Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
Available online at:
http://journal.uny.ac.id/index.php/wuny
DOI: https://doi.org/10.21831/jwuny.v8i2.97601

Development of a Learning Management System Using the Agile Method at Ibnu Syam Center Obsession

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ARTICLE INFO

Article History
Submitted:
May 04, 2026
Revised:
June 30, 2026
Accepted:
September 6, 2026

Keywords
Learning Management System, Agile Methodology, Laravel, Islamic Religious Education, Web-Based Application

ABSTRACT

Background: The rapid growth of digital technology has encouraged educational institutions to adopt Learning Management Systems (LMS) to improve teaching and learning processes. However, many organizations still face limitations in using generic systems that do not fully support their specific educational needs.
Objectives: This study aims to develop an LMS application for Islamic Religious Education at Ibnu Syam Center Obsession, Blitar in order to enhance learning accessibility and management efficiency.
Method: The research applied Agile methodology supported by the PIECES framework to guide system development, analyze requirements, and identify problems and improvement opportunities.
Result: The study successfully produced a web-based LMS with features including learning material management, quizzes, assessments, and student progress monitoring. The development process consisted of planning, design, development, testing, release, and feedback stages. During the planning and design phases, the system architecture was modeled using class diagrams, activity diagrams, use case diagrams, and sequence diagrams to define system requirements and relationships among components. The implementation phase utilized Laravel PHP Programming Framework, and MySQL Database.
Conclusion: The findings indicate that the integration of Agile methodology and modern web technologies is effective in creating an adaptable and reliable LMS that improves the quality of educational delivery in non-formal institutions.

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INTRODUCTION

The pervasive evolution of information and communication technology has catalyzed a paradigm shift in the global education landscape, optimizing instructional quality and student engagement through Learning Management Systems (LMS). By leveraging robust network infrastructures, e-learning effectively mitigates traditional spatial and temporal constraints, establishing a flexible framework that democratizes access to education. However, the sustained efficacy of these digital platforms remains contingent upon the strategic alignment of technological innovation with specific pedagogical requirement (Elfaki et al., 2019; Rahmadani et al., 2024).

Within this ecosystem, the LMS serves as a pivotal infrastructure for managing, delivering, and tracking complex instructional processes. It facilitates the systematic organization of learning activities while significantly improving content accessibility and retrievability. From an information systems perspective, system success is predominantly governed by usability and integration of quality, which directly influences user satisfaction. Consequently, LMS development must transcend basic functional requirements by strategically aligning technical performance with learner-centered design to ensure effective knowledge of construction (Dahal & Manandhar, 2024).

Despite widespread adoption, several limitations persist in generic LMS solutions, particularly regarding system adaptability, customization, and integration. In practice, many institutions rely on Content Management Systems (CMS) that offer basic functionality but lack the flexibility and scalability required to meet complex organizational needs (Abid et al., 2024) . These architectural constraints underscore the urgent necessity for a systematic approach to developing tailored LMS applications that can accommodate specific institutional workflows more effectively (Supuwiningsih & Pramartha, 2024).

To address these challenges, a comprehensive system analysis using the PIECES framework is employed to diagnostically identify performance, information, and service bottlenecks. Furthermore, adopting an Agile development methodology is crucial to ensure iterative flexibility and strong user collaboration. Agile practices enable continuous feedback and rapid adaptation to change requirements, which have been shown to improve software quality and ensure that system functionalities align closely with user expectations (Al-Saqqa et al., 2020; Bagus et al., 2024; Dikert et al., 2016; Hoda et al., 2013).

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The Ibnu Syam Center Obsession Foundation in Blitar exemplifies these challenges, having encountered critical operational inefficiencies due to the restricted customization of its previous CMS-based platform. These constraints necessitate a transition toward a bespoke LMS designed to integrate seamlessly with the foundation of complex workflows. Consequently, this research develops an integrated LMS by synthesizing the PIECES framework for diagnostic analysis and Agile methodology for iterative execution. By mitigating performance and usability of bottlenecks, the proposed system establishes a robust, scalable framework tailored specifically for non-formal educational environments.

