Courtyard Reserva: A Web-Based Booking System for Community Sports Facilities with Data Visualization and Scheduling Algorithm

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DOI: https://doi.org/10.51244/IJRSI.2026.13020059

Received: 02 December 2025; Accepted: 08 December 2025; Published: 28 February 2026

ABSTRACT

This study developed "Courtyard Reserva", a web-based single-court booking system with data visualization and a scheduling algorithm to improve the reservation process for community sports facilities. Traditional manual booking methods are inefficient, prone to errors, and limited by accessibility. The system allows users to view available schedules, request reservations online, and manage bookings in real time, while storing user profiles and booking records in a secure database to ensure accuracy and accessibility.

Anchored in Information Visualization and Scheduling Theories, the system integrates analytical dashboards and an automated scheduling algorithm that prevents double-booking, showing only the first schedule occupying a time slot. The development followed the System Development Life Cycle (Iterative Model) to allow continuous refinement. Key technologies include PHP, MySQL, HTML, CSS, and JavaScript, with Visual Studio Code, phpMyAdmin, and XAMPP supporting development and testing. Fifty (50) participants, comprising users and technical experts, evaluated the system using a 4-point Likert scale based on ISO 25010 standards, focusing on functionality, usability, reliability, and security.

Findings indicate that Courtyard Reserva achieved high usability and satisfactory functionality and reliability, though security features require further enhancement. Overall, the system streamlined booking processes, minimized scheduling conflicts, and improved administrative monitoring through data visualization. Recommendations for future development include enhanced security measures, system scalability for multiple facilities, mobile application integration, extended features for community services, and user training and documentation to ensure efficient operation.

Keywords: Courtyard Reserva, web-based booking system, community sports facilities, data visualization, scheduling algorithm, System Development Life Cycle, ISO 25010, PHP, MySQL, software usability

INTRODUCTION

The growing demand for accessible and efficient sports facility booking services has revealed the limitations of traditional booking methods. Manual systems that rely on physical records or basic spreadsheets are often prone to human error, double-booking, and lack of real-time accessibility. To overcome these issues, many studies have explored the transition to web-based booking systems designed to simplify scheduling, improve management efficiency, and enhance user satisfaction.

Booklux (2025) demonstrated how modern booking platforms can streamline operations by providing features such as real-time notifications, booking history tracking, and recurring or group reservations. These capabilities highlight how automation and data-driven tools optimize both customer experience and administrative workflows. Similarly, Mendis and Rathnayake (2020) developed GoPlay, a sports facility reservation application that automated manual processes and improved accessibility for both users and venue owners, underscoring the practicality of digitization in managing reservations efficiently.

Lim and Darman (2023) further supported this advancement by introducing a web-based booking system for badminton courts in Batu Pahat. Their system simplified scheduling for court owners and minimized booking conflicts through automated tracking and validation features. In addition, Avomo et al. (2022) presented an

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

online sports facility reservation model in Equatorial Guinea that provided an integrated platform for both management and marketing, proving that such systems can enhance visibility and resource optimization in developing regions.

To complement these developments, Ware (2020) emphasized the importance of information visualization in understanding and managing complex data. Applying this theory to booking systems allows administrators to interpret trends such as peak usage hours, customer patterns, and facility performance more effectively. By combining data visualization and automation, modern web-based platforms can support better decision-making and ensure more efficient use of community sports facilities.

The development of Courtyard Reserva is grounded in understanding the historical context and challenges faced by organizations managing courtyard booking systems. Abdullah, Tuan Mohd Yasin, and Md. Ali (2025) found that manual facility booking systems often result in inefficiencies, inaccuracies, and resource wastage, underscoring the limitations of traditional methods. Additionally, the "5 hidden costs of outdated facility booking methods" (SferaAI, n.d.) identify key problems such as under-utilization of assets, poor visibility into usage data, and missed revenue opportunities. These issues are further exacerbated by external pressures like economic downturns and resource constraints, which can impair operational efficiency.

In response, Courtyard Reserva, specifically designed for a single-court setting, modernizes and automates the reservation process by integrating advanced data analytics, a scheduling algorithm, and information visualization. Its Court Usage Insights feature provides administrators with real-time metrics such as utilization rates and peak booking hours, ensuring informed decision-making and preventing scheduling conflicts. The system is also designed to prevent double-booking: only the first schedule occupying a time slot is displayed, and overlapping reservations are automatically blocked.

