# PSSGM: An Integrated Web-Based Silat Management Platform

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## ABSTRACT

Silat is a traditional martial art involving structured training, grading, practitioner development, and organizational administration. However, manual records and fragmented management processes can create challenges in maintaining accurate information and monitoring practitioner progress. Existing digital solutions primarily focus on membership or competition management, with limited integration of continuous practitioner activities. This study presents PSSGM, an integrated web-based Silat management platform developed for Pertubuhan Silat Seni Gayong Malaysia (Melaka). The platform centralizes membership, training, attendance, grading, rank progression, activities, and performance monitoring through a role-based interface and centralized database. The system was developed using the Waterfall model and Database Life Cycle (DBLC), with PHP and PostgreSQL supporting application development and data management. Functional testing achieved a 100% pass rate across 18 test cases, while preliminary manual non-functional testing examined usability, access control, and input validation. These results demonstrate the functional correctness of the tested system components. However, real-world organizational effectiveness has not yet been empirically evaluated. The study contributes a domain-specific integration of administrative and continuous practitioner management processes, providing a foundation for future evaluation involving actual organizational users.

**Keywords:** Silat Management; Digital Transformation; Integrated Information System; Practitioner Development; Web-Based Platform; Sports Management

## INTRODUCTION

Silat is a traditional martial art rooted in the Malay Archipelago, representing an important aspect of Malay cultural heritage. Its cultural significance was internationally recognized through its inscription on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity in 2019 (UNESCO, 2019). Beyond cultural preservation, Silat involves structured training, grading, competitions, and organizational management. However, manual records and fragmented administrative processes can create challenges in managing membership, attendance, and practitioner development. Dewi et al. (2021) highlighted similar difficulties in maintaining and retrieving Silat membership information. Digital technologies offer opportunities to improve organizational management through centralized information systems. Falese et al. (2026) emphasized the importance of digital transformation in sports organizations, while Jafridin and Salamat (2023) demonstrated the potential of web-based systems to address limitations associated with conventional administrative practices.

Previous studies have introduced digital solutions for Silat and martial arts, including tournament management (Wardana & Aribowo, 2021) and combat sports competition administration (Indiran et al., 2026). However, existing systems primarily focus on specific administrative functions or competitions, with limited integration of continuous practitioner management, including training, attendance, grading, and performance monitoring.

To address this gap, this study presents PSSGM, an integrated web-based Silat management platform developed for Pertubuhan Silat Seni Gayong Malaysia (Melaka). The platform centralizes membership, training, attendance, grading, activities, and performance records. The main contribution is the integration of continuous practitioner and organizational management processes into a single platform. This study focuses on the design, development, and preliminary technical evaluation of PSSGM through functional and selected non-functional testing, providing a foundation for future real-world organizational evaluation.

# RELATED WORK

## Digital Transformation in Sports Management

Digital transformation has increasingly influenced how sports organizations manage information, coordinate activities, communicate with stakeholders, and support organizational decision-making. Rather than merely converting paper-based information into digital records, digital transformation involves the integration of technology into organizational processes and management practices. Ströbel et al. (2021) highlighted the disruptive potential of digitalization in sport management and emphasized its implications for organizational structures, services, and stakeholder interactions. Similarly, Ehnold et al. (2021) found that sports clubs adopt digital technologies according to their organizational objectives and available capacities, indicating that digital adoption is closely associated with organizational needs. The digitalization of sports organizations has subsequently received greater research attention. Ehnold et al. (2023) identified different patterns of digitalization among voluntary sports clubs, demonstrating that sports organizations do not necessarily progress toward digital transformation in the same manner. Stegmann et al. (2023) further explained that digital transformation changes how value is created and exchanged among stakeholders in the sports environment. These findings suggest that effective digital platforms should be designed according to the operational characteristics and requirements of the organization rather than simply introducing technology as an additional administrative tool. Recent research also emphasizes the organizational capabilities required for successful digital transformation. Merten et al. (2024) identified factors such as information and communication technology infrastructure, digital competencies, organizational culture, leadership support, and knowledge management as important capabilities for sports organizations. Thompson et al. (2024) similarly demonstrated that digital technologies can facilitate organizational change in non-profit sports organizations but require appropriate organizational support. Gallardo-Guerrero and Maciá-Andreu (2024) further highlighted both the opportunities and challenges associated with digital transformation in contemporary sport management. Beyond administrative efficiency, digital transformation may also contribute to organizational sustainability and long-term development. Glebova and Madsen (2024) similarly emphasized the strategic role of digitalization within modern sport management. More recently, Falese et al. (2026), through a systematic review of digital transformation in sports organizations, identified recurring themes including technology adoption, leadership, organizational change, digital platforms, governance, barriers, and data management. Collectively, these studies indicate that centralized digital systems have become increasingly important for managing contemporary sports organizations.

