month	22	6%
	Less frequently than a month	13	4%
	First time	154	43%

identified that food quality and service quality are determinants of customer satisfaction [9]. Additionally, the professionalism and

responsiveness of staff are critical factors in ensuring customer satisfaction [16]. The data was further subjected to Pareto analysis, a statistical quality control tool, which helped identify the most critical factors contributing to customer satisfaction.

Table 2: Descriptive statistics of customer satisfaction of services provided by the cafeteria

Variables		Mean
1	The food is served fresh, maintaining its quality and taste.	5.2
2	The food is served at the desired temperature, ensuring it is enjoyable to eat.	4.6
3	The food is delicious and flavorful, making each meal a satisfying experience.	4.7
4	The quality of the food is excellent, meeting high standards of taste and presentation.	5.1
5	The beverages, including fruit juice and cola, are of excellent quality and taste.	4.8
6	The beverages are served at the optimal temperature, enhancing their refreshment value.	4.8
7	The food portion sizes are satisfying, providing good value and fulfilling meals.	4.7
8	The food offers great value for the price, balancing quality and affordability.	4.3
9	The cafeteria has ample space to accommodate customers comfortably, even during busy times.	4.3
10	I can easily find a seat in the cafeteria, ensuring a convenient and stress-free dining experience.	3.2
11	The cafeteria provides an excellent ambiance with ideal temperature and ventilation, enhancing the overall dining experience.	3.1
12	The availability of sauces, utensils, napkins, and other dining essentials is consistently good, ensuring convenience and satisfaction for customers.	4.2
13	The cafeteria is maintained in a very clean condition, including tables, dishes, and utensils, reflecting high standards of hygiene and cleanliness.	3.2

14	The servers are always clean and tidy, presenting a professional and well-groomed appearance.	4.3
15	The menu board is easy to read, with clear and well-organized information that helps customers make informed choices	3.8
16	The menu has a good variety of items	4.7
17	The cafeteria staff takes my order promptly and accurately.	5.5
18	The cafeteria staff handles special requests accurately.	5.7
19	The cafeteria maintains consistent food quality over time.	5.8
20	The cafeteria ensures all transactions, including orders and billing, are accurate and error-free.	4.9
21	Staff of the cafeteria are always willing to help you.	4.5
22	Staff of the cafeteria are never too busy to respond to your requests.	4.8
23	The cafeteria staff promptly clears tables and cleans the dining area.	4.3
24	The cafeteria staff quickly refill any empty items on the self-service counters.	4.9
25	The cafeteria staff are knowledgeable about the menu and can answer any questions I have about the food and beverages	5.4
26	The cafeteria staff are courteous and polite, providing a friendly atmosphere in the cafeteria	6.4
27	The cafeteria staff handle any issues or complaints promptly and efficiently, ensuring my satisfaction.	6.3
28	The cafeteria staff are always professional when taking orders and serving food, making the dining experience pleasant.	6.1
29	I am thoroughly satisfied with the services provided at this cafeteria, feeling that my needs and preferences are well understood and met.	5.4
30	I plan to patronize this cafeteria frequently in the future because of the excellent personalized service and attention I receive.	4.8
31	I will eagerly share positive experiences and recommend this cafeteria to others, reflecting my high level of satisfaction.	5.2

32	I see myself as a loyal customer to this cafeteria, due to the consistent, caring, and individualized service provided.	4.7
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4.3 Pareto Chart

The Pareto chart is a bar graph and a line graph that illustrates how the data types are compared to the whole. The data is classified and sorted from left to right according to the order of highest to lowest ranking. The highest ranking is the priority problem or the most important problem to be resolved immediately, while the lowest ranking is a problem that does not have to be resolved immediately. The function of the Pareto diagram is to identify the main problems for quality improvement from the biggest to the smallest. There are 355 questionnaires analyzed and considered in Pareto diagram. As it can be interpreted from the presented result in the Figure 1, most important questions according to their order are:

- A. Question number eleven (ambiance of the cafeteria): 122 customers selected it as one of the most important questions with 22 % of effect,
- B. Question number nine (space of the cafeteria): 110 customers selected it as one of the most important questions with 19 % of effect,
- C. Question number four (quality of the food): 102 customers selected it as one of the most important questions with 18 % of effect,
- D. Question number thirteen (cleanness): 94 customers selected it as one of the most important questions with 76 % of effect.

