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TECHNOLOGICAL OPTIMIZATION OF RESORT SERVICES FOR PROCESS EFFICIENCY AND MANAGEMENT OPERATIONS

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ABSTRACT
This study on the technological optimization of resort services for process efficiency and management operations examined how digital solutions can address persistent issues in traditional resort booking processes, including double bookings, misplaced records, delayed responses, and inconsistent customer service. Using Ishikawa analysis, SWOT analysis, human-centered design principles, and structured system evaluation, the research identified core operational challenges that guided the development of an optimized resort management system. The developed system provides real-time room and cottage availability, supports seamless online booking, implements GCash payment validation through automated transaction checking with partial manual verification, sends automated alerts, offers a centralized management dashboard, and includes a 24/7 chatbot for guest inquiries. System evaluation through user testing and surveys conducted with resort staff and guests resulted in a high usability rating of 4.8 out of 5, indicating improvements in operational accuracy, response speed, and customer satisfaction. While the system demonstrates a cost-efficient and scalable alternative to manual processes, limitations include dependence on stable internet connectivity and partial payment processing. Future enhancements are recommended to incorporate a full online payment gateway, a dedicated mobile application, and advanced analytics to support data-driven short- and long-term decision-making. These improvements support sustainable service quality and informed managerial planning.

Keywords:
Technological optimization, Resort management system, Online reservation, Process efficiency, Management operations, GCash payment integration, Automation.

INTRODUCTION

New technology has changed how modern organizations operate. It enables faster service delivery, reduces errors, and lowers effort across many sectors. As institutions increasingly rely on digital platforms for complex tasks, well-managed research services are now viewed as a key factor in improving performance and supporting sound decision-making.

Effective research management requires coordination across four main stages: data collection, storage, analysis, and dissemination. Traditional manual systems, fragmented workflows, and weak integration between technologies often disrupt these stages (Acharya, 2024; James & Osasere, 2023). Such limitations increase the risk of errors, delay outputs, and reduce the overall effectiveness of institutions that depend on reliable information.

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Recent studies show that digital reservation, monitoring, and management systems significantly improve daily operations. Research in the tourism and resort sectors indicates that technology reduces human error, enables real-time monitoring, and supports better resource allocation (Balintag et al., 2025; Fitriastuti et al., 2025). Similarly, advances in artificial intelligence, microservices, cloud computing, and web-based platforms demonstrate that organizational performance, automation, and data reliability improve with digital adoption (Barua, 2022; Neicu et al., 2020; Vargas-Calderón et al., 2021). The growing use of AI-supported decision tools, user-friendly interfaces, and automated workflows highlights the need for research-focused institutions to modernize their operational systems.

Despite strong evidence supporting digital solutions, many research service units in academic and public institutions still face challenges such as inconsistent procedures, inefficient data handling, and the lack of an integrated digital management platform. These gaps point to the need for a technology optimization framework designed specifically for research services. When intelligent tools and automated processes are integrated, organizations benefit from improved transparency, accuracy, and efficiency—qualities essential for reliable research outcomes, stakeholder trust, and institutional growth (Sousa et al., 2024; Shahzad et al., 2024).

This study therefore aims to test and apply technology optimization strategies that enhance the efficiency of research services and strengthen management functions. By aligning technological solutions with service needs, institutions can develop streamlined, data-driven systems that support research productivity in an increasingly digital environment.

REVIEW OF RELATED LITERATURE

The increasing adoption of digital tools within organizations has transformed service delivery, work speed, and decision-making across multiple sectors. Studies show that manual and obsolete systems often create bottlenecks, inconsistencies, and delays, prompting institutions to adopt automated, web-based platforms that streamline operations. In the hospitality and tourism sectors, technology optimization in research and service systems has reduced errors, enabled real-time information tracking, and improved guest satisfaction (Acharya, 2024; James & Osasere, 2023; Khan et al., 2021). Systems such as SORMS and Nature Spring Resort's online platform demonstrate how digital booking solutions improve record accuracy, response time, and information handling capacity (Balintag et al., 2025; Fhel Dancel et al., 2024). Similarly, platforms developed using frameworks such as Laravel and integrated with payment gateways like Midtrans enhance transaction security, support smooth data processing, and provide managers with real-time operational oversight (Fitriastuti et al., 2025; Ismail, 2023).

