

POINT-OF-SALE OF CTU-DANAO CAMPUS CANTEEN: USABILITY STUDY

Nikki Jean A. Cabangbang¹, Lorence L. Gardose², Angel Mae C. Guarin³, Emhel Jake Medequillo⁴, Rhea Mae C. Melgo⁵, Bethany Monte⁶, Brigitte A. Raz⁷, Engr. Roel L. Vasquez⁸

^{1,2,3,4,5,6,7}Student, Department of Industrial Engineering, Cebu Technological University- Danao Campus
College of Engineering

⁸Professor, Department of Industrial Engineering, Cebu Technological University- Danao Campus
College of Engineering

cabangbangnikkijean@gmail.com, gardoselorence18@gmail.com, jhsghelmaeguarin@gmail.com, mhelkoymedequillo@gmail.com, rheamaemelgo@gmail.com, montebethany11@gmail.com, brigetteraz26@gmail.com, roel.vasquez@ctu.edu.ph

Abstract

The study examined the usability of the Point of Sale (POS) system implemented in the Cebu Technological University-Danao Campus Canteen that addressed long queues, particularly during peak hours, and improved service quality. The system's performance was evaluated based on six key factors of effective usability: ease of use, task completion, user comfort, satisfaction, system capabilities, and error feedback. Data collection was done using a time and motion study to gather data on the average service time in minutes for customers' orders per day and a seven-point Likert Scale survey to test the usability of the POS System. The survey respondents included five instructors (17%). Ten canteen staff (33%), and fifteen students (50%) of the total sample were selected through a random sampling method.

The analysis revealed significant improvements with consistency in average service time; with the utilization of the POS system, a 37.72% efficiency improvement rate was achieved. Average service time decreased to 0.58 minutes per transaction, compared to the previous system's 1.25 minutes. The strongest performance was observed on Day ten, with an average transaction time of 1.10 minutes. The usability rate is 4.1 based on ease of use and 4.7 regarding error feedback. Results from the Likert scale showed a wide range of scores between 5.30 and 6.15, demonstrating very high user satisfaction and efficiency. The findings revealed significant improvements in the POS system in terms of boosting service efficiency.

Keywords: *POS System, Service Time, Queuing Theory, Usability Study, Efficiency, Satisfaction, Ease of Use.*

1. Introduction

Cebu Technological University - Danao Campus is one of the multiple satellite educational locations across different municipalities within Cebu, Philippines. The university's expansion led to the establishment of CTU Danao Campus to support educational opportunities in various subjects across the local student

population. The courses available at the campus combined undergraduate and graduate programs from Engineering to Education with Information Technology to Industrial Technology and Hospitality Management. The teaching institution CTU Danao achieved significant prominence in its area over time while generating proficient specialists across different fields that helped advance local growth. The CTU Danao canteen was a centrally located dining area on the campus that provided meals and refreshments at economical rates to students, faculty, and staff; simultaneously, it served as a social center where members of the university assembled and interacted with each other. Serving practically as a central hub where students took their meals and snacks, the canteen had grown with the university through the years, expanding to accommodate the needs of its population. As of the 2023-2024 academic year, the Cebu Technological University's Danao Campus reported the following enrollment figures across its various colleges: The College of Education, Arts, and Sciences (CEAS) had 932 students; the College of Management and Entrepreneurship (CME) comprised 1,164 students; the College of Engineering (COE) enrolled 1,428 students; and the College of Technology (COT) totaled 2,424 students, with an overall faculty and staff count of 206. Thus, the total population of the Cebu Technological University Danao Campus in 2023-2024 was 6,154, including faculty and staff.

The CTU Danao Canteen aimed to provide affordable and nutritious food that appealed to the varied tastes of students. The canteen used manual operations for transactions. However, this created issues involving waiting in line as all students rushed to the canteen simultaneously, causing inconvenience for the canteen staff and students. According to Meher et al. (2021), traditional systems took longer to cater to the students' requests throughout the ordering process. The students and canteen personnel in the university dining space primarily consumed meals between 11:00 AM and 12:30 PM. The occasion caused an overwhelming surge of people who waited in long queues at the canteen. The situation at the canteen revealed difficulties for staff handling multiple transactions and service speed issues while indicating the need for better efficiency upgrades. Researchers identified practical solutions for the canteen difficulties by implementing a Traditional Point-of-Sale (POS) System, which would enhance operational performance.

This study aimed to test the usability of a Point-of-Sale (POS) system in the CTU-Danao Canteen to determine its effectiveness in addressing current challenges related to long queue times and poor transaction processes, which affected service quality. The researchers evaluated the system's usability, efficiency, and ability to simplify transactions, evaluating its potential to improve overall service delivery at the canteen.

1.1 Statement of the Problem

This study aimed to evaluate the usability and effectiveness of the Traditional Point-of-Sale (POS) System to assess the Cebu Technological University-Danao Campus Canteen's current manual transaction system efficiencies. It also addresses the following specific questions:

1. What is the average service time in minutes for a student's order without POS?
2. What is the average service time in minutes for a student with a POS order?
3. What is the comparison of the service time per student with or without the POS?
4. What is the average scale range on the usability of the CTU-Danao Canteen POS in terms of:
 - 4.1. simplicity,
 - 4.2. task completion,
 - 4.3. user comfort,
 - 4.4. user satisfaction,
 - 4.5. system capabilities,
 - 4.6. error feedback,
 - 4.7. error recovery,

- 4.8. information access,
- 4.9. information support,
- 4.10. information design,
- 4.11. functionality,
- 4.12. user experience,
- 4.13. interface design, and
- 4.14. overall satisfaction?
- 4.15. Is there a significant difference in the usability test as perceived by the three groups of respondents?
- 4.16. Based on the findings, what recommendations are made to improve the canteen's operation?