METHODS

This research was conducted at the Ibnu Syam Center Obsession and carried out from February to April 2026. The first one and a half months focused on the development of the registration process, covering the stages from user registration to course payment, while the following one and a half months focused on the development of the learning process, covering the stages from accessing learning materials to obtaining a certificate upon completion. The participants involved in this study were application developers and software engineers responsible for building and implementing the LMS. The instruments used in this research include supporting libraries, a server environment, and an Integrated Development Environment (IDE). Data were collected through business process documents that served as the basis for system requirements, while data analysis was performed based on user feedback obtained throughout the development and testing stages.

The concept of Agile is rooted in the Agile Manifesto, which emphasizes adaptive rather than predictive development, welcoming change over rigidly sticking to a pre-defined plan, and prioritizing developer skills and autonomy over rigid adherence to process. Building on this philosophy, the Agile methodology is technically implemented through several interconnected stages in software development, namely Plan, Design, Development, Testing, Release, and Feedback. Several studies have applied similar stages in information system development; for instance, Agile Development with stages of system analysis, design, application development, testing, application deployment, revision and evaluation, and system maintenance, while other studies divide the Agile method into Planning, Implementation, Software Testing, Documentation, Deployment, and Maintenance, showing that the number and naming of stages may vary depending on project scope and complexity. In this study, the Agile method was applied to the development of the LMS at Ibnu Syam Center Obsession through two main processes: the

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registration process and the learning process. The registration process consists of user registration, course selection, and payment, allowing users to enroll in the desired course. The learning process consists of accessing learning materials, completing quizzes (if available), and obtaining a certificate upon completion, representing the core learning flow experienced by users within the system.

Agile is considered highly effective in software development because it can accommodate changing requirements while fostering close collaboration between development teams and users. Its adaptive nature makes it particularly suitable for projects that demand flexibility and the ability to respond quickly to dynamic needs.

RESULTS AND DISCUSSION

This section presents the findings of the study along with their discussion in an integrated manner, aiming to provide a thorough understanding of the development of a learning management system application to support islamic education learning at Ibnu Syam Center Obsession.

In the development process, several important outcomes were produced to support the design, implementation, and evaluation of the system. These outcomes include four key system design artifacts—class diagrams, activity diagrams, use case diagrams, and sequence diagrams—along with the coding implementation and the final results of the application after deployment on the server. Together, these components provide a comprehensive representation of the system development lifecycle, from conceptual modeling to practical execution and operational deployment.

Class diagrams represent the structural framework of a system and assist developers in understanding relationships among system components. A class diagram shows the structure and description of classes, attributes, methods, and relationships of each object, helping to visualize the main elements within a system (Sandfreni et al., 2024).

In the proposed Learning Management System (LMS), the class diagram serves as a blueprint for database design by defining the entities, attributes, and associations required to support system functionalities. The database structure consists of several main entities, namely User, Registration/Verification, Dashboard, Service, IT Learning, IT Module, Transaction & Product, Certificate, and Admin. Each entity contains specific attributes that represent the data required by the system. For instance, the User entity stores user-related information such as

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user ID, email, phone number, username, and password, while the Registration/Verification entity maintains verification data associated with account activation. Similarly, the Service entity contains information regarding available learning products, whereas the IT Module entity stores learning materials and module completion status. Transactional data are maintained in the Transaction & Product entity, which records product details, prices, payment status, and proof of transactions. Furthermore, the Certificate entity stores certificate identifiers, issue dates, and credential information, while the Admin entity maintains administrative data required for system management. By organizing information into separate entities, the database design promotes data consistency, minimizes redundancy, and facilitates easier maintenance and future expansion of the system.

In addition, the class diagram defines the relationships among entities, which form the foundation for establishing associations within the database. The User entity is connected to the Registration/Verification entity to support account validation, while interactions with the Dashboard entity provide access to summarized information. The Service entity is associated with IT Learning, which in turn is linked to IT Module and Certificate entities to manage learning materials and certification records. Transaction & Product entities are related to both learning activities and administrative functions, allowing payment information to be integrated with course participation and certificate issuance. The Admin entity has relationships with registration and transaction entities to support verification and content management processes.