Beyond reservation systems, recent literature highlights the growing role of artificial intelligence, machine learning, and microservices in improving operational performance. Research on AI-enabled systems indicates that these technologies can automate tasks previously performed by humans, support data-driven decision-making, and predict system stability through continuous data processing (Deshpande et al., 2022; Barua, 2022; Barua & Kaiser, 2022). Previous studies further demonstrate that AI improves user experience, enhances access to information, and increases overall service quality in both tourism and education contexts (Sousa et al., 2024; Shahzad et al., 2024). In addition, machine learning has proven effective in analyzing customer feedback and evaluating service quality, enabling organizations to identify service gaps and implement targeted improvements (Vargas-Calderón et al., 2021).

User acceptance and interface design are also critical factors influencing the success of digital platforms. Chen et al. (2022) report that perceived risk, system complexity, and resistance to change can discourage travelers from using mobile ticketing services. Similarly, Wei et al. (2023) find that poor navigation and unclear interfaces make service recovery difficult on online travel platforms. These findings emphasize the importance of user-centered design, clear communication, and intuitive navigation. Tsai (2023), in a comparative analysis of major travel e-business models, reinforces this view by highlighting transparency, accessible information, and competitive digital frameworks as essential elements of effective system design.

Technology adoption also plays a significant role in organizational development and employee performance. Research in environmental and organizational management shows that digital tools enhance employee awareness, improve compliance, and support the achievement of institutional goals (Antari et al., 2024). Advances in service technologies are closely linked to higher customer satisfaction, making continuous system upgrades essential for maintaining service quality (Truong et al., 2020). Cloud computing has received particular attention, as it accelerates communication, expands operational reach, and strengthens data management capabilities (Neicu et al., 2020). For research-focused institutions, these features are especially valuable in supporting shared information environments. Complementing cloud solutions, web-connected IoT

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monitoring and location systems further improve data accessibility and service quality by providing timely and accurate operational insights (Jamil et al., 2025).

Overall, the literature consistently demonstrates that the adoption of digital platforms, artificial intelligence, cloud services, and user-centered design leads to faster, more accurate, and more reliable services. Findings from hospitality, tourism, and commercial booking systems are equally applicable to research service units. As research institutions increasingly manage large volumes of data, submissions, and administrative processes, the integration of modern digital technologies becomes essential for efficient workflows, transparent operations, and data-driven decision-making.

METHODOLOGY

The study on Technological Optimization of Resort Services for Process Efficiency and Management Operations was conducted. The work took place at Northwestern Mindanao State College of Science and Technology in Labuyo, Tangub City, Misamis Occidental, Philippines. Every step - data collection, system testing and full implementation - happened on campus so that the outcomes would be accurate, valid and dependable. Because the study ran inside the real workplace, the researchers watched the actual problems that the staff faced and checked that the system worked under true resort conditions.

Research Methodology

The study used a mixed methods plan that placed side by side two kinds of evidence. It drew on qualitative tools - Human Centered Design, a Conceptual Framework, an Ishikawa Diagram, SWOT analysis, BPMN modelling besides Core Benefits Analysis. Those tools exposed day-to-day problems and showed what users required. It gathered numbers through a survey that asked participants how they saw the present hand worked process plus that rated the ease of use and the payoff of the planned system. The two strands together gave a full picture of how staff experience the current workflow but also of how well the new technology supported way of running operations is expected to perform and to help. In addition to the above approaches, a strategic planning framework was developed as the general project methodology and guided the development of the propose technological optimization of research services for process efficiency and management operations. Strategic planning is ideal for system development objects because it provides an organized and iterative approach for identifying the customers online transactions.