1.2 Scope and Limitations

The scope of this study focused on evaluating the usability of the Point-of-Sale System in CTU-Danao Canteen. Thus, the study also addressed the existing challenges in the current manual system. The target population for this study are canteen staff, instructors, and students of CTU-Danao. The research explored the POS System, which features a digital list of all items, including the dishes with their corresponding prices. It allows canteen staff to scan the items, automating the total payment calculations and streamlining the ordering process. The evaluation of the usability of the POS System was conducted during the central hours of the operation, at least between 11 AM and 6 PM, at which the canteen usually experiences the highest traffic. Additionally, the researchers also observed during the post-implementation of the POS System.

However, the research has some limitations. Although the POS System offers inventory management features, this study does not utilize these functionalities. Therefore, the stock would have to be managed manually by the staff members. In addition, the observation period for the POS System was short; therefore, not all the long-term problems or benefits may be observed.

2. Research Methodology

2.1. Research Design

The researchers utilized the quantitative research design to examine the effectiveness and usability of the Point of Sale (POS) System in CTU Danao Canteen. The researchers used the time and motion study to gather data about the average service time in minutes for customers' orders per day.

According to Kothari (2021), quantitative research emphasizes structured data collection methods, often employing statistical analysis to test hypotheses and generalize about a larger population based on sample data.

2.2. Research Process Flow

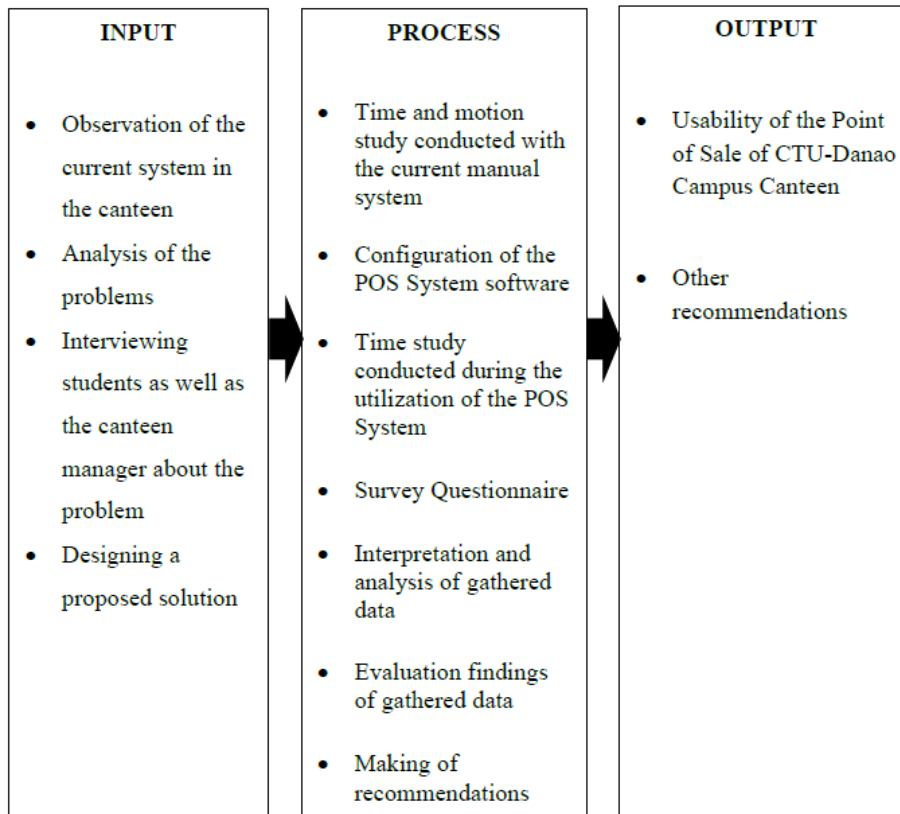


Figure 1. Flow of Study

Figure 1 represents the flow of the study. The research process flow of this study begins with the researchers' thorough observation of the current canteen system to identify existing operational issues. This involved direct assessment of service workflows, customer interactions, and overall efficiency. Following the observation phase, the identified problems are analysed, incorporating insights from interviews with students and the canteen manager to understand their perspectives on the challenges faced. Lastly, the researchers came up with the solution: a POS System. The next step was data collection; a time and motion study were conducted using their current manual system to understand the operational dynamics of the canteen. The POS system was configured to align with the canteen's specific needs, such as menu integration and sales tracking. Then, a second study was conducted during the POS system's utilization to measure improvements in transaction speed, waiting times, and error reduction. The gathered data from both phases was analysed to compare performance and determine the system's impact. After several processes, the research evaluated the findings and assessed the POS system's usability. The main output of this research was the usability of the POS System of the CTU-Danao Campus Canteen, which automates canteen transactions and makes service delivery smooth. Additionally, from the examined data, the study proposed other suggestions to enhance efficiency in serving and satisfying customers within the canteen operating environment.

2.3. Data Gathering

The researchers wrote an official letter noted by the research adviser, endorsed to the Chairman of Industrial Engineering and addressed to the Canteen Manager of CTU-Danao Canteen for permission to conduct observations for ten (10) consecutive days regarding the transaction process of the canteen. After receiving the approval, the researchers collected data through time and motion study. The researcher made direct observations using a stopwatch for tracking service times, and it was conducted in the canteen for approximately eight (8) hours a day and ten (10) consecutive days before and during the utilization of the POS System.

2.4. Treatment of Data

For Problems 1 and 2, to calculate and analyzed the weighted average service time for students ordering with and without a Point-of-Sale (POS) system, the data was converted into minutes by adding the minutes to the seconds divided by 60. All the individual service time was converted, and the average service time was obtained by summing the total service time of all transactions and dividing by the number of transactions. Meanwhile, for problem 4, the average mean was used to measure the behaviour of the three groups of respondents in terms of ease of use, user satisfaction, functionality and the interface design of the POS system.

