



Design of a Web-Based SPMNB System Integrated with a Payment Gateway Using the Waterfall Method at SMPS Daarut Tasbih Ar-Rafi

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Article Info :

Received:
26-07-2026
Revised:
21-08-2026
Accepted:
28-08-2026

Abstract

The New Student Admission Selection (SPMB) process at SMPS Daarut Tasbih Ar-Rafi is still conducted manually, covering registration, submission of required documents, payment of registration fees, document verification, and dissemination of admission results. This condition creates fragmented administrative processes, increases the time required for data verification, and limits the effectiveness of information delivery to prospective students. This study aims to design and develop a web-based SPMB system integrated with a payment gateway to improve the effectiveness, efficiency, and integration of the admission process. The study employed the Waterfall development method, consisting of requirements analysis, system design, implementation, testing, and maintenance. System requirements were analyzed using the PIECES framework, while system modeling was performed using Unified Modeling Language (UML). The application was developed using Laravel 12, PHP, and MySQL, with integration of the Midtrans Payment Gateway, WhatsApp Notification Gateway, and Email Notification Gateway. The implemented system facilitates account registration, online registration forms, document uploading, document verification, online payment, applicant-data management, admission-result publication, and registration and payment reporting. Functional evaluation using Black Box Testing covered 12 test scenarios and achieved a 100% success rate, indicating that the tested system functions operated according to the specified requirements. The findings demonstrate that the proposed system provides an integrated digital platform for improving the accessibility, traceability, and efficiency of SPMB administration at SMPS Daarut Tasbih Ar-Rafi.

Keywords: *Laravel 12, Notification Gateway, Payment Gateway, SPMB, Waterfall.*



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INTRODUCTION

The rapid development of information technology has transformed administrative practices across educational institutions, including the management of new student admissions, as schools increasingly adopt web-based platforms to improve accessibility, data accuracy, processing speed, and service responsiveness. Digital transformation in admissions is no longer limited to replacing paper forms with online forms, but increasingly involves the integration of data management, document verification, payment processing, and information delivery within interconnected information systems. Recent studies indicate that web-based admission systems can reduce administrative workload while improving the organization and accessibility of applicant data throughout the admission cycle (Melati et al., 2024). The expansion of digital admission services also reflects a broader shift toward administrative environments in which applicants and parents expect registration procedures to be accessible remotely, transparent, and capable of providing timely information without requiring repeated interaction with school staff. Research on web-based admission implementation has demonstrated that centralized online registration can facilitate data collection, document submission, and administrative monitoring while reducing dependence on physical documents and face-to-face procedures (Uche-Nwachi et al., 2026). This transformation is particularly relevant for schools that manage multiple admission activities simultaneously, because fragmented administrative procedures can create bottlenecks when applicant numbers increase and transaction records must be reconciled manually. A digitally integrated SPMB environment therefore represents not merely a technological

upgrade, but an organizational mechanism for restructuring admission workflows around more consistent, accessible, and traceable information management.

Previous research has established the practical value of web-based systems for new student admission, particularly in improving registration efficiency, centralizing applicant records, and facilitating access to admission information for prospective students and parents. A web-based PPDB system developed for SMP IT DAR Al-Atiq, for example, demonstrated the relevance of online registration in replacing conventional procedures and supporting more structured applicant-data management (Khulaimi & Hafizi, 2023). Similar developments have shown that the Waterfall approach can be applied to admission-system development when requirements are sufficiently identifiable and system functions can be systematically translated into sequential development stages (Ziky et al., 2025). The consistency of these findings suggests that web technology provides a viable foundation for improving admission administration, yet the dominant emphasis of earlier studies remains on registration and data management rather than on end-to-end service integration. Studies of online payment administration have also shown that web-based systems can improve the recording and monitoring of educational payments, particularly when payment status is incorporated into the administrative database (Mustapa et al., 2023). Payment gateway integration extends this capability by enabling transactions to be processed and payment confirmations to be communicated electronically rather than requiring administrators to verify bank transfers manually (Nurwahida et al., 2021). These developments indicate a progression from isolated digital registration toward integrated transaction management, although the degree of integration among registration, payment, verification, and communication functions remains uneven across existing systems. The literature therefore provides strong evidence for individual technological components, while offering less consistent evidence regarding their orchestration as a unified SPMB service architecture.

A critical limitation in the existing literature is the persistence of fragmented system designs in which online registration is implemented independently from payment processing, information dissemination, or administrative verification, leaving schools to reconcile information across separate channels. Research on PPDB systems has frequently concentrated on the digitization of registration procedures, while payment functionality is either absent or treated as an additional feature rather than as an integral component of the admission workflow (Oktapiani et al., 2023). Although payment gateway technology can automate transaction recording and reduce manual verification, studies of payment integration have often emphasized transaction functionality without sufficiently addressing its relationship with the broader admission lifecycle (Ardha & Rosid, 2022). This fragmentation becomes problematic when applicants must complete registration through a website, transfer funds through an external banking channel, submit proof of payment through messaging applications, and subsequently wait for administrators to validate the transaction. Such a workflow creates multiple points at which inconsistent data, delayed confirmation, duplicated records, or communication failures may occur, particularly when administrative personnel must coordinate information originating from different platforms. Recent work has begun combining payment gateways with admission systems, yet the technological emphasis remains comparatively narrow, with integrated communication mechanisms receiving less systematic attention (Syah et al., 2026). The unresolved issue is therefore not simply whether schools can digitize admission or payment, but how these functions can be architecturally connected so that registration status, transaction status, administrative verification, and user-facing information remain synchronized within a single operational environment.