Research Participants

The respondents of the study consisted of 45 participants, including 5 administrators and 40 end-users who were directly involved in or affected by the system's operation. Participants were selected using purposive sampling, as they possessed the necessary experience and familiarity relevant to system evaluation. All participants took part in the survey and system testing activities.

Research Instruments

A researcher-developed questionnaire was used as the primary data-gathering instrument. The questionnaire utilized a 5-point Likert scale, where:

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neutral
- 2 – Disagree
- 1 – Strongly Disagree

The instrument evaluated the system based on the following criteria: functionality, usability, reliability, efficiency, and user satisfaction. To ensure reliability, the questionnaire items were reviewed and validated by subject-matter experts prior to deployment.

Data Collection Procedure

Data collection was conducted after the full implementation of the system in its actual operating environment. Participants were oriented on the purpose of the study and the proper use of the system. After a period of hands-on system usage, respondents were asked to complete the evaluation questionnaire. Observations and feedback during system use were also noted to support quantitative findings.

Data Analysis Technique

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Collected data were analyzed using descriptive statistical methods, specifically frequency counts, percentages, and weighted mean. The weighted mean was used to determine the overall level of system performance based on the respondents' ratings. Results were interpreted using predefined scale ranges to assess the system's effectiveness and acceptability.

Ethical Considerations

Ethical standards were strictly observed throughout the study. Participants were informed of the study's objectives and their participation was entirely voluntary. Informed consent was obtained prior to data collection. Respondents were assured of the confidentiality and anonymity of their responses, and all collected data were used solely for academic and research purposes.

Human Centered Design

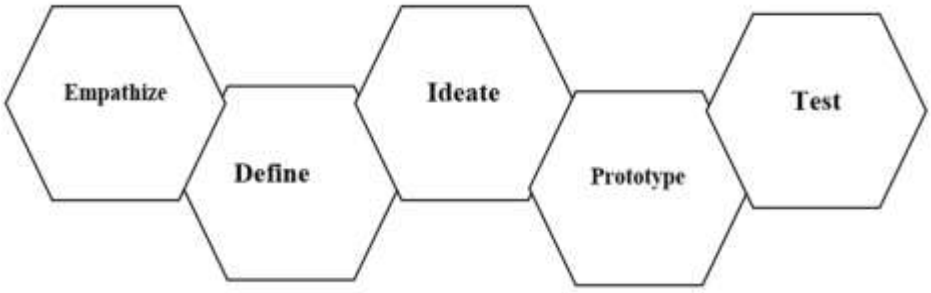

Figure 1 Human Centered Design

The study also applied the Human-Centered Design (HCD) framework to ensure that the system was tailored to the real needs of its users. The work started with the Empathize step. The team spoke with staff and guests to learn what problems the paper reservation system caused. Next came the define step the main troubles were slow bookings, wrong messages plus lost records. In the Ideate step the team listed the features the new system must have. After that the Prototype step produced a first working model of the electronic booking tool. During the Test step users tried the system, the code was checked and faults were fixed so the tool would run but also would be easy to use. In the last step Implement, the finished booking system went live and became part of the resort's daily work.

