

DEVELOPMENT OF A SURFING CLASS BOOKING SYSTEM FOR CHERATING SURF CLUB: A USABILITY EVALUATION USING THE SYSTEM USABILITY SCALE (SUS)

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Abstract: Modern sports academies frequently rely on informal, manual administrative procedures, which introduce operational friction and scheduling overlaps. This paper discusses the development of the Surfing Class Booking System for the Cherating Surf Club, a major recreational provider in Pahang, Malaysia. Prior to system deployment, operations were primarily managed through WhatsApp, causing significant administrative redundancy, inconsistent manual payment records, and scheduling inaccuracies, particularly during unstable seasonal monsoons. Adopting an Adapted Waterfall Model, a centralised, role-based platform was designed and implemented using Laragon, phpMyAdmin, and Visual Studio Code. The system was empirically evaluated by 39 respondents, yielding an above-average System Usability Scale (SUS) score of 87.05, suggesting that participants generally perceived the system as usable. The system successfully modernises surf school management, though prospective enhancements like automated payment gateway refund integrations remain vital for broader scalability.

Keywords: Adapted Waterfall Model, Management Information Systems, Online Booking Systems, System Usability Scale, Surfing class

Introduction

Transitioning from traditional manual procedures to structured digital infrastructures is an essential requirement for modern organisations seeking operational sustainability. Historically, enterprise administration relied exclusively on physical records, which are inherently vulnerable to human error, geographical dispersion, and communication friction. The emergence of modern Management Information Systems (MIS) has fundamentally transformed this workflow by integrating computational networks, database infrastructure, and human resources to consolidate operational data into coherent, actionable information repositories (Fila et al., 2025). By digitising scheduling, registration, and transaction workflows, service-oriented systems enable seamless information transparency and rapid decision-making capabilities across various structural layers (Santoso et al., 2022).

The sports and beach recreation sector represents a highly dynamic environment where seasonal demands and resource scarcity complicate daily administrative workflows (Toubes et al., 2024). In Malaysia, local surf tourism has experienced substantial growth, relying primarily on localised sports academies to guide domestic and international visitors. Cherating Surf Club, operating in Pahang since 2008, serves as a key case study. The club utilises a workforce of 15 certified surf instructors capable of instructing up to 20 students per session. Despite its prominent position in local tourism, the club's daily administration was severely limited by a dependence on manual social media interactions (scattered WhatsApp), highlighting the urgent necessity for functional (booking duplication, fixing billing inconsistencies and centralising its schedules) and web-based automation (inappropriate digital data storage).

To establish a proper digital architecture, three main research objectives were defined. First, the project aimed to identify the specific user requirements of surf class booking and resource coordination within the local sports tourism framework. Second, a web-based, role-segmented booking and scheduling platform was designed and developed to replace manual coordination channels. Third, the system's usability was evaluated through empirical user usability testing (SUS) to ensure high structural acceptability.

Literature Review

Concept of Management Information Systems (MIS) and Online Booking Systems

An effective Management Information System acts as the core of an enterprise by collecting, processing, and distributing accurate operational data to support organisational management (Putri et al., 2022). In specialised service environments, MIS coordinates diverse operational inputs—such as employee availability, client personal data, and transaction histories—into normalised repositories, eliminating data fragmentation (Fitria et al., 2023). Booking systems represent a crucial operational division of MIS, establishing automated client-facing interfaces that allow customers to execute real-time registrations and payments. This automation reduces clerical workloads, minimises booking vulnerabilities, and ensures 24/7 service accessibility, expanding market reach (BOZ, 2016; Rajput, 2025).

Waterfall Model

The waterfall model is one of the Software Development Life Cycle (SDLC) methods that provides an organised and linear technique for project development. According to Saravanos & Curinga (2023), the waterfall model is known as the classic model in software engineering and is known as the oldest model in the SDLC method. Moreover, the waterfall model was inspired by the inability of water to flow uphill. The phases were run individually which is planning,

design, development, testing, and deployment that is completed in sequentially. In 2019, a study was conducted to compare the Agile Model and Waterfall Model, which led to 28.1% of software developers still using waterfall model as their methodologies (Saravanos & Curinga, 2023). In addition, the waterfall model is very suitable for projects that requirement is well to understand, stable and not likely change considerably during the project. Figure 1 shows the Waterfall Model.

