



Ticketless ID Operated Queue Management Optimization with SMS Notification and Voiceover Feature

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ABSTRACT: This research investigated the feasibility and effects of deploying a hybrid Queue Management System (QMS) at the Jose Rizal Memorial State University-Dipolog Campus in the 2023–2024 academic years. The study addressed long-standing inefficiencies in the manual queuing processes of the Registrar and Cashier offices, which had led to long waiting times, crowded service areas, and communication gaps that hampered administrative operations and student satisfaction. It did this by using a developmental research design and by drawing on the work of Ramasamy and Chua (2012). A ticketless Student ID-Operated Queue Management Optimization system was created in response, incorporating voiceover announcements through the Public Address (PA) system, a live dashboard, an admin control panel, and real-time SMS notifications. The system was rated highly in terms of sustainability, efficiency, compatibility, usability, security, maintainability, and portability after being assessed using surveys and descriptive statistics. The outcomes show that the technology improved service delivery and efficiently streamlined queuing processes. The solution, which was created using Agile methodology and was based on Queueing Theory, optimized queue lengths, reduced waiting times, and enhanced user experience, establishing both theoretical soundness and practical functionality. These results imply that operational responsiveness and service quality in academic contexts can be greatly enhanced by strategic digital solutions catered to institutional demands. For smooth system engagement, the study suggests updating hardware, especially touch screen components. Additionally, it supports the system's potential as a scalable model for queue management in comparable institutional environments by promoting future research to increase the system's adaptability across different deployment contexts.

KEYWORDS: Queue Management System, SMS Notification, Ticketless Id, University

1.0 INTRODUCTION

Technology has profoundly transformed the landscape of human interaction and institutional operations in the contemporary digital era. It has redefined the nature of service delivery, making transactions across various domains more convenient, efficient and accessible. Technological innovations have particularly modernized procedural systems in sectors where traditionally time-consuming tasks have been streamlined through automation and digital platforms. Despite these advancements, however, the issue of queuing remains a persistent and often overlooked challenge in many public institutions. The continued reliance on manual queue management undermines the potential of digital tools to deliver seamless and efficient services. This paradox on the coexistence of technological capability and operational inefficiency underscores the necessity of reexamining queuing practices within technologically integrated service environments.

Queueing or the act of waiting in line for service is a universal phenomenon that significantly influences perceptions of service quality and institutional effectiveness. It is especially critical in service-intensive settings where large volumes of clients are expected such as universities during enrolment periods. The absence of effective queue management often results in prolonged waiting times, overcrowding and dissatisfaction among stakeholders. Yet, despite its ubiquity and impact, queuing as a component of service delivery has received limited attention in empirical research particularly within educational institutions in the Philippine context. This gap in the literature reveals an urgent need to develop and implement systems that optimize queue management and enhance the overall service experience. A Queue Management System (QMS) serves as a technological framework designed to organize, monitor and analyze the flow of clients within service environments.

These systems employ various tools and techniques to regulate queues, reduce service delays and improve client satisfaction. Notably, the integration of Short Message Service (SMS) notifications and Public Address (PA) systems has become instrumental in delivering real-time updates and managing large crowds. SMS technology allows clients to receive timely alerts regarding their

queue status, enabling them to engage in other productive activities while waiting. Meanwhile, PA systems facilitate clear and efficient communication within service venues, enhancing operational coordination (Tšernov, 2022). QMS implementations not only reduce idle time but also promote fairness, transparency and efficiency by automating the queueing process. Clients are served based on predetermined protocols, such as first-come-first-served rules or appointment priorities, thus minimizing biases and disputes.

At present, Jose Rizal Memorial State University-Dipolog Campus faces substantial challenges in managing queues during critical service periods, particularly in the registrar and cashier offices. With approximately 5,000 students enrolling each semester, the absence of a formal Queue Management System results in inefficient service delivery, long wait times and significant frustration among students. The current setup fails to meet the demands of a growing academic population within a technologically advancing society. This study thus seeks to investigate the viability and potential impact of introducing a tailored QMS to address these institutional concerns.

Therefore, this study endeavors to examine the need for a robust and context-sensitive Queue Management System within Jose Rizal Memorial State University, Dipolog Campus. It finds out how digital solutions can mitigate persistent queuing inefficiencies and improve institutional service quality to contribute to the broader discourse on the role of technology in enhancing public service delivery in educational institutions.