Input–Process–Output (IPO) Diagram of the Proposed Resort Reservation System

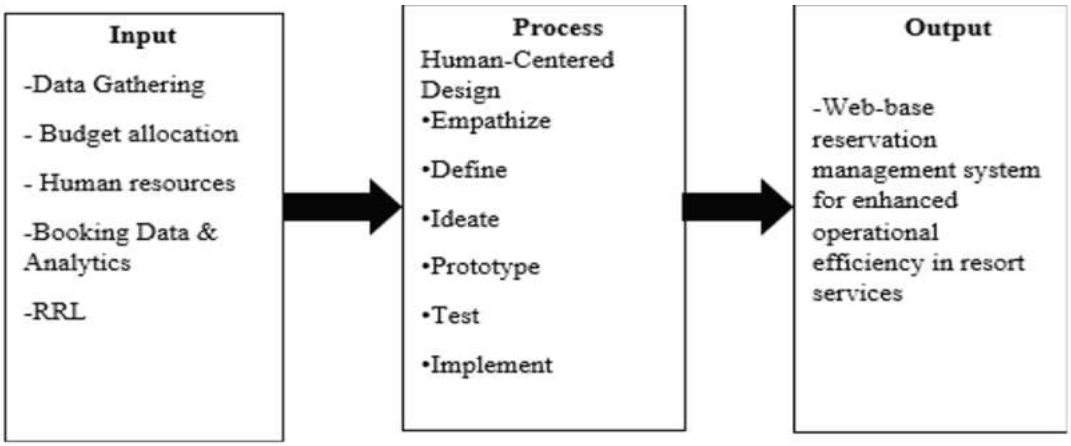

Figure 2 Input–Process–Output (IPO) Diagram of the Proposed Resort Reservation System

As shown in Figure 2, the system architecture uses the Input-Process-Output model to show the step-by-step path for building the online booking system. Input covers the raw materials - data to collect, the budget, staff, past booking records, analytics and relevant literature. Process applies Human-Centered Design - first grasp what users need, state the exact problems, invent solutions, build prototypes, test them plus revise until the

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system works well and feels easy to use. Output is the working online booking system delivered at the end. Taken together the IPO model gives a plain, orderly map for planning, building but also explaining both the design and its results.

Ishikawa Diagram

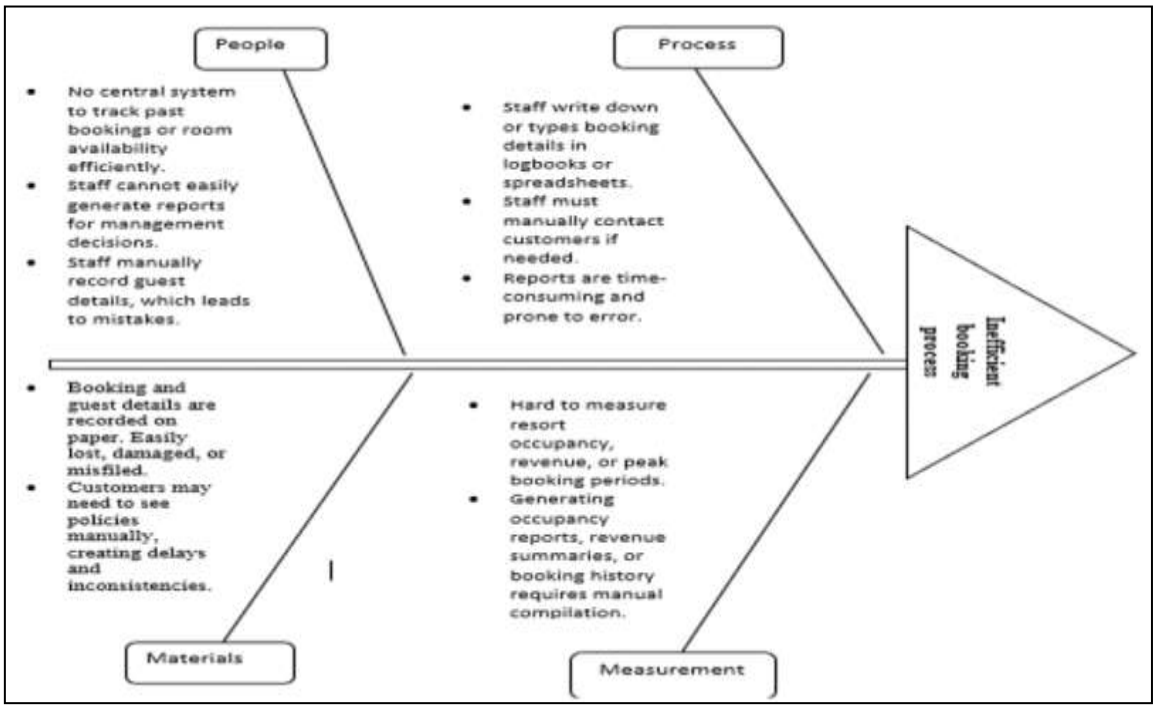

Figure 3: Ishikawa Diagram (Fishbone Diagram)