The study aims to develop a web-based sports facility booking system tailored for a single-court facility, improving the scheduling process and user experience. The system eliminates the need for users to physically visit the facility just to pick a schedule by allowing them to view available time slots and make reservations online anytime and anywhere. The platform includes a database to store booking records, schedules, and user information, ensuring data accuracy and accessibility. Specific objectives include:

- Developing a web-based platform for single-court bookings with an integrated database to store schedules, user information, and booking records.
- Creating a user-friendly interface that allows sports enthusiasts to make reservations anytime and anywhere.
- Implementing administrative features to enable staff to efficiently manage and update user data, booking schedules, and records.
- Reducing errors and delays by automating the court booking and scheduling processes.
- Integrating data visualization tools that provide real-time insights into court usage, booking patterns, and scheduling efficiency through charts and dashboards.
- Developing the system following ISO 25010 standards, focusing on functionality, usability, reliability, and security.

Scope

This study focuses on the design and development of a web-based sports facility booking system. It includes the development of a secure database to store booking schedules, and records. Users can perform basic functions such as creating, updating, and cancelation of their reservations, while administrators have broader control through a dedicated admin interface.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

The platform features a dashboard that allows staff to monitor average-time courtyard usage, track user activity, view booking statistics, and sports booking details. For users, there's a login and booking form. The system also includes data visualization tools within the dashboard that present booked schedules, peak usage, and schedule density through interactive charts and graphs. These features help administrators make informed decisions, optimize sports courtyard availability, and enhance overall facility management.

Limitation

This study is not intended for actual business operations, hence, there is no integration of business services such as payment processing. The business operation issue is needed by the study for systems analysis and design research. User access is restricted to booking and viewing schedules, and no other facility services are provided through the platform. The system's security focuses on basic authentication and role-based access for users and staff but does not include advanced security features such as multi-factor authentication.

Maintenance, long-term technical support, and scalability to accommodate multiple courts or additional facilities are beyond the scope of this study. The system is also limited to internet-connected devices, requiring users to have online access to use the platform.

Theoretical Framework

The study is anchored in two major theories that support the system's functionalities in data visualization and scheduling optimization: Information Visualization Theory and Scheduling Theory. These frameworks guide the development of Courtyard Reserva's analytical dashboards and automated scheduling process for efficient sports facility management.

1. Information Visualization Theory - It emphasizes transforming complex data into graphical representations that enhance understanding, pattern recognition, and decision-making (Card, Mackinlay, & Shneiderman, 1999). In the context of Courtyard Reserva, this theory supports the system's use of interactive charts, graphs, and dashboards to present booking trends, court usage, and user activity. The theory is applied in the system through:

- Dynamic data dashboards that show reservation volumes, peak hours, and user behavior.
- Visual reports that allow administrators to monitor booking trends in real-time.
- Simplified data interpretation, allowing staff to make informed operational decisions based on visual insights.

2. Scheduling Theory – It involves the study of how resources can be allocated over time to optimize performance under certain constraints. It provides mathematical and algorithmic foundations for automating task assignments such as court reservations to avoid conflicts and maximize efficiency. In Courtyard Reserva, Scheduling Theory is used to:

- Implement a scheduling algorithm that prevents overlapping bookings and ensures fair slot distribution.
- Optimize time slots based on court availability, user demand, and priority rules (e.g., first-come, first-served).
- Maintain a reliable and conflict-free booking system by automating the validation of time slots.

Together, these theories establish a foundation for building a system that not only automates the booking process but also visualizes operational data in meaningful ways. This improves user experience, streamlines administrative tasks, and ensures that court reservations are both efficient and data-driven.

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Conceptual Framework

The study is anchored on the Input–Process–Output (IPO) Model that illustrates the logical flow of the system's operations—from user engagement to computational processing—culminating in an output that assist users in booking requests for use of a sport courtyard facility.

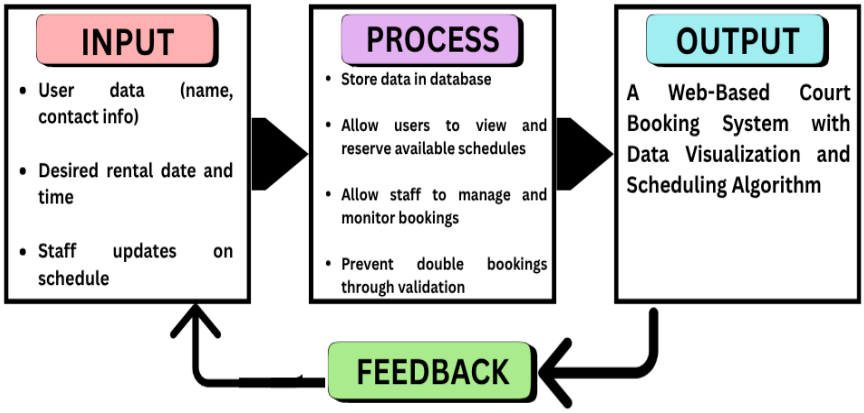

Figure 1: Conceptual Framework

As input, the system collects information from users such as their personal details, preferred court booking dates and times, and booking requests. This data is entered through the web-based interface by users who want to reserve the court.

