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Q-Line UCLM: Enhancing Student Service Flow Through Paperless

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ABSTRACT

The increase in the number of enrolled students and daily transactions at the University of Cebu – Lapu-Lapu and Mandaue (UC-LM) have caused long queues and slow services at the primary administrative offices, like cashier and EDP. The use of printed priority numbers in line control is outdated, causes a lot of paper waste, and is inflexible and inefficient to suit the needs of the present campus. This proposal invites the implementation of an automated queuing system that would enable students and administrative staff to minimize the use of paper and streamline the process of queuing. The system allows students to view queue numbers via electronic kiosks or an internet interface. The system places the student in a virtual queue once a number is assigned and gives instant information on their queue position, waiting time, and serving counter. The electronic platform minimizes the physical presence of students at service stations. They can wait from afar or in the vicinity while being automatically reminded to inform them. The system provides fair and efficient treatment of each client on a First-In, First-Out (FIFO) queuing system. The system aids different service departments by scheduling requests in the right order, for example, when an individual needs to pay tuition or ask about their records. The system also has an administrative dashboard, where employees are able to see customers waiting in line and the line length at a specific time. The strategy enables the maintenance of a neater and cleaner campus environment through the removal of paper waste. Through decreasing the waiting process via automation, UC-LM has the potential to reduce congestion, enhance the clarity of services, and overall student satisfaction. The program is also eco-friendly, as it minimizes the use of printed queue numbers and other paper material

Keywords: *Campus Automation, Digital Ticketing, FIFO, Paperless Queue, Queue Management, Queuing System, Student Services, Sustainable Practices, UC-LM*

INTRODUCTION

In the evolving landscape of higher education, student service delivery has emerged as a critical component of institutional performance and learner satisfaction. Globally, universities are transitioning toward digital ecosystems to address inefficiencies in administrative processes, particularly those involving high-volume transactions such as enrollment, clearance, and financial services (Almeida et al., 2022). In the Philippine context, these challenges are compounded by limited infrastructure and manual workflows, which hinder operational efficiency and the student experience.

National policy frameworks reinforce the imperative for digital transformation. The Commission on Higher Education (CHED, 2020) advocates for flexible learning modalities and the integration of digital systems across academic and support services. Likewise, the Department of Information and Communications Technology (DICT, 2021) promotes e-governance and innovative campus initiatives,

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emphasizing the role of digital infrastructure in enhancing public service delivery and institutional resilience.

At the University of Cebu – Lapu-Lapu and Mandaue (UC-LM), administrative offices, including the cashier and EDP, routinely experience congestion during peak periods. The current queuing system, based on printed priority numbers and manual processing, results in transactional bottlenecks, disorganized workflows, and excessive paper consumption. These inefficiencies not only compromise service quality but also contradict the university's sustainability goals.

Empirical studies support the adoption of digital queuing systems in educational settings. Laurel et al. (2021) found that implementing a digital queuing platform reduced average wait times by 60% and significantly improved user satisfaction in a comparable university environment. Similarly, Cruz and Mendoza (2023) emphasized that digital queue management enhances transparency, reduces staff workload, and fosters a more student-centered service culture.

Internal data from UC-LM's 2023–2024 academic year revealed that over 68% of surveyed students waited more than one hour for routine transactions, underscoring the urgency of systemic reform. In response, this study proposes the design and implementation of a digital queuing system that allows students to obtain queue numbers via mobile devices or kiosks, receive real-time updates, and access services with minimal physical interaction. This initiative aligns with institutional goals of operational efficiency, environmental sustainability, and enhanced student engagement.

OBJECTIVES OF THE STUDY

The main objective of this study is to design and develop a digital queuing system for the University of Cebu – Lapu-Lapu and Mandaue (UC-LM) that will systematize the flow of students requesting services, reduce physical queuing, and eliminate the need for printed queue numbers.

Specifically, this study aims to:

1. Develop a paperless queuing system that allows students to secure queue numbers digitally through kiosks or online platforms.
2. Organize and systematize long queues in key university offices, such as the cashier and EDP, by implementing a First-In, First-Out (FIFO) queuing logic.
3. Provide real-time queue monitoring for both students and staff and notification alerts when their turn is near.
4. Equip administrative personnel with a dashboard to monitor queue lengths to improve workflow and staff allocation.
5. Minimize paper consumption and printing costs by replacing traditional printed priority numbers with digital alternatives.
6. Enhance student experience and satisfaction by reducing wait times, physical crowding, and confusion during peak enrollment or adjustment periods.
7. Align the queuing system with the institution's sustainable and digital transformation goals, as well as national policies on innovative campus initiatives.

