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Implementation of a Web-Based Information System to Improve the Effectiveness of Administrative Management for Computer Training Participants

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***Abstract*— This study aims to design and develop a web-based information system that can support the administration and registration of computer training participants at the Computerization Development Institute. This system was developed using the System Development Life Cycle (SDLC) with an *Agile Method* that emphasizes iterative and flexible processes so that development can adapt to user needs. During the analysis phase, requirements related to training management, participant registration, and payment validation were identified. The design phase was carried out using Unified Modeling Language (UML) modeling, including use cases, activity diagrams, sequence diagrams, and class diagrams to visually depict the system's workflow. The system was implemented using the PHP programming language, the Bootstrap framework for the user interface, and MySQL as the database. Key features of this system include training data management, session scheduling, online participant registration, and payment validation. The system also provides administrators with ease of data management and ensures transparency for participants during the registration process. Testing was conducted using *Black-box Testing* to ensure that all functions operate as expected. The research results show that the developed system is capable of assisting the Computerization Development Institute in conducting training administration in a more structured and efficient manner, and making it accessible online according to user needs.**
Keywords— Web-Based Information Systems, Administrative Management, Participant Registration, Computer Training, System Development.

Intisari— **Penelitian ini bertujuan untuk merancang dan membangun sistem informasi berbasis web yang dapat mendukung administrasi dan pendaftaran peserta pelatihan komputer pada Lembaga Pengembangan Komputerisasi. Sistem ini dikembangkan menggunakan System Development Life Cycle (SDLC) dengan metode *Agile* yang menekankan proses iteratif dan fleksibel agar pengembangan dapat menyesuaikan kebutuhan pengguna. Pada tahap analisis dilakukan identifikasi kebutuhan terkait pengelolaan pelatihan, pendaftaran peserta, hingga validasi pembayaran. Tahap perancangan diwujudkan melalui pemodelan Unified Modeling Language (UML) berupa use case, activity diagram, sequence diagram, hingga class diagram untuk menggambarkan alur sistem secara visual. Implementasi sistem dilakukan dengan memanfaatkan bahasa pemrograman PHP, framework Bootstrap untuk tampilan antarmuka, serta MySQL sebagai basis data. Fitur utama dalam sistem ini meliputi manajemen data pelatihan, pengaturan sesi, pendaftaran online peserta, hingga proses validasi pembayaran. Sistem ini juga menyediakan kemudahan bagi admin dalam mengelola data serta transparansi bagi peserta dalam melakukan pendaftaran. Proses pengujian menggunakan metode *black-box testing* untuk memastikan setiap fungsi berjalan sesuai harapan. Hasil penelitian menunjukkan bahwa sistem yang dibangun mampu membantu Lembaga Pengembangan Komputerisasi dalam menyelenggarakan administrasi pelatihan dengan lebih terstruktur, efisien, serta dapat diakses secara daring sesuai kebutuhan pengguna.**
Kata kunci— Sistem Informasi Berbasis Web, Pengelolaan Administrasi, Pendaftaran Peserta, Pelatihan Komputerisasi, Pengembangan Sistem.

I. INTRODUCTION

The use of web-based information technology has grown rapidly and has had a significant impact in various fields [1], [2]. What began as a simple static information medium has now evolved into an interactive platform that supports communication, transactions, and real-time data management. Colleges and universities, educational institutions, government agencies, and the industrial sector are increasingly relying on web-based systems to support their operational activities and services [3], [4], [5]. Its use not only speeds up access to information but also improves efficiency and transparency, while making it easier for users to interact without the constraints of time and space.

Several previous studies have examined the use of web-based systems; among them, Imam Aliffandi et al (2025) developed a web-based application for the registration of new students (PPDB) in a babysitting program at the Tiara Medica Ciamis Course and Training Institute using the *Agile* Method. Alif Hakim Alanuari and Abdurrahman Harits (2026) designed a web-based information system for calibration services using the *Agile* Method (Case Study: Center for Environmental

Control Facilities). The application of the *Agile* Method in the development of a Laravel-based course management system website (case study: Inet Komputer). The design of a web-based student information system at the Hidayatul Qur'an Islamic Boarding School using the *Agile* Method was also carried out. This demonstrates that web-based information technology plays a crucial role in supporting digital transformation, particularly in the fields of education and academic services. [6], [7], [8].