For Problem 5, to test the hypothesis of the study, One-Way ANOVA was used to determine the significant difference in the usability test as perceived by the three groups of respondents towards the POS system in terms of ease of use, user satisfaction, functionality and interface design.

3. Results and Discussion

3.1. Average Service Time per student without the POS system

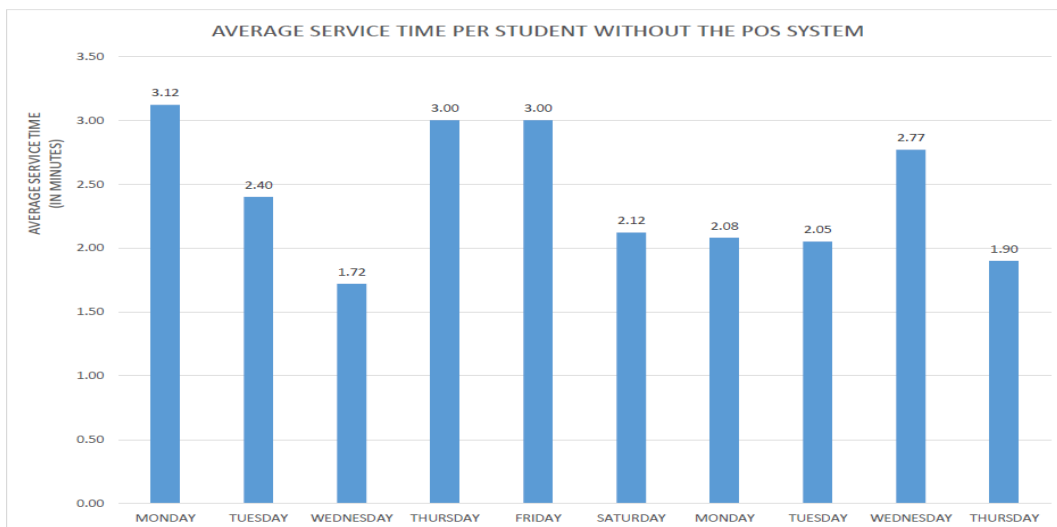


Figure 2. Average Service Time per student without the POS system

Figure 2 showed the average service time in minutes at the Cebu Technological University-Danao Campus canteen observed by researchers across ten days without the Point-of-Sale system. Monday, Day 1 started at 3 minutes and 12 seconds on September 30, 2024; the time decreased to 2 minutes and 40 seconds on Day 2, reaching a low of 1 minute and 72 seconds on Day 3, indicating significant gains. Although Day 4 saw a slight rise to 3 minutes, Day 5 remained steady. By Day 10, the average service time was approximately 1 minute and 90 seconds, demonstrating overall progress in service efficiency throughout the period. The analysis revealed that the adjustment period on Day 1 had the longest service time at 3 minutes and 12 seconds, while Thursday and Friday, Days 4 and 5, averaged around 3 minutes, indicating that variations in customer volume impacted efficiency.

The start of the school week, like Mondays and Fridays, have busier days in cafeterias, likely due to students returning to their routines after the weekend and preparing for the upcoming one (Eposito F et al., 2022). This observation aligns with findings from a study on the canteen operations at Mabolo National High School, which found that effective operations management practices significantly influenced student satisfaction and recommended pursuing advancements in canteen facilities for overall customer satisfaction (Medina, A. et al., 2024). Furthermore, establishments using POS systems experienced a 30% reduction in waiting times and a 20% improvement in overall customer satisfaction, demonstrating the advantages of automated systems over manual processes (Dr. Smith & Doe, 2023).

3.2. Average Service Time per student with the POS system

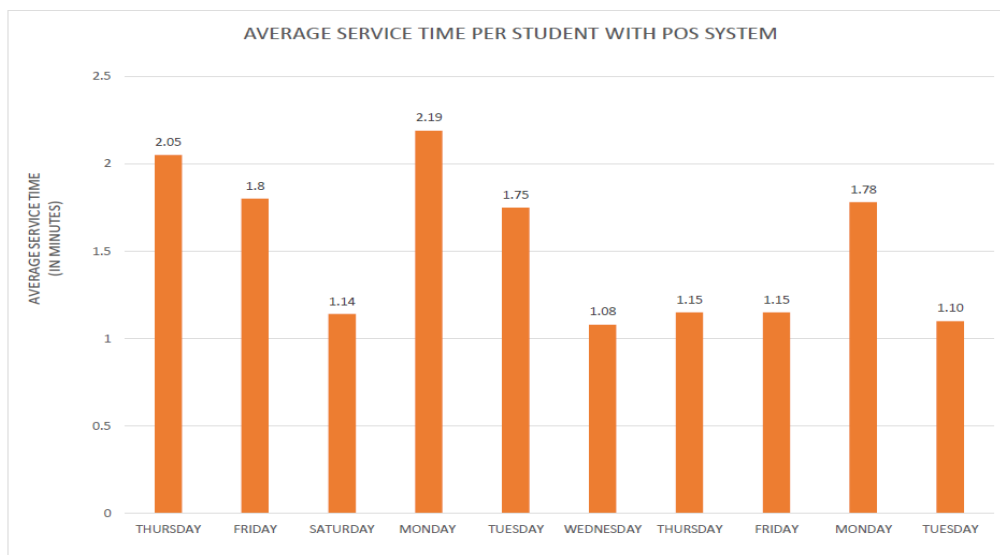


Figure 3. Average Service Time per student with the POS system

Figure 3 showed the average service time in minutes across ten days of observation at the Cebu Technological University-Danao Campus canteen with Point-of-Sale system. The collected time started at 2 minutes and 5 seconds on Day 1, November 21, 2024, Thursday, then improved to 1 minute and 8 seconds on Day 2. There was a slight increase to 1 minute and 14 seconds on Day 3, followed by a rise to 2 minutes and 19 seconds on Day 4, attributed to a higher customer volume. However, the app stabilized at 1 minute and 75 seconds on Day 5 and returned to 1 minute and 8 seconds on Day 6. Days 7 and 8 maintained an average of 1 minute and 15 seconds, with a minor increase to 1 minute and 78 seconds on Day 9. By Day 10, December 3, 2024, Tuesday, service time improved to around 1 minute and 10 seconds, indicating significant progress in efficiency.