These questions significantly impact customer perception of service quality. Q11 is notably the highest priority, suggesting that improvements in this area could yield substantial benefits in service quality. This is in conformance to the study of [17] mentioned that ambiance plays a crucial role in enhancing customer satisfaction as it affects their overall dining experience. Studies have shown that elements such as lighting, temperature, and noise levels significantly influence customers' perceptions and satisfaction.

Furthermore, Adequate space and comfortable seating arrangements are important for a positive dining experience. Research indicates that a well-organized and spacious environment can improve customer satisfaction by reducing crowding and providing a more pleasant dining atmosphere [18]. Food quality is another major determinant of customer satisfaction. High-quality food in terms of taste, freshness, and presentation is essential for retaining customers and encouraging repeat visits. Studies have consistently highlighted food quality as a primary factor in customer satisfaction in food

service establishments [19]. In addition, Cleanliness is a fundamental aspect of service quality that significantly impacts customer perceptions. A clean environment not only meets health standards but also enhances the overall dining experience, leading to higher satisfaction levels. Maintaining cleanliness in dining areas, restrooms, and food preparation zones is important [20].

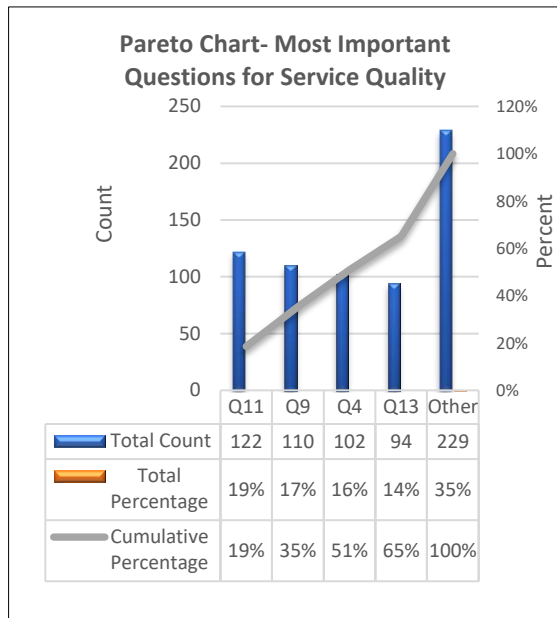


Figure 1: Pareto chart of the most significant questions

4.4 Control Chart analysis

4.4.1 Individual and Moving Range Chart for Cafeteria Ambiance

The results from the Individual and Moving Range (I-MR) chart analysis for cafeteria ambiance are presented in Figure 2. The I-MR chart includes both the Individual (I) chart and the Moving Range (MR) chart, providing a comprehensive view of the process stability and variability in ambiance ratings. For Individual Chart analysis, the majority of ambiance ratings fall within the control limits, indicating a stable process with no significant outliers. The result presents a Mean (CL) of 3.30, Upper control limit (UCL) of 3.86 and a lower control limit (LCL) of 2.74. It was observed that most of the points fall below the center line, suggesting that overall satisfaction with the cafeteria's ambiance is somewhat lower than the mean rating. On the other hand, the moving ranges are mostly within the control limits, indicating stable variability between consecutive ratings. The analysis of the Individual (I) chart demonstrates that the process of maintaining the cafeteria's ambiance is under control, with the ratings consistently within the established control limits. This stability reflects effective management of

ambiance-related factors such as temperature and ventilation, contributing to a consistent dining experience. However, the observation that most points fall below the center line suggests that the average ambiance rating is slightly lower than desired, indicating room for improvement.

Moreover, The Individual (I) chart reveals that while the overall ambiance ratings are stable, there are occasional fluctuations. These fluctuations are within acceptable limits, indicating normal process variation. The Moving Range (MR) chart supports this stability by showing that the variability between consecutive ratings is within control limits. Maintaining process stability in service environments is crucial for achieving high levels of customer satisfaction. According to Smith [15], continuous monitoring and addressing potential issues in service quality can lead to a stable and controlled process. The stable process indicated by the I-MR chart in this study suggests effective management of the factors contributing to the cafeteria's ambiance, such as temperature and ventilation, but needs more improvement to have a positive and consistent dining experience.