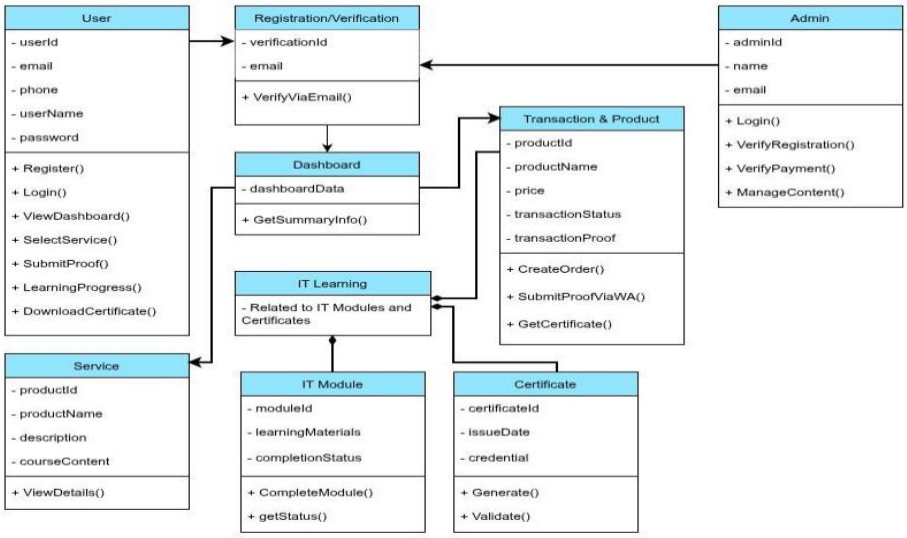

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Figure 1. Class Diagram.

Activity diagrams illustrate the functioning of a process sequentially, rather than merely depicting the static actions of a system. In a Learning Management System (LMS), activity diagrams are essential for delineating complex workflows, such as authentication, material retrieval, and assessment completion. Clear visualization of these flows enables developers to identify system inefficiencies and optimize overall processes. Consequently, activity diagrams are highly beneficial for designing adaptable and structured workflows within dynamic learning environments (Audytra, 2024; Bergaoui & Ghannouchi, 2023; Ma'ruf, 2024). To provide a comprehensive understanding of the workflows illustrated in Figure 2, the operational architecture of the system is partitioned into three functional swimlanes to enforce a structural separation of concerns, namely: Registration, Service Dashboard, and Product Purchase.

The operational workflow initiates within the Registration swimlane, which serves as the primary gateway for user onboarding. The process begins at the initial control flow node with the "Register (Input Personal Identity)" action, where the user executes account registration. During this phase, the system captures vital credentials and personal profiles, which are subsequently transmitted to the backend for permanent storage. Upon receiving the data, the control flow transitions immediately to the "Data Validation & Email Verification" node. This step executes synchronous backend validation routines to ensure data uniqueness and format validity, followed by an automated SMTP handshake to dispatch a verification link to the registered email address. If the email validation token expires or fails, the control flow prompts the user to request a new link, thereby restarting this specific sub-process. Once validation and token verification are successfully completed, the control flow advances to the "Access Dashboard" state, allowing authenticated users to access the available dashboard menus.

Upon clearing the authentication layer and registration workflow, the control flow is horizontally transferred to the Service Dashboard swimlane, which manages the core runtime features of the LMS platform. Within this domain, the authenticated user encounters the "Select Service (IT Training or Product)" action block. The dashboard presents an interactive interface where users can select from available educational programs, such as IT technical bootcamps featuring modules and assignments that grant certificates upon completion, online donations, or religious lecture sessions. If a user selects an unavailable or fully booked service,

Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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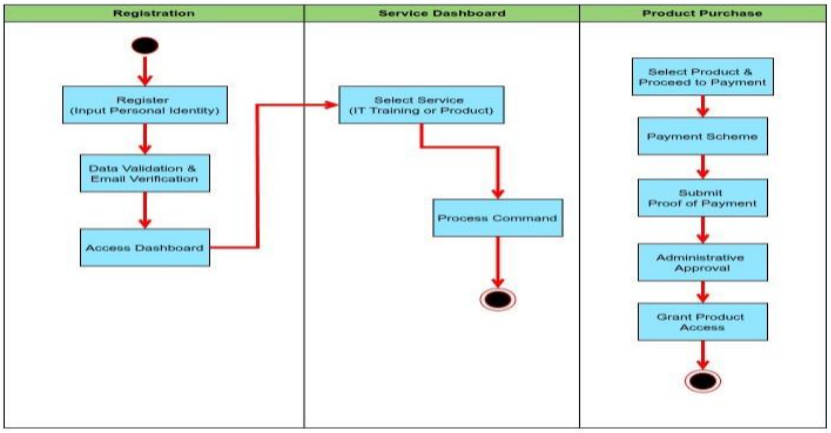
the system display updates to show a notification and prompts the user to make an alternative selection. After the user finalizes a valid service selection, the system state updates, moving the control flow to the "Process Command" action block. At this juncture, the application processing unit handles the request payload, verifying resource availability and scheduling parameters, after which the execution command is verified by the backend controller.