SCOPE AND LIMITATION OF THE STUDY SCOPE

This study focuses on the design, development, and evaluation of a digital queuing system for the University of Cebu – Lapu-Lapu and Mandaue (UC-LM). The system aims to automate and systematize the current queuing process in key student services departments, including the Cashier's Office and EDP Office.

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It allows students to generate queue numbers digitally via kiosks or a web-based application and receive real- time notifications about their queue status.

The system is designed to implement a First-In, First-Out (FIFO) queue discipline and support multi- department queuing, allowing for separate queues for various services. It also features an administrative dashboard that allows staff to monitor active queues. The system is intended for use within the campus premises and is accessible via on-site digital kiosks and the UC-LM intranet or university web portal.

The study covers:

- Basic UI/UX design for both students and staff.
- Queue number generation and tracking.
- Real-time notifications (in-app or on-screen).
- Basic performance reporting for administrative use.
- Simulation and testing in a controlled university setting.

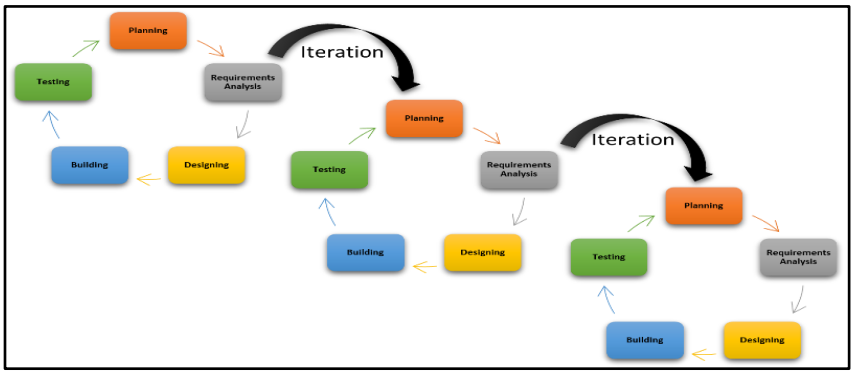
Limitations

This study has the following limitations:

1. The system does not support mobile push notifications or SMS alerts in its initial version due to budget and integration constraints.
2. The system is limited to use within UC-LM and is not intended for deployment across other University of Cebu campuses at this stage.
3. The project will not cover biometric or QR code-based attendance or check-in features.
4. It does not integrate with existing Campus Information Systems (CIS), though manual encoding of student details is supported.
5. Internet or intranet availability is required to use the system. Offline functionality is not included.
6. The system is primarily intended for service queuing only and does not cover appointment scheduling or long-term reservations.

Software Engineering Methodology

Agile Development Technology is the researchers' chosen Software Development Life Cycle (SDLC) for the study. The following phases of the selected model are based on the activities that the researchers will do to develop the proposed system.



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The figure above shows the many stages of Agile Methodology Technology. This methodology repeats its five phases throughout project development, depending on the required iteration. Every iteration, typically called a sprint, lasts about 2-3 weeks. Using this paradigm, one can quickly create a functioning piece of software and handle any necessary additions as part of the sprint's backlog in the subsequent iteration. Additionally, Agile methodology's adaptability to change, especially in the technological realm where user patterns change quickly, allows it to accommodate any changes in plans and needs.

The researchers used this methodology to ease the time constraints. This approach is the most effective way to achieve their goals. They wanted a rapid, fundamental, basic, and functional system to consistently provide a working program. The researchers' decision to use the Agile technique was also influenced by the flexibility it offers for modification. This process enables them to make the adjustments they feel are essential whenever they need to.

Meet Phase

This is the initial phase in figuring out the project's objectives and specifications. The researchers review the information and issues found in the University's current archiving method throughout this phase as they develop their project's goal. The proponents gather and use all relevant solutions for future discussion to ensure the system is successfully developed.

Planning Phase

In this speculative phase, the Agile life cycle starts to emerge. Release planning is when proponents come together to determine what needs to be done. Researchers then collected the data and identified problems using online survey questionnaires. After that, proponents gathered the needs and decided what was required to develop the system.

Design Phase

Once the requirements have been established based on the data gathered, the task itself starts at this point. A practical and workable solution will be provided throughout the project's initial design and iteration phases. During this stage, the proponents select the system's functions and build a prototype to visualize them. As a result, each component of the proposed system is developed using use cases, activity diagrams, database design, high-level design, and entity relationship diagrams. In the designing stage, the researcher's main objective is to be user-friendly to encourage simple access to content and services.

