

Enhancing Service Efficiency: A Data-Driven Study of Resource Utilization Trends in TLTS Operations at CEU Makati

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Abstract

Original Research Article

This study investigates the patterns of service demand and resource utilization within an academic institution's Technology and Learning Section (TLTS) operations of CEU Makati. The research uses online reservation data from various campuses and departments to identify trends in equipment usage, service durations, and peak demand periods from SY 2022-2023 and SY 2023-2024. Key findings highlight the most frequently requested resources, significant variations in demand across campuses, and the average duration of service utilization. The study provides actionable recommendations for enhancing resource allocation and ensuring operational efficiency.

Keywords: Service Demand, Resource Utilization, Technology and Learning Section (TLTS), Equipment Usage, Operational Efficiency

INTRODUCTION

Effective resource allocation is crucial for ensuring the smooth delivery of services in academic and administrative settings. In institutions where technology and logistics support systems (TLTS) play a critical role, understanding service demand patterns and utilization is key to optimizing operations. This study explores the operational metrics of TLTS reservations, focusing on the requests for equipment, materials, and services across campuses from SY 2022-2023 and SY 2023-2024.

By analyzing trends in service demand, resource utilization, and duration of requests, this research seeks to identify areas for improving efficiency and meeting the needs of various departments and campuses. The data-driven insights aim to provide actionable recommendations for better aligning resource availability with institutional requirements, ultimately enhancing the quality and reliability of TLTS operations.

This study also highlights the importance of tailoring resource allocation strategies to campus-specific needs, ensuring that technological and logistical support aligns with the diverse goals of academic and administrative units. Through a comprehensive examination of reservation data, this research sheds light on peak demand periods, the most frequently

requested resources, and usage patterns across time and locations.

By addressing these factors, the study contributes to the ongoing efforts to streamline operations and deliver impactful services within the institution.

Background: Effective resource allocation is fundamental to the operational success of educational institutions, where the efficient distribution of equipment, services, and personnel is crucial for academic excellence. Studies highlight that strategic decision-making in resource allocation improves institutional efficiency and supports long-term sustainability (Jafari et al., 2024). Educational institutions, like the Teaching and Learning Technology Section (TLTS), often encounter challenges such as overburdened staff, underutilized equipment, and unmet service demands, which can hinder productivity and user satisfaction.

Integrating data-driven methodologies in resource management has been shown to significantly enhance outcomes. Research suggests that higher education institutions leveraging analytics for budgetary planning and resource distribution achieve better alignment with their goals, thereby reducing inefficiencies (Saini & Singhaniya, 2024). Moreover, historical studies on resource allocation models underscore the importance of

tailoring strategies to align with institutional priorities and demand patterns (Bowles, 1980).

This study analyzes service demand and utilization trends within TLTS operations, it aims to identify inefficiencies and propose actionable improvements. To address the challenges, the research seeks to contribute to the broader discourse on resource optimization in academic settings.

Statement of the Problem: This study will analyze TLTS online reservation data to identify resource demand and utilization trends. Specifically, it aims to answer the following questions:

1. What are the monthly and daily trends in service demand within TLTS operations?
2. Which type of equipment, materials, and services are most frequently requested?
3. Which campus has the most demands of requests?
4. What is the average service duration of the request?
5. What strategies can be implemented to improve resource allocation and optimize service delivery?

Significance: The findings will help administrators make data-driven decisions to enhance service delivery, maximize resource usage, and effectively address campus-specific needs.

METHODS

The data used in this study was collected from TLTS online reservation forms from SY 2022-2023 and SY 2023-

2024, encompassing 1,172 entries detailing service requests from various campuses and departments. Key variables include timestamps, requested equipment/materials, service durations, and campus affiliations.

Data cleaning and preprocessing steps involved:

- Removing incomplete entries (e.g., missing dates or equipment details).
- Converting date fields into a consistent format for analysis.
- Categorizing services and equipment into standardized groups.

The data analysis focused on:

- Demand Trends: Grouping requests by date, month, and day of the week.
- Resource Utilization: Identifying the most requested equipment and services.
- Service Duration: Calculating average and total durations for each request. Campus and Departmental
- Patterns: Comparing usage across campuses and departments.

Tools such as Excel and Python were used for statistical analysis and visualization.

LIMITATIONS

The dataset's scope did not include cost analysis or staff workload metrics.

RESULTS AND DISCUSSIONS

1. Service Demand Trends

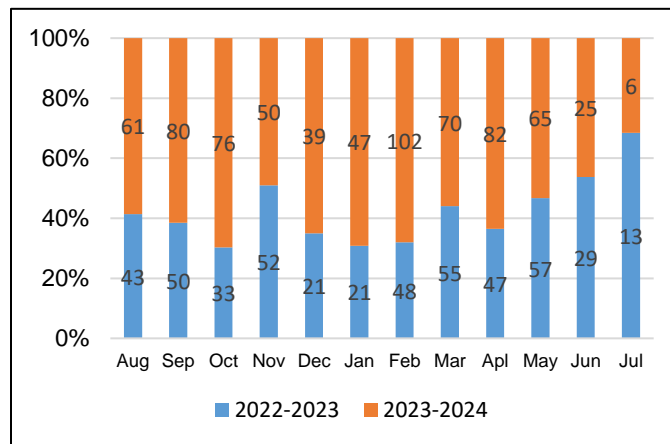


Figure 1: Monthly borrowing trends for equipment SY 2022-2023, SY 2023-2024

The data shows clear variations in borrowing activity across the months in both 2022 and 2023. Several trends emerge when comparing the two years:

Borrowing activity tends to peak during academic months (August to May), reflecting increased demand coinciding with school schedules. The months with the highest equipment borrowing are March 2022 (n=55), May 2022 (n=57), February 2023 (n=102), and April 2023 (n=82).