The Ishikawa Diagram proved to be another tool to find the root causes of inefficiencies in the manual booking process. According to the results, the staff's technical skills were insufficient (People), manual recording was responsible (Process) for the errors and delays, the old logbooks and paper records were restricting the accuracy (Materials), and the lack of proper tracking tools was impeding (Measurement) the monitoring of occupancy and revenue.

SWOT Analysis

Table 1
SWOT Analysis

STRENGTHS	WEAKNESSES
• Equipped with basic digital tools such as computers, mobile phones, and stable internet connection • Management and staff willing to adapt to technological innovations.	• Limited technical knowledge among staff in handling digital systems. •Dependence on unreliable internet connectivity, which can disrupt online booking operations.
OPPORTUNITIES	**THREATS**
• Attract customers beyond the local area through online visibility. •Strengthen competitive advantage compared to other local resorts relying on manual bookings.	• Technical issues, system downtime, or cybersecurity risks may disrupt operations. • Customers' lack of familiarity with online booking could lead to missed reservations

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The SWOT analysis presented in Table 1 demonstrates the strengths, weaknesses opportunities and threats associated with the implementation of a new technology to improve process efficiency at the resort and improve operational management efficiencies. As strength factor the resort has basic digital tools available and also staff members that are willing to use the new technology developed. Weaknesses include the limited technical skills of the staff and reliance on the internet to access the new system which will limit their ability to utilize it. Converting from manual to automated booking for example, may increase the number of clients to the resort and make it more attractive to other resort operators. Threats identified in the analysis include; technical problems with the new system, technical down time experienced when transitioning from the old system to the new system, cybersecurity risk and the potential risk of the customer base not being familiar with online booking. The SWOT analysis therefore highlights both the potential positives and negatives of introducing the new system and clearly states what has been outlined above in terms of the potential benefits of implementing this technology to improve the overall effectiveness of the operations of the resort.

Cost Benefits Analysis

This section presents the financial analysis of the proposed system based on the projected costs as well as benefits. The table lists the projected implementation cost and the anticipated annual benefits. It shows how the system improves operational efficiency, lowers the manual workload or reduces overall costs.

To determine how long it will take for the project to recover its total investment through the generated benefits, the proponents used the Payback Period analysis.

General formula is:

$$\text{Payback Period} = \frac{\text{Total Investment}}{\text{Annual Benefit}}$$

Given to this estimated data:

Cost/Investment:	Benefits (Cash Inflows):
Year 1: ₱30,000	Year 1: ₱23,000
Year 2: ₱3,000	Year 2: ₱35,000
Year3: ₱3,000	Year3: ₱73,000

COST	YEAR 1	YEAR 2	YEAR 3	TOTAL
System Customization	₱10,000			₱10,000
Domain and Hosting	₱1,000	₱1,000	₱1,000	₱3,00
Third-Party Payment Integration	₱2,000			₱2,000
Tablet/PC for admin	₱15,000			₱15,000
Maintenance & Support	₱2,000	₱2,000	₱2,000	₱6,000
TOTAL COST	₱30,000	₱3,000	₱3,000	₱36,000

BENEFITS	YEAR 1	YEAR 2	YEAR 3	TOTAL
COST SAVINGS				
Increased Reservations	₱10,000	₱15,000	₱30,000	₱55,000
Avoided Overbooking & Manual Errors	₱5,000	₱5,000	₱5,000	₱15,000
24/7 Availability	₱5,000	₱10,000	₱30,000	₱45,000
No Missed Sales from Confusion	₱3,000	₱5,000	₱8,000	₱16,000
TOTAL BENEFITS	₱23,000	₱35,000	₱73,000	₱131,000