The practical implications of this gap become more significant in schools where conventional procedures still rely on paper registration forms, spreadsheet-based data management, direct payments, and manual communication between applicants and admission committees. At SMPS Daarut Tasbih Ar-Rafi, preliminary observation indicates that SPMB activities remain dependent on paper forms and Microsoft Excel, while payment confirmation requires applicants who transfer funds to send proof of payment through WhatsApp for subsequent manual verification. A comparable problem has been identified in educational payment systems where manual transaction administration creates additional administrative work and increases the possibility of delays in payment-status confirmation (Astriyani et al., 2020). The problem extends beyond transaction processing because applicants and parents also need timely information regarding registration status, payment confirmation, selection schedules, and admission results, all of which become difficult to manage when information is distributed through separate communication channels. Information quality is consequently central to the effectiveness of

an integrated admission system because inaccurate, incomplete, or untimely information can directly affect administrative decisions and user confidence in the service (Sumantri et al., 2025). Recent development of web-based academic information systems further reinforces the importance of presenting administrative information through structured interfaces that allow users to access relevant data efficiently and consistently (Putri Hari Wijaya et al., 2025). The combination of manual registration, fragmented payment verification, and non-centralized information delivery at SMPS Daarut Tasbih Ar-Rafi consequently represents a concrete empirical problem that requires a system-level intervention rather than isolated digitization of individual administrative tasks.

Within this landscape, the present research positions the development of an integrated web-based SPMB system as a response to the conceptual and operational gap between digital registration and genuinely integrated admission services. The proposed system combines online registration, applicant-data management, document administration, payment processing through a payment gateway, and information delivery within a unified platform, thereby treating the admission process as an interconnected workflow rather than a collection of independent administrative activities. The selection of Laravel provides an appropriate technological foundation because its Model–View–Controller architecture separates data management, interface presentation, and application logic, supporting the development of structured and maintainable web applications (Hanum et al., 2024). The use of a payment gateway is particularly relevant because automated transaction processing can connect payment status directly with the admission database, reducing dependence on manual confirmation and improving the traceability of financial transactions. Previous research on digital financial systems in educational environments also indicates that payment gateway integration can support more systematic financial administration when transaction functionality is incorporated into a web-based information system (Hudawi et al., 2025). From a software-development perspective, the Waterfall method is appropriate for this study because the system requirements can be identified through observation and analysis of the existing SPMB workflow before being translated into sequential stages of analysis, design, implementation, testing, and deployment. The research consequently extends existing work by emphasizing functional integration and workflow continuity rather than treating registration, payment, and information services as disconnected technological features.

This study aims to design and develop a web-based SPMB system integrated with a payment gateway using the Waterfall method at SMPS Daarut Tasbih Ar-Rafi to address the limitations of manual registration, spreadsheet-based data management, manual payment verification, and fragmented information delivery. The system is designed to provide an integrated mechanism through which prospective students can register, submit required information and documents, complete registration payments, and monitor relevant admission information through a centralized digital platform. For school administrators, the system is intended to support structured management of applicant data, verification processes, payment records, and admission information within a consistent workflow. The study contributes theoretically by strengthening the understanding of integrated information-system design in educational admission services, particularly by connecting information management, transaction processing, and user-oriented service delivery within a single system framework. Its methodological contribution lies in demonstrating the application of the Waterfall development model to an integrated SPMB context in which functional requirements can be systematically translated into a structured web application. The resulting design is expected to provide a reproducible reference for educational institutions seeking to move from fragmented administrative practices toward integrated digital admission services. The study ultimately seeks to demonstrate that effective digital transformation in SPMB should be evaluated not only through the availability of online registration, but through the extent to which core administrative processes can operate coherently within one accessible, traceable, and maintainable information system.

RESEARCH METHODS

This study employed an empirical system-development design because the research involved the implementation and functional testing of a web-based SPMB system integrated with a payment gateway at SMPS Daarut Tasbih Ar-Rafi. The system was developed using the Waterfall model, which organizes development into sequential stages consisting of requirements analysis, system design, implementation, testing, and maintenance, with each stage completed before the subsequent stage begins (Hasanah & Untari, 2020). The requirements analysis stage identified the existing SPMB

procedures, including applicant registration, personal-data collection, document submission, payment confirmation, administrative verification, and dissemination of admission information, which were then translated into functional system requirements. The system architecture was designed as a web-based application using the Laravel framework with the Model–View–Controller (MVC) architecture, in which the Model manages application data and database interactions, the View presents information to users, and the Controller manages application logic and communication between components (Hanum et al., 2024). The implementation stage incorporated a relational database for storing applicant, registration, document, payment, and selection data, while the payment gateway was integrated to process registration fees and provide transaction-status information to the system. The development process followed the sequential characteristics of Waterfall because the administrative requirements of the school were sufficiently identifiable and could be documented before implementation began (Munthe et al., 2025). The resulting application provided separate functional access for prospective students and administrators, enabling registration and payment activities on the user side while supporting data verification, transaction monitoring, and admission administration on the institutional side.

System validation was conducted using Black Box Testing, which evaluates system functionality through input and output behavior without examining the internal source-code structure. The testing procedure consisted of preparing functional test scenarios, providing predetermined inputs to each system feature, observing the resulting outputs, and comparing the observed behavior with the expected results specified in the system requirements. Black Box Testing was selected because it can identify functional errors from the user's perspective and is suitable for verifying whether implemented features operate according to their intended specifications. The test coverage included applicant registration, data validation, document submission, authentication, payment processing, payment-status verification, administrative data management, and presentation of admission information. Each test case was classified as successful when the actual output corresponded to the expected output and unsuccessful when the system produced an incorrect response, failed to process the input, or generated an output inconsistent with the defined requirement. The sequential testing stage is consistent with the Waterfall approach, in which system verification is performed after implementation to determine whether the developed application satisfies the requirements established during the preceding stages (Hasanah & Untari, 2020). System performance was evaluated primarily through the functional success rate, calculated as the proportion of successfully executed test cases relative to the total number of test cases multiplied by 100%, while payment integration was also validated by comparing the transaction status generated by the payment gateway with the corresponding payment status recorded in the application database.