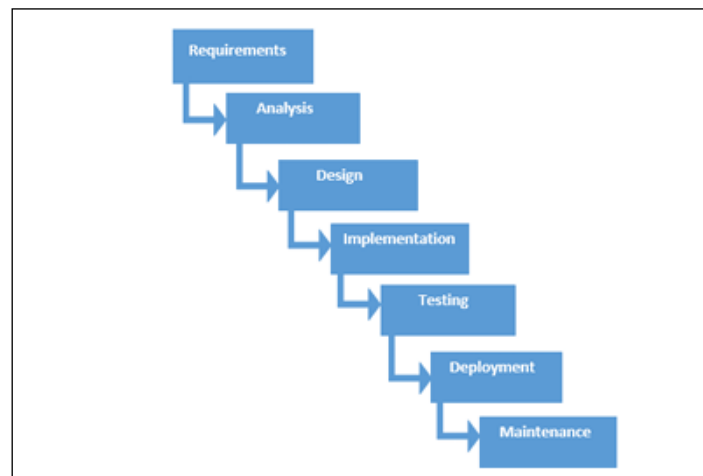


Figure 1: Traditional Waterfall Software Development Lifecycle

Source: M.I.S. (2023)

Surfing and Surfing Class Booking System

Surfing is a type of water sport in which a person rides a board, focuses their body forward, and uses the waves to propel them to the shore. Both open oceans and ocean shorelines have waves that are ideal for surfing. A surf break is a natural structure that allows other surfers to engage in fun activities like bodyboarding, body surfing, stand-up paddling, and surfing. Additionally, a surf break depends on certain geographical factors that cause surfers who require an experience close to their level of skill and ability to migrate and visit. However, because waves require a favourable mix of wave period, speed, and other factors, they are not always rideable wherever they break. Additionally, the migration and visitation of surfers who require an experience that is comparable to their ability and competence depends on certain geographical factors. However, since waves require a favourable mix of wave period, speed, peel angle, and size, they are not always rideable wherever they break (Manero & Mach, 2023).

The surfing lesson can be run with professionalism and efficiency by employing an online booking system, which also helps to make things go more smoothly. Every year, 35 million people take up surfing, according to Huang et al. (2023). Then, some people have found that surfing has improved their health by providing them with sunlight exposure and meeting their psychological needs. Surfing is referred to as irregular activity periods that include a variety of body parts, varying in intensity and duration, and the need for numerous recovery times. Furthermore, according to Cruz et al. (2021), surfers often spend 44% to 54% paddling, 28% to 53% waiting for waves, 2.2% to 16% engaging in other activities, and 2% to 8% riding the waves (Cruz et al., 2021). The development of a surfing class booking system aims to support managers and clerks in overseeing the facilities, keeping track of past reservations, and enabling clients to make reservations that include details about class availability and wave off-seasons.

Usability Evaluation using System Usability Scale (SUS)

Usability relates to how easily, efficiently, and successfully people may engage with a system or interface. A usability review is essential to ensuring that the system is user-friendly, satisfies user needs, and promotes a pleasant experience. It helps find design flaws, enhance functionality, and boost user satisfaction. Surveys, user testing, heuristic evaluation, and expert reviews are frequently used in usability evaluation. To gain a deeper understanding of the system, the System Usability Scale (SUS) was used for this system through survey. According to Jhosua Putra and Suwitno (2026), SUS is a tool created by John Brooke in 1986 that is widely used to measure the usability of systems such as software, hardware, mobile apps, and websites.

Research Methods

To ensure the structured construction of the web application, this study utilised an Adapted Waterfall Model, conforming to sequential development standards while accommodating academic time constraints. Due to the restricted 12-month development window (two semesters), the traditional post-deployment maintenance phase was excluded (Aditiyawarman & Mu'alim, 2022). The adapted methodology consists of six (6) core phases: Requirement, Analysis, System Design, Implementation, Testing/Usability Evaluation and Documentation. This sequential execution ensures that the system satisfies all organisational parameters before final deployment. Figure 2 shows the Adopted Waterfall Model used in developing the system.

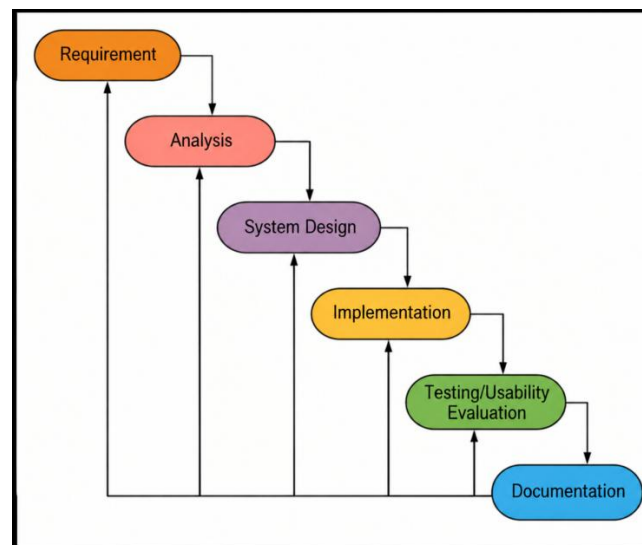


Figure 2: Adapted Waterfall Model Framework for Software Development

Source: Author's Own Data (2026)