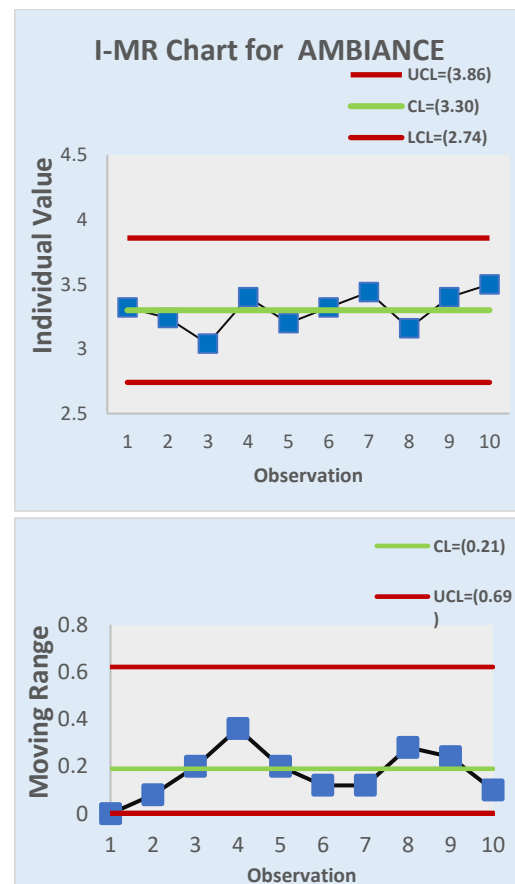


Figure 2: Individual and Moving Range Chart for Cafeteria Ambiance

4.4.2 Individual and Moving Range Chart for Space of cafeteria

Figure 3 reveals that all individual data points fall within the control limits (UCL = 5.78 and LCL=4.66), indicating that the process is under statistical control. This suggests the absence of special causes of variation, which aligns with [21], who states that control charts are used to distinguish between common cause variation (inherent to the process) and special cause variation (due to external factors). On the other hand, all moving range values fall within the control limits. This indicates that the variability between consecutive observations is consistent and stable. This means that no noticeable shifts where points consistently fall above or below the centerline for an extended period. This absence of shifts is consistent with [22], who notes that shifts in process level typically indicate a change in the process, no significant runs, as points are randomly distributed around the centerline, suggesting that the process variation is due to common causes rather than special causes.

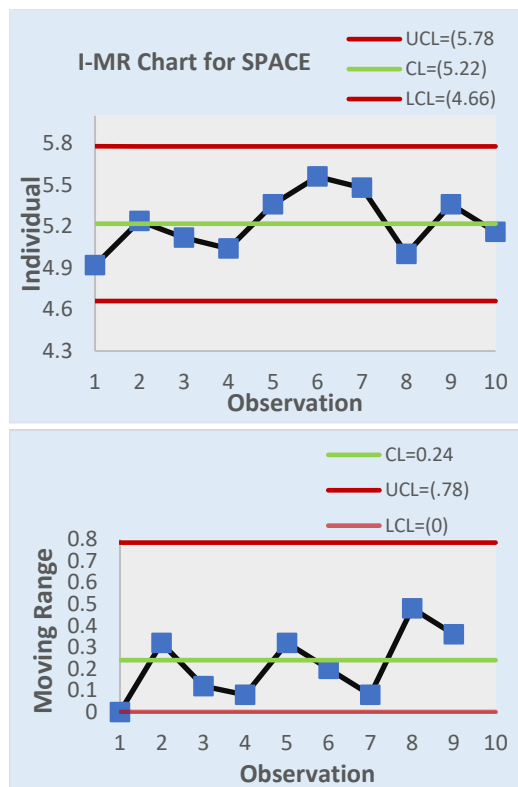


Figure 3: Individual and Moving Range Chart for Space in Cafeteria

According to Ryan [23], the lack of runs supports the notion of process stability, no continuous movement of points in one direction, indicating no gradual changes in the process. Nelson [24] highlights that trends can indicate a slow, consistent change in the process and Points are not closely bunched

together; they show normal variation around the mean. This suggests a lack of unusual stability or periods of low variation, as described by Ryan [23].