The Computerization Development Institute organizes training programs to equip students with practical skills relevant to their academic and industry needs. In line with the digital transformation agenda in higher education, academic and administrative services are required to be increasingly fast, transparent, and measurable in order to enhance the experience of both students and administrative units. In practice, processes and data managed through online platforms play a crucial role in service efficiency and institutional performance monitoring. The current manual training registration process—which involves filling out forms, separate data compilation, verification via private messages, and certificate distribution—creates operational challenges such as long service times, the risk of errors or data duplication, and a weak audit trail. Web-based registration digitization—featuring online forms, file uploads, and status tracking—can simplify workflows and improve service quality. This study proposes a web-based training registration information system for the Computerization Development Institute that includes online registration, payment receipt uploads, verification by administrators, and the issuance of downloadable digital certificates. [9], [10], [11].

Simplifying the registration process through a web-based system is expected to improve data accuracy and service speed. Automating certificate issuance speeds up the distribution of proof of participation and simplifies digital archive management. Verification support enhances the reliability and ease of checking certificate authenticity. It provides a streamlined data management interface while adhering to the principles of web application security and ease of use. By developing a web-based workshop registration information system at the Computerization Development Institute, we can improve administrative efficiency and effectiveness, simplify participant data management, and enable participants to automatically download digital certificates after administrative verification. [12], [13], [14].

II. BACKGROUND / LITERATURE REVIEW

The rapid development of information and communication technology has significantly transformed administrative practices in educational and training institutions. Administrative activities that previously relied on paper-based records, spreadsheets, and independent applications are increasingly being transformed into integrated digital systems. This transformation is particularly important for training institutions because administrative processes involve various types of data, including participant registration, personal information, training schedules, attendance records, training activities, and administrative reports. When these activities are managed manually or through separate applications, institutions may experience difficulties in maintaining data accuracy, retrieving information, updating participant records, and preparing reports efficiently.

Computer training programs require systematic administrative management because the number of participants, training periods, schedules, and participant records may change continuously. Administrative staff are therefore expected to manage participant information accurately and provide information within a relatively short period. Manual data processing may become increasingly problematic as the volume of participants and administrative transactions increases. Repetitive data entry may also lead to duplicated records, inconsistencies, human error, and delays in information retrieval. These conditions can reduce administrative effectiveness and potentially affect the overall quality of services provided to training participants.

Information systems have become an important technological solution for addressing such administrative problems. A management information system provides a structured mechanism for collecting, processing, storing, and presenting data to support operational activities and organizational decision-making. In an administrative context, the implementation of an information system allows previously fragmented activities to be integrated into a centralized database. Consequently, authorized users can access updated information, minimize redundant data processing, and generate administrative information more systematically.

Among different technological platforms, web-based information systems offer several advantages for administrative management. Web-based systems can generally be accessed through a browser without requiring users to install specific applications on each device. This characteristic improves accessibility and provides greater flexibility for administrators and other authorized users. Moreover, centralized database management enables information to be updated consistently and reduces dependence on scattered documents or individually maintained spreadsheets. Therefore, web-based systems are increasingly used to support administrative processes in educational institutions and training organizations..

III. RESEARCH METHODOLOGY

Agile Model

The System Development Life Cycle (SDLC) method used is the *Agile* model [15], [16]. The *Agile* model was chosen because it supports iterative, flexible, and adaptive software development in response to changing user needs, while also being suitable for small-scale projects carried out individually. With the *Agile* approach, the stages of the SDLC are still followed, but they are not executed as a one-time process. At each stage, the process is repeated in several small iterations so that the system can be developed gradually and the results of the process can be tested from the very beginning of each stage.