Requirement Gathering

During the requirement gathering phase, extensive collaborative interactions were conducted with the senior surf instructor and administrator of the Cherating Surf Club, Wan Muhammad Irfan, who possessed over seven years of operational experience at the club. Communication was structured using localised digital channels, including WhatsApp dialogues, Google Meet sessions, and questionnaires. These sessions focused on mapping the traditional business process, clerical pain points, and customer booking bottlenecks. Through this process, the user requirements were established, segmenting the web interface into four distinct user roles (Customer, Clerk, Instructor, and Manager). Tables 1 to 4 represent the requirements from these users.

Table 1: User Requirement for Customer

No.	User requirement	User Story
1.	Sign Up	"I can create an account by entering my name, email, phone number and password".
2.	Log In	"I can log in with my email and password to access the booking page".
3.	Check Available packages	"I can browse the list of surf packages and off-season dates are blocked".
4.	Choose Packages	"I can pick a package, select my instructors and choose how many of us are joining".
5.	Add Extra Info	"I can enter an emergency contact"
6.	Leave Feedback	"I can leave a review and feedback for the booking packages"
7.	Make Payment	"I can review all the information and pay online"
8.	Booking Confirmation	"After payment, I will get a confirmation invoice and can see my booking on the dashboard"

Table 2: User Requirement for Clerk

No.	User requirement	User Story
1.	Log In	"I can log into the system with my username and password"
2.	View Booking	"I can see all the upcoming bookings and be able to filter them"
3.	Check Customers Info	"I can view customers' details and emergency contact"
4.	Mark Attendance	"When customers arrive, I will check them in"
5.	Assign Equipment	"I'm in charge of giving surfing equipment and keeping track of it"
6.	Track Instructors Schedules	"I can view which instructors are assigned for each class"
7.	Verify Payments	"Before class starts, I will double-check that customers have paid for the packages"
8.	Update Booking Status	"After class, I can update the booking to show it is completed"
9.	View Reports	"I can access the daily booking report for preparation for next sessions"

Table 3: User Requirement for Instructor

No.	User requirement	User Story
1.	Log In	"I can log in to the system with my account to access my instructor's dashboard"
2.	View Classes	"I can see my upcoming surf sessions and all information about the packages"
3.	Set Availability	"I can update my available time slots when I'm free to teach"
4.	Prepare for Class	"I can check the student's information, including their surfing level and request"
5.	Take Attendance	"I will mark who showed up and who did not"
6.	Stay Updated	"The system will notify me if I get a new class or reschedule changes"

Table 4: User Requirement for Manager

No.	User requirement	User Story
1.	Log In	"I can log in with full system access. My dashboard gives me control over users, settings, and overall system configurations."
2.	Manage Booking	"I can view and filter all the bookings"
3.	Assign Instructors	"I check instructors' availability and assign them to sessions"
4.	Check Feedback	"I can review customers' feedback to see how things went"
5.	View Reports	"I can generate daily or monthly reports to track bookings, attendance and instructor load"
6.	Manage User Accounts	"I can create, edit, or delete accounts for all user roles such as customers, instructors, clerks, and managers. I also assign their roles and permissions"
7.	Set Surfing Seasons	"I can configure the active surfing periods. Off-season dates are blocked from booking automatically to prevent scheduling conflicts"
8.	Adjust System Settings	"I can manage system rules like max participants per session, cancellation policies, and booking cut-off times"

Software and System Design

The conceptual specifications were converted into rigorous architectural blueprints using standardised database and process-mapping modelling notations. System interface boundaries and external entities were mapped using a Context Diagram, illustrating data exchanges between the core engine and external roles. To construct a robust relational database schema, an Entity Relationship Diagram (ERD) was engineered, defining nine highly normalised tables including Customer, Booking, Instructor, Clerk, Manager, Package, Schedule, Payment, and Feedback. These tables were defined with strict primary-foreign key relationships and explicit data types to ensure referential integrity and prevent data anomalies. Figure 3 and Figure 4 show the Context Diagram and ERD for the Cherating Surfing Class Booking System.