4.4.3 Individual and Moving Range Chart for Food Quality

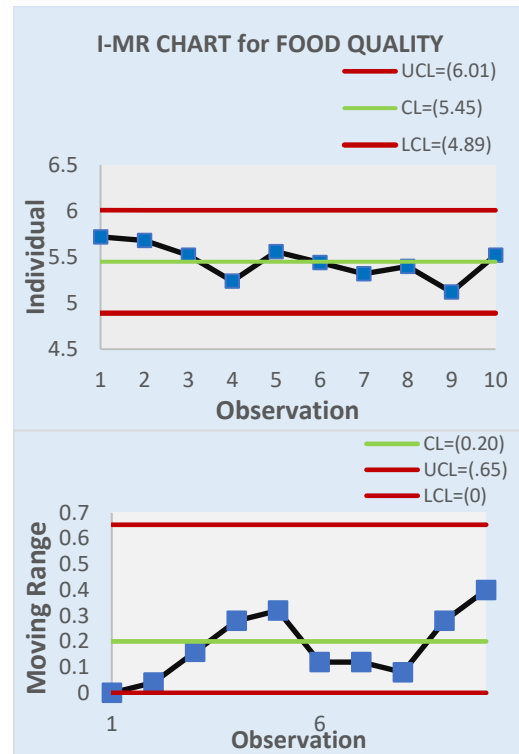


Figure 4: Individual and Moving Range Chart for Food Quality

The I-MR chart for food quality (Figure 4) indicates that the process is under statistical control. All individual data points fall within the control limits (UCL = 6.01 and LCL = 4.89), which suggests that the observed variation is likely due to common causes, inherent factors that typically cause variation in any process [21]. There is no evidence of special causes such as a change in supplier or recipe, that could significantly impact the quality of the food. Similarly, all the moving range values fall within the control limits (UCL = 0.65 and LCL = 0), indicating stable variability between consecutive observations. This stability in the process is essential for maintaining consistent food quality that meets customer expectations.

4.4.4 Individual and Moving Range Chart for Cleanliness

Figure 5 reveals that the individual data points fall within the control limits (UCL = 6.05 and LCL = 4.93), indicating that the process is under statistical control. The points do not exhibit any noticeable trends, shifts, or runs that would indicate instability

or the influence of special causes. On the other hand, the moving range values are all within the control limits (UCL = 0.56, LCL = 0), indicating consistent variability between consecutive observations.

This is crucial for maintaining predictability in the process, as highlighted by [23], who emphasizes that stable variability is a key indicator of a controlled process. Regular monitoring using control charts allows for early detection of potential issues, enabling timely interventions to prevent deviations. This proactive approach to quality control aligns with best practices outlined by ASQ (2023) and ensures that high standards of cleanliness are consistently met, ultimately enhancing product quality and safety.

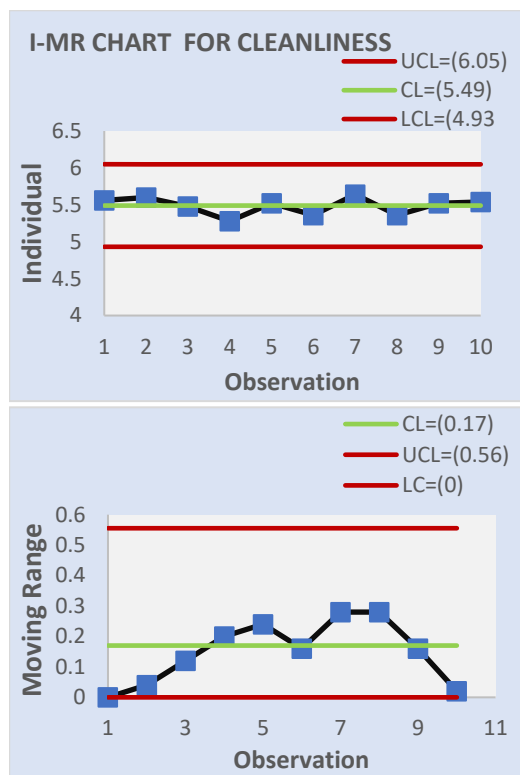


Figure 5: Individual and Moving Range Chart for Cleanliness

4.5 Cause and effect analysis

The Fishbone diagram in Figure 6, illustrates the causes of customer dissatisfaction regarding the ambiance of the cafeteria. These causes are divided into several categories. Environmental Factors include poor ventilation, excessive heat inside the cafeteria, dim lighting, and excessive noise, all of which contribute to an uncomfortable atmosphere. Facilities issues encompass the lack of a cooling system, an insufficient number of fans, tables, and chairs, as well as malfunctioning facilities, leading to