This approach provides feedback at every stage, making system development more focused. The *Agile* SDLC phases applied in this study include the Planning Phase, Requirements Analysis Phase, System Design Phase, Development Phase, Testing Phase, and Implementation/Incremental Release Phase. [17], [18], [19].

Navigation Structure

In web-based systems, the navigation structure is a set of interface elements (menus, tabs, links, breadcrumbs, footers) that help users find content and features and understand where they are. A commonly used structure combines global navigation (a main menu that spans pages), local/sectional navigation (within a specific section), and supporting elements; a well-designed structure emphasizes visual hierarchy and consistent terminology to enable quick navigation and minimize cognitive load.

Unified Modeling Language (UML)

Unified Modeling Language is a standard modeling language used to visualize, define, build, and document software. Its primary purpose is to align understanding among stakeholders through consistent diagrams—from requirements specifications to detailed designs—so that design decisions can be reviewed and iterated upon in a structured manner. Components within UML include Use Case Diagrams for mapping key actors and services, Activity Diagrams for illustrating end-to-end workflows, Sequence Diagrams for showing sequential interactions between components, and Class Diagrams for mapping data structures or entities.

Black-box Testing

Black-box Testing is a functional testing method aimed at detecting errors or inconsistencies in a system, such as features that do not function properly or menu items that do not appear. This testing process involves providing various random data inputs to ensure that the system can accept valid data and reject invalid data, thereby preventing incorrect data from being stored in the database.

The *Agile* model is one of the System Development Life Cycle (SDLC) models selected for developing the administrative and registration information system for computer training participants at the Computerization Development Institute. Figure 1 illustrates the stages of the *Agile* model for developing the administrative and registration information system.

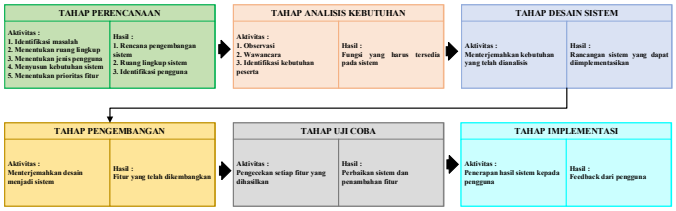


Figure 1. Phases and Activities of the *Agile* Model

The *Agile* model allows systems to be developed incrementally through iterations, evaluations, and improvements based on user needs.

1. Planning Phase: Conducted to define the objectives, scope, initial requirements, and system development goals. During this phase, issues in the administrative and training participant registration processes are identified; the system scope is defined—including participant registration, participant data management, training data, administration, payments, and reporting; system users are identified, such as institution administrators and training participants; initial system requirements are compiled; and feature priorities to be developed in each sprint are determined. The outcomes of the planning phase include the system development plan, the system scope, and user identification.
2. Requirements Analysis Phase: This involves a more in-depth review through observation of administrative processes, interviews with institution managers, and identification of training participants' needs. The results of the analysis are used to determine the functions that must be available in the system. The primary requirements are identified in Table I.

TABLE I. RESULTS OF THE NEEDS ANALYSIS

Actor	Functions
Participant	Can register an account
Participant	Can view training program information
Participant	Can register for training online
Participant	Can enter and update personal information
Admin	Can manage participant data
Admin	Can manage training programs and schedules
Admin	Can verify registrations
System	Can manage administrative and payment information
System	Can generate reports on participant data and registrations

3. System Design Phase: translating the analyzed requirements into an implementable system design. The design is carried out in stages according to feature priorities within each sprint. The system design is shown in Table II.