The evaluation of the Point of Sale (POS) system app over ten days revealed a significant boost in service efficiency. The average service times dropped from 2 minutes and 5 seconds on Day 1 to around 1 minute and 10 seconds by Day 10. Despite minor fluctuations, including a peak of 2 minutes and 19 seconds on Day 4, the overall trend indicated clear improvements in transaction processing and customer management, underscoring the POS system's effectiveness in enhancing operational efficiency. A POS system in school cafeterias improves staff scheduling by predicting peak service days like Mondays, ensuring better staff distribution for enhanced service quality (Delikopos, 2023). An integrated POS system streamlines transactions, reduces congestion, and enhances dining experiences, enabling faster service during busy hours (DBS4POS, 2024). Efficient POS systems also accelerate payment processing, minimizing service interruptions and allowing cafeterias to serve more quickly (Tidal Commerce, 2025).

3.3. Average service time comparison per student with and without the POS system.

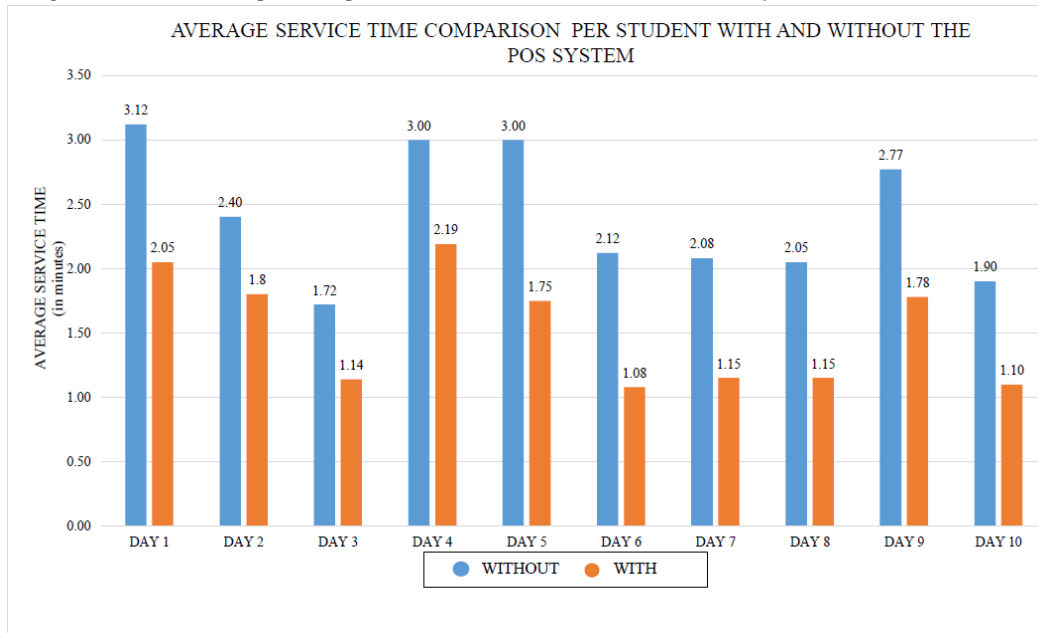


Figure 4. Average service time comparison per student with and without the POS system

Figure 4 showed the comparison of average service time of with and without the POS System in the CTU Danao Canteen over ten days of observation. On Day 1, the current system took 3.12 minutes, while the POS system was faster at 2.05 minutes. On Day 2, the current system improved to 2.40 minutes, and the POS system dropped to 1.80 minutes. By Day 3, service times were 1.72 minutes for the current system and 1.14 minutes for the POS system. On Day 4, the current system recorded 3.00 minutes, while the POS system was slightly faster at 2.19 minutes. On Day 5, the current system remained at 3.00 minutes, but the POS system improved to 1.75 minutes. On Days 6 to 8, the current system averaged between 2.05 and 2.12 minutes, while the POS system ranged from 1.08 to 1.15 minutes. On Day 9, the current system increased to 2.77 minutes, while the POS system recorded 1.78 minutes. On Day 10, the current system dropped to 1.90 minutes, and the POS system had its best time at 1.10 minutes.

The data showed that the POS system is faster and more consistent than the current system in handling service time. Before the utilization of the POS system, it started with much higher service time and showed variations, especially on Days 4 and 9. On the other hand, after using the POS system, the service time constantly improved over the ten days, ending with 1.10 minutes on Day 10. This indicates that using the

CTU Danao Canteen's POS system accelerates service and saves between 0.58 and 1.25 minutes per transaction, which is a 37.72 percent improvement in efficiency. Using a POS system in business cannot be underestimated because it can improve operational efficiency, speed up the transaction process, and obtain accurate financial and sales reports (Hidayati et al., 2023). The practicality provided by POS can help cashiers who no longer need to count individually and make reports manually (Zada & Sopiana, 2021). The concise expression allowed for easy comparison between some of the results obtained from the two methods. (Liu et al., 2020)

Table 1. Survey responses from the five instructors.