RESULTS AND DISCUSSION

Analysis of the Existing SPMB System and Functional Requirements

The analysis of the existing Seleksi Penerimaan Murid Baru (SPMB) process at SMPS Daarut Tasbih Ar-Rafi identified an administrative workflow that remains dependent on paper-based registration, Microsoft Excel, direct payment, and manual communication between prospective students and admission administrators. The prospective student must interact with the admission committee at several stages, beginning with registration and continuing through document submission, payment confirmation, and acquisition of admission information. Applicant data are recorded separately from payment and verification activities, resulting in a fragmented information flow that requires administrators to reconcile information from different sources. The use of conventional procedures also restricts applicants' ability to independently monitor the progress of their registration because status information is not available through a centralized interface. Previous research has shown that web-based admission systems can improve registration-data management and facilitate access to admission services by moving administrative activities into an integrated digital environment (Khulaimi & Hafizi, 2023). The empirical condition at the research site therefore indicates that the principal requirement is not merely the conversion of paper forms into digital forms, but the integration of interconnected administrative activities into a single information system.

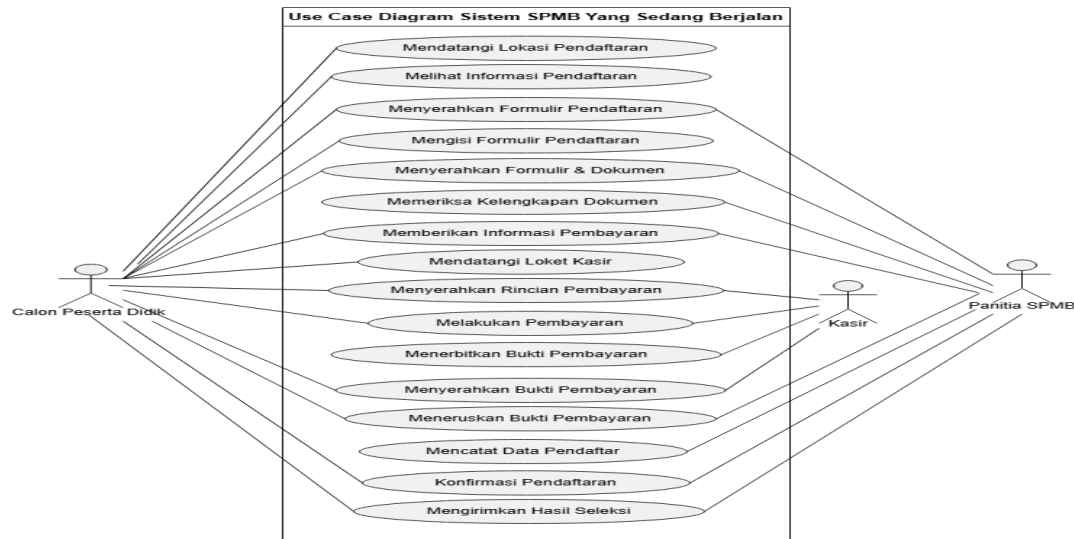


Figure 1. Use Case Diagram of the Existing System

Figure 1 illustrates the interaction between actors and activities in the existing SPMB process, in which prospective students and administrators have different responsibilities throughout registration, document submission, payment, verification, and information delivery. The prospective student acts as the primary user who initiates the registration process, submits required information, completes payment, and communicates with the administrator when confirmation or additional information is required. The administrator is responsible for receiving applicant information, checking submitted documents, confirming payments, managing selection information, and communicating the results to applicants. This interaction pattern indicates that several activities are performed outside an integrated application environment, particularly payment confirmation and status communication. The separation of registration and payment administration creates additional administrative work because transaction evidence must be checked manually before the applicant's payment status can be updated. Similar research on web-based student payment administration demonstrates the value of integrating payment records into an information system to improve the organization and monitoring of educational transactions (Mustapa et al., 2023). The existing use case configuration therefore provides the empirical basis for identifying functions that must be centralized within the proposed SPMB system.

From the prospective student's perspective, the existing procedure begins with obtaining and completing the registration form, followed by submission of personal information and supporting documents to the admission committee. After registration, the applicant completes the registration payment through bank transfer or direct payment and, for transfer-based transactions, sends proof of payment through WhatsApp for manual verification. The applicant must subsequently wait for confirmation from the administrator because payment status is not automatically connected to the registration record. This procedure creates a dependency between applicants and administrative personnel that can increase response time and complicate transaction tracking when the number of applicants increases. Web-based registration systems have been shown to provide a more accessible mechanism for applicants to submit registration information and interact with admission services without repeatedly visiting the educational institution (Tarmizi et al., 2019). The observed workflow consequently establishes several functional requirements, particularly online account creation, digital registration, document upload, payment processing, payment-status monitoring, and access to admission information.