TABLE II. SYSTEM DESIGN

Design Tools	Explanation
Use Case Diagram	To describe the interactions between participants and administrators with the system
Activity Diagram	To describe the registration and administrative workflows
Sequence Diagram	To describe the interactions between objects within the system processes
Class Diagram	To describe the data structure and relationships between objects
Database Design	To store data on participants, training sessions, registration, payments, and administration
Navigation Structure	Design of navigation and access rights based on user type
Interface	Design of the user interface for the login page, dashboard, registration, participant data, training sessions, payments, and reports

4. Development Phase: This is the process of translating the design into a functional web-based system. Development is carried out iteratively; the system does not have to be

completed all at once. Features that have been fully developed undergo an evaluation process to identify necessary improvements or add features requested by users. The breakdown of development by sprint is shown in Table III.

TABLE III. SPRINT DEVELOPMENT BREAKDOWN

Sprint Phases	Description
Sprint 1	Development of modules for login, account registration, and user management
Sprint 2	Development of modules for participant data and training program data
Sprint 3	Development of modules for training registration and participant verification
Sprint 4	Development of modules for administration, payments, and reports

5. Testing Phase: Verifying that each developed feature functions as intended. Testing is conducted on each increment or sprint outcome so that errors can be identified early on. Testing can be performed using Black Box Testing, which evaluates system functionality based on the generated inputs and outputs.
6. Implementation/Incremental Release Phase: The process of deploying development results to system users. In this *Agile* model, the implementation phase is carried out incrementally, meaning that the system can be rolled out to users in stages, once specific modules or features are fully ready for use by users in accordance with their intended functions. For example, the initial phase might release the participant registration and enrollment features, followed by modules for participant data management, training, administration, payments, and reporting. After each increment is deployed, users provide feedback. This feedback is used to improve the system and is incorporated into the Product Backlog as input for the next sprint. With this approach, the development of an administrative information system for computer training participant registration can be carried out flexibly and in stages. The resulting system is expected to streamline the registration process, improve participant data management, assist with training administration, and provide information and reports more quickly, in a structured manner, and in an integrated way.

IV. RESULTS AND DISCUSSION

The navigation structure was designed based on the results of a needs analysis to ensure that the system's user flow is clear and consistent. Figure 2 illustrates the hybrid navigation structure used by users.

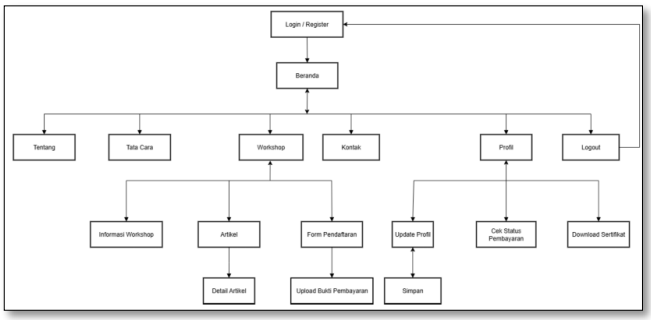


Figure 2. User Navigation Structure

When users first access the site, the Home page appears as the starting point. From the Home page, users can navigate to the About, Guidelines, Training, Contact, and Account (user profile) menus. The Training menu features Training Information and Articles; users can view Article Details or proceed to the Registration Form. After the form is submitted, users are directed to upload proof of payment. Through the Profile menu, users can update their profile information, check payment status, and download a certificate after the workshop is complete, provided the status has been validated. A Logout feature is provided to end the user's session. Figure 3 illustrates the mixed navigation structure used by the Admin.

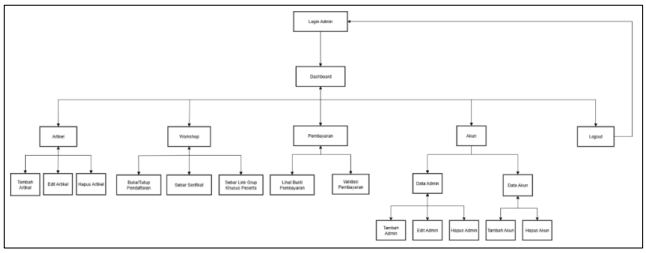


Figure 3. Admin Navigation Structure

Figure 3 illustrates the hybrid navigation structure used by administrators to manage the system. After successfully logging in, administrators are directed to the Dashboard page, which serves as the main control center. From this page, administrators can access several core menus: Articles, Training, Payments, and Accounts. In the Articles menu, administrators can add, edit, or delete articles displayed on the user page. The Training menu allows the admin to open or close registration, issue certificates, and share private group links with participants. The Payments menu is used to view payment receipts uploaded by participants and to validate payments. The Account menu contains two submenus: Admin Data and Account Data. These submenus allow the admin to add, edit, or delete admin data. To protect privacy, admins are restricted to only adding and deleting account data (users/participants). Admins create user accounts. The system provides a Logout feature for admins to ensure account security.