a less accommodating environment. People factors involve a limited number of staff and inadequate grooming of staff, which can negatively impact customer service and overall experience. Lastly, Process issues highlight inconsistent cleaning schedules and the absence of a system for regular customer satisfaction surveys, resulting in a decline in maintenance standards and feedback management. Addressing these categories comprehensively can significantly improve the ambiance and enhance customer satisfaction in the cafeteria.

To support this, Customer satisfaction in hospitality settings, such as cafeterias, is influenced by multiple factors, including the physical environment, service quality, and operational processes. Studies have shown that environmental factors like lighting, noise, and temperature significantly impact customer comfort and satisfaction [25]. Poor ventilation and excessive heat can lead to discomfort, reducing the likelihood of repeat visits. Another is, Facilities play a crucial role in shaping the customer experience. Adequate and well-maintained seating, effective cooling systems, and proper maintenance of equipment are essential for ensuring customer comfort [26]. Deficiencies in these areas can lead to negative perceptions and dissatisfaction.

Furthermore, Staff behavior and appearance also significantly influence customer perceptions. Professional grooming and appropriate attire are part of the service quality that customers expect in hospitality settings [27]. Limited staff and improper grooming can lead to a perception of poor service quality and negatively affect the overall ambiance. Lastly, consistent cleaning schedules and mechanisms for gathering customer feedback are vital for maintaining high standards of hygiene and service. Regular customer satisfaction surveys provide valuable insights that can help improve service delivery and address areas of concern [28].

Figure 7 presents several factors contributing to customer dissatisfaction in the cafeteria through fishbone diagram. These factors include physical layout, facilities, people, and processes. Issues with the physical layout include poor seating arrangements, inadequate spacing, narrow aisles, and a lack of designated dining and studying areas. Facilities issues involve uncomfortable and defective seats, an inadequate number of seats, and tables that are either too small or too large for the space. In the people category, problems include insufficient staff during peak hours, customers moving furniture