2.0 METHODOLOGY

This study employed the developmental research method, a methodical way of planning, creating and testing computer programs, processes, and products that need to meet standards for being effective and consistent with each other. Developmental research is particularly important in the field of information and communication technology.

2.1 Research Environment

The study is conducted in Jose Rizal Memorial State University – Dipolog Campus, the Premiere University in Zamboanga del Norte.

2.2 Respondents of the Survey

The respondents of this study were the 368 students of JRMSU-Dipolog Campus comprising 37 from the College of Arts and Sciences (CAS), 120 from the College of Business Administration (CBA), 43 from the College of Criminal Justice Education (CCJE), 99 from the College of Industrial Technology (CIT), 11 from the School of Medicine (SOM), and 58 from the College of Teacher Education (CTEd) and 10 IT professionals.

Table 1. Respondents of the Study

<i>Groups</i>	<i>f</i>	<i>%</i>
IT Students	368	97.35
IT Professionals	10	2.65
Total	378	100

2.3 Research Instrument

The data collection instrument utilized in this study comprised of three (3) distinct components. The initial section outlined the existing system and procedures for admitting students to the Registrar and Cashier's Office during enrollment. The second part outlined the challenges encountered by university students during enrollment based on observations and interviews with students from Jose Rizal Memorial State University-Dipolog Campus. The third part examined the levels of sustainability, efficiency, compatibility, usability, reliability, security, maintainability and portability of the project using a questionnaire-checklist, which was structured according to the fundamental attributes of the ISO 25010 Quality Model.

2.4 Statistical Treatment

The following tools were used:

Frequency Count and Percentage. It was used to describe the respondents of the study which were the students and the IT professionals of JRMSU. The following formula was used: $P = \frac{f}{N} \times 100$

Where:

- P = Percentage
- f = Frequency
- N = Total Population

Weighted Mean. This was used to determine the performance level of the system which was the newly developed and designed queuing management system for JRMSU. The formula is: $W\bar{X} = \frac{\sum fW}{N}$

Where:

$W\bar{X}$ = Weighted Mean
 $\sum fW$ = The summation of frequency and weight
 N = Total Number of Cases

2.5 Ethical Consideration

The researcher evaluated the application's respect for people by getting the institution's informed consent to disseminate a study questionnaire free of technical phrases. Respondent consent was sought by the researcher during the investigation. Respondents' identities are protected and active participation is guaranteed by the researcher. Respondents' identities were kept confidential in this study. Following the study, the researcher saves important data for other studies.

3.0 RESULTS AND DISCUSSION

This chapter presents the data in tables followed by the description, analysis and interpretations. Along the way, the analysis and the interpretations crucially examine the data being gathered to have a clearer understanding of the ratings of respondents.

Current Status of QMS in JRMSU Dipolog

This section discusses the current status of the Queue Management System in the JRMSU Dipolog Campus. Resulting from the interviews and observations, Jose Rizal Memorial State University (JRMSU) Dipolog Campus has implemented an Academic Records Management System (ARMS) to facilitate various academic processes. This system allows students to log in, access their academic records, and manage enrollment-related tasks through an online portal. However, there is never a queuing system particularly for in-person services such as enrollment, subsidy release, or administrative transactions. The services are not readily available in JRMSU Dipolog. While the ARMS portal streamlines certain academic processes online, it does not necessarily provide a comprehensive digital queue management system for all on-campus services. Given the university's ongoing efforts to enhance operational procedures and its commitment to continuous improvement as evidenced by initiatives like the ISO 9001:2015 Internal Audit, it is plausible that developments in queue management systems are either underway or planned for future implementation.

Reiterating that Jose Rizal Memorial State University–Dipolog Campus has yet to implement a formal queue management system (QMS) to streamline service delivery particularly in key administrative units such as the registrar and cashier offices, the study found out that this is an issue yet to be addressed. This lack of a systematic queuing mechanism presents operational challenges especially considering the projected influx of approximately 4,000 to 5,000 enrollees each semester.

The enrollment process passes through the different offices of the university. Some of which where queueing mostly occur was in the Cashier's Office and the Registrar's Office. The Cashier's Office is where students pay tuition fees in partial basis or full basis, posting section, where every student verifies the receipt, and lastly the Registrar's Office as the last station for the enrollment system. These different services have the same waiting line for the students that could be served immediately. This without an organized queuing process for both students and university personnel are subjected to inefficiencies such as long waiting times, service congestion and compromised user satisfaction.