Questions	Weighted Mean	Description
Simplicity	6.00	The respondents mostly agreed on the usability of the CTU-POS System in terms of simplicity.
Task completion	5.00	The respondents somewhat agreed on the usability of the CTU-POS System in terms of task completion.
User comfort	6.00	The respondents mostly agreed on the usability of the CTU-POS System in terms of user comfort.
User satisfaction	5.60	The respondents mostly agreed on the usability of the CTU-POS system in terms of user satisfaction.
System capabilities	5.60	The respondents mostly agreed on the usability of the CTU-POS System in terms of system capabilities.
Error feedback	5.60	The respondents mostly agreed on the usability of the CTU-POS System in terms of error feedback.
Error recovery	5.40	The respondents mostly agreed on the usability of the CTU-POS System in terms of error recovery.
Information access	5.20	The respondent somewhat agreed on the usability of the CTU-POS System in terms of information access.
Information support	5.40	The respondents mostly agreed on the usability of the CTU-POS System in terms of information support.
Information design	5.60	The respondents mostly agreed on the usability of the CTU-POS System in terms of information design.
Functionality	6.00	The respondents mostly agreed on the usability of the CTU-POS System in terms of functionality.
User experience	5.80	The respondents mostly agreed on the usability of the CTU-POS System in terms of user experience.
Interface Design	4.60	The respondent somewhat agreed on the usability of the CTU-POS System in terms of interface design.
Overall Satisfaction	5.40	The respondents mostly agreed on the usability of the CTU-POS System in terms of overall satisfaction.

Table 1 showed the weighted mean of five instructors for 14 system questions. The highest-rated attributes were under Simplicity, Functionality, and User Comfort of the system, all achieved a weighted mean of 6.00, which indicates that instructors mostly agreed that the system offered an easy navigation layout alongside efficient performance and comfortable user experience. User Experience was closely followed, and a weighted mean of 5.80 was obtained, revealed that the instructors accepted the system as an intuitive and task-enabling application. User Satisfaction, System Capabilities, Error Feedback, and Information Design were equally obtained with a weighted mean of 5.60, demonstrated the instructors' agreement on the system's operational capabilities and error message feedback. The instructors evaluated CTU-POS System usability through error recovery and information support and overall satisfaction with a weighted mean of 5.40, thus indicating favourable agreement regarding system reliability and information support. Moreover, information access and task completion obtained a weighted mean of 5.20 and 5.00, respectively, which means that the CTU POS system functions adequately but needs further enhancement. The interface design section obtained the lowest weighted mean score of 4.60, indicating the need for system visual layout enhancement. Taking feedback from faculty members enables system problem detection that enhances both user satisfaction and productivity levels (Tolle et al., 2020). The structure of the process of collecting faculty feedback enables targeted improvements to educational information systems, thereby improving their overall functionality (Talib et al., 2021). Additionally, faculty involvement in usability assessment enabled improved system operation and design, thus leading to enhanced user experience and better educational outcomes (Tselios et al., 2023).

Table 2. Survey responses from the ten-canteen staff.

Questions	Weighted Mean	Description
Simplicity	5.00	The respondents somewhat agreed on the usability of the CTU-POS System in terms of simplicity.
Task completion	4.80	The respondents somewhat agreed on the usability of the CTU-POS System in terms of task completion.
User comfort	4.60	The respondents somewhat agreed on the usability of the CTU-POS System in terms of user comfort.
User satisfaction	4.90	The respondents somewhat agreed on the usability of the CTU-POS System in terms of user satisfaction.
System capabilities	4.90	The respondents somewhat agreed on the usability of the CTU-POS System in terms of system capabilities.
Error feedback	4.30	The respondents neither agreed nor disagreed on the usability of the CTU-POS System in terms of error feedback.
Error recovery	4.70	The respondents somewhat agreed on the usability of the CTU-POS System in terms of error recovery.
Information access	5.00	The respondents somewhat agreed on the usability of the CTU-POS System in terms of information access.
Information support	5.00	The respondents somewhat agreed on the usability of the CTU-POS System in terms of information support.
Information design	5.00	The respondents somewhat agreed on the usability of the CTU-POS System in terms of information design.
Functionality	4.00	The respondents neither agreed nor disagreed on the usability of the CTU-POS System in terms of functionality.
User experience	4.70	The respondents somewhat agree on the usability of the CTU-POS System in terms of user experience.
Interface Design	5.10	The respondents somewhat agreed on the usability of the CTU-POS System in terms of interface design.
Overall Satisfaction	4.50	The respondents somewhat agreed on the usability of the CTU-POS System in terms of overall satisfaction.

Table 2 showed the weighted mean of ten canteen staff for 14 questions. The highest-rated feature was the Interface Design, with a weighted mean of 5.10, which means that the staff found the POS System visually appealing and easy to navigate. Simplicity, Information Access, Information Support, and

Information Design also scored 5.00, highlighting that the staff agreed that the POS System made it easy to find information, gave enough support, and had a straightforward design. System Capabilities and User Satisfaction both weighted mean of 4.90, which indicated that the staff agreed on the system's usability and ability to handle transactions effectively. Task Completion had a weighted mean of 4.80, meaning staff somewhat agreed that the system helped them finish tasks efficiently. User Experience and Error Recovery both got a weighted mean of 4.70, showing that users had a good experience overall and that the system could fix errors reasonably well. User Comfort has a weighted mean of 4.60, meaning staff felt somewhat comfortable using the system. Overall satisfaction was at a weighted mean of 4.50, showing users were generally satisfied with the system but not fully content. The lowest weighted mean was for Error Feedback at 4.30 and functionality at 4.00. This indicates that the staff had a neutral stance that the system could perform effectively and provide clear and compelling error messages.