Operating in parallel with or sequentially following the service selection is the Product Purchase swimlane, which governs the transactional and monetization logic of the platform. As illustrated in the workflow diagram in Figure 2, this structured process begins with the user executing the "Select Product & Proceed to Payment" action, where the product item is added to the shopping cart and mapped to a transaction state. Subsequently, the control flow transitions to the "Payment Scheme" phase based on the products in the cart and the transaction status; during this stage, the system presents various integrated payment gateways and billing options. Following the financial transaction, the user must proceed to the "Submit Proof of Payment" node to upload a valid proof of payment corresponding to the purchased product. This triggers the "Administrative Approval" step, a semi-automated verification gate where system administrators cross-check the proof of payment against the user's submission logs. If the administrator rejects the proof due to mismatching data, the control flow reverts to the submission node, forcing the user to re-upload the document. Once the administrator approves the transaction, the control flow triggers the "Grant Product Access" action, which dynamically updates database permissions to unlock the digital assets for the user, before terminating at the final activity node.



Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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Figure 2. Activity Diagram.

A use case diagram depicts the functional specifications of a system by showing interactions between actors and the system. In the context of an LMS, it recognizes important users like students, teachers, and administrators, along with their specific actions within the platform. This illustration is crucial for confirming that system features correspond with user requirements and aids in creating user-focused systems that improve usability and learning efficiency (Yulianto & Layona, 2023; Haikal, 2025; Enggarnisa, Y. 2026).

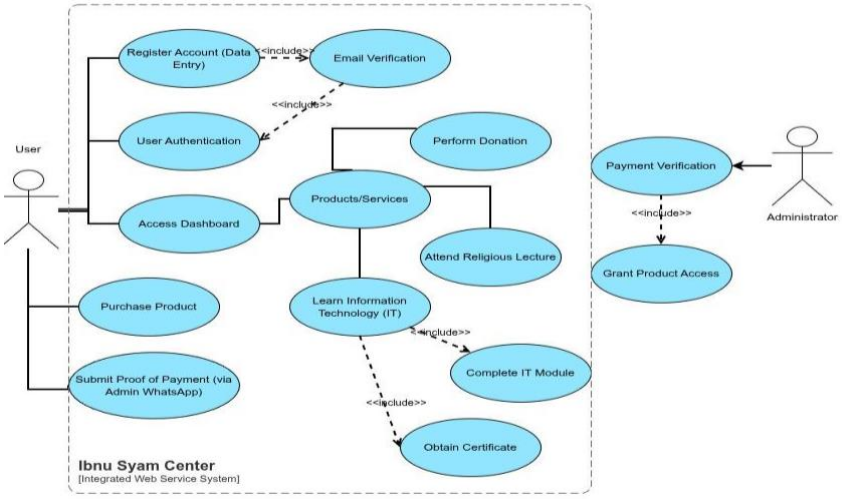

Figure 3. Use Case Diagram

A sequence diagram serves as a behavioral model that shows how different components of a system interact with one another over time in a specific order. It effectively illustrates the exchange of messages that occur while the system performs its various functions. In the context of Learning Management System (LMS) development, sequence diagrams are particularly useful for visualizing important processes such as user login authentication, retrieving learning materials, and submitting assignments. This method gives developers a clear and detailed picture of how the system behaves, which ultimately helps ensure that all

Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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components work together smoothly and increases the overall reliability and performance of the application (Laswi et al., 2022; Yusuf, 2026).

The functional architecture of the Ibnu Syam Center system, also known as the Integrated Web Service System, acts as a comprehensive platform that brings together several key services. These include user registration, online learning activities, donation management, and the overall administration of information technology-based services combined with religious education. Presented using standard UML notation, this Use Case Diagram clearly maps out the interactions between two primary actors: the User and the Administrator. Various use cases are connected through include and extend relationships, creating a well-structured model. This modeling technique is consistent with agile software development principles that prioritize flexibility and the ability to adapt quickly to changes in business processes (Al-Saqqa et al., 2020; Dikert et al., 2016).