Similar challenges have been documented in other academic institutions. At Manuel S. Enverga University Foundation in Candelaria, researchers emphasized that integrating a QMS significantly reduced wait times and enhanced student satisfaction by digitizing queues and allowing real-time updates (Maala, Sebuia & Evangelista, 2023).

At Quirino State University, the development of a centralized Enrollment Queueing Management System led to more organized student transactions, reduced overcrowding, and better tracking of administrative performance (Garcia et al., 2023). In another similar study, the Automated Enrollment Queueing System project found that waiting lines could be drastically improved with a technology-driven queuing mechanism designed to analyze and correct weaknesses in existing systems (Espinosa, Serrano & Balmes, 2024).

These studies support the need for Jose Rizal Memorial State University–Dipolog Campus to implement its own queue management system, tailored to its unique demands. The current reliance on manual queues not only hampers administrative efficiency but also runs counter to the institution's ongoing ISO 9001:2015 quality assurance initiatives. As such, this research proposes the design and development of a "Ticketless Student ID Operated Queue Management Optimization with SMS Notification and Voiceover Feature", a system that aligns with best practices and technological advances adopted by peer institutions.

Problems Encountered

The Jose Rizal Memorial State University (JRMSU) Dipolog Campus encountered various problems without the Queue Management System. Without the Queuing and Service Management System, interviews and observations showed that providing an organized and systematic way of accommodating client is lack of competence. In fact, priority numbers are provided less fairly. Distributing priority numbers to the clients is not provided properly which showed that there is a possibility of overtaking clients. This fact showed that prioritizing students' needs improvement. As revealed, processing the transaction of the students takes a lot of time to serve while the record of serving the students is manually done.

Interviews and observations have revealed significant deficiencies in the current queuing practices at Jose Rizal Memorial State University–Dipolog Campus. Notably, the distribution of priority numbers lacks fairness, leading to instances where clients can overtake others in line. This disorganized system results in prolonged transaction times for students, with service records maintained manually, further exacerbating inefficiencies. Similar challenges have been documented in other academic institutions. For instance, a study at Southern Leyte State University identified that the existing Queuing and Service Management System was deficient in providing an organized and systematic approach to client accommodation. The improper distribution of priority numbers led to possibilities of clients overtaking others, and the manual processing of student transactions contributed to extended service times (Paragas, 2023).

The fairness of queuing systems is a critical concern. Levy and Raz (2004) introduced the Resource Allocation Queueing Fairness Measure (RAQFM) to analyze the fairness in systems with class priorities. Their findings indicated that while assigning higher priority to certain tasks can improve system efficiency, it does not always enhance fairness. In fact, such prioritization can lead to significant disparities in service times among different customer classes.

Moreover, Alexander et al. (2012) explored the social implications of priority queues particularly in settings where customers can pay for expedited service. Their research highlighted that such systems often lead to perceptions of injustice among regular customers, negatively impacting overall satisfaction and trust in the service provider.

These studies underscore the necessity for implementing a fair and efficient queue management system at JRMSU–Dipolog Campus. The university can enhance service delivery, reduce waiting times and improve overall client satisfaction by addressing the current shortcomings such as the unfair distribution of priority numbers and manual transaction processing.

Design of the Hybrid QMS

A hybrid Ticketless Students ID Operated Queue Management Optimization with Short Message Service (SMS) Notification and Voiceover Feature through Public Address System was designed to meet the needs of JRMSU Dipolog clientele. The project system integrated three (3) important systems in its development. The project involved the “ticketless ID-operated queue management optimization system,” the “short message service system,” and the “public address system.” The software development life cycle was informed by Agile Methodology in software development which was limited to the phases plan, design, develop, test, deploy, review, and launch.

The software design and for the hardware side, architectural design were used. The software design involved algorithms and flowcharting. The hardware design involved the student's ID with an embedded QR code, a QR code reader, a computer and monitor, and PAS. The researcher-developed initiated with the front-end programming language after making thorough analyses of algorithms and flowcharts to savor the system.

Performance of the Developed System

The following tables present a comprehensive evaluation of the performance of the Ticketless Student ID-Operated Queue Management Optimization with SMS Notification and Voiceover Feature through the Public Address System as assessed by both IT experts and students across eight indicators, namely: sustainability, efficiency, compatibility, usability, reliability, security, maintainability, and portability of the hybrid queueing solution developed for Jose Rizal Memorial State University – Dipolog Campus.