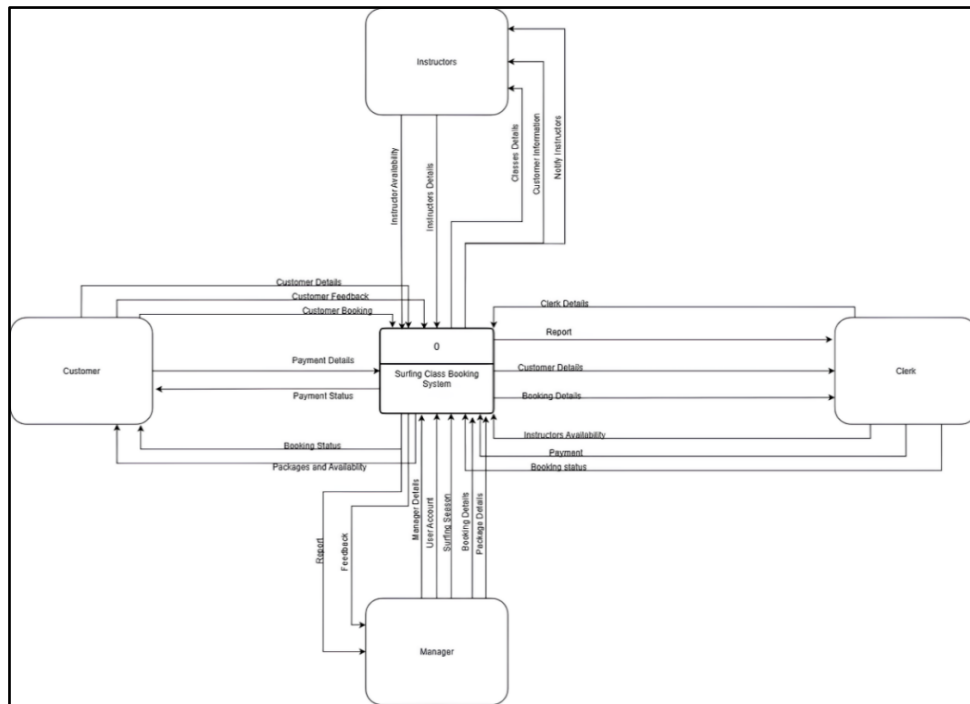


Figure 3: System Context Diagram and Data Exchange Processes

Source: Author's Own Data (2026)

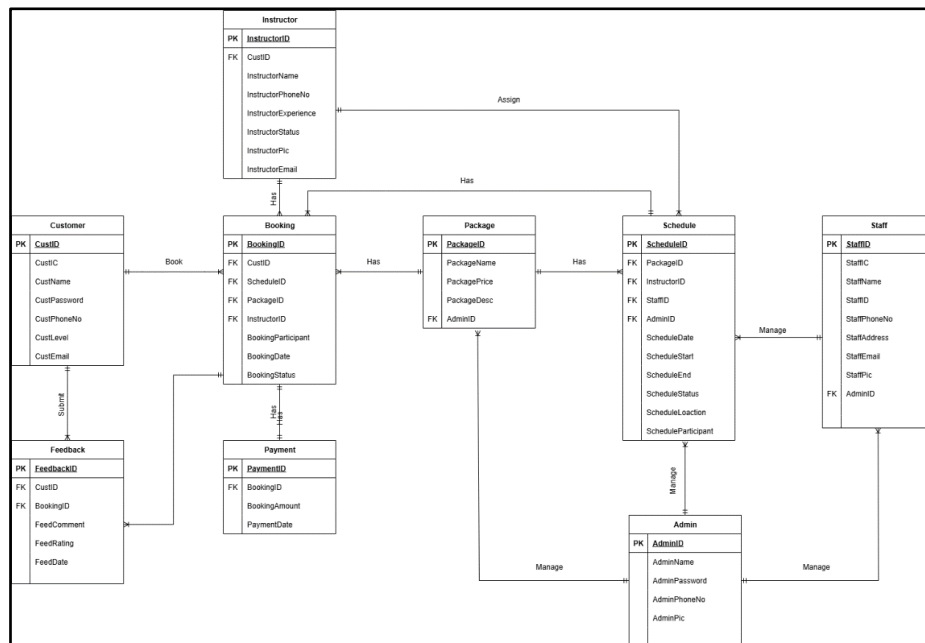


Figure 4: Entity-Relationship Diagram (ERD)

Source: Author's Own Data (2026)

Developmental Technologies

System development was performed using a standard local development stack. The local server environment was managed using Laragon, a modern, portable alternative to traditional environments, providing high MySQL database and Apache web server performance. Relational database administration and SQL querying were conducted through phpMyAdmin. The core application logic, interface formatting, and role-based validation routines were developed using Visual Studio Code, utilising standard scripting and styling libraries. The hardware infrastructure was standardised on an HP laptop with an AMD Ryzen 3 processor and 8.00 GB of RAM, ensuring consistent processing speeds during testing and compilation. Table 5 and Table 6 refer to the hardware and software specifications for the system.