Processing is designed to provide a secure and user-friendly reservation experience. It includes: (a) a database to store user profiles, booking records, and courtyard schedules; (b) an administrative panel where staff can manage and monitor bookings; and, (c) a front-end platform where users can view available schedules and make or update reservations.

The output is a system that automates booking process, to prevent double bookings, ensures accurate scheduling, and allows users to make reservations remotely. Staff are also able to efficiently oversee courtyard usage without relying on manual record-keeping. The system streamlines the entire process of scheduling and managing courtyard bookings.

The feedback part of the Conceptual Framework shows how the system's output helps improve the next cycle of inputs. After the system generates results such as confirmed bookings and updated schedules, this information guides both users and administrators in making better decisions. Users can adjust their reservations based on availability, while administrators can update schedules and manage conflicts more effectively. This feedback loop keeps the system accurate, responsive, and continuously improving.

Significance Of the Study

The development of Courtyard Reserva system aims to improve accessibility and efficiency in booking a sports facility. This study is significant to the following:

- Users – The system provides a convenient platform to check available time slots and reserve the courtyard without physically visiting the facility.
- Staff – The system streamlines reservation management by automating booking records to prevent double booking, and minimize paperwork. It allows staff to monitor, approve, and update reservations through an administrative interface.
- Future Researchers – This study may serve as a reference for future systems aimed at digitizing community services. Researchers can build on its core features by exploring enhancements such as payment integration, mobile compatibility, or expansion to other facilities.

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REVIEW OF RELATED LITERATURE

The shift from manual to digital systems has significantly improved the efficiency of reservation processes in sports facilities. Pedroche et al. (2024) emphasized the value of streamlining client reservation and monitoring systems through QR code scanning to improve convenience and entry-exit tracking. This supports the idea of developing accessible systems that minimize human error and reduce paperwork.

German et al. (2024) stated that adopting a web-based platform for facility bookings in the Philippines not only accelerates the reservation process but also introduces an eco-friendly and cost-effective alternative. Their findings are consistent with Jinisys Software Inc. (2022), which explained that the core of an online booking system is to enable users to view, schedule, and pay for reservations through a platform, enhancing user autonomy and transaction speed.

In addition, Courtslots (n.d.) was created by sports enthusiasts who recognized the need for digitized solutions in sports facility reservations. Their motivation reflects how user-driven systems can solve inefficiencies at the community level. However, modernization also requires robust data protection. The Department of Information and Communications Technology (DICT, 2024) emphasized the importance of adopting information security standards such as ISO/IEC 27000 to safeguard user data and ensure secure digital services.

Several local studies support the implementation of online booking systems across various sectors.

German et al. (2024) observed that online reservation platforms contribute to cost reduction and customer satisfaction by eliminating manual entry and paper-based processing. Lapuz et al. (2021) advanced this idea by incorporating data visualization tools into a web-based reservation platform, allowing stakeholders to make informed decisions based on real-time analytics and transaction history.

While not directly related to reservation systems, Gosela and Encarnacion (2024) introduced the LakByahe app, a web-based booking and reservation system using location-based services to enhance efficiency, accessibility, and sustainability. This highlights how innovative system design can address user needs while promoting sustainable digital transformation.

Internationally, the rise of online booking systems is attributed to their professional interfaces, secure payment processes, and real-time management features. Pitchbooking (n.d.) described how customizable platforms and user-friendly designs contribute to effective facility management. Similarly, Upperhand (n.d.) highlighted features such as optimized facility usage, real-time analytics, and efficient communication tools that ultimately improve operational outcomes and revenue.

Mărcuță and the MoldStud Research Team (2024) emphasized that integrating online booking systems into business operations can boost revenue and efficiency through streamlined workflows, analytics-driven decisions, and improved user experience. Salameh et al. (2023) further examined how website quality and online reviews influence users' intention and continued use of online hotel booking platforms, underscoring that system quality and positive user perception are essential for long-term adoption.

Globally, educational institutions and community groups have implemented online reservation systems to address inefficiencies in facility usage. Ahmad et al. (2024) developed a booking system for sports venues at UTHM, using web-based tools such as MySQL and PHP to improve accessibility and community engagement. Their system addressed inconsistent usage and aligned with institutional goals for community service.

Tshering et al. (2024) designed a web-based sports field booking system for Bhutan to enhance accessibility and management efficiency, demonstrating the role of technology in improving sports facility utilization.

Synthesis

Local and international studies show a clear trend toward digital transformation in sports facility booking management. Pedroche et al. (2024) and German et al. (2024) emphasize streamlining processes to provide users

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with greater convenience and control, while platforms like Courtslots demonstrate how community-based initiatives can address local booking needs through digital innovation.

Security remains essential. The Department of Information and Communication Technology (DICT, 2024) highlights standards to protect user data, and examples from Ahmad et al. (2024) and Mărcuță et al. (2024) show that scalable, modern systems can adapt to diverse user groups and operational goals.