## Web-Based Systems for Sports Management

Web-based information systems provide an accessible approach for integrating administrative and operational activities within sports organizations. Unlike isolated spreadsheets or paper records, centralized web platforms allow information to be stored, retrieved, updated, and shared through a common environment. Such systems can therefore support activities including participant registration, scheduling, facility management, competition administration, reporting, and performance monitoring. Wen and Wang (2022) investigated an integrated management information system for major sporting events, demonstrating how information technology can support the management of complex event-related information. Jafridin and Salamat (2023) developed a web-based management system for a sports center to address problems associated with conventional paper-based processes, including duplicated records and difficulties in managing customer information. Similarly, Sumarjo et al. (2023) developed an integrated web-based service management system for a sports facility, demonstrating the potential of centralized platforms to improve service management and information accessibility. The growing use of web technologies within sports management reflects a broader shift toward integrated digital environments. Digital systems can reduce

repeated data entry, improve information availability, and provide organizations with structured historical records. However, the value of such systems depends on how effectively their functions correspond to actual organizational processes. Recent sport management literature therefore emphasizes that technological transformation should address operational requirements while considering users, organizational capabilities, and existing management processes (Merten et al., 2024; Thompson et al., 2024).

**Digital Systems for Silat and Martial Arts**

The application of web-based information systems to Silat and Pencak Silat has also emerged in recent studies. However, much of the existing research focuses on individual management functions rather than comprehensive organizational management. Dewi et al. (2021) developed a web-based membership management information system for a Pencak Silat organization. The study identified several limitations associated with manual membership management, including difficulties in entering, storing, retrieving, and maintaining increasing amounts of member information. The developed system provided functionality for managing member records and membership levels through a centralized web environment. This study demonstrates the usefulness of web technology for replacing paper-based Silat membership administration.

Wardana and Aribowo (2021) focused instead on competition management by developing a web-based Pencak Silat tournament information system. Their system was designed to support the organization of Pencak Silat championships through stages involving requirements analysis, system design, implementation, and testing. The study demonstrated that a dedicated information system could facilitate more organized and professional tournament administration. Other studies have extended web technology to different Silat related activities. Putra and Apriyanto (2022) developed a web-based registration information system for Pencak Silat championships, focusing primarily on improving the registration process. Prasetya (2022), meanwhile, developed a web-based geographic information system for mapping Pencak Silat schools. These applications illustrate the increasing adoption of digital technologies within the Silat environment but also demonstrate that existing solutions commonly address a specific administrative requirement. A more comprehensive martial arts system was recently presented by Indiran et al. (2026) through the Varsity Combat Sport System 2025. The web-based platform was developed for a Malaysian national varsity combat-sports tournament involving Silat, taekwondo, and karate. It centralized athlete registration, medical documentation, accreditation, scheduling, competition results, medal tallying, reporting, and multimedia records. The system was evaluated based on ease of use, interface and design quality, functionality, learnability, and user satisfaction. The study reported improvements in administrative efficiency, transparency, usability, and reduction of human error, demonstrating the feasibility of centralized digital platforms for managing large-scale martial-arts competitions. Despite these developments, the existing Silat related systems predominantly address membership administration, tournament organization, competition registration, geographic information, or event management. For example, Dewi et al. (2021) concentrated on membership records, while Wardana and Aribowo (2021) and Indiran et al. (2026) primarily addressed competition related processes. Consequently, there remains limited attention to a web-based platform that integrates the continuous management of practitioners and routine Silat organizational activities.

**Research Gap**

The reviewed studies demonstrate that digital technologies can improve information management within sports and martial arts organizations. Nevertheless, three limitations can be identified from the existing literature. First, many Silat related systems are designed around a single operational function, particularly membership registration or competition management. Second, competition-oriented systems primarily manage athletes during specific events rather than maintaining the continuous development records of practitioners. Third, limited integration has been reported between administrative information and practitioner-related information such as attendance, training history, grading, rank progression, achievements, and performance.

PSSGM is positioned to address these limitations through an integrated web-based management platform. Instead of concentrating exclusively on membership or competition administration, the platform combines member management, training records, attendance, grading and rank progression, activities, achievements,

and performance monitoring within a centralized environment. This approach allows practitioner information to be maintained continuously from registration through training and progression. Therefore, the contribution of PSSGM lies not merely in converting manual Silat records into digital form but in integrating previously fragmented management activities into a common platform. This integration provides a foundation for more systematic record management, improved information accessibility, practitioner development monitoring, and data supported management of Silat organizations. The proposed platform consequently extends previous Silat information-system studies from function-specific digitalization toward a more integrated approach to Silat management.