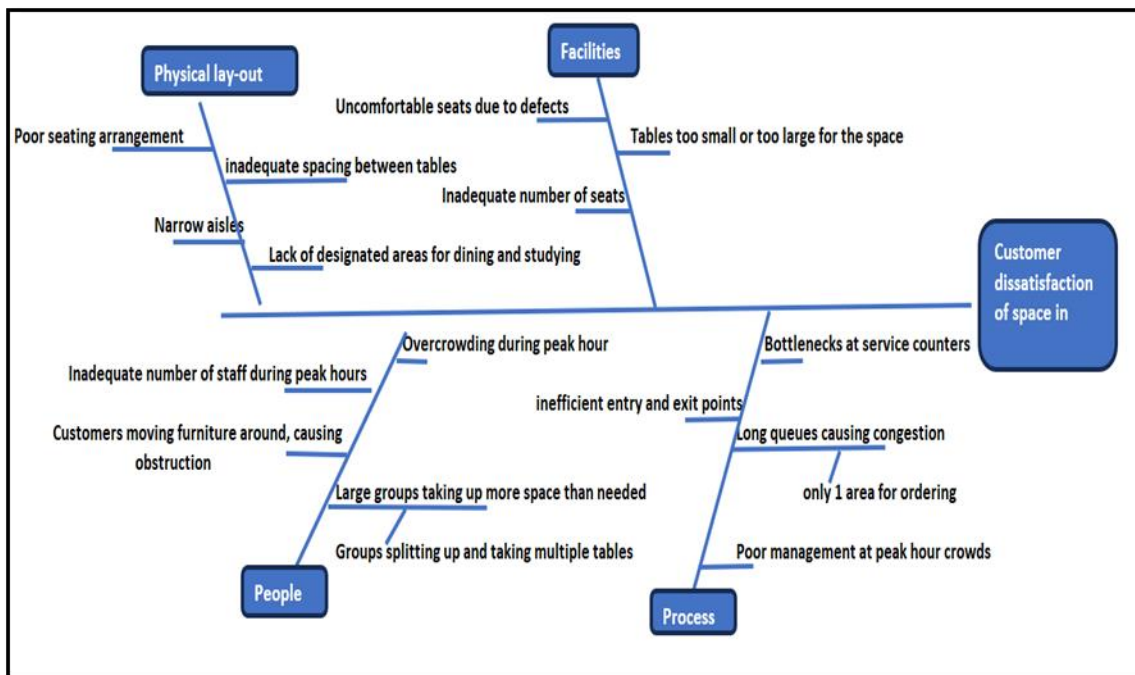


Figure 6: Cause and effect analysis for Customer dissatisfaction of cafeteria space

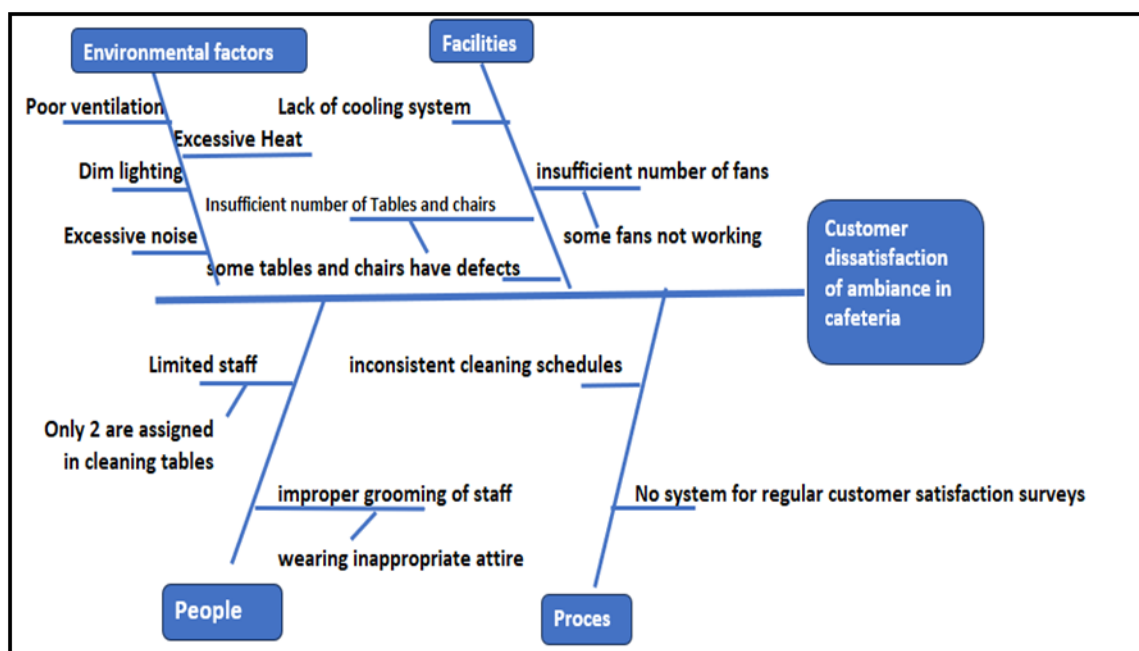


Figure 7: Cause and effect analysis for Customer dissatisfaction of cafeteria ambience

causing obstructions, and large groups occupying excessive space and overcrowding during peak hour. Process-related issues highlight, inefficient entry and exit points, bottlenecks at service counters, long queues, and poor management of peak hour crowds. Recent studies support these findings. For instance,[29] indicates that the physical environment, including layout and ambience, plays a significant role in customer satisfaction in fast-food

restaurants. This is consistent with findings from [30], which highlight the importance of a clean, well-arranged physical environment and attentive staff in institutional foodservice settings. These studies collectively underscore the importance of addressing physical layout, facilities, staff management, and efficient processes to enhance customer satisfaction in cafeteria environments.