Figure 4 Cost Benefits Analysis

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RESULTS AND DISCUSSION

Word Breakdown Structure Progress

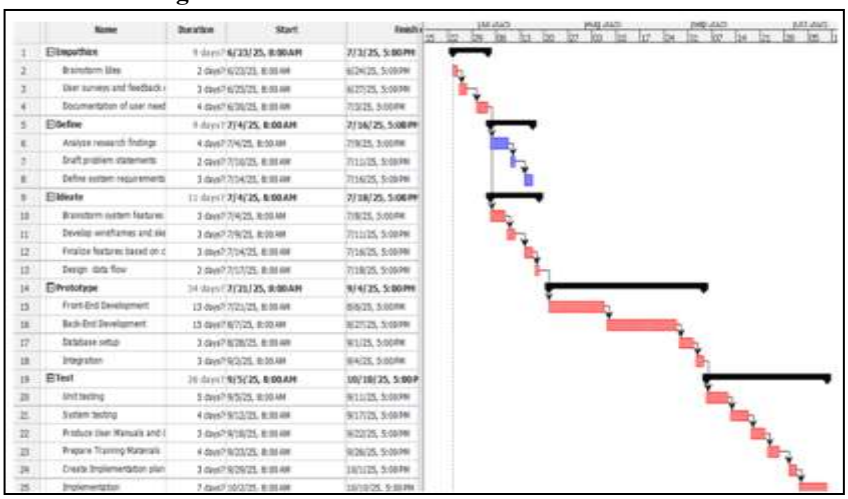

Figure 5 Work Breakdown Structure Progress

The Work Breakdown Structure (WBS) is created in this study to breakdown the implementation of the online booking system into smaller pieces of work. The project as a whole can be broken down into smaller tasks encompassing the planning of the system, the design, implementation, testing, deployment, and training. The WBS is made up of smaller tasks in which a functional and clear structure are provided to assist in defining the scope of work. Overall the WBS is used as a tool that can improve project planning, coordination and communication, and execution to improve successful implementation of the online booking system.

Structured System Evaluation

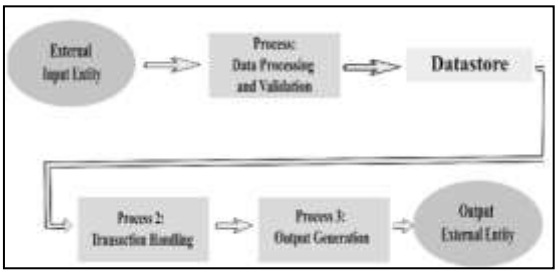

Figure 6 Structured System Evaluation

This structured system evaluation weighs in the comparison of four resort reservation systems on the availability of the main functional modules that are of prime importance for the smooth resort operations and customer service. The resort reservation systems that are being reviewed are: Online Beach Resort Reservation System,

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Web-Based Resort Room and Cottage Reservation Management System, Hotel Reservation System, and the Implementation of an Online Booking System for Generalao Mountain Resort (Proposed).

External Input Entity

The Input External Entity is the source of the users or stakeholders (e.g., visitors, or administrators) that start a dialog with the system by supplying data such as questions, booking requests, or transaction details. The first operation gets the input data from the external entity.

Process 1: Data Processing and Validation

The system performs checks on the given information to make sure that it is complete, accurate and correct before it is processed further. After the verification, the necessary data are put into the system's datastore from where they can be retrieved and referred to at a later time.

Datastore

The Datastore is the place where all the data that have been verified such as booking details, user information, and transaction records are stored. This guarantees that the data are saved for a long time and also makes it possible for other processes within the system to request the data they need.

Process 2: Transaction Handling

Process 2 use the data that has been retrieved from the datastore that is of relevance to them, followed by the execution of transaction-related tasks. For instance, they might be involved in the process of room availability, verification of booking, as well as the status updates pertaining to the booking.