Table 5: Hardware Specification for System

No.	Hardware	Specifications
1.	Computer Name	HP
2.	System Model	HP 245 G8 Notebook PC
3.	Processor	AMD Ryzen 3 5300U processor
4.	RAM	8.00 GB
5.	Operating System	Microsoft Windows 11 Home
6.	Printer	HP DeskJet 2130 Series
7.	Storage	240GB SSD

Source: Author's Own Data (2026)

Table 6: Software Specification for System

No.	Software	Description
1.	Laragon	A local development platform used to set up and run the system, including handling the database and server.
2.	Visual Studio Code	A code editor used to write and manage the programming code for the system.
3.	Draw.io	An online diagramming tool used to create context diagrams, data flow diagrams, and ERDs for system design.
4.	Microsoft Word	Microsoft Word was used for writing the project documentation.
5.	PHPMyAdmin	A web-based tool used to manage and interact with the MySQL database easily.
6.	Google Chrome	A web browser used to test and run the booking system during development.

Source: Author's Own Data (2026)

Testing and Empirical Usability Evaluation (SUS)

To systematically validate functional completeness, role-based test plans were executed with the development team and external testers. Furthermore, to evaluate overall usability, the System Usability Scale (SUS) was integrated as the primary empirical evaluation tool. A sample of 39 target users, primarily consisting of active students and local surf athletes, participated in usability testing. Roscoe (1975) suggested sample sizes greater than 30 and less than 500 are enough for most quantitative research. Based on the statement, the SUS evaluation for this research obtained 39 responses from participants.

After completing an online or in-person system demonstration, participants answered the standardised 10-item SUS questionnaire using a 5-point Likert scale (Nadila et al., 2025). For

positively worded items (Items 1, 3, 5, 7 and 9), the score was calculated by subtracting one from the user response, while for negatively worded items (Items 2, 4, 6, 8 and 10), the score was calculated by subtracting the response from five (Nadila et al., 2025). The total SUS score was obtained by summing all item scores and multiplying the result by 2.5, producing a score ranging from 0 to 100 (Lorincz et al., 2026). According to Brooke (1996) cited by Nabila et al. (2025), a high SUS score indicates greater perceived usability and greater acceptance of the system by the user. This is supported by the Sauro–Lewis Curved Grading Scale, which indicates 84.1–100 = A+, 80.8–84.0 = A and 78.9–80.7 = A– (Sauro & Lewis, 2016). Table 7 below shows the SUS questionnaire.

Table 7: SUS Questionnaire - SUS Usability Evaluation

Construct	Questions	Sources
Q1 (Positive)	I think that I would like to use the Surfing Class Booking System frequently.	Brooke (1996) cited by Nadila et al. (2025)
Q2 (Negative)	I found the system unnecessarily complex (For example, booking a package or choosing an instructor was too difficult)	
Q3 (Positive)	I thought the system was easy to use.	
Q4 (Negative)	I think that I would need the support of a technical person to be able to use this booking system.	
Q5 (Positive)	I found the various functions in this system (like booking, payment, instructor selection) were well integrated.	
Q6 (Negative)	I thought there was too much inconsistency in this system.	
Q7 (Positive)	I would imagine that most people would learn to use this system very quickly.	
Q8 (Negative)	I found the system very cumbersome to use (For example, navigating between the dashboard and the payment page).	
Q9 (Positive)	I felt very confident using the Surfing Class Booking System.	
Q10 (Negative)	I needed to learn a lot of things before I could get going with this system.	