Real-time analytics and user dashboards, as discussed by Lapuz et al. (2021) and Upperhand (n.d.), improve user experience and support management decisions. The Technology Acceptance Model (Fiorini et al., 2018) reinforces the need for systems that are intuitive and clearly enhance performance to achieve higher adoption rates.

These insights confirm that Courtyard Reserva has strong potential as a secure, user-friendly, and well-structured online booking and pricing management system.

METHODOLOGY OF THE STUDY

This study employs an applied research approach, utilizing both descriptive and developmental research designs.

The descriptive component analyzes the quantified data taken from assessment activities conducted to ascertain the system conforms with the ISO 25010 standards. The assessment data is given interpretation taken from a 4-point Likert Scale.

The developmental component centers on the design and implementation of Courtyard Reserva system. It includes key features such as real-time reservations, user and schedule management, and an interactive administrative dashboard. It integrates data visualization tools to present booking trends and usage patterns, as well as a scheduling algorithm to reduce conflicts and improve operational efficiency.

After developing the system, the researchers conducted primary data gathering to evaluate its performance. User respondents and technical experts tested the system and accomplished an assessment questionnaire based on the ISO 25010 software quality model. The gathered data measured the system's functional suitability, usability, reliability, and security. This evaluation process provided actual user feedback and served as the basis for determining whether the system met the intended quality standards.

The development of Courtyard Reserva system follows the System Development Life Cycle (SDLC) to ensure an organized and structured process. The study follows the Iterative Model, which emphasizes repeated development cycles to allow gradual improvements through feedback and testing. Rather than completing the system all at once, it is built in stages. Each version is refined before moving to the next.

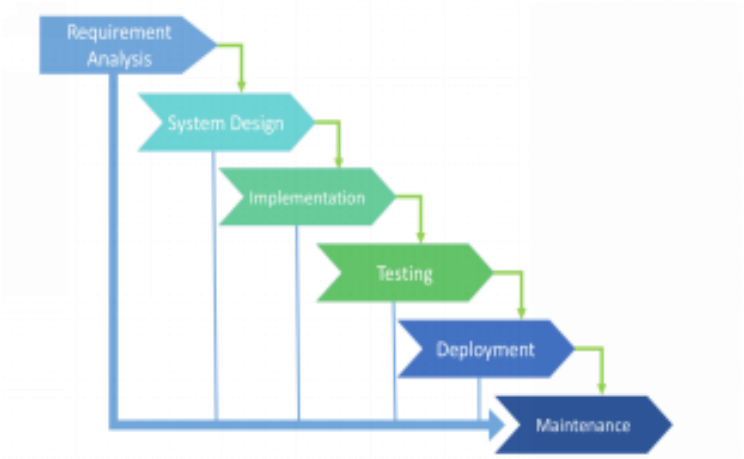

Figure 2: The SDLC Iterative Model

The above figure presents the Iterative Model used for the design and development of the system.

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- Analysis: Identify the requirements for a courtyard booking and pricing system, focusing on user needs, administrative workflows, and real-time availability.
- Design: Plan the system's structure, including the interface, database schema, and dashboard for scheduling and analytics.
- Implementation: Develop core modules such as schedule viewing, reservations, pricing management, and report generation.
- Testing and Evaluation: Perform functionality and usability testing in each iteration to ensure system reliability, performance, and user satisfaction.
- Deployment and Refinement: Launch the system incrementally, collect user feedback, and make enhancements based on real-world use.
- Maintenance: Apply ongoing updates to fix issues, improve efficiency, and add new features as needed.

This development model provides a flexible and adaptive process, allowing continuous improvement and resulting in a more accurate, scalable, and user-friendly court booking system.

The organization of vital data, including product characteristics, quantities, expiration dates, and user accounts, is greatly aided by database design. One of its design is a context diagram that shows how users engage with the system and its operations. It is a high-level visual depiction of the relationships between a system and its external entities such as users, other systems, or processes is called a context diagram. Without delving into specifics, it gives a general picture of how the system interacts with its surroundings.

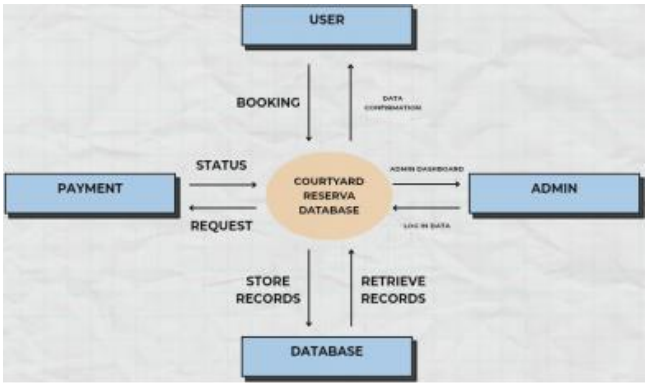

Figure 3. The Context Diagram

Figure 3 presents the context diagram of the Courtyard Reserva system. Users access the system to submit booking requests, provide personal details, and select schedules. The system responds by confirming reservations, displaying availability, and generating booking records. Administrators interact with the system through a dedicated login, granting them access to an administrative dashboard where they can manage bookings, monitor user activity, and oversee reservation data. All booking details, user accounts, and court schedules are stored and retrieved from the database to ensure accuracy and consistency. This overall setup ensures smooth booking operations, secure data handling to improve the management of a sports facility.