According to the study of subsequent research, the authors emphasized the need to understand the system's usefulness and job satisfaction regarding system capacity and error recovery (Arian & Setiawan, 2024). The workload balance perception affects job satisfaction since those with an equitable workload reported high satisfaction (Ali & Farooqi, 2020). Additionally, enhancing employees' perception of their working experience lowers turnover intentions and increases job satisfaction (Guchait et al., 2020).

Table 3. Survey responses from the fifteen students.

Questions	Weighted Mean	Description
Simplicity	6.07	The respondents mostly agreed on the usability of the CTU-POS System in terms of simplicity.
Task completion	6.00	The respondents mostly agreed on the usability of the CTU-POS System in terms of task completion.
User comfort	5.60	The respondents mostly agreed with the usability of the CTU-POS System in terms of user comfort.
User satisfaction	5.80	The respondents mostly agreed on the usability of the CTU-POS System in terms of user satisfaction.
System capabilities	5.80	The respondents mostly agreed on the usability of the CTU-POS System in terms of system capabilities.
Error feedback	5.47	They mostly agreed on the usability of the CTU-POS System in terms of error feedback.
Error recovery	5.20	The respondent somewhat agreed on the usability of the CTU-POS System in terms of error recovery.
Information access	5.80	The respondents mostly agreed on the usability of the CTU-POS System in terms of information access.
Information support	5.93	The respondents mostly agreed on the usability of the CTU-POS System in terms of information support.
Information design	5.73	The respondents mostly agreed on the usability of the CTU-POS System in terms of information design.
Functionality	5.93	They mostly agreed on the usability of the CTU-POS System in terms of functionality.
User experience	6.00	The respondents mostly agreed on the usability of the CTU-POS System in terms of user experience.
Interface Design	5.87	The respondents mostly agreed on the usability of the CTU-POS System in terms of interface design.
Overall Satisfaction	6.20	The respondents completely agreed on the usability of the CTU-POS System in terms of overall satisfaction.

Table 3 showed the weighted mean of fifteen students for 14 questions. Overall satisfaction, simplicity, task completion, and the user experience of the POS System received the highest scores from students, achieving weighted means of 6.20, 6.07, 6.00, and 6.00, respectively, indicating that the students highly valued the POS system as it fulfilled essential requirements and provided satisfactory performance. Information support and functionality received similar ratings from students, as shown by the weighted

mean score of 5.93, indicating that the system successfully delivered its functional and information needs. Moreover, student evaluation showed a weighted mean of 5.87 for interface design because they mainly agreed that the CTU-POS System had easy-to-understand interfaces. The users agreed on system performance through a 5.80 weighted mean for each aspect, including user satisfaction, system capabilities, and information access. Information design obtained a weighted mean of 5.73, indicating a substantial student agreement regarding the system's information organization and availability. The weighted mean for user comfort reached 5.60, demonstrating favourable student agreement, but the rating revealed that the POS usability required further improvement. Student ratings indicated that the CTU-POS System performed adequately regarding Error Feedback and Error Recovery since both scored weighted means of 5.47 and 5.20, respectively. However, they did not meet full expectations.

Students' feedback during usability tests can help uncover design errors and enhance system functionality. The author claimed that feedback effectively points out exact difficulties (Folstad, 2019). Additionally, according to Human-centric Computing and Information Sciences (2023), usability testing on getting the opinion of the students is helpful when it comes to identifying the factors that hinder practical usage of the system that need to be removed because they hinder the users from achieving their goals within the system. This research investigates how different usability evaluation methods improve e-learning programs and how student feedback contributes to usability testing activities (Alqurni, 2023).

Table 4. Significant critical F-value showing the relationship in the usability test as perceived by the three groups of respondents.

COMPUTED F-VALUE	F-T BULAR VALUE	LEVEL OF SIGNIFICANCE	DECISION ON H_0	INTERPRETATION
39.198	3.238	0.05	Reject H_0	There is a significant difference in the usability test as perceived by the three groups of respondents.

Table 6 showed the results of an ANOVA test comparing the usability test perceptions of three groups of respondents. Since the F-value of 39.198 is greater than the F-tabular value of 3.238 at a 0.05 significance level. Therefore, there is a significant difference in the usability test as perceived by the three groups of respondents.

Support for these results was seen in various studies that employed ANOVA to analyzed usability testing outcomes. For instance, the application of ANOVA notes significant differences among diverse user groups in usability assessments (Friedman & Kauffman, 2021). Similarly, insights provided into the statistical validity of ANOVA in revealing significant differences in usability perceptions across multiple groups (Smith & Brown, 2022). Furthermore, ANOVA's critical role in identifying disparities in user experiences reinforces the importance of computed F-values in establishing statistical significance (Johnson & Lee, 2023).

3.4. Summary of Findings

The findings demonstrated the significant improvement of using the POS system in boosting service efficiency in the CTU Danao Canteen. During a ten-day observation period, the POS system consistently delivered faster transaction times than the manual system, leading to an efficiency improvement rate of 37.72%. In relation to the POS system, the average service time decreased by an equivalent of 1.25 to 0.58 minutes on average for each service transaction, with the strongest average of 1.10 minutes noted on Day 10 POS systems. The current system's average service time was 1.90 minutes for 50 different services. The lowest and highest averages for the manual system were 1.72 and 3.12 minutes, respectively.

The survey resulted from the usability of the CTU Danao Canteen POS system, which showed different views from respondents. For instructors, the lowest aspect was interface design, with a weighted mean of 4.60, indicating some agreement on the system's usability. For canteen staff, functionality received the lowest rating by weight mean of 4.00, while error feedback had a lower rating of 4.30, reflecting a neutral, neither agreeing nor disagreeing on these aspects. Error recovery was rated by students at the weighted mean of 5.20 as somewhat agreeable. In contrast, 5.47 for error feedback ck was rated primarily agreeable, showing a better outlook on the system than the other groups. The study found that there was a significant difference between the three groups' understanding of the system, scoring an F value of 39.198, which surpassed the critical value of 3.238 with a p-value of .05. The result indicates that while the POS system was adequate, user experiences varied, emphasizing the need for tailored enhancements to address the unique requirements of each group of respondents.