Sustainability. It is the system's long-term viability and its capacity to operate effectively over time with minimal resource consumption while remaining adaptable to changes. Table 2 focuses on the sustainability of the system. IT experts gave a mean rating = 4.74 and students = 4.65 both categorized as Very Much Sustainable (VMS). The high scores across all sustainability indicators indicate that the system can operate effectively over time with minimal degradation. The system therefore aligns well with the university's long-term service delivery goals and can be relied upon for future use without significant maintenance or resource strain. The interpretation is clear that both expert and end-user communities perceive the system as a long-lasting solution suitable for institutionalization.

The high sustainability ratings indicate that the system effectively meets user goals, provides precise results, and functions reliably over time. This aligns with findings by Himo et al. (2022) who reported that a Community Request Queue

Management System achieved an overall functionality rating described as excellent and therefore demonstrates long-term viability and adaptability in public service settings.

Table 2. Functional Sustainability of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. The services fulfill all the specified tasks and user goals that were designed.	4.92	VMS	4.75	VMS
2. Services deliver accurate results with a certain degree of precision.	4.97	VMS	4.82	VMS
3. Services can make it easier to finish certain tasks or, more specifically, to carry out business processes.	4.82	VMS	4.59	VMS
4. Its touchscreen monitor responds quickly and accurately to every touch.	4.20	VMS	4.17	VMS
5. The text expected from the system reaches the user completely.	4.78	VMS	4.92	VMS
Mean	4.74	VMS	4.65	VMS

Efficiency. It measures how well the system optimizes time, resources and processes to reduce queuing and improve service delivery eventually ensuring swift and organized transactions. Table 3 assessed the system's efficiency. It received a rating = 4.85 from IT experts and rating = 4.78 from students both described as Very Much Efficient (VME) which reflect the system's strong performance in reducing wait times, managing multiple concurrent users, and enabling fast data processing such as QR code reading. This result emphasizes that the system can support high-volume transactions especially during peak periods such as enrollment. This efficiency not only minimizes student frustration but also enhances overall productivity within JRMSU offices.

Efficiency ratings reflect the system's strong performance in reducing wait times and managing multiple concurrent users. This is supported by Safdar et al. (2020), who developed a queue assessment model that effectively reduced patient wait-times in a public hospital setting. Along this line, Gamboa and Amosco (2024) highlighted that optimized queue management systems enhance service efficiency by addressing staffing and process inefficiencies.

Table 3. Functional Efficiency of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. The amount of time it takes for a service to process a request and return a response.	4.78	VME	4.92	VME
2. Services utilize resources, such as servers, to access data from other applications.	4.88	VME	4.72	VME
3. The ability to remain functional despite a large number of concurrent accesses.	4.92	VME	4.68	VME
4. Behavior of the time in which the reading of the QR Code from the student ID.	4.79	VME	4.86	VME
5. Capacity of the system to send text messages.	4.89	VME	4.72	VME
Mean	4.85	VME	4.78	VME

Compatibility. It assesses how well the system integrates with existing hardware, software and procedures without causing disruptions or requiring significant modifications. Table 4 shows the IT experts' rating = 4.86 and students' rating = 4.88 both under Very Much Compatible (VMC). The system's high compatibility with various platforms suggests that it can be easily integrated into existing IT infrastructure. This implies that JRMSU Dipolog need no extensive reconfiguration of its current digital environment to deploy the system making implementation cost-effective and scalable. This also suggests potential for replication in other university campuses.

The system's high compatibility ratings suggest seamless integration with existing platforms and tools. Himo et al. (2022) meanwhile emphasized the importance of compatibility when they reported an overall compatibility rating for their system eventually facilitating easy deployment across various environments.

Table 4. Compatibility of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. Different composite services can share the use of same service operations.	4.78	VMC	4.79	VMC
2. Interoperable services exist. Services permit interaction between systems via interfaces and communication protocols.	4.92	VMC	4.92	VMC
3. Interoperable with any operating system platform.	4.88	VMC	4.89	VMC
4. Interoperable with any database version.	4.89	VMC	4.92	VMC
5. Interoperable with any Microsoft Office application.	4.82	VMC	4.89	VMC
Mean	4.86	VMC	4.88	VMC

Usability. It evaluates the ease with which users can interact with the system, including its interface, clarity of functions, and overall user experience. Table 5 assesses the system's usability, with mean ratings = 4.64 according to IT experts and mean = 4.81 according to students both categorized as Very Much Usable (VMU). These high ratings indicate that the system is intuitive, simple to operate, and easily accessible. These confirm that the interface is student-friendly and aligns with the principles of user-centered design. The students' higher rating implies a positive user experience which is crucial for long-term system adoption. The training requirements for system use are minimal even non-technical users can quickly adapt implying the system's acceptance across user groups.