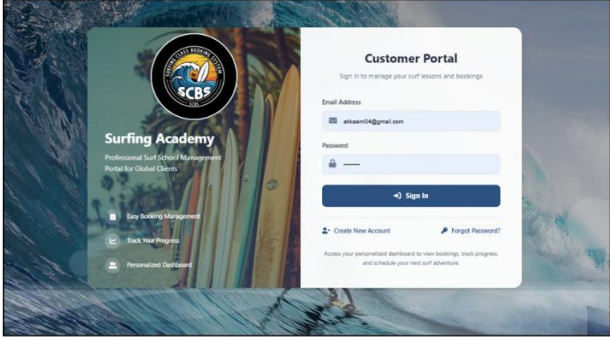
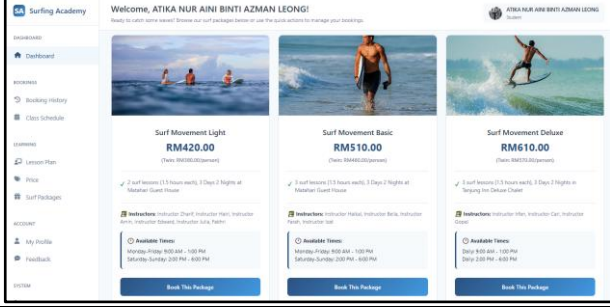
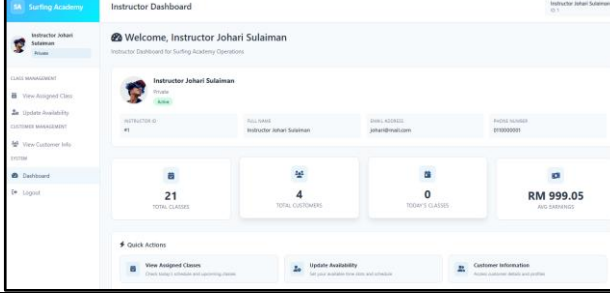
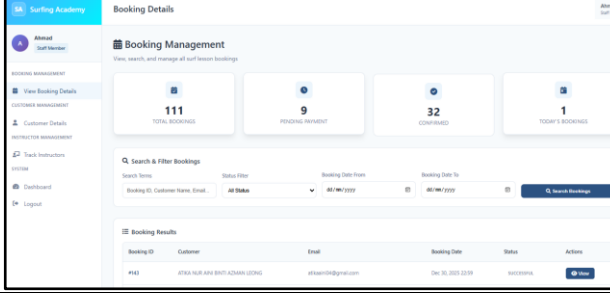
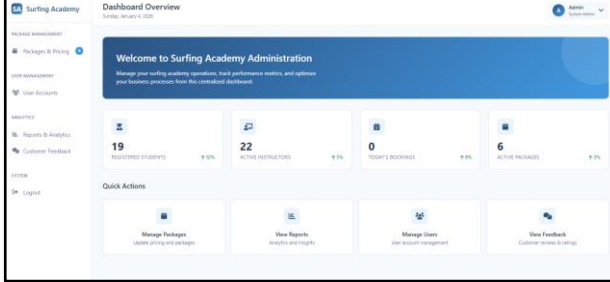
Results and Discussions

Results

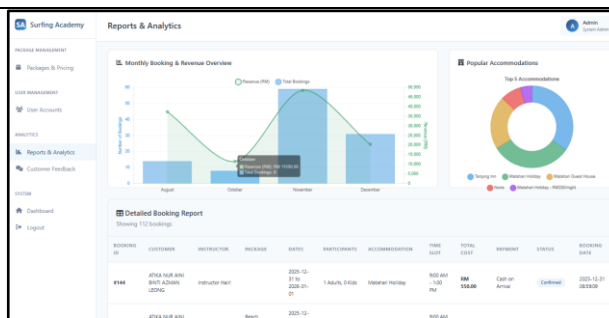
Interface Design of Cherating Surfing Class Booking System

The interface design for the system is shown in Table 8. The system interface was designed to reflect the surfing theme using ocean, wave, and surfing-related visual elements. Simultaneously, a minimalist design approach was implemented by keeping the interface layout simple, eliminating superfluous visual components, and providing users with only the most important features and information.

Table 8: Interface Design of Cherating Surfing Class Booking System

Login page		User login using the password and username before going to the dashboard.
Customer dashboard		The dashboard features provide direct access to make a booking, view booking history or check the class schedule.
Instructor dashboard		The instructor dashboard acts as a personalised home base for instructors to manage their teaching schedule and track their performance.
Clerk dashboard		The booking details page acts as a comprehensive management interface for clerk to monitor and organise all surf lesson reservations.
Manager dashboard		Provides a summarised view of key operational data, including the total number of registered students, active instructors, today's bookings, and active packages, allowing the manager to quickly monitor system performance.

Booking Visual Analytics Section



The page illustrates the visualisation and auditing components of the Reports & Analytics module, combining graphical trends with a detailed transactional record..

Empirical Usability Evaluation Analysis using SUS

The demographic distribution of the 39 usability testing respondents confirmed high alignment with the primary target market. Most participants were young adults, with 87.2% (34 respondents) falling within the 18 to 25 age range. Students represented 76.9% (30 respondents) of the cohort, while local surf athletes constituted the remaining 23.1% (9 respondents). As digital natives, these participants represent an ideal cohort for assessing web-based interactions, as they expect rapid loading speeds, clear feedback states, and intuitive visual structures. Figure 5 illustrates the distribution of the user sample.