Process 3: Output Generation

Transaction handling is complete; Process 3 gets the responsibility to generate the final output. The communication from the process takes processed data, which is formatted in an apt way that helps in preparing understandable booking confirmations, reservation summaries, notification messages, etc.

Output External Entity

The Output External Entity represents the receiver of the processed information. The parties that can be identified as the receiver are the guest, resort staff, or the management. The system provides the delivery of the communications in the form of confirmations, reports, or notifications. The system maintains a controlled flow whereby input from the user is first validated, stored safely, processed through various internal functions, and then presented as something useful. This method ensures that data is handled efficiently, with accuracy and interaction between users and the system being smooth.

Comparison of Four Resort Reservation Systems

Table 2 Comparison of Four Resort Reservation Systems

Functional Modules	Online Beach Resort Reservation System	Web-Based Resort Room and Cottage Reservation Management System	Hotel Reservation System	Online Booking System for Generalao Mountain Resort (Proposed)
Online Reservation	✓ Available	✓ Available	✓ Available	✓ Available
Room/Cottage Availability Display	✓ Limited (Rooms only)	✓ Limited (Rooms only)	✓ Limited (Rooms only)	✓ Limited (Rooms only)
Real-Time Booking Updates	✗ Not Real-Time	✓ Semi Real-Time	✓ Semi Real-Time	✓ Semi Real-Time
Customer Information Management	✓ Basic	✓ Basic	✓ Basic	✓ Basic
Payment Integration	✗ Not Available	✗ Not Available	✓ Available	✓ Available (Online & Walk-in)
Admin Dashboard	✓ Basic	✓ Available	✓ Available	✓ Available
Booking Confirmation (Email/SMS)	✗ Not Available	✗ Not Available	✗ Not Available	✗ Not Available
Report Generation	✗ Not Available	✗ Not Available	✗ Not Available	✗ Not Available
User-Friendly Interface	✓ Moderate	✓ Moderate	✓ High	✓ High
Customization for Resort Needs	✗ Limited	✓ Moderate	✗ Limited (Hotel-focused)	✓ Highly Customizable
Mobile Accessibility	✗ Not Mobile-Optimized	✓ Mobile-Friendly	✓ Mobile App/Web	✓ Mobile-Friendly
Overall System Suitability	Moderate	Good	Very Good	Excellent

The criteria used for system comparison were selected based on common functional requirements of reservation systems and related studies. These include booking accuracy, processing speed, usability, reporting capability, and customer support features. The criteria were chosen to ensure a fair and objective evaluation of the proposed system against existing systems, focusing on aspects that directly affect operational efficiency and user satisfaction.

Login Module

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The system provides secure user login, enables administrators to manage records, and supports automated report generation.