Table 1. Functional Requirements Based on the Existing SPMB Process

Existing Activity	Required System Function
Paper-based registration	Online applicant registration
Microsoft Excel data management	Centralized applicant database
Manual document submission	Online document upload

Manual document verification	Document verification module
Bank transfer/direct payment	Integrated payment gateway
Manual payment-proof verification	Automated payment-status synchronization
Direct/WhatsApp information delivery	WhatsApp and email notification
Manual result dissemination	Online selection-result announcement
Manual administrative reporting	Automated registration and payment reports

Table 1 summarizes the functional requirements derived from the observed administrative workflow and demonstrates that each major limitation in the existing process corresponds to a specific system function. The conversion of manual registration into online registration reduces dependence on physical forms while establishing a standardized structure for applicant data collection. Centralized data management also enables registration records, documents, payment information, and selection results to be associated with the same applicant account, improving traceability throughout the admission cycle. The integration of a payment gateway is particularly important because payment information can be transmitted electronically to the application and used to update transaction status without relying exclusively on manually submitted payment evidence (Ardha & Rosid, 2022). The functional requirements also include notification services because applicants require timely information regarding document verification, payment status, and admission results. Digital communication mechanisms have previously been applied in educational administrative systems to improve the delivery of transaction and service information to users (Astriyani et al., 2020). The resulting requirement structure provides a direct bridge between the observed problems and the technical functions implemented in the proposed SPMB application.

Based on the identified requirements, the proposed procedure for prospective students was structured as a continuous digital workflow beginning with website access and ending with the publication of selection results. First, the prospective student accesses the SPMB website, creates an account, and logs in using the registered credentials before completing the online registration form and uploading the required documents. The applicant can then monitor the document-verification status through the system and proceed to the registration payment using the Midtrans Payment Gateway after fulfilling the required registration conditions. The payment transaction generates a digital payment record that can be accessed by the applicant, while the transaction status is synchronized with the application for administrative monitoring. The applicant subsequently receives relevant notifications through WhatsApp and email and can independently monitor registration and payment information through the application interface. The integration of payment functionality into the registration workflow is consistent with previous PPDB research demonstrating that payment gateways can be incorporated into web-based registration services to support more systematic transaction processing (Nurwahida et al., 2021). The proposed workflow transforms the applicant's role from a participant who depends heavily on administrator confirmation into an active system user who can submit information, complete transactions, and monitor administrative status through a centralized platform.

The administrator procedure was designed to provide broader access corresponding to the institutional responsibilities associated with SPMB management. After authentication, the administrator can manage applicant accounts and registration records, review submitted documents, verify payment status, manage selection results, publish announcements, and generate registration and payment reports. Administrator access also includes management of school-profile information, programs, facilities, galleries, and news so that general institutional information can be maintained within the same web platform. The separation of applicant and administrator functions establishes role-based access in which each actor receives system capabilities according to operational responsibilities, reducing unnecessary exposure of administrative functions to prospective students. The resulting design also connects registration data with document verification, payment information, and selection outcomes, allowing administrators to trace the progression of an applicant through the complete admission workflow. The use of UML as a means of representing actors, functions, and relationships supports systematic communication of these requirements before implementation, particularly because UML can provide a structured representation of system functionality during information-system development (Aurellia et al., 2025). The functional requirements identified through this analysis consequently become the basis for the proposed system design, interface implementation, payment integration, and subsequent Black Box Testing.

Proposed SPMB Workflow and System Design

The proposed SPMB system was designed by translating the functional requirements identified in the existing workflow into an integrated web-based architecture involving prospective students and administrators as the principal actors. The design uses Unified Modeling Language (UML) to represent functional requirements, user interactions, process sequences, and relationships among system components before implementation. The use of UML provides a structured representation of system behavior and enables the identified administrative requirements to be mapped into explicit system functions (Aurellia et al., 2025). The proposed design places registration, document submission, verification, payment, notification, and selection-result management within a connected workflow rather than treating each activity as an independent administrative process. This configuration is intended to reduce information fragmentation by ensuring that data generated during one stage can be referenced during subsequent stages of the admission process. Similar web-based admission research demonstrates that structured system design can support more organized registration activities and improve accessibility for prospective students (Oktapiani et al., 2023). The resulting architecture provides the conceptual foundation for implementing a system that connects applicant-facing services with administrator-facing management functions.