Respondents Of The Study

The study involved two groups of respondents: (a) user respondents and (b) technical experts.

The user respondents consisted of twenty (25) individuals. These are participants who are qualified to provide feedback based on their experiences as end-users of the system. They evaluated the system in terms of usability, functionality, and how it meets their needs from a user's perspective.

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The technical experts consisted of twenty (25) individuals, who are IT professionals. This group includes developers, system analysts, and other individuals with technical backgrounds in Information Technology. They assessed the system from a technical standpoint, focusing on aspects such as system performance, reliability, maintainability, and security.

Development And Evaluation Procedure

The development of the Courtyard Reserva system employed a combination of programming languages, software tools, and frameworks to ensure efficient functionality, accurate data handling, and a user-friendly interface. These tools were carefully selected to support a responsive web platform that enables users to book sports courtyards, visualize scheduling data, and manage reservations seamlessly. The main tools and technologies used include:

- PHP: Used for back-end development to handle server-side logic, manage booking transactions, and generate dynamic web content efficiently.
- HTML and CSS: Responsible for structuring and styling the web pages, ensuring a visually appealing, accessible, and user-friendly interface for users and administrators.
- JavaScript: Implemented to provide interactivity and real-time validation within the system, enhancing the responsiveness and overall user experience during booking and data visualization.
- MySQL: Chosen as the primary database management system for storing court information, booking records, user details, and system logs. Its strong integration with PHP ensures efficient data handling and scalability.
- phpMyAdmin: Utilized for managing the MySQL database through a graphical interface, enabling developers to easily create, modify, and maintain database structures.
- XAMPP: Used as the local web server environment integrating Apache, MySQL, and PHP, allowing smooth local development, testing, and debugging before deployment.
- Visual Studio Code: Served as the main coding environment for writing, editing, and managing the project's codebase efficiently, offering useful extensions and integrated development features.
- Git: Employed for version control and collaboration, enabling developers to track changes, manage updates, and ensure consistency throughout the system's development process.

The evaluation of the Courtyard Reserva system adhered to the ISO 25010 software quality standards, assessing the system's functionality, usability, reliability, and security in meeting the needs of both end-users and administrators. A structured questionnaire using a 4-point Likert scale was administered to collect feedback from users and technical experts.

This comprehensive development and evaluation approach ensured that Courtyard Reserva provides a reliable, secure, and user-friendly solution for single-court booking management, while also delivering actionable insights through data visualization and analytics.

Data Analysis Plan

To evaluate the effectiveness and performance of Courtyard Reserva system, statistical tools are used to support the assessment of core software quality attributes such as Functional Suitability, Usability, Reliability, and Security based on ISO/IEC 25010 standards. These include:

1. Frequency and Percentage Distribution - It shows how many respondents selected each option and what percentage that represents out of the total. This helps visualize general user perception of system functionalities.

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2. Weighted Mean - It is used to measure the average evaluation of the system's attributes (e.g., usability, reliability, security, and functionality). This method helps quantify data results into a single interpretable score per criterion.

3. Likert Scale – It a quantitative data analysis gathering method used in research and evaluations to gauge people's attitudes, beliefs, or perceptions. Respondents are shown a series of statements or questions. Numerical values are assigned to the responses, enabling quantitative data analysis. A weight of 4 means "Strongly agree" while 1 means "strongly disagree" on a standard Likert scale.

These statistical analyses helped the researchers evaluate whether the system met the desired quality standards and user expectations effectively.

The System

The Courtyard Reserva is a web-based sports courtyard booking system with Data Visualization and Scheduling Algorithm designed to streamline sports courtyard reservations solutions. The system enables users to book sports courtyards, manage reservations, and visualize usage statistics through an interactive dashboard. Developed using tools such as PHP, MySQL, HTML, CSS, and JavaScript, it ensures functionality, security, and responsiveness across devices while maintaining a user-friendly interface for both administrators and clients. The project addresses common issues such as manual booking errors, double scheduling, and lack of data visibility in courtyard management. Two of its interfaces include:

Figure 4: Home Page

As stated in the objectives, the web-based Courtyard Reserva System is designed and developed to allow users to view the booking calendar and access the court reservation form for efficient scheduling.