3.5. Conclusion

In conclusion, the Point-of-Sale (POS) system improved service efficiency at the Cebu Technological University- Danao Campus Canteen. The system streamlined transactions, reduced waiting times and enhanced operational performance. However, the findings highlighted areas for improvement, such as refining the POS system to streamline transactions further, enhancing user training for smoother operation, and optimizing system capabilities to maximize efficiency and reliability. Furthermore, the study also concluded that the three groups of respondents, namely the instructors, canteen staff, and students, significantly influenced the perceived usability of the POS system at Cebu Technological University–Danao Campus Canteen. Therefore, the study emphasized the importance of continuously evaluating and refining service quality to meet evolving customer and user expectations. By leveraging these findings and implementing targeted improvements, the Point-of-Sale (POS) system can maintain its current customer and user satisfaction level while building a reputation for excellence in automation within the CTU Danao Canteen's operational services. This proactive approach addresses other operational inefficiencies, enhances usability, and ensures a better dining experience for the university community.

4. Recommendation

Based on the conclusion, the recommendations are proposed to improve the operational service and the functionality of the Point of Sale (POS) system.

Inventory Tracking and Management: Integrate real-time inventory tracking into the POS system with automatic updates, low-stock alerts, and reports on inventory movement to identify trends and prevent shortages.

Enhanced POS Efficiency: Implement an advanced POS system that facilitates fast and efficient transactions with precise input. Staff members must be able to make transactions quickly using the system's touch-screen interface, which is designed to provide an intuitive experience.

4.1. Other recommendations:

1. Upgrade the POS system to a more user-friendly interface that reduces complexity and helps staff learn to use it more effectively. Clearly stated and easily navigated menus will make the system user-friendly during busy periods and enhance usability.

2. Assign additional servers exclusively to operate the POS system during peak hours. This approach ensures efficient transaction handling without overstaffing. Perform regular evaluation of peak service points to understand the maximum staff required for uninterrupted POS operation.

The following recommendations are proposed to improve worker efficiency and productivity.

References

- 5 Powerful Cost-Saving Strategies For Your Student Cafeteria. (2023). Delikopos.. <https://www.delikopos.com/blog/5-powerful-cost-saving-strategies-for-your-student-cafeteria/>.
- Ahmed, N. et al. (2022). Table Token Generator and Indicator in Restaurant using Micro-controller. *European Journal of Engineering and Technology Research*, 7(2), 55–60. <https://doi.org/10.24018/ejeng.2022.7.2.2761>
- Ali, A., & Farooqi, M. (2020). Perception of workload balance and employee job satisfaction in work organizations. *International Journal of Business and Management*, 15(1), 1–12.
- Arian, M., & Setiawan, A. (2024). The role of job satisfaction and employee engagement in enhancing organizational performance: A comprehensive review. *International Journal of Academic Research in Business and Social Sciences*, 14, 3413-3430.
- Adinath, D. V., & Navnath, D. V. (2021). Canteen Management System—International Journal for Research in Engineering Application & Management (IJREAM).
- Bautista, J., Mendoza, L., Santos, R. (2021). SJC Canteen Point of Sale and Inventory System Updated. <https://www.scribd.com/document/686361588/Sjcb-Canteen-Point-of-Sale-and-Inventory-System-Updated?utm>
- Davis, J. (2021). The Impact of Automation on Work and Society: Opportunities and Challenges. *Journal of Automation and Society*, 12(3), 45–62.
- Decker, R. et.al, (2023). The Role of Automation in Business Dynamics: Evidence from the U.S. *American Economic Journal: Applied Economics*, 15(1), 1-28.
- Dela Cruz, R. C., & Villanueva, J. (2024). School canteen management and service quality of junior high schools in Digos City Division. *National Institute of Junior School Education*, 12(1), 50-65. <http://nijse.org/index.php/home/article/view/150>
- Dr. Mahiba, C., Tamilselvan S., Rajendran, S. (2023). College E-Canteen Management System. <https://ijrpr.com/uploads/V4ISSUE6/IJRPR14356.pdf?utm>
- Dr. Smith, J., & Doe, J. (2023). Impact of Restaurant POS Systems on Efficiency and Customer Satisfaction. *Journal of Restaurant Management and Technology*. Alexandria Computers. Retrieved from <https://alexandriacomputers.com/impact-of-restaurant-pos-systems-efficiency-customer-satisfaction/>

Friedman, H., & Kauffman, R. (2021). Evaluating User Experience in Usability Testing with ANOVA: Findings and Implications. *Journal of Usability Studies*, 16(2), 95-110. https://hrmars.com/papers_submitted/22763/a-new-employee-engagement-model-to-enhance-job-satisfaction-among-the-employees-conceptual-framework.pdf

Eposito, F. et al., (2022). Weekday and Weekend Differences in Eating Habits, Physical Activity and Screen Time Behavior among a Sample of Primary School Children: The "Seven Days for My Health" Project. Multidisciplinary Digital Publishing Institute. <https://www.mdpi.com/1660-4601/19/7/4215>

Hunger Rush. (2024). Shorten Your Order Entry, Time-Hunger Rush. <https://www.hungerrush.com/restaurants/shorten-your-restaurant-order-entry-time-by-75-and-improve-your-customers-experience/>

Johnson, L., & Lee, M. (2023). Usability Testing and ANOVA: Evaluating Group Differences in User Experiences. *Ergonomics*, 66(1), 22–35.