## RESEARCH METHODOLOGY

This study adopted the Database Life Cycle (DBLC) approach integrated with the Waterfall development model for the development of PSSGM. The DBLC approach (Connolly & Begg, 2022) was used to guide the systematic development of the database, while the Waterfall model (Royce, 1970) provided a structured sequence for the overall system development process. The methodology consisted of preliminary analysis, requirement analysis and proposed solution and testing as shown in Figure 1.

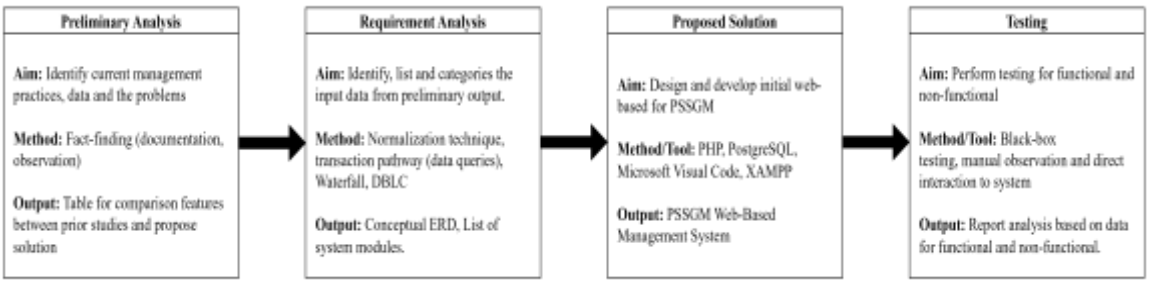



**Figure 1: Workflow of PSSGM web-based development.**

### Preliminary Analysis

The study began with a preliminary analysis to understand the existing processes used in managing Silat related activities and information. This phase focused on identifying current management practices and the problems encountered when maintaining information related to members, training, attendance, grading, rank progression, activities, and practitioner performance. The analysis identified that information managed through manual or separate records may lead to difficulties in retrieving information, maintaining consistent records, tracking practitioner development, and monitoring organizational activities. When information is distributed across different files or records, administrators may also require additional time to update and verify information. Based on the identified problems, the study established the need for a centralized web-based platform capable of integrating major Silat management activities. Table 1 shows the comparison features based on prior studies and proposed web-based system.

**Table 1: Comparison features between prior studies and propose web-based system.**

| Study | Main Features | Member | Training | Attendance | Rank/Grading/ Performance | Competition |
|---|---|---|---|---|---|---|
| Dewi et al. (2021) | Membership management | ✓ | – | – | Limited | – |
| Wardana & Aribowo (2021) | Silat tournament | – | – | – | – | ✓ |
| Putra & Apriyanto (2022) | Championship registration | ✓ | – | – | – | ✓ |
| Prasetya (2022) | Silat school mapping | – | – | – | – | – |
| Indiran et al. | Martial-arts | ✓ | – | – | – | ✓ |

| | | | | | | |
|---|---|---|---|---|---|---|
| (2026) | competition | | | | | |
| Proposed web-based system (PSSGM) | Integrated Silat management | ✓ | ✓ | ✓ | ✓ | - |

**Requirement Analysis**

Following the preliminary analysis, the system requirements were identified and classified into functional and non-functional requirements. Functional requirements describe the main operations provided by PSSGM. These include user authentication, member management, training management, attendance recording, grading and rank progression, activity management, achievement records, performance monitoring, and information reporting. Non-functional requirements define the quality characteristics expected from the system. These include usability, performance, security, reliability, accessibility, responsiveness, and data integrity. These requirements provided the basis for subsequent system design and testing. The requirements were also used to determine the data that needed to be stored in the database and the relationships among the major entities.

**Proposed Solution**

Based on the identified requirements, PSSGM was proposed as a web-based platform to centralize and simplify Silat management activities. The system development followed the Waterfall model, while the Database Life Cycle (DBLC) approach was applied to guide the database development process. The database was designed using an Entity Relationship Diagram (ERD) and relational database structure to organize related data such as members, training, attendance, grading, activities, and achievements. PostgreSQL was used as the database management system.