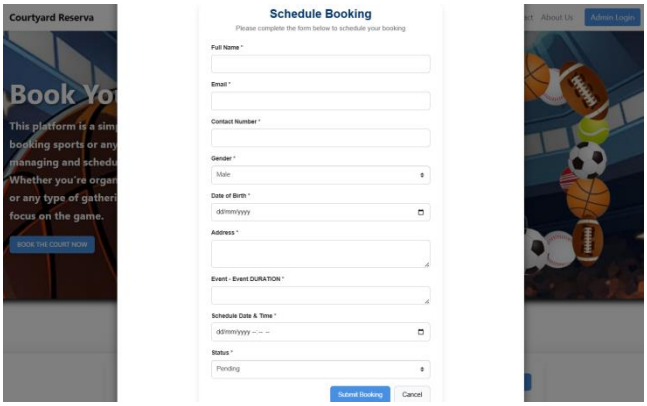

Figure 5. Schedule Booking Page

This page provides users with a structured form to input essential details required for court reservations, including full name, email, contact number, gender, date of birth, address, event with its duration, and preferred schedule date and time. Once submitted, the system records the booking and marks it as pending by default, awaiting confirmation from the administrator.

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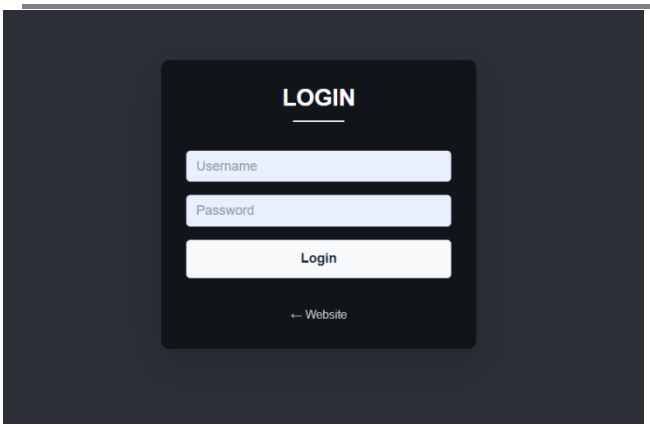
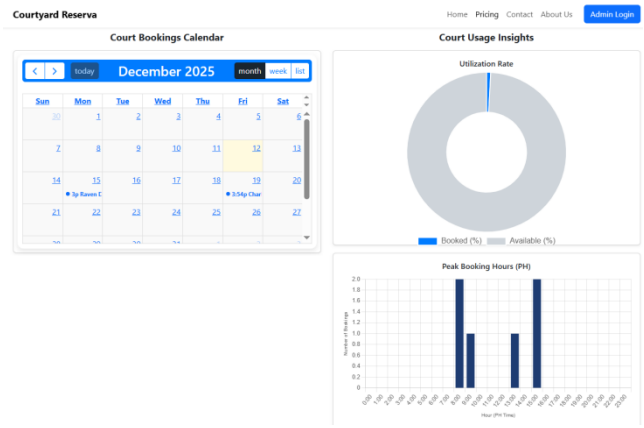
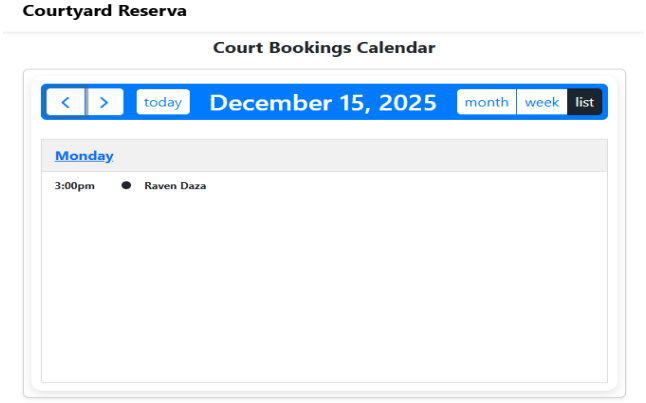


Figure 6. Admin Login Page

This page provides a secure access point for administrators through a login form requiring a username and password. Once authenticated, admins are redirected to their dashboard, where they can manage bookings, schedules, and user information.





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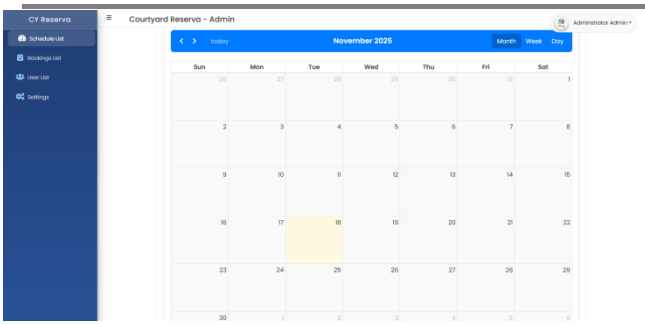

Figure 7. Schedule List Page

The system provides users with a clear court booking calendar on the home page, allowing them to easily view available and reserved time slots. This helps users check court availability before making a reservation. In addition, the administrator dashboard features a detailed calendar that displays all scheduled events by month, week, or day. When a double booking occurs, only the first schedule occupying the time slot is shown, while conflicting bookings are hidden to prevent overlap. Alongside this, the Court Usage Insights section visualizes key metrics such as utilization rates and peak booking hours. This organized layout enables administrators to efficiently track bookings, monitor court usage trends, and prevent conflicts.