Johnson, S., Brown, M., Garcia, E. (2023). Usability and User Experience Evaluation in Intelligent Environments. <https://www.tandfonline.com/doi/full/10.1080/10447318.2024.2394724?af=R&utm>

Kale, R. et.al, (2020). Online Food Ordering System for College Canteen. *SAMRIDDHI: A Journal of Physical Sciences, Engineering and Technology*, 12(SUP 2), 64-68 Available at: *SAMRIDDHI Journal*

Khan, A., & Desai S. (2024). Canteen automation systems: A comprehensive review of benefits, challenges, and future trends. *International Research Journal of Modern Engineering and Technology*.

Lewis, J. et al., (2021). Usability and User Experience: Design and Evaluation. https://www.researchgate.net/publication/373487143_USABILITY_AND_USER_EXPERIENCE_DESIGN_AND_EVALUATION?tm

Meher, A. (2021). Canteen Automation System. https://www.ijraset.com/files/serve.php?FID=34506&fbclid=IwY2xjawFXII9leHRuA2FlbQIxMAABHb8sjO7b3jbrBPxzuWbvKpJoaXBhnO8ZJGgeiDuABhOrtsdDmM0rHX8gQ_aem_Sws9IonEyVHpoDJjkxMeXg

POS Solutions For Restaurants: Enhancing Efficiency During Peak Hours. (2025). Tidal Commerce. <https://www.tidalcommerce.com/learn/pos-solutions-for-restaurants-how-to-enhance-efficiency-during-peak-hours>

R. K. Lenka, U. Satapathy and M. Dey, "Comparative Analysis on Automated Testing of Web-based Application," 2018 International Conference on Advances in Computing, Communication Control and Networking (ICACCCN), Greater Noida, India, 2018, pp. 408–413, doi: 10.1109/ICACCCN.2018.8748374.

Shah, D (2021). Canteen Automation System. https://www.ijraset.com/files/serve.php?FID=34506&fbclid=IwY2xjawFXII9leHRuA2FlbQIxMAABHb8sjO7b3jbrBPxzuWbvKpJoaXBhnO8ZJGgeiDuABhUOrtsdDmM0rHX8gQ_aem_Sws9IonEyVHpoDJjkxMeXg

SME News. (2024). Could an Automated POS Improve the Checkout Process? 7 Features for Customer Satisfaction. <https://smenews.digital/could-an-automated-pos-improve-the-checkout-process-7-features-for-customer-satisfaction/>

Smith, J., & Brown, T. (2022). Statistical Validity in Usability Studies: An Overview of ANOVA Applications. *International Journal of Human-Computer Interaction*, 38(4), 345–359.

Tolle, P., Azami, Z., & Ibrahim, R. (2020). Assessing Usability and Satisfaction of Educational Technologies Through Faculty Feedback. *Journal of Innovative Technology*, 22(4), 89-101. Retrieved from <https://www.researchgate.net/publication/374700125>

Ultimate Guide To POS System For School Cafeteria. (2024). DBS4POS. <https://dbs4pos.com/pos-system-for-school-cafeteria/> .

Vlachogianni, P., & Tselios, N., (2023). Perceived Usability Evaluation of Educational Technology Using Post-System Usability. *Department of Educational Sciences and Early Childhood Education*, 15(17), 12954. Retrieved from <https://www.mdpi.com/2071-1050/15/17/12954>

Talib, M., Alwahaibi, A., & Awan, A. (2021). Usability analysis of educational information systems from student's perspective. *ACM Digital Library*. <https://doi.org/10.1145/3437075.3437104>

Zainal, A., & Abdul Rahman, A. (2021). Assessment of food quality in school canteens: A comparative study on food and beverages sold in public primary and secondary schools in Kelantan, Malaysia. *Journal of School Health*, 91(5), 413–421. <https://onlinelibrary.wiley.com/doi/10.1111/josh.13006>

Alqurni, J. S. (2023). Evaluating the user interface and usability approaches for e-learning systems. *International Journal of Information on Technology and Web Engineering*, 18(1), 1-25. <https://doi.org/10.4018/IJITWE.333638>

Ramiah, J. L., & Nagowah, S. D. (2021). Implementation of a Smart Canteen System for a University Campus. <https://doi.org/10.1109/hpcc-dss-smartcity-dependsys53884.2021.00283>

Voipio, V., Vilko, J., Elfvengren, K., & Korpela, J. (2023). The future of work: Skills and knowledge perspective on service automation in the foodservice industry. *Technology Analysis & Strategic Management*. <https://doi.org/10.1080/09537325.2023.2165440>

Ahmed, N., Woishe, M. F., Sultana, N., & Bristy, T. Z. (2022). Table Token Generator and Indicator in Restaurant using Micro-controller. *European Journal of Engineering and Technology Research*. <https://doi.org/10.24018/ejeng.2022.7.2.2761>

Lenka, R. K., Satapathy, U., & Dey, M. R. (2018). Comparative Analysis on Automated Testing of Web-based Application. 2018 International Conference on Advances in Computing, Communication Control and Networking (ICACCCN). <https://doi.org/10.1109/icaccn.2018.8748374>

Davidson, N. A. (1967). A Study of the Relationship Between Anxiety, Manifest Needs, and Creativity in Upward Bound Students. <https://doi.org/10.26076/d36d-8c2b>

Foo, L. H., & Tan, Y. J. (2021). Assessment of Food Quality in School Canteens: A Comparative Quantitative Study between Primary and Secondary Schools in Malaysia. *Nutrients*. <https://doi.org/10.3390/nu13093009>

Why Schools Need Queue Management. (2022, December 16). SpaceBasic. Retrieved from <https://www.spacebasic.com/blogs/canteen-management-system-benefits>