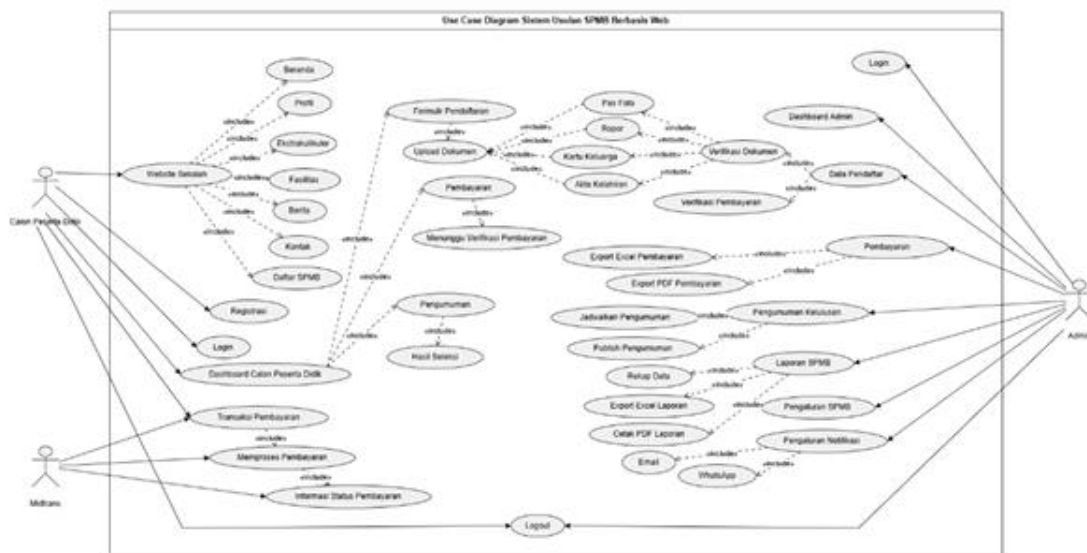


Figure 2. Use Case Diagram of the Proposed System

Figure 2 represents the proposed use case configuration and identifies prospective students and administrators as actors with distinct but interconnected system responsibilities. Prospective students can register an account, authenticate, complete the online registration form, upload required documents, monitor document verification, complete payment through the Midtrans Payment Gateway, access payment information, receive notifications, and view admission results. Administrator functions include authentication, applicant-data management, document verification, payment verification, selection-result management, announcement management, website-content management, user management, and report generation. The separation of these functions establishes controlled access while maintaining a common data environment in which applicant-related information can be connected across the admission workflow. The design is consistent with the principle that information systems should organize data, procedures, technology, and users as interrelated components supporting operational activities and information requirements (Sumantri et al., 2025). The integration of payment functionality within the same use case structure distinguishes the proposed system from admission applications that primarily concentrate on online registration without incorporating transaction processing. Research on payment gateway implementation in educational registration has demonstrated that payment integration can extend web-based admission services by enabling digital transaction processing within the registration workflow (Simatupang et al., 2022).

The proposed workflow begins when a prospective student accesses the SPMB website and creates a personal account using the required identity and contact information. After successful authentication, the applicant completes the registration form and uploads the required documents, which are then stored in the system for administrative review. The administrator accesses the submitted registration data through the administrative interface and evaluates the completeness and validity of the uploaded documents before determining their verification status. When the registration requirements have been fulfilled, the applicant proceeds to the payment stage through the integrated Midtrans Payment Gateway rather than transferring funds independently and submitting a separate payment receipt for manual verification. The payment gateway functions as an intermediary between the application and the payment service, allowing transaction information to be processed and returned to the application for status monitoring. Integration of an external payment service through an application interface has been shown to support more systematic online payment processing and improve the connection between transaction data and application functions (Hanum et al., 2024). This workflow establishes a continuous relationship between registration and payment, reducing the number of independent channels through which administrative information must be exchanged.

The payment component constitutes an important part of the proposed architecture because registration status and payment status are operationally related within the SPMB process. After initiating a payment transaction, the applicant is directed to the available payment interface provided by Midtrans and completes the transaction according to the selected payment mechanism. The resulting transaction status is subsequently used by the system to determine whether the registration payment has been completed, remains pending, or requires further action. This mechanism reduces dependence on screenshots or manually transmitted transfer evidence, which previously required administrators to verify transaction information separately from registration records. Payment gateway integration has been applied in educational registration systems to support more systematic transaction processing and reduce manual payment administration (Ardha & Rosid, 2022). The proposed design also allows administrators to monitor payment information through the administrative interface, creating a shared reference between the applicant's transaction and the school's financial record. Such integration strengthens transaction traceability because payment information becomes part of the applicant's digital admission record rather than an isolated communication artifact.

The system design also incorporates notification mechanisms to support continuous communication between the application and prospective students throughout the admission process. Notifications are intended to communicate relevant events such as registration status, document verification, payment confirmation, and other admission-related information through WhatsApp and email. This approach reduces the need for applicants to repeatedly contact administrative personnel to obtain information that can be generated automatically from changes in the system. Previous educational information-system research has demonstrated the usefulness of automated messaging for communicating payment and administrative information to users (Astriyani et al., 2020). The notification layer is therefore positioned as an extension of the information-management function rather than as an independent communication feature. The design also provides an online interface through which applicants can access their current registration and payment status, allowing notification messages and system-based information access to operate as complementary mechanisms. The combination of centralized information and digital notifications is expected to improve information accessibility while reducing the communication burden associated with manual admission administration.

At the structural level, the proposed system organizes the identified functions into connected components covering authentication, registration, document management, payment, notification, selection, content management, and reporting. Laravel was selected as the development framework because its Model–View–Controller architecture separates data processing, user-interface presentation, and application control, allowing each functional component to be developed and maintained within a structured software architecture. Previous research on Laravel-based payment systems indicates that the MVC structure and RESTful API integration can support the development of web applications requiring communication between application components and external payment services (Hanum et al., 2024). The proposed architecture consequently places the database as the central repository for applicant and administrative information while the application layer manages business processes and communicates with the payment gateway and notification services. The interface layer provides different views

according to the authenticated user's role, ensuring that prospective students access applicant-specific services while administrators obtain management and reporting functions. This architectural separation also supports maintainability because changes to a particular application component can be managed without necessarily modifying unrelated functional components. The resulting design represents an integrated SPMB information system in which registration, payment, verification, communication, and selection processes are connected through a common application environment, providing the technical basis for the implementation and functional testing presented in the subsequent stage.

Web-Based SPMB System Implementation

The implementation stage translated the functional requirements and system design into a web-based SPMB application that can be accessed by prospective students and administrators through a browser. The application was developed using the Laravel framework with an MVC architecture to separate data management, application logic, and user-interface presentation. This architectural approach provides a structured development environment for applications that manage registration data and transactions because each functional component can be organized according to its specific responsibility (Hanum et al., 2024). The implementation integrates applicant registration, document submission, verification, payment, notification, selection-result management, and administrative reporting within one application environment. The database serves as the central repository for applicant accounts, registration information, submitted documents, payment records, verification status, and selection results. This configuration is consistent with previous web-based admission implementations that emphasize centralized management of registration information to improve administrative accessibility and processing efficiency (Melati et al., 2024). The resulting application provides an integrated operational environment in which information generated during registration can subsequently be utilized for verification, payment monitoring, and selection administration.