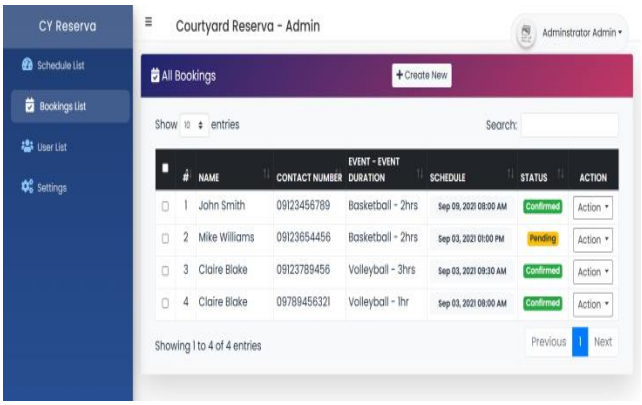

Figure 8. Booking List Page

This page is designed for administrators to manage all court reservations submitted by users. It displays a database-style table containing details such as the booking ID, client name, contact number, event and duration, schedule, and booking status. The admin can view, edit, confirm, or cancel bookings, as well as create new entries if needed. A search function is also available to quickly locate specific records, ensuring efficient handling of reservations.

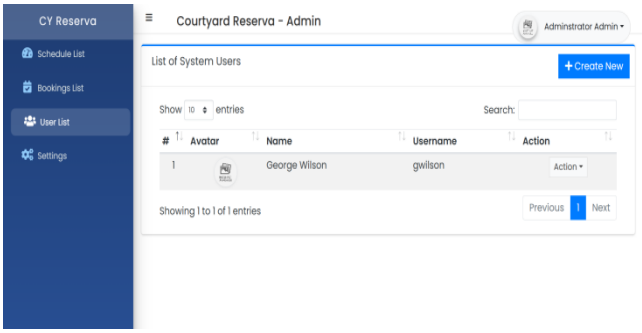

Figure 9. User List Page

his page allows administrators to manage all registered system users. It presents a table that displays user details such as ID, avatar, name, and username, with options to view, edit, or add new users. A search bar is also provided to help admins quickly locate specific accounts. This feature supports efficient user management and ensures proper monitoring of individuals accessing the system.

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Assessment: Summary Of Respondents On The System

This section presents the summary and comparison of respondents' evaluations of the Courtyard Reserva System based on the ISO 25010 software quality standards.

Respondents (groupings)	Size (n)	Percentage
Users	25	50
Technical	25	50
Total (n)	**50**	**100.0%**

Table 1: Distribution of Respondents

Table 1 shows the number of respondents (n) and their corresponding percentages. The respondents were composed of system users and technical experts who participated in evaluating the system's functionality, usability, reliability, and security. The combined responses provide an overall assessment of the system's performance from both user and technical perspectives.

Criteria (ISO25010)	Respondents (50)			
	Users (25)		Technical (25)	
	WM	VI	WM	VI
1. Functional Suitability	3.2	SA	3.0	A
2. Usability	3.4	SA	2.7	A
3. Reliability	3.3	SA	3.0	A
4. Security	2.4	A	1.7	DA
Overall Average Mean (gender)	3.1	SA	2.6	A

Table 2: Summary and Comparison of Evaluations of Respondents

Table 2 presents the summary and comparison of the evaluations of user respondents and technical experts based on the ISO 25010 quality characteristics. User respondents obtained an overall mean rating of 3.1, interpreted as Strongly Agree, while technical experts obtained an overall mean rating of 2.6, interpreted as Agree. These results indicate that users generally rated the system more favorably than the technical experts across the evaluated criteria.

In terms of functionality, usability, and reliability, both groups provided positive assessments, suggesting that the system operates as intended, is easy to use, and performs consistently. However, differences were observed in the security criterion, where user respondents rated the system as Agree while technical experts rated it lower. This suggests that although the system meets basic security expectations from the users' perspective, technical experts identified limitations in existing security measures such as access controls and authentication mechanisms.

An independent samples t-test was initially considered to determine whether the differences between the evaluations of user respondents and technical experts were statistically significant. However, the test was not conducted due to the limited number of technical expert respondents, which is insufficient to meet the assumptions required for valid inferential statistical analysis. As a result, the comparison of evaluations was based on descriptive statistics, particularly mean scores.