**Young Cohorts (18-25) and Students Comprise Over 75% of System Evaluators
(Total Respondents, N = 39)**

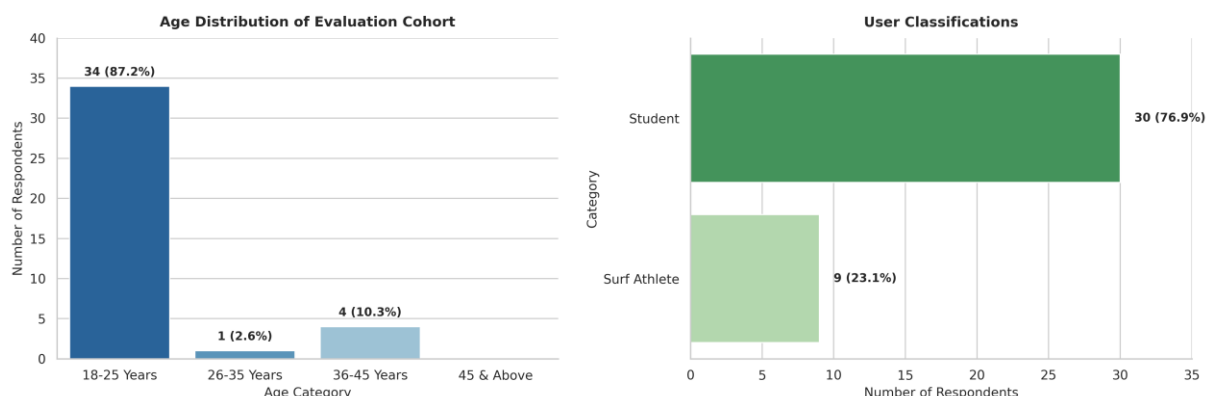


Figure 5: Demographic Breakdown of the Usability Evaluation Respondents (N=39)

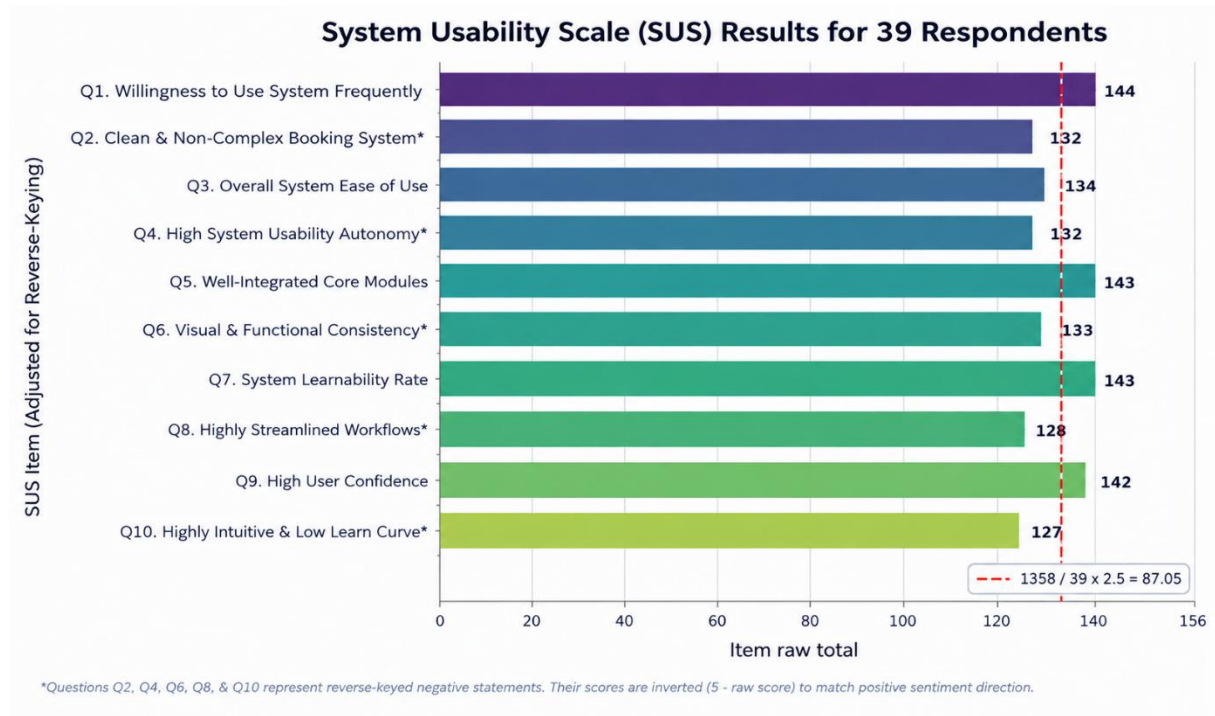
Source: Author's Own Data (2026)

The quantitative analysis of the 10 items of the System Usability Scale (SUS) yielded highly favourable results. Each SUS item contributes between 0 and 4 points per respondent. With 39 respondents, the maximum possible score for each item is therefore 156 points (39 respondents x 4), while the maximum raw total across the ten SUS items is 1560 points (39 respondents x 10 items x 4).