The system interface and functions were designed based on the identified user and system requirements. PSSGM was implemented as a web-based application using PHP for the application logic and PostgreSQL for data storage and management. After implementation, functional testing was conducted to verify that each system function produced the expected results. Non-functional testing was also performed to evaluate relevant system qualities such as usability, performance, security, compatibility, and responsiveness. The final output of the development process is PSSGM, an integrated web-based platform that provides centralized management of Silat members, training, attendance, grading and rank progression, activities, achievements, and performance information.

## SYSTEM IMPLEMENTATION

PSSGM was implemented as a web-based platform using PHP and PostgreSQL based on the requirements and system design established in the previous phases. The system integrates the main Silat management functions into a centralized platform. This section presents the implementation of the key system interfaces and functions, as illustrated in Figure 2 until 5.




**Figure 2: Admin Dashboard Page**




**Figure 3: Instructor Dashboard Page**

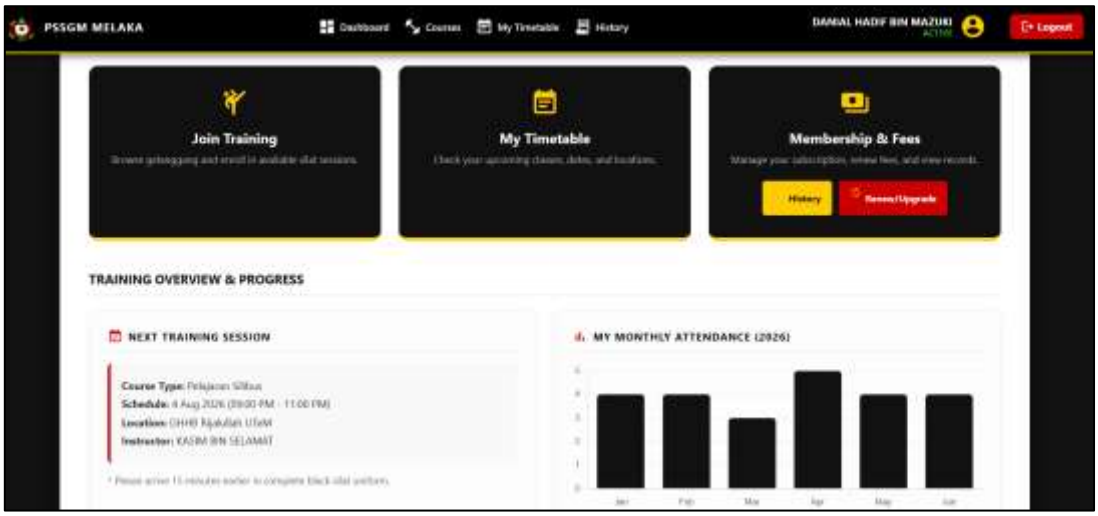



**Figure 4: Student Dashboard Page**

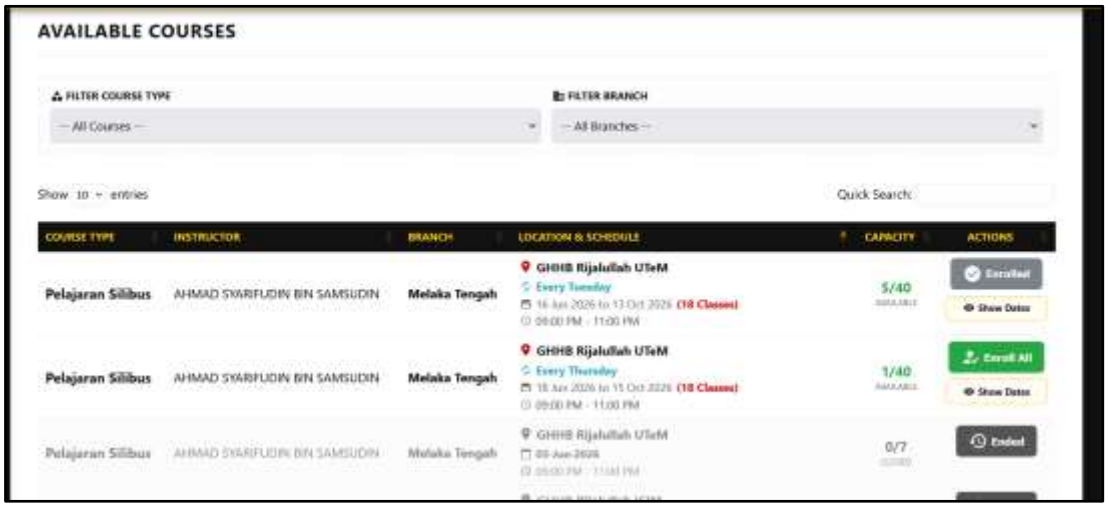



**Figure 5: Available Courses in Student Page**

## RESULTS AND DISCUSSION

The developed PSSGM platform was evaluated through functional and non-functional testing to determine whether the system met the identified requirements. The testing focused on the correctness of the main

system functions and the overall quality of the web-based platform.