Figure 3. SPMB Registration Page

Figure 3 presents the main SPMB registration page, which functions as the initial access point for prospective students before entering the registration process. The page provides information concerning the new student admission process, registration requirements, and access options for account creation and user login. The placement of registration information on the initial interface allows prospective students to understand the admission process before submitting personal information to the system. This design supports the role of websites as centralized information and service media capable of providing educational administrative information through an accessible online interface (Putri Hari Wijaya et al., 2025). The registration page also separates general admission information from authenticated applicant functions, preventing users from accessing personalized registration features before establishing an account. Such separation is relevant to the implementation of web-based admission systems because prospective students require both public information and secure access to

individual registration services. The interface therefore represents not only a visual component but also the first functional layer connecting prospective students with the digital SPMB workflow.

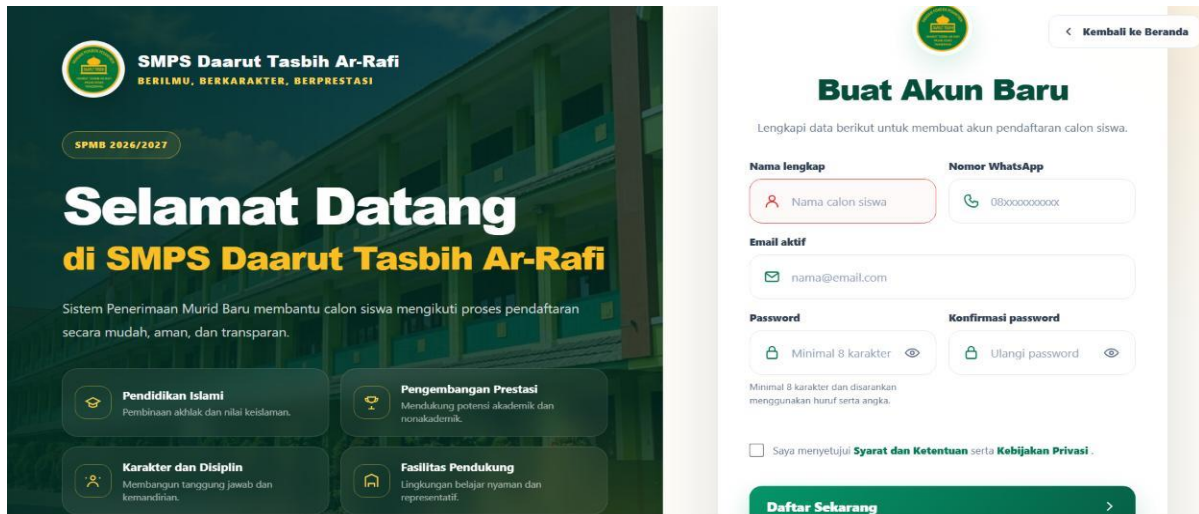


Figure 4. SPMB Registration Page

Figure 4 shows the registration interface used to create prospective-student accounts before the applicant can access the complete SPMB functionality. The form requires the applicant to enter the full name, WhatsApp number, email address, password, and password confirmation, establishing the minimum credentials required for account authentication and subsequent communication. The inclusion of WhatsApp and email addresses also creates a direct connection between applicant identity and the notification mechanism incorporated into the proposed system. Account-based registration provides a more structured approach than anonymous form submission because subsequent registration activities can be associated with a unique user identity within the database. Web-based admission systems similarly use applicant accounts to organize registration information and facilitate access to individual admission services (Khulaimi & Hafizi, 2023). The registration mechanism also supports data consistency because the account credentials become the reference through which subsequent forms, documents, payment information, and admission status can be linked. The implementation therefore establishes an identifiable digital record for each prospective student before the applicant proceeds to the subsequent stages of the SPMB process.

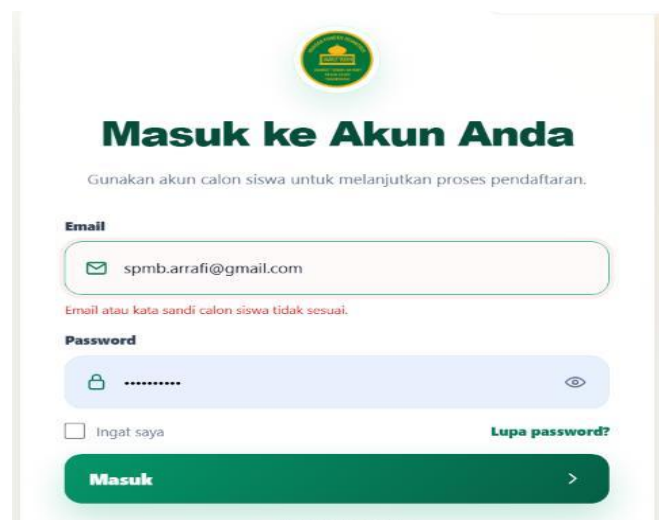


Figure 5. Failed Login Page

Figure 5 presents the failed-login interface, which displays an error message when the email address or password entered by a prospective student does not correspond to the credentials stored in

the system. The implementation of this validation mechanism prevents unsuccessful authentication attempts from proceeding to applicant-specific functions and provides immediate feedback to the user. Authentication validation is important because the proposed application stores personal information, registration documents, payment records, and selection information that should only be accessible according to the user's authorization level. The system consequently treats authentication as a control mechanism rather than merely as an entry form, linking user credentials with the appropriate application permissions. Role-based access is particularly relevant in information systems because different actors require different levels of access according to their operational responsibilities (Sumantri et al., 2025). In the implemented SPMB system, prospective students are restricted to functions associated with their own registration, while administrators receive broader access for verification, content management, payment monitoring, and reporting. The implementation of authentication and access separation therefore supports both functional organization and controlled access to admission information.