Hence, the raw items total calculated SUS scores for this system across all 39 participants amounted to 1358 out of 1560. Dividing this total by the number of respondents and applying the standard multiplier of 2.5 yielded a final average SUS usability score of 87.05. Table 9 and Figure 6 show the results of SUS for this system.

Table 9: SUS Score for Each Item

SUS item	Raw total	Maximum
Q1	144	156
Q2	132	156
Q3	134	156
Q4	132	156
Q5	143	156
Q6	133	156
Q7	143	156
Q8	128	156
Q9	142	156
Q10	127	156
Total	1,358	1,560



SUS Calculation for System

$$1358 / 39 \times 2.5 = 87.05$$

Figure 6: Itemised Score Performance of the System Usability Scale (SUS) Assessment

Source: Author's Own Data (2026)

Based on the Sauro–Lewis Curved Grading Scale, the SUS score of 87.05 falls within the Grade A+ range (Sauro & Lewis, 2016). The positive odd-numbered questions, including Q1 (Willingness to use the system frequently, score 144 out of 156), Q5 (Well-integrated functions, score 143 out of 156), and Q9 (Confidence in using the system, score 142 out of 156), indicated user comfort and system integration. Conversely, the negative even-numbered statements, such as Q2 (System complexity, score 132 out of 156) and Q4 (Requirement for technical assistance, score 132 out of 156), confirmed that users found the application intuitive and self-explanatory,

requiring minimal technical orientation. This finding represents the acceptability and user-friendliness of the system (Nabila et al., 2025).

Discussions

The successful development and empirical validation of the Surfing Class Booking System for the Cherating Surf Club demonstrate the transformative power of Management Information Systems (MIS) within specialised sports tourism. The club switched from manual, scattered WhatsApp coordination to a consolidated, database-backed web platform, which let it eliminate administrative duplication, fix billing inconsistencies, and centralise its schedules. Moreover, because beach-based recreation is heavily influenced by seasonal monsoon patterns, adding automated off-season booking blocks is a crucial safety-oriented innovation that directly reduces risks during hazardous weather, highlighting the increasing importance of weather-responsive destination management in coastal tourism. In contrast to existing local booking platforms that depend heavily on manual human coordination for scheduling and payment checks, the proposed system offers real-time system feedback and clear instructor availability. This design approach shows that using structured heuristic reviews during the development process is very effective in spotting visual barriers and preventing operational errors before deployment, aligning with findings from contemporary software evaluation research. This design advantage is strongly backed by empirical usability testing, which produced an average System Usability Scale (SUS) score of 87.05, placing the system in the Grade A+ category (Sauro & Lewis, 2016). This score suggested good system acceptability, learnability, and user confidence. In addition, the demographic analysis shows a perfect match with the club's primary market, where most respondents are young adults and active students. As digital natives, this group naturally expects fast interactions and immediate system responsiveness, making the system's low complexity and high self-explanatory especially impactful. The very high scores for positive usability indicators such as willingness to use the system frequently and systemic integration, along with low scores for negative indicators like the need for technical support, support the claim that heuristic-guided web interfaces yield significantly higher user satisfaction.

Conclusion

This study details the successful design, implementation, and empirical evaluation of a web-based Surfing Class Booking System for the Cherating Surf Club, demonstrating how Management Information Systems can modernise localised sports tourism. While the current system represents a significant step forward, several developmental boundaries remain. The current version lacks multilingual toggles, relies on manual cash approval for physical transactions, and lacks automated instructor leave management. Future work should focus on integrating payment processor APIs to programmatically automate refunds and cancellations. Additionally, the deployment of internationalisation libraries will enable seamless translation between English and Bahasa Melayu, improving accessibility for international tourists. Resolving these limitations will further strengthen the platform's scalability and contribute to the growth of the regional surf tourism economy especially in rural place.

Other than that, the usability evaluation reported in this study was based on the System Usability Scale (SUS), administered to 39 respondents. In the future, there may be consider broader sampling approaches to get better insights of the SUS result indirectly capture deeper insights into long-term community adoption.

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