**Functional Testing**

Functional testing was conducted using a black-box testing approach (International Software Testing Qualifications Board [ISTQB], 2024). The testing evaluated the main system modules by comparing actual outputs with expected results based on predefined functional requirements. A total of 18 test cases were executed across six modules, covering user authentication, member management, training and attendance, grading and rank progression, activities and achievements, and performance reporting. All 18 test cases passed, achieving an overall success rate of 100%, as summarized in Table 2. These findings indicate that the tested functions operated according to their specified requirements.

**Table 2: Summary of functional testing results based on modules.**

| Module | User Access | Test Cases | Passed | Failed | Result |
|---|---|---|---|---|---|
| User Authentication | Admin, Instructor, Student | 6 | 6 | 0 | Pass |
| Member Management | Admin, Instructor | 2 | 2 | 0 | Pass |
| Training & Attendance | Admin, Instructor, Student | 5 | 5 | 0 | Pass |
| Grading & Rank Progression | Admin, Instructor | 2 | 2 | 0 | Pass |
| Activities & Achievements | Admin, Instructor | 2 | 2 | 0 | Pass |
| Performance & Reporting | Admin | 1 | 1 | 0 | Pass |
| **Overall** | | **18** | **18** | **0** | **100%** |

**Non-Functional Testing**

Non-functional testing was conducted through manual observation and direct interaction with the PSSGM platform. The evaluation focused on usability, access control, and input validation. The results presented in Table 3 indicate that the system passed the selected test scenarios, demonstrating acceptable behavior under the conditions evaluated. These findings provide an initial assessment of the platform's operational quality.

**Table 3: Summary of non-functional testing results based on criteria.**

| Criteria | Expected Result | Actual Result | Result |
|---|---|---|---|
| Usability | The user should be able to navigate the system's interface and complete the assigned tasks intuitively and efficiently. | The user successfully navigated the interface and completed all assigned tasks smoothly without any confusion. | Pass |
| Security (Access Control) | The system must actively block the unauthorized access attempt and safely redirect the user back to their respective dashboard. | The system successfully identified the unauthorized role, blocked the access, and safely redirected the user to the student dashboard. | Pass |
| Input Validation and Error Handling | The system must prevent the data submission and display clear, user-friendly validation warnings instead of crashing or showing system-level database errors. | The system successfully caught the missing inputs and displayed clear validation warnings without any internal system crashes. | Pass |

## DISCUSSION

The functional testing results indicate that the developed PSSGM platform successfully executed all 18 predefined test cases, demonstrating that the tested functions operated according to their specified requirements. The preliminary non-functional evaluation also provided initial observations regarding system usability, access control, and input validation. The main contribution of this study is the integration of multiple Silat management processes into a centralized web-based platform, including membership, training, attendance, grading, activities, and practitioner progress monitoring. Unlike previous studies that primarily focused on membership management (Dewi et al., 2021), tournament administration (Wardana & Aribowo, 2021), championship registration (Putra & Apriyanto, 2022), and competition management (Indiran et al., 2026), PSSGM provides an integrated environment for managing routine organizational activities and maintaining continuous practitioner records. However, the evaluation was limited to functional verification and preliminary manual non-functional testing. The study did not assess the platform's effectiveness through extensive real-world deployment, comparative efficiency measurements, or structured user satisfaction assessments. Consequently, the findings establish the initial technical feasibility of the platform rather than its demonstrated organizational impact. Future evaluation should involve actual PSSGM administrators, instructors, and students to assess usability, operational efficiency, user satisfaction, and the platform's effectiveness in supporting routine Silat management activities.

## CONCLUSION

This study presented PSSGM, an integrated web-based Silat management platform designed to centralize membership, training, attendance, grading, activities, and practitioner performance records. Its main contribution is the integration of continuous practitioner management processes into a single platform, extending beyond existing systems focused primarily on membership or competition administration. Functional testing achieved a 100% pass rate across 18 test cases, demonstrating that the tested functions met their specified requirements. However, the evaluation was limited to functional verification and preliminary manual non-functional testing, without extensive real-world user assessment. Future research should focus on user satisfaction, operational efficiency, and organizational effectiveness through evaluation involving actual administrators, instructors, and students.

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