Overall, the findings indicate that the Courtyard Reserva System performs effectively in most quality aspects, particularly in usability and functionality. Nevertheless, improvements in security features are necessary to enhance system protection, stability, and user confidence.

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Ethical Considerations

The study guarantees the confidentiality and integrity of the data obtained from participants. Information provided by respondents is secure, and no personally identifiable information is shared without permission. Respondents are allowed to leave the study at any moment without facing any repercussions, in accordance with the principles of voluntary participation. Strict adherence to data security protocols guards against misuse and illegal access to information. Lastly, in order to preserve the study's integrity, all results are presented truthfully and accurately, free from prejudice or manipulation.

Summary

This study focused on the design, development, and evaluation of Courtyard Reserva, a web-based booking system for a single community sports court with integrated data visualization and a scheduling algorithm. The system was developed to address the inefficiencies of traditional manual booking processes, such as scheduling conflicts, limited accessibility, and lack of data visibility.

The system allows users to view available schedules, submit booking requests online, and manage reservations remotely, while administrators can monitor bookings, manage user records, and analyze court usage through visual dashboards. The development followed the System Development Life Cycle (SDLC) using the Iterative Model, allowing continuous refinement through testing and feedback.

To evaluate system quality, fifty (50) respondents composed of user respondents and technical experts assessed the system using a 4-point Likert scale based on the ISO/IEC 25010 software quality standards, focusing on functional suitability, usability, reliability, and security. Descriptive statistical tools, including frequency distribution and weighted mean, were used to analyze the results.

The assessment results showed that user respondents provided a more favorable evaluation of the system, with an overall mean interpreted as Strongly Agree, while technical experts rated the system as Agree. Both groups positively evaluated the system’s functionality, usability, and reliability. However, security received comparatively lower ratings from technical experts, indicating the need for further enhancement in system protection mechanisms.

CONCLUSION

Based on the findings of the study, the Courtyard Reserva System successfully achieved its primary objective of providing a web-based solution for managing single-court sports facility reservations. The system effectively automated the booking process, reduced scheduling conflicts through an integrated scheduling algorithm, and improved accessibility by allowing users to view available schedules and submit booking requests online. These outcomes demonstrate that the system addressed the limitations of traditional manual booking methods.

The evaluation results further indicate that the system exhibits strong functional suitability and usability. User respondents rated the system highly, reflecting satisfaction with its ease of use, clarity of interface, and ability to perform booking and management tasks efficiently. Similarly, technical experts assessed the system as functionally sound and reliable, confirming that it performs consistently and accurately in handling reservations, schedules, and user records within a single-court environment.

In terms of reliability, both groups of respondents agreed that the system operates dependably, with minimal errors during booking and schedule management. The consistent performance of the system supports its suitability for community-level sports facility management, where accuracy and availability of schedules are critical to avoiding conflicts and ensuring fair access to the court.

However, the evaluation also revealed limitations in the system’s security features. While basic security mechanisms such as user authentication and role-based access control are implemented, technical experts provided lower ratings for security, indicating the need for stronger protection measures. This suggests that

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

although the system meets basic security expectations from a user perspective, it does not yet fully comply with advanced web application security standards.

Overall, the integration of data visualization tools significantly enhanced administrative oversight by providing clear insights into court usage, booking trends, and peak scheduling periods. These visual analytics supported informed decision-making and improved monitoring of facility utilization. Despite the need for improved security, the Courtyard Reserva System is concluded to be an effective, user-friendly, and reliable web-based booking system for single-court sports facilities.

RECOMMENDATION

Based on the findings and limitations of the study, the following recommendations are proposed for future researchers and developers seeking to enhance the Courtyard Reserva System with Data Visualization and Scheduling Algorithm. These are the following:

- Enhanced Security Features: Future developers should consider implementing stronger security measures such as multi-factor authentication, data encryption, and secure password recovery options to ensure better protection of user information and prevent unauthorized access.

- System Scalability: Future improvements may include expanding the system to support multiple courtyards or sports facilities.

- Offline Accessibility: Developers may explore adding an offline functionality that allows users to temporarily store booking data and synchronize it automatically once an internet connection becomes available.

- Comprehensive Maintenance and Support Plan: Establishing a long-term maintenance and update plan is recommended to ensure the system remains functional, secure, and compatible with evolving technologies.

- Mobile Application Development: To enhance accessibility, future researchers could develop a companion mobile app version of the system for Android and iOS devices, allowing users to make and manage bookings on the go.

- Expanded Features and Services: The system can be extended to include other community services such as event scheduling, facility announcements, and user notifications to increase its overall functionality and usefulness.

- User Training and Documentation: Conducting user training sessions and providing a detailed user manual or help guide would promote better understanding and smoother system operation for both administrators and users.

Overall, the researchers recommend the continuous development and optimization of the Courtyard Reserva system to enhance its functionality, security, and scalability.

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