4.6 Possible Suggestions to address the identified Service Quality Issues in University Cafeteria Services

4.6.1 Ambiance of the cafeteria

To address customer dissatisfaction regarding the ambiance of the cafeteria, a structured approach focusing on environmental factors, facilities issues, people factors, and process issues is essential. For environmental factors, it's important to improve ventilation by installing or upgrading systems and ensuring their regular maintenance. Installing or upgrading cooling systems and using thermostats to regulate the temperature can help maintain comfort. Enhancing lighting by replacing dim lights with bright, energy-efficient LEDs and ensuring adequate lighting in all areas is crucial.

Moreover, addressing facilities issues involves installing air conditioning units, increasing seating capacity by purchasing and arranging additional tables and chairs, and conducting regular facility inspections with a maintenance schedule to keep everything in good working order. To improve people factors, hiring additional staff for adequate coverage, especially during peak hours, and providing thorough training in customer service and grooming are necessary. Regular training programs and grooming standards should be implemented, with resources provided to staff. Additionally, staff should have uniforms to ensure they are presentable.

For process issues, establishing consistent cleaning schedules and assigning specific tasks to staff, along with implementing a system for regular customer satisfaction surveys and analyzing feedback, is vital. Addressing these areas comprehensively, the cafeteria's ambiance can be significantly enhanced, leading to greater customer satisfaction. The cause-and-effect diagram associated to the ambiance of the cafeteria has been drawn in Figure 6.

4.6.2 Space of the cafeteria

To address the factors contributing to customer dissatisfaction in the cafeteria as presented in Figure 7, a series of actions need to be implemented for each category: physical layout, facilities, people, and processes. To eliminate this problem, Improving the seating arrangements by redesigning the layout to optimize space, widening aisles, and creating designated areas for dining and studying will enhance the physical layout. Upgrading facilities involves replacing uncomfortable and defective seats with ergonomic alternatives, adjusting table sizes to fit the space appropriately, and increasing seating capacity to accommodate more customers. In the people category, hiring additional staff for peak hours, training them for efficient service, and

implementing policies to manage furniture movement and control large groups will improve customer flow and prevent overcrowding. Process-related improvements include optimizing entry and exit points to minimize congestion, adding service counters or self-service kiosks to reduce long queues, and developing a crowd management plan for peak hours. Additionally, integrating digitization can further increase efficiency by implementing several key technologies. Mobile ordering apps allow customers to place orders in advance, reducing wait times and improving service speed. Digital signage can guide customer flow, provide real-time updates on wait times, menu changes, and promotions, and enhance overall communication within the cafeteria. A comprehensive approach involves forming a dedicated task force with specific roles, setting clear milestones and deadlines, and holding regular review meetings to assess progress and plan for further improvements. If the suggestions are applied properly, it will help cafeteria to improve the quality significantly.

Conclusion

This study effectively combines SERVQUAL and SPC methodologies to evaluate and enhance cafeteria services at a state university in the Philippines. SERVQUAL identifies gaps between customer expectations and perceptions, while SPC monitors these variables over time to detect trends and areas needing improvement. The findings of this study offer valuable insights for cafeteria managers and university administration, enabling them to monitor and enhance service quality, thereby creating a more efficient and satisfactory environment for customers. The managerial role is crucial in any organization, especially in the service industry, where continuous quality control is a key success factor.

Moreover, this study suggests incorporating the SERVQUAL methodology to assess customer expectations and perceptions, providing a comprehensive understanding of service quality. The developed questionnaire can be utilized to evaluate service quality across various university cafeterias, ensuring its broad applicability.

Future research should consider integrating SERVQUAL, business process reengineering, and SPC to further elevate service quality. Given that SERVQUAL is uniquely suited for quality control in the service industry, its application in a university cafeteria setting—catering to students, faculty, and staff—demonstrates its versatility and effectiveness. This method can undoubtedly be adapted for use in other sectors.

Local universities and colleges can leverage the insights from this research to enhance their cafeteria services, making them more attractive to their customers. By adopting these methodologies, cafeterias can significantly improve their service levels, ultimately leading to increased customer satisfaction and loyalty.

Thus, this research not only provides a practical framework for improving service quality in cafeterias but also highlights the potential for broader application across various service settings. The integration of SPC and SERVQUAL methodologies offers a robust approach to quality management, ensuring continuous improvement and excellence in service delivery.

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