Usability scores indicate that the system is user-friendly and accessible which is consistent with findings of Abdulle (2021) after reporting that electronic queue management systems improved customer service by reducing wait-times and enhancing the user experience in Kenyan hospitals. Additionally, Himo et al. (2022) underscored the importance of intuitive design in queue management systems.

Table 5. Usability of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. Users can tell if this service meets their needs by looking at the service description, which includes how the service works and what kinds of data are sent.	4.59	VMU	4.79	VMU
2. The extent to which a service makes its operation easier to comprehend.	4.62	VMU	4.84	VMU
3. The system has characteristics that make it simple to operate and manage.	4.78	VMU	4.88	VMU
4. The system would only accept correct input from the user.	4.71	VMU	4.67	VMU
5. The system is placed in a space that is easy to use and is immediately visible to the majority.	4.48	VMU	4.89	VMU
Mean	4.64	VMU	4.81	VMU

Reliability. This is the system's consistency in performing its intended functions without failure, particularly during peak periods such as enrollment.

Table 6 yields scores = 4.63 from IT experts and 4.67 from students described as Very Much Reliable. The system's ability to perform consistently, recover data, and remain operational under various conditions underscores its dependability. This is

particularly important in academic institutions where system downtimes can delay vital processes such as enrollment and scholarship disbursement. The system supports uninterrupted service delivery and builds user trust in digital interventions.

Reliability ratings affirm the system’s consistent performance and data integrity. This aligns with the study by Himo et al. (2022), which reported a reliability rating indicating dependable system operations. Furthermore, Safdar et al. (2020) emphasized the significance of reliable queue management systems in maintaining continuous service delivery in healthcare settings.

Table 6. Reliability of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. Under regular operation, the system meets the need for reliability.	4.59	VMR	4.73	VMR
2. The system is operational and accessible when required for use.	4.72	VMR	4.79	VMR
3. The system operates as intended despite the presence of hardware or software faults.	4.71	VMR	4.59	VMR
4. The system can recover the data directly affected and re-establish the desired state of the system.	4.62	VMR	4.63	VMR
5. The system can store data in a longest time.	4.53	VMR	4.59	VMR
Mean	4.63	VMR	4.67	VMR

Security. It measures the system’s ability to protect sensitive student data and communication towards privacy and safeguarding against unauthorized access or breaches. Table 7 presents the system’s security ratings = 4.78 from IT experts and 4.57 from students both labeled Very Much Secure (VMS). While both groups acknowledge the system's effectiveness in preventing unauthorized access and protecting data, the slightly lower student rating may reflect limited understanding of underlying security mechanisms. The analysis suggests that while the system has strong technical safeguards, user education on data privacy and security protocols may further improve user confidence. This reminds developers to provide more visible or transparent indicators of system security to reassure users.

Security assessments reflect the system’s effectiveness in protecting data and preventing unauthorized access. Himo et al. (2022) highlighted the importance of security in queue management systems when they noted that minor changes should be implemented to maintain user data confidentiality during deployment. Additionally, ensuring robust security measures is crucial for user trust and compliance with data protection regulations.

Table 7. Security of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. The system ensures that data are accessible only to those authorized to have access	4.73	VMS	4.59	VMS
2. The system prevents unauthorized access to, or modification of, computer programs or data.	4.82	VMS	4.55	VMS
3. The system refused to accept the wrong inputs from the user.	4.79	VMS	4.48	VMS
4. The system can detect which actions of an entity can be traced uniquely to the entity.	4.85	VMS	4.62	VMS
5. The ability of the system to know the owner of the data entered into the system.	4.71	VMS	4.59	VMS
Mean	4.78	VMS	4.57	VMS

Maintainability. This describes how easily the system can be updated, repaired or improved over time including responsiveness to errors and system upgrades. Table 8 showed a rating = 4.58 from IT experts and 4.63 from students described as Very Much Maintainable. These results indicate that the system is easy to update, debug, and adapt to changing institutional needs. The ability to fix bugs without affecting core functionality ensures the system’s long-term effectiveness and resilience. The

University's IT people can manage and maintain the system internally reducing reliance on external vendors and thereby enhancing cost efficiency and sustainability.