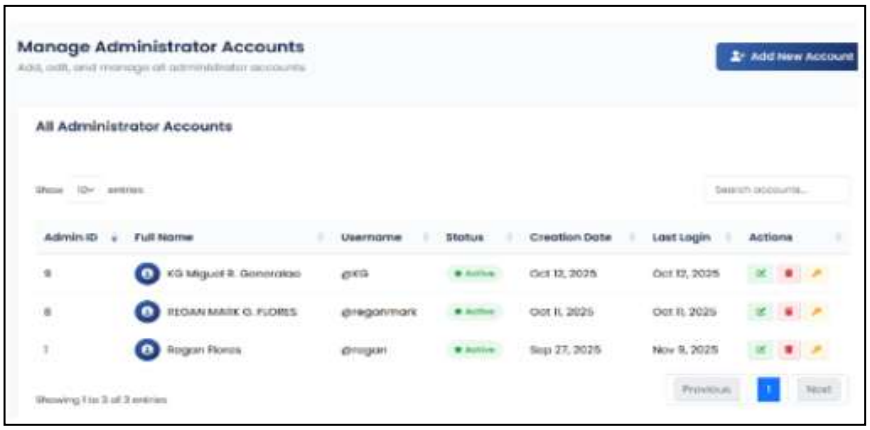

Figure 7 Login Module

Account / Admin Module

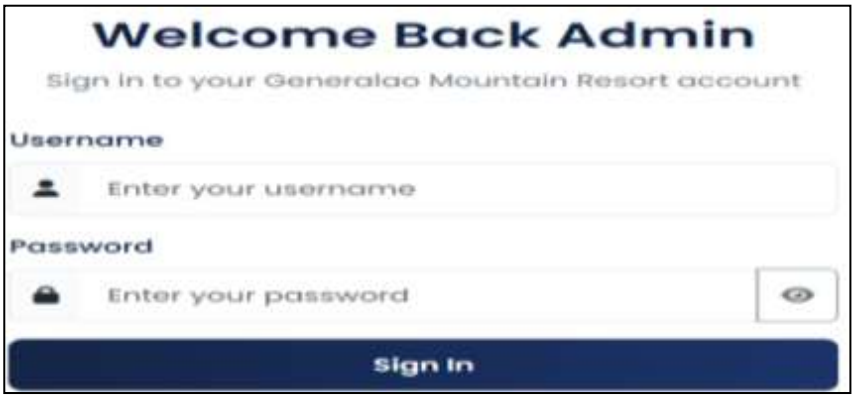

Figure 8 Account/Admin Module

Report / Summary Module

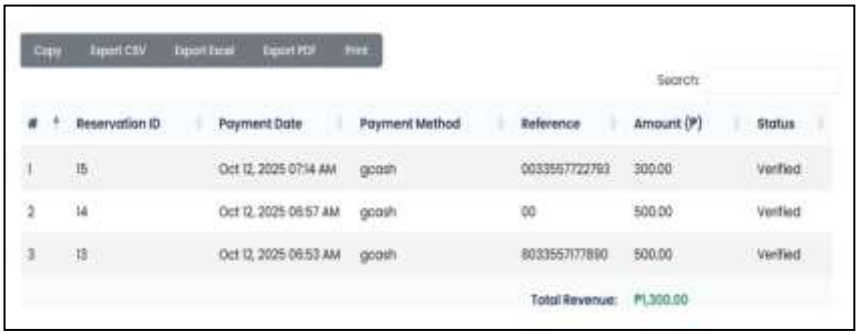

Figure 9 Report/Summary Module

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Chatbot Result

Figure 10 Chatbot Result

This chatbot can also be expanded in the future for incorporation with real-time bookings in alternative payment methods. In matters of security, it doesn't involve the storage of sensitive info, just as basic data protection principles. Finally, the rating for user satisfaction is high since users are appreciative of speed, and clarity provided by the system. Overall, the evaluation indicates that the chatbot is a valuable technology that improves customer service and operational efficiency.

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CONCLUSION

The Technological Optimization Booking besides Management Operations raises the speed, correctness and dependability of resort reservations. It handles bookings automatically, shows room status at once and improves communication - in this way it removes long standing operational problems. Tests show that guests plus staff express strong satisfaction, which proves that the system works.

Limitations

The system needs an even internet link - if the network drops, use becomes difficult. It has no automatic online payment gateway, therefore staff must check each transaction by hand. No mobile app exists - people who rely on apps have limited access. The system is missing the functionality for a customer login or account page - guests are unable to check their previous bookings or modify their reservations without assistance.

Future Work

Additionally, updates to these systems in the future could incorporate full online payment processing capabilities through services such as PayMongo or Maya, along with an exclusive iOS mobile application in addition to existing Android mobile applications. The application may also incorporate predictive advanced analytics for forecasting how many rooms at a specific location will have guests staying at any given time. Furthermore, it is anticipated that the system may aggregate reservations from multiple resorts owned by an owner/operator with the same parent corporation. Future developments may also focus on enhancing data privacy through stronger encryption and compliance with data protection regulations.

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