The implemented application also provides administrative functions for managing applicant data, submitted documents, payment information, selection results, and website content. Administrator users can review registration records, verify submitted documents, monitor payment status, manage selection results, publish announcements, and generate administrative reports through the management interface. These functions transform the administrator's role from manually reconciling information from paper documents, spreadsheets, and messaging applications into managing information through a centralized database. The integration of payment processing further connects applicant registration with financial administration because transaction information can be associated with the corresponding applicant record through the application. Previous research on web-based payment systems has shown that integration between registration and payment functions can support more systematic transaction administration and reduce dependence on manual payment verification (Nurwahida et al., 2021). The implementation also incorporates website-content management for school profiles, programs, facilities, galleries, and news, allowing general institutional information to be maintained through the same platform. This combination of applicant-facing and administrator-facing functions creates a complete application environment that supports both service delivery and internal administrative operations.

Table 2. Main Functional Modules of the Implemented SPMB System

Module	Primary User	Main Function
Account Registration and Authentication	Prospective Student	Create account and access the system
Online Registration	Prospective Student	Complete and submit registration data
Document Management	Prospective Student/ Administrator	Upload, review, and verify requirements
Payment Gateway	Prospective Student/ Administrator	Process and monitor registration payments
Notification	Prospective Student	Receive registration and payment information
Selection Management	Administrator	Manage and publish selection results
Website Content	Administrator	Manage school information and publications
Reporting	Administrator	Generate registration and payment reports

Table 2 summarizes the principal functional modules implemented in the SPMB application and demonstrates the correspondence between identified requirements and realized system functions. The modules are interconnected through the applicant's registration identity, allowing information from registration, document verification, payment, and selection to remain associated with the same user record. The payment gateway module provides an important extension because the system does not treat payment as an external administrative activity, but incorporates transaction processing into the admission workflow. Similar integrated web applications have demonstrated that combining core administrative functions with payment gateway services can improve the continuity of digital transaction processes (Chalim et al., 2025). The implementation also supports notification functionality so that changes in relevant registration or payment information can be communicated without requiring

administrators to manually contact each applicant. Research on digital admission environments indicates that web-based services can improve accessibility and administrative efficiency when registration information and institutional services are delivered through an integrated platform (Uche-Nwachi et al., 2026). The implemented modules therefore provide the functional foundation for the next stage of evaluation, in which each major process is tested through Black Box Testing to determine whether the application produces outputs consistent with its defined requirements.

System Functional Testing and Performance Evaluation

The implemented SPMB application was evaluated using Black Box Testing to determine whether each functional component produced outputs consistent with the requirements established during the system-design stage. The testing focused on observable system behavior rather than internal source-code structure, making it appropriate for validating user-facing functions such as authentication, registration, document submission, payment, notification, and administrative management. Black Box Testing is commonly applied to verify whether software functions operate according to specified inputs and expected outputs without requiring direct examination of the program's internal logic (Hasanah & Untari, 2020). Each test scenario was executed by providing predetermined input conditions and recording the system response generated by the corresponding function. A test case was categorized as successful when the actual output matched the expected output, whereas a failed case indicated an incorrect response, unsuccessful processing, invalid validation, or inconsistency with the specified requirement. The testing procedure therefore provided empirical evidence regarding the functional readiness of the implemented SPMB application. This approach also maintains consistency with the sequential Waterfall development process, in which functional verification is conducted after implementation to confirm conformity between the developed system and previously defined requirements (Melati et al., 2024).

The functional testing covered the main activities performed by prospective students and administrators throughout the SPMB workflow. For prospective students, the evaluated functions included account registration, login, completion of registration data, document upload, payment initiation, payment-status checking, notification access, and viewing of admission results. Administrative functions included login, applicant-data management, document verification, payment monitoring, selection-result management, announcement management, and report generation. The testing scope was designed to represent the complete operational sequence rather than evaluating isolated interface elements. This is important because an admission system depends on the continuity of information between registration, document verification, payment, and selection stages. Previous research on web-based admission systems has emphasized the importance of integrating registration activities into a structured application so that administrative data can be managed more consistently (Khulaimi & Hafizi, 2023). The inclusion of payment and notification functions also extends the testing scope beyond conventional registration systems by examining whether transaction and communication processes can operate as part of the same application workflow. The resulting test structure provides a direct basis for determining whether the proposed system can support the operational requirements of SMPS Daarut Tasbih Ar-Rafi.

Table 3. Functional Black Box Testing of the SPMB System

No.	Tested Function	Expected Output	Result
1	Account Registration	Applicant account is successfully created	Pass
2	Login	Valid credentials provide access to the appropriate dashboard	Pass
3	Registration Form	Applicant data is validated and stored	Pass
4	Document Upload	Required documents are uploaded and recorded	Pass
5	Payment Initiation	Payment transaction is generated through Midtrans	Pass
6	Payment-Status Verification	Transaction status is displayed according to the payment response	Pass
7	Applicant-Data Management	Administrator can view and manage registration records	Pass

8	Document Verification	Administrator can verify submitted documents	Pass
9	Selection-Result Management	Administrator can enter and manage selection results	Pass
10	Notification	Registration or transaction information is delivered through the configured notification channel	Pass
11	Admission Announcement	Applicant can access the published selection result	Pass
12	Report Generation	Registration and payment reports can be displayed or printed	Pass

Table 3 presents the functional testing results for the implemented SPMB system and shows that the evaluated functions produced outputs corresponding to their predefined requirements. The successful execution of account registration and authentication indicates that the system can establish controlled access before applicants enter personalized registration services. The registration, document-management, and verification functions demonstrate that information submitted by applicants can proceed through the intended administrative workflow without requiring a separate manual recording process. The payment test confirms that the transaction process can be initiated through the integrated Midtrans service and that the resulting transaction information can be represented within the application. Integration of a payment gateway into a student-registration environment has previously been demonstrated as a mechanism for connecting registration and transaction activities within a single digital workflow (Ardha & Rosid, 2022). The administrative functions also operated according to their intended roles, allowing authorized users to manage applicant records, verification activities, selection results, and reports. The functional findings indicate that the implemented architecture was capable of translating the documented SPMB requirements into operational application features.