In this system, the User actor represents students, training participants, or donors who engage directly with the platform. The primary flow starts with Account Registration, which involves Data Entry and is strengthened by Email Verification to confirm the validity of the user's identity. After successful registration, users proceed to User Authentication and gain access to the main Dashboard. From this central dashboard, users have the option to Purchase a Product. This process is connected to Submitting Proof of Payment through WhatsApp to the Admin, representing a practical hybrid payment method suitable for the local context. The main use cases related to products and services encompass Making a Donation, Learning Information Technology (IT), Attending a Religious Lecture, Completing an IT Module, and Obtaining a Certificate. The connections between IT learning activities, module completion, and certificate issuance demonstrate a solid competency-based learning approach integrated within the Learning Management System (LMS) (Audytra, 2024; Supuwiningsih & Pramartha, 2024; Rahmadani et al., 2024).

From the Administrator's perspective, the diagram includes Payment Verification, which further extends to Grant Product Access. This mechanism ensures tight control over every transaction and the granting of access rights. Such integration has been shown to improve the efficiency of business processes according to multiple studies on LMS implementation (Bergaoui & Ghannouchi, 2023; Ma'ruf, 2024; Haikal, 2025). Additionally, the adaptive BPM-based method applied in this diagram supports the agile adjustment of learning processes when needed (Bergaoui & Ghannouchi, 2023).

Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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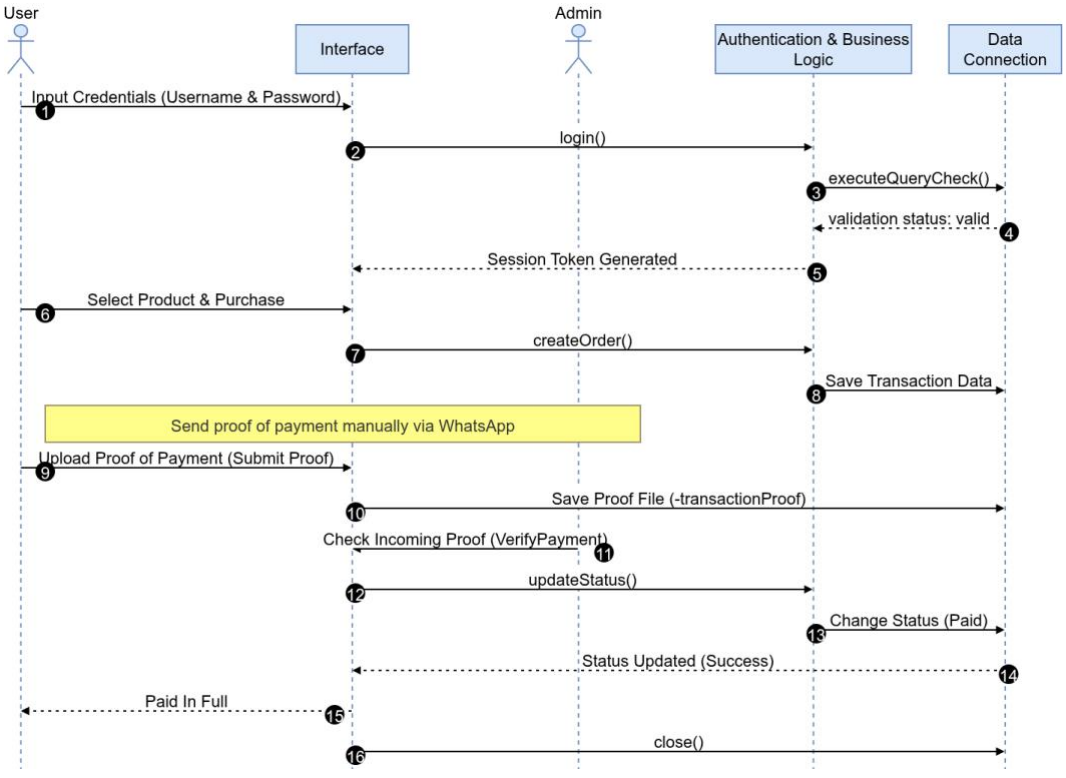
In summary, this Use Case Diagram presents a user-focused system design where the dashboard functions as the main entry point. It successfully integrates user authentication, hybrid payment systems, and dual learning content that covers both technological and religious education. Comparable systems have proven effective in increasing user satisfaction and overall learning outcomes (Bagus et al., 2024; Dongoran, 2025; Iriani, 2025). Especially in the post-pandemic era, this kind of model is very relevant for educational institutions across Indonesia that are transitioning to web-based LMS solutions (Yulianto & Layona, 2023; Naufal et al., 2025; Laswi et al., 2022). The use of modular design with include and extend relationships further enhances the system's scalability and ease of maintenance, staying true to established agile development practices (Hoda et al., 2013; Al-Saqqa et al., 2020). Ultimately, this diagram lays a robust foundation for building an integrated platform that promotes transparency in donations while significantly improving the quality of both technological skills and religious learning.



Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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Figure 4. Sequence Diagram.

A framework can be understood as a structural foundation in software development. It consists of a collection of functions, procedures, and specific classes designed for particular purposes, enabling programmers to complete development tasks more efficiently and effectively. By utilizing a framework, developers can simplify their workflow without the need to create functions or classes from scratch, making the overall programming process more practical and concise.

Laravel is a PHP-based web development framework that adopts the MVC architecture. It is intended to improve software quality by reducing both initial development and maintenance costs, while also enhancing user experience. As a result, Laravel supports the creation of applications that are expressive, well-structured, and delivered efficiently.

In the development of the LMS, several stages were carried out to build a complete Learning Management System. These stages included the installation of the Laravel framework, configuration of Tailwind CSS, database migration, and the creation of models, views, and controllers (MVC). In addition, media interface design was implemented, followed by software testing to ensure system functionality and reliability.

The Sequence Diagram presents the chronological sequence of dynamic interactions between various objects within the Ibnu Syam Center system, using standard UML notation. This diagram serves as a natural complement to the Use Case Diagram by providing a detailed visualization of message flows between the User, Interface, Authentication & Business Logic, and Data Connection layers. These interactions are shown specifically during the processes of authentication, product selection and purchase, and payment handling. The layered architecture shown here is consistent with best practices in successful LMS implementations (Elfaki et al., 2019; Dahal & Manandhar, 2024; Enggarnisa, 2026).

The process initiates when the User executes Input Credentials (Username & Password) through the Interface, which subsequently invokes the login() function within the Authentication & Business Logic layer. This triggers an executeQueryCheck() call to the Data Connection layer. Upon receiving a validation status: valid response, the system transmits a Session Token Generated signal back to the interface to unlock the system layout. Following successful authentication, the User triggers Select Product & Purchase, prompting the interface to execute the createOrder() method within the business logic layer, which then

Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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performs Save Transaction Data directly into the Data Connection layer. To accommodate the hybrid workflow, the User executes Upload Proof of Payment (Submit Proof) via the interface, triggering a Save Proof File (transactionProof) command to the Data Connection layer. The Admin then conducts a manual check via the Check Incoming Proof (VerifyPayment) action on the interface, prompting the interface to invoke the updateStatus() process within the business logic layer, which subsequently triggers Change Status (Paid) in the Data Connection layer. Once the Status Updated (Success) confirmation is returned, the system transmits a Paid In Full notification to the User, and finally invokes the close() method from the interface to safely disconnect the session.

This Sequence Diagram effectively portrays a realistic hybrid payment system that fits well with the Indonesian context, combining manual verification through WhatsApp with automated system processes. This design matches the findings from various studies regarding both the difficulties and achievements of LMS adoption after the pandemic (Yulianto & Layona, 2023; Dahal & Manandhar, 2024). Moreover, the architecture contributes to better academic performance and pedagogical competence by providing well-organized learning content (Haikal, 2025; Iriani, 2025; Dongoran, 2025).

From the agile development viewpoint, this Sequence Diagram is valuable for spotting possible bottlenecks early and maintaining data consistency throughout the system. This approach corresponds with key success factors identified in large-scale agile transformations (Dikert et al., 2016; Al-Saqqa et al., 2020; Hoda et al., 2013). Many related studies also underline how sequence analysis plays an important role in boosting LMS efficiency and user satisfaction levels (Bagus et al., 2024; Audytra, 2024; Rahmadani et al., 2024). The model presented here remains highly relevant for developing modern web-based LMS platforms, whether using frameworks like Express.js (Naufal et al., 2025) or Flutter (Laswi et al., 2022).

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Figure 5. Application Landing Page.