Development Phase

The agile development process's fourth step is development. It is the most extended process since it carries most of the tasks. The proponents will begin putting all the product needs obtained during the meeting, planning, and designing phases into one cohesive whole. Before it is completed, it is subject to numerous evaluations and adjustments for improvement.

Testing Phase

During the testing phase, the researchers conduct several tests to ensure the software's functionality before deployment. The proponents will test the software to check for errors and bugs and ensure the code is clean. The issue that arises during this stage is the main focus of the researchers. The test's goal is to compare the results achieved to those anticipated by the system.

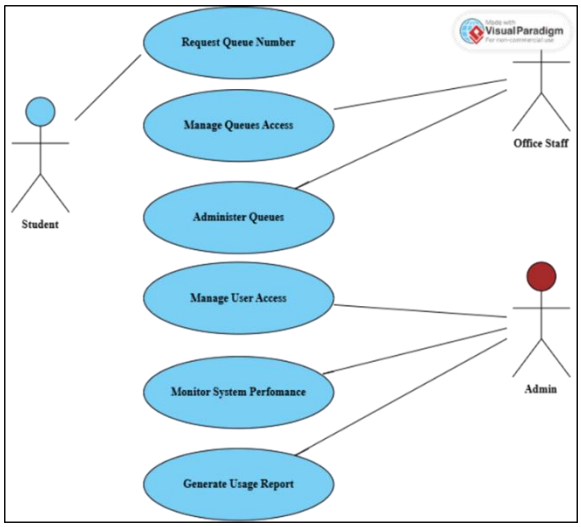
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Evaluate Phase

Researchers will complement the system throughout the evaluation phase to ensure that the system is tested. They shall ensure that the methodology laid down can be reliably applied. In addition, with the rest of the team at this stage, user requirements are examined and assessed.

Use Case Diagram

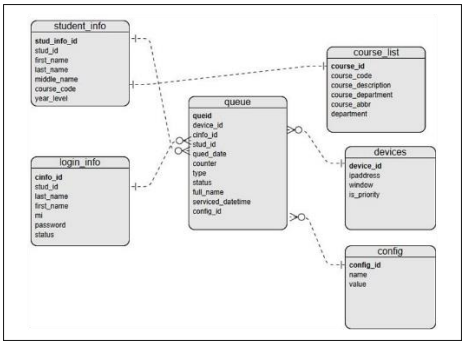
A use case diagram is a graphic representation of how a consumer could interact with a system and is used to describe the system's numerous use cases, different categories of users, and complex nature. Other charts often follow this diagram.



MAIN USE CASE DIAGRAM OF Q-LINE: UCLM

Database Design

Database Design is the process of producing a detailed data model of a database. This data model encompasses all the necessary logical and physical design choices, as well as physical storage parameters, required to generate a design in a data definition language, which can be used to create a database.



DATABASE DIAGRAM OF Q-LINE:UCLM

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RESULTS AND DISCUSSION

This chapter presents a synthesis of key findings, conclusions, and strategic recommendations about the implementation of the Q-Line UC-LM paperless queuing system. It critically examines the system's efficacy in mitigating persistent challenges within student services, specifically those related to prolonged queuing times, excessive paper consumption, and fragmented service workflows. The analysis underscores the system's contribution to operational efficiency and environmental sustainability. Furthermore, the chapter delineates evidence-based conclusions regarding the system's overall impact. It proposes targeted recommendations for its enhancement, scalability, and prospective integration into other administrative units, including but not limited to the Records Office.

FINDINGS

The primary objective of this study was to design and implement a paperless queuing system, Q-Line UC- LM, intended to address the operational inefficiencies associated with manual, paper-based queuing processes at the University of Cebu – Lapu-Lapu and Mandaue (UC-LM). Based on system analysis and empirical testing, the following key findings were established:

1. Limitations of the Existing System - The legacy printed-number queuing mechanism was found to contribute significantly to prolonged waiting times, service area congestion, and excessive paper consumption. These factors collectively led to diminished student satisfaction and disrupted workflow continuity across frontline service units.
2. Operational Efficiency of the Digital System - The Q-Line UC-LM system effectively integrated a First-In, First-Out (FIFO) queuing algorithm, which facilitated equitable and orderly processing of service requests. This logic enhanced procedural fairness and reduced service bottlenecks.
3. Enhanced Accessibility and Transparency - The system enabled students to generate queue numbers via self-service kiosks or online platforms, with real-time visibility into queue progression. This feature reduced the necessity for physical presence and improved user autonomy in managing service interactions.
4. Administrative Optimization - Service personnel were equipped with a centralized dashboard interface that provided dynamic insights into queue lengths and transaction throughput. This functionality supported more strategic workload allocation and improved overall service governance.
5. Environmental and Policy Alignment - The transition to a digital queuing framework significantly reduced paper usage, thereby contributing to the university's sustainability objectives.
6. Scalability and Future Integration - While the initial deployment focused on the Cashier and Electronic Data Processing (EDP) offices, the system demonstrated potential for broader institutional integration. Expansion into the Records Office and other administrative departments was identified as a strategic opportunity for further development.