It can be observed that borrowing is consistently low during

July for both years, with only 13 requests in 2022 and 6 requests in 2023, likely aligning with summer breaks and reduced academic activity.

2022 exhibits a more balanced borrowing trend, with peaks in March and May but lower variations in other months possibly due to core subjects that are purely conducted online. 2023 shows significant spikes in February and April, possibly due to specific institutional events and operational adjustments such as meeting students face to face one week before every exam.

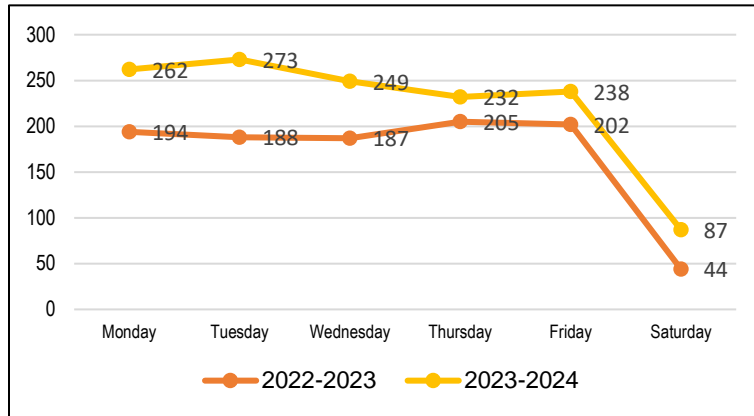


Figure 2: Daily borrowing trends for equipment SY 2022-2023, SY 2023-2024

While Thursdays were the busiest in 2022-2023 (n=205), Tuesdays became the peak day in 2023-2024 (n=273), possibly due to schedule changes, mid-week events, or increased academic activity on that day. However, it shows a Monday surge jump in requests from 194 to 262 indicating a stronger start to the week in 2023-2024, likely driven by preparation for

academic or institutional tasks.

Although Saturdays are still low-demand days, the increase from 44 to 87 indicates growing weekend activity, such as workshops or student events.

2. Most Requested Resources

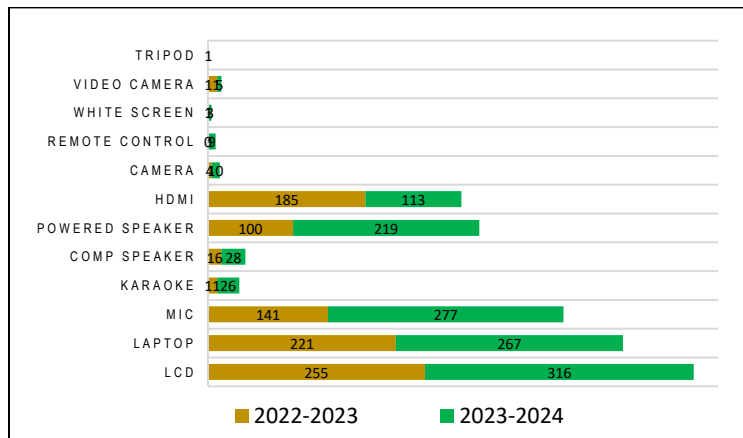


Figure 3: Equipment borrowing trends for SY 2022-2023, SY 2023-2024

LCD Projectors showed that borrowing increased from 255 in 2022 to 316 in 2023, reflecting a steady reliance on this equipment for presentations and lectures. A rise from 221 in 2022 to 267 in 2023 in laptops suggests increased integration of technology into academic activities and an increase in the number of classes conducted in person. Microphones show the most notable increase in usage, from 141 in 2022 to 277 in 2023, indicating a growing need for sound amplification in events or classroom settings. Powered Speakers borrowing jumped significantly from 100 in 2022 to 219 in 2023, showing the importance of enhanced audio solutions for institutional events or learning sessions it can also be associated with the increased numbers of combined classrooms.

Equipment that is moderately increased in requests is karaoke, it rose from 11 in 2022 to 26 in 2023, possibly due to combined classes conducted. Computer speakers show also a similar trend, increasing from 16 to 28 borrowings.

Cameras, borrowing increased from 4 to 10, suggesting a slight rise in the use of visual recording for documentation or academic projects. Remote Controls from 0 in 2022 to 9 in 2023, likely reflecting improved inventory or inclusion of this equipment in the borrowing list.