Implementation is an essential stage in transforming system design into a fully functional application that can achieve its intended objectives. At this stage, the conceptual design of the Learning Management System (LMS) was realized into a complete web-based system through programming using PHP and MySQL as the database platform. The resulting LMS application provides a digital learning environment that supports educational activities in an organized and accessible manner. Through this implementation, the designed features were successfully integrated into a practical system that can be used by administrators, teachers, and students.

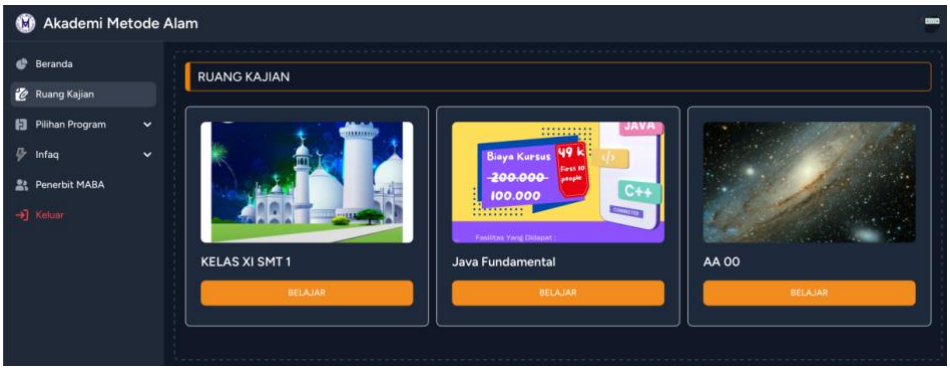

Figure 6. List Online Class.

Jurnal Ilmiah WUNY, Vol 8, No 2 (2026)
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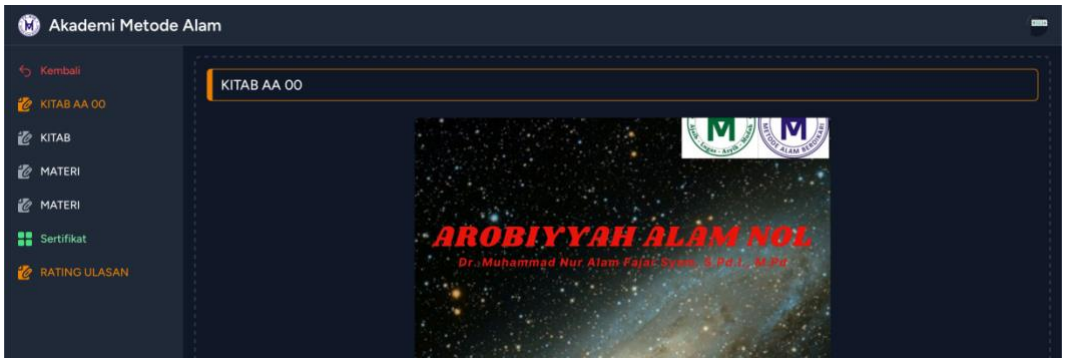

Figure 7. Classroom.

The LMS application offers several main features to support the learning process effectively. The homepage serves as the initial interface, presenting navigation menus and access points for users, such as login, registration, and learning material management. In addition, the system includes modules for quiz implementation, learning assessment, and monitoring student progress. The interface was developed to ensure ease of use, with a responsive and structured design that supports optimal user interaction. As a result, the application functions as a comprehensive platform that enhances the delivery of Islamic Religious Education in a digital format.

CONCLUSION

In conclusion, this study demonstrates that the development of a Learning Management System (LMS) for Islamic Religious Education at Yayasan Ibnu Syam Center Obsession Blitar was successfully carried out through a structured and adaptive approach. By integrating the PIECES framework for system analysis and the Agile methodology for iterative development, the research was able to identify institutional needs and transform them into a functional digital learning platform. The use of system design artifacts—such as class diagrams, activity diagrams, use case diagrams, and sequence diagrams—provided a comprehensive blueprint that supported consistency, scalability, and effective implementation throughout the development lifecycle.

Furthermore, the implementation of the LMS using Laravel, Tailwind CSS, PHP, and MySQL resulted in a responsive and reliable web-based application. The system successfully supports essential educational functions, including material

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management, quizzes, assessments, and progress monitoring. These findings confirm that combining Agile practices with modern web technologies can produce an LMS that is both efficient and adaptable, ultimately improving the quality of digital learning delivery in non-formal educational environments.

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