CONCLUSIONS

The deployment of the Q-Line UC-LM paperless queuing system has demonstrably enhanced the operational efficiency and procedural transparency of student services at the University of Cebu – Lapu-Lapu and Mandaue (UC-LM). By implementing a fair and systematic queuing mechanism, the system effectively reduced waiting times, alleviated service congestion, and improved overall student satisfaction. Moreover, its digital architecture supports environmentally sustainable practices by minimizing paper consumption, thereby aligning with institutional and national directives on digital transformation.

Beyond its initial application within the Cashier and Electronic Data Processing (EDP) offices, the system exhibits considerable potential for horizontal scalability across other administrative units,

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particularly the Records Office. These findings affirm that digital queuing solutions serve not only as effective interventions for resolving service delivery bottlenecks but also as strategic instruments for fostering institutional resilience, sustainability, and future-readiness in higher education settings.

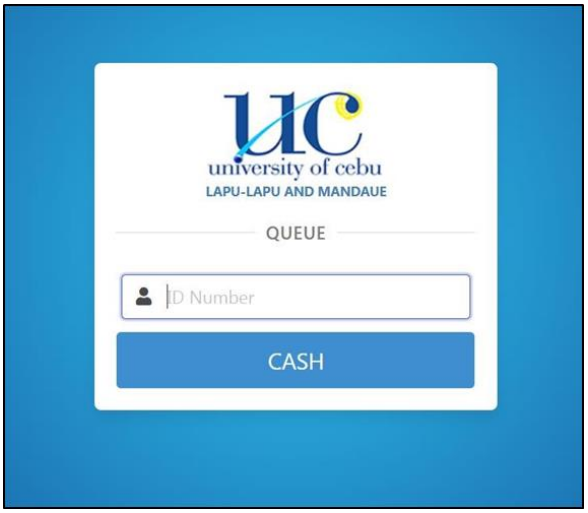
RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations are proposed to enhance the functionality, scalability, and institutional integration of the Q-Line UC-LM paperless queuing system:

- Expansion to the Records Office. It is recommended that the system be extended to encompass records-related services, including transcript issuance, certification requests, and student clearance processing. This expansion would further streamline administrative workflows and reduce service fragmentation across departments.
- System Enhancement and Scalability: To improve accessibility and user engagement. Additionally, integrating student RFID-based authentication mechanisms would expedite user verification processes. The incorporation of appointment scheduling features is also recommended to manage service demand during peak operational periods.
- Administrative Optimization: The deployment of advanced analytics and reporting tools is crucial for monitoring key service metrics, including peak hours, transaction volumes, and staff performance. Regular capacity-building initiatives, including training sessions for administrative personnel, should be institutionalized to ensure effective system utilization and continuous process improvement.
- Pilot Testing and Feedback Mechanisms: A phased implementation strategy is already deployed at the Cashier. Concurrently, structured feedback mechanisms should be established to capture insights from both students and administrative staff, thereby enabling iterative system refinement and responsive development.

System Interface Snapshots

Customer Dashboard



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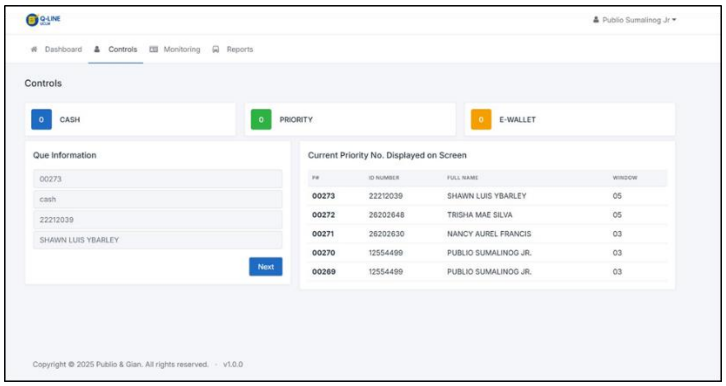
Customer Viewing Ques



Staff Dashboard



Staff Monitoring Dashboard



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