The payment gateway integration received particular attention because payment verification represented one of the principal administrative constraints in the previous procedure. The implemented mechanism connects the registration record with the corresponding transaction information, enabling payment status to be monitored through the application rather than relying exclusively on manually submitted transfer evidence. This configuration improves traceability because transaction information can be associated with the applicant record and subsequently used by administrators during registration verification. Similar research involving payment gateway implementation in new-student registration has reported the feasibility of incorporating digital payment processing into web-based admission services (Nurwahida et al., 2021). The present implementation extends this concept by positioning payment within a broader workflow that also includes document verification, notifications, and selection-result management. The integration reduces the separation between administrative and financial records that occurs when applicants register through one channel but submit payment evidence through another. From an information-system perspective, the configuration strengthens data continuity because registration and payment become related components of a common information environment rather than independent administrative activities.

The functional success rate was calculated using the ratio between successfully executed test cases and the total number of executed test cases, expressed as a percentage. Based on the twelve functional scenarios presented in Table 3, all twelve test cases produced the expected outputs, resulting in a functional success rate of 100%. This value indicates that no functional failure was identified within the tested scenarios under the defined test conditions. The result should be interpreted specifically as evidence of functional conformity rather than as proof that the system is free from all possible software defects, because Black Box Testing evaluates the selected input-output scenarios rather than the complete internal state space of an application. The use of functional testing as an acceptance-oriented evaluation is consistent with research on web-based payment and student-administration systems that assesses whether implemented functions correspond to specified operational requirements (Mustapa et al., 2023). The result also indicates that the sequential requirements, design, implementation, and testing stages produced a system whose principal functions remained aligned with the operational objectives identified during requirements analysis. The empirical finding provides a measurable basis for assessing the technical feasibility of the proposed SPMB application at the institutional level.

The evaluation further indicates that the proposed system addresses the fragmentation observed in the previous SPMB workflow by bringing registration, document verification, payment, notification, and admission-result access into an integrated platform. The functional success rate of 100% demonstrates that the tested workflow could be executed according to the predefined requirements, while the payment-status verification confirms the operational connection between the application and the external payment service. The result is comparable with the broader direction of recent admission-system development, which increasingly combines web-based registration with digital transaction and administrative services (Syah et al., 2026). The integration also provides a more structured information environment for administrators because applicant records, verification status, payment information, and selection data can be accessed through designated system functions. From the user perspective, the availability of online registration and status information reduces dependence on direct interaction with administrative personnel for routine admission activities. The testing findings therefore support the conclusion that the implemented system is functionally suitable for the defined SPMB workflow at SMPS Daarut Tasbih Ar-Rafi, while further evaluation involving usability, security, scalability, and real-world transaction performance would be required to establish broader system quality beyond functional correctness.

CONCLUSION

Based on the results of the research on the Web-Based New Student Admission Selection (SPMB) System Integrated with a Payment Gateway at SMPS Daarut Tasbih Ar-Rafi, it can be concluded that the previous SPMB process relied on manual procedures for registration, document verification, payment, and dissemination of admission information, resulting in fragmented administrative activities and limited process integration. The developed system applies the Waterfall method through sequential stages of requirements analysis, system design, implementation, and functional testing, enabling the identified admission requirements to be translated into an operational web-based application. The system integrates applicant registration, online form completion, document uploading, document verification, payment processing, selection-result management, and admission announcements within a centralized platform. The integration of the Midtrans Payment Gateway enables applicants to complete registration payments online while allowing transaction-status information to be associated with the corresponding registration data. The system also incorporates WhatsApp and email notification services to support the delivery of registration, payment, verification, and selection-related information to prospective students. Black Box Testing demonstrated a 100% functional success rate across 12 tested scenarios, indicating that the implemented core functions generated outputs consistent with the specified requirements. These findings indicate that the proposed system provides a more integrated, traceable, and accessible mechanism for managing SPMB activities at SMPS Daarut Tasbih Ar-Rafi.

For further implementation, the SPMB system should be deployed comprehensively at SMPS Daarut Tasbih Ar-Rafi and accompanied by structured training for administrators and admission committee members to ensure consistent utilization of each system function. Periodic maintenance should be conducted to preserve system reliability, particularly as changes in payment services, notification platforms, browser technologies, and institutional admission procedures may affect system operation over time. Future research can extend the system through integration with the school's academic information system to establish continuity between admission records and subsequent student administration. The addition of analytical dashboards could also support administrators in examining applicant trends, payment status, registration progress, and admission outcomes as a basis for institutional decision-making. Digital document archiving can be further developed to strengthen document management, retrieval, and long-term administrative traceability. Future system evaluations should incorporate usability, security, scalability, response time, and real-world transaction performance to complement the functional assessment obtained through Black Box Testing. Such developments would position the SPMB platform as a more comprehensive digital infrastructure for managing student admission services and adapting to the evolving technological and administrative requirements of the school.

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