Maintainability scores suggest that the system is easy to update and adapt to changing needs. This is corroborated by Himo et al. (2022) when their system's maintainability rating indicated that the system could be efficiently modified and scaled as required. They disclosed that effective maintainability ensures the system's longevity and adaptability to evolving institutional requirements.

Table 8. Maintainability of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. The ease with which this system can be updated.	4.62	VMM	4.73	VMM
2. This project can be used in more than one system, or in building other assets.	4.59	VMM	4.55	VMM
3. It is easy to check and see the changes and contrasts in the system if there is an unexpected change.	4.67	VMM	4.68	VMM
4. The ease with which the client-side program can be modified without affecting the server-side program or vice versa.	4.48	VMM	4.62	VMM
5. Easily fix system bugs if any.	4.55	VMM	4.59	VMM
Mean	4.58	VMM	4.63	VMM

Portability. It assesses the system's ability to function across different platforms, devices, or institutional branches, and how easily it can be deployed in other campuses or settings. Table 9 addresses portability with scores = 4.52 (IT experts) and 4.37 (students), both under Very Much Portable (VMP). While these ratings are still favorable, these are considered low especially from the students' perspective. This implies concerns about deploying the system on different hardware or platforms without performance loss. The interpretation suggests that while technically portable, the system may require some hardware-specific configurations or staff support when implemented in varied environments. Nonetheless, the ratings confirm that the system has the potential for deployment beyond the current location with appropriate planning.

Portability ratings indicate that the system can function across different environments though some concerns exist regarding deployment on various hardware configurations. Himo et al. (2022) achieved a portability rating demonstrating that their system could be effectively deployed across multiple platforms. Accordingly, addressing portability challenges is essential for broader implementation and scalability.

Table 9. Portability of the Program

Items	IT Experts		Students	
	AWV	D	AWV	D
1. The system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments.	4.59	VMP	4.44	VMP
2. The system can be successfully installed and/or uninstalled in a specified environment.	4.42	VMP	4.40	VMP
3. The system can replace another software product for the same purpose and environment.	4.53	VMP	4.38	VMP
4. Parts of the system can be easily replaced without disturbing other parts of the system.	4.58	VMP	4.29	VMP
5. The system software can be installed at any time on any computer.	4.48	VMP	4.33	VMP
Mean	4.52	VMP	4.37	VMP

Table 10 presents a consolidated summary of the system’s overall performance across the eight indicators, namely: sustainability, efficiency, compatibility, usability, reliability, security, maintainability, and portability. These indicators reflect both the technical robustness and user satisfaction with the Ticketless Student ID-Operated Queue Management Optimization with SMS Notification and Voiceover Feature through the Public Address System. The mean ratings provided by IT experts ranged from 4.52 to 4.86, while student ratings ranged from 4.37 to 4.88. The grand mean for both evaluators indicates a strong overall approval of the system's design, implementation, and functionality.

For instance, Daluyon and Zamora (2024) developed a Student Evaluation System for faculty performance at the University of Rizal System. Their system was evaluated based on ISO 25010 software quality criteria, encompassing functional suitability, performance efficiency, usability, reliability, security, maintainability, and portability. The results indicated that the developed system was generally acceptable with high ratings across all evaluated attributes, suggesting strong user satisfaction and system effectiveness.

This comprehensive evaluation aligns with the findings of Himo et al. (2022), who accordingly remarked that high performance across multiple dimensions of the newly-developed system underscores its readiness for full implementation and potential as a model for other institutions. Paragas (2023) highlighted the prospect of alleviating queuing inefficiencies in public institutions.

Table 12. Summary on the Ticketless Students’ ID Operated Queue Management

Items	IT Experts		Students	
	Mean	D	Mean	D
1. Sustainability	4.74	VMS	4.67	VMS
2. Efficiency	4.85	VME	4.78	VME
3. Compatibility	4.86	VMC	4.88	VMC
4. Usability	4.64	VMU	4.81	VMU
5. Reliability	4.63	VMR	4.67	VMR
6. Security	4.78	VMS	4.57	VMS
7. Maintainability	4.58	VMM	4.63	VMM
8. Portability	4.52	VMP	4.37	VMP
Grand Mean	4.70		4.67	

4.0 SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary of findings, conclusions, and recommendations of the study.