Other equipment that declined demands are HDMI Cables: Borrowing dropped significantly from 185 in 2022 to 113 in 2023, potentially due to alternative connectivity solutions such as wireless technology, it can also be associated with the reason that most of the cables are already available inside the LCD bag or already installed inside the classroom. Borrowing of video cameras decreased from 11 in 2022 to 5 in 2023, indicating reduced reliance on traditional recording equipment.

Items with low requests are white Screens from 1 in 2022 to 3 in 2023 suggesting limited use, possibly due to less activity outside the campus. Tripods are newly recorded in 2023 with 1 borrowing, indicating very minimal demand.

3. Campus-Specific Patterns

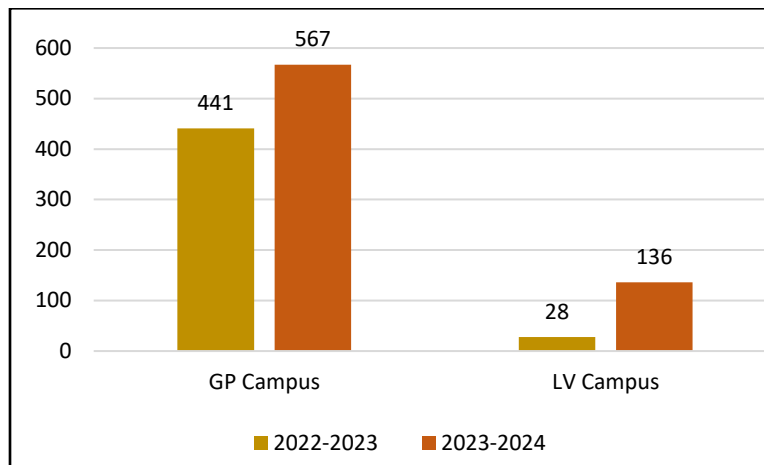


Figure 4: Campus-Specific Patterns of Borrowing Trends for SY 2022-2023, SY 2023-2024

The GP Campus remains the dominant contributor to borrowing requests, with an increase from 441 in 2022-2023 to 567 in 2023-2024. This growth of 126 additional requests (28.6% increase) reflects the sustained reliance on resources at GP Campus, likely due to a higher population of students, faculty, or institutional activities.

However, the LV Campus shows a dramatic increase in borrowing requests, rising from 28 in 2022-2023 to 136 in 2023-2024. This 385.7% increase indicates a notable surge in resource utilization, due to the back-on-campus classes.

While the GP Campus accounts for the majority of borrowing requests in both years (91.6% in 2022-2023 and 80.6% in 2023-2024), the LV Campus is narrowing the gap, suggesting its evolving needs and growing demand for resources.

4. Service Duration

The average service duration was three days, with a range spanning same-day requests to month-long reservations. Moreover, long-term reservations were noted primarily made by administrative departments for ongoing projects.

5. Strategies to Improve Resource Allocation and Optimize Service Delivery

Area	Strategies
Staffing	<p>Allocate more staff and resources on peak days, especially on the GP campus. The peak days are not constant they might be different every semester. Get the class schedule before the opening of classes and differentiate the teacher frequently requests equipment.</p> <p>Ensure technical support staff is well-prepared to manage the surge in requests.</p>
Scheduling	<p>Introduce a flexible workforce schedule where staff and equipment availability are aligned with demand patterns.</p> <p>Do not allow off days during the high volume of early-week requests.</p> <p>Allow staff to have days off during low-demand days.</p>
Optimize equipment availability	<p>Ensure adequate inventory of popular equipment (e.g., laptops, LCD projectors, and microphones) to meet the surges experienced on peak days.</p> <p>Perform regular maintenance on frequently borrowed items to avoid delays or disruptions.</p> <p>Promote the borrowing of underutilized equipment to balance resource usage.</p>
Reservation systems	<p>Encourage early bookings to allow for better preparation and allocation of equipment and staff.</p> <p>Improve the current online reservation platform to automate scheduling, track demand trends in real-time, and reduce last-minute requests.</p>
Data Analytics for Forecasting	<p>Use historical data trends (e.g., peak demand on Tuesdays and Mondays) to anticipate future needs and adjust resources accordingly.</p> <p>Develop predictive models to account for special events or academic cycles that could affect resource utilization.</p>
Review of Policies and Procedures	<p>Conduct annual evaluations of resource allocation strategies based on updated data to refine scheduling and staffing decisions.</p> <p>Gather user feedback to identify areas for improvement in service delivery.</p>

CONCLUSIONS

The analysis highlights a significant variation in resource demand across campuses and departments. Concentrated requests during peak periods suggest better scheduling strategies to distribute demand evenly. Based on

demand patterns, additional laptops and projectors should be allocated to high-demand campuses. Implementing a reservation system that limits overlapping requests can alleviate resource bottlenecks. Campus-specific needs suggest potential benefits of decentralized resource management.

RECOMMENDATION

Proactive planning and continuous evaluation of

trends will help the institution remain responsive to evolving academic and technological needs. Additionally, further studies should explore the integration of user feedback and cost-efficiency metrics to complement this study's findings.

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