4.1 Summary of Findings

The study revealed the following:

1. There was no existing Queue Management System in the JRMSU Dipolog Campus to address the efficiency needs of the University. The enrollment process at JRMSU–Dipolog Campus traditionally experiences inefficiencies due to manual queuing systems.
2. The traditional queuing system employed during the enrollment process at Jose Rizal Memorial State University- Dipolog Campus particularly in the Registrar’s Office and the Cashier’s Office was long been marked by inefficiencies such as prolonged waiting times, congested hallways, and the absence of real-time communication with students. These challenges not only led to student inconvenience and discomfort but also disrupted the workflow of administrative personnel and diminishing overall institutional productivity.
3. A hybrid QMS known as Ticketless Students ID Operated Queue Management Optimization with Short Message Service (SMS) Notification and Voiceover Feature through Public Address System was designed to address the problem.
4. The developed Ticketless Student ID-Operated Queue Management Optimization with SMS Notification and Voiceover Feature through the Public Address System involved a ticketless ID-based registration system, a real-time SMS notification feature via SMS gateway, a voiceover announcement system connected to the campus Public Address (PA) system, a real-time queue dashboard, a database and admin control panel for logging queue transactions, managing settings, and generating reports. These combined features enabled a hybrid solution that blends automation, accessibility, and real-time communication to improve queue management and service delivery at JRMSU – Dipolog Campus.

5. The Ticketless Student ID-Operated Queue Management Optimization with SMS Notification and Voiceover Feature through the Public Address System was found very much sustainable, very much efficient, very much compatible, very much usable, very much reliable, very much secure, very much maintainable, and very much portable.

4.2 Conclusions

The absence of a formal Queue Management System (QMS) at Jose Rizal Memorial State University – Dipolog Campus has long contributed to operational inefficiencies particularly during high-demand periods. The traditional manual queuing system prevalent in the Registrar's and Cashier's Offices resulted not only in prolonged waiting times and overcrowded service areas but also in diminished student experience and staff productivity. These inefficiencies reflect a broader institutional gap in integrating technological solutions to support service delivery in a growing academic environment. The development of the Ticketless Student ID-Operated Queue Management Optimization with SMS Notification and Voiceover Feature through the Public Address System represents a strategic shift toward digital transformation in university administration. More than a technological upgrade, the system embodies a rethinking of service accessibility, student engagement, and organizational responsiveness. Built through the Agile methodology, the iterative and user-informed development process ensured that the solution was responsive to actual needs on the ground. Each component from ticketless ID registration and SMS alerts to voiceover announcements was not simply a convenience feature but a deliberate intervention to address specific pain points such as lack of fairness, communication delays, and disorganized crowd flow.

Along this context, the strong performance ratings across sustainability, efficiency, compatibility, usability, reliability, security, maintainability, and portability reveal more than just technical success as they indicate a high level of system acceptability and trust among users. The system's usability in particular reinforces the value of human-centered design in technology implementation within academic institutions. Importantly, the application of Queueing Theory gives this study both theoretical and practical depth in evaluating the system's ability to maintain optimal queue lengths, manage arrival rates, and minimize waiting times which practically means that the solution is not only functional but also analytically sound. This theoretical alignment offers a replicable model for other institutions facing similar challenges.

The study demonstrates that well-designed, theory-informed, and user-responsive systems can transform institutional inefficiencies into opportunities for innovation. The hybrid queue management system is more than a localized solution as it represents a scalable model for other institutions which targets to modernize operations. Ultimately, this study affirms that digital transformation when rooted in real-world challenges and supported by sound theory can meaningfully enhance service quality, operational effectiveness, and stakeholder satisfaction in higher education settings.

4.3 Recommendations

On the basis of the study's findings and conclusion, the following recommendations are hereby served:

1. The University may prioritize upgrading or calibration of touch screen hardware used in the system to avoid delays on touch screen responsiveness which can hinder user interaction during peak periods.
2. The University may consider investing in higher-sensitivity touch screen devices to ensure smooth performance and fast and accurate touch screen functionality.

Future researchers may enhance the portability aspect of the Ticketless Student ID-Operated Queue Management Optimization with SMS Notification and Voiceover Feature through the Public Address System by exploring optimization of the system's adaptability across various hardware configurations, operating environments, or contexts for deployment flexibility and wider applicability towards consistent system performance.

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