The Use Case Diagram in Figure 4 explains the main functions that can be performed by both users and admins. This

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system has two actors: User and Admin. The Use Case Diagram in Figure 4 illustrates these two main actors. Here, the User acts as a training participant; the features provided for the User include registering, uploading proof of payment, viewing registration status and proof of payment, downloading e-certificates, and managing personal data. Meanwhile, the Admin serves as the system administrator. The Admin has access to open registration, validate payment status, and create and distribute e-certificates.

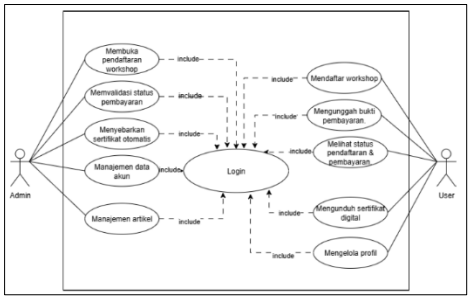


Figure 4. Use Case Diagram

The Activity Diagram for the Admin shown in Figure 5 is used to illustrate the sequence of activities in the application, from the start of the process, through the course of the activities, to the end of the process. The first step is for the admin to log in by entering a username and password. If the entered credentials are valid, the system will then display the main page. On the main page, the admin can perform the available functions, including opening registration access, verifying participants' proof of payment, issuing e-certificates, managing user accounts, and configuring article displays.

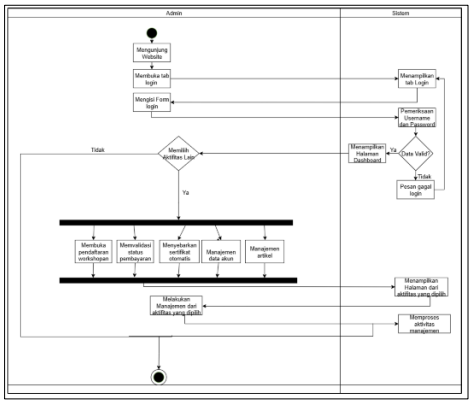


Figure 5. Admin Activity Diagram

The flow of user activities within the system is shown in Figure 6. The user begins by logging in with their username and password. If the username and password are valid, the system directs the user to the dashboard. The dashboard provides several functions for the user, including registration, payment verification, uploading proof of payment, retrieving an e-certificate (if the user has passed the training), and updating profile information. Once the user selects a feature, the system displays the corresponding page based on the selected activity, and the user can perform the activity according to the feature's function.

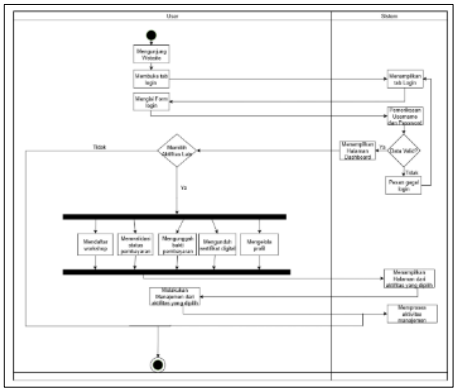


Figure 6. User Activity Diagram

Figure 7 shows the sequence diagram for the admin. After the admin logs into the system, If the username and password are validated correctly by the system, the admin can access several menus provided by the admin dashboard, namely adding articles, editing articles, and deleting articles. The admin role also grants access to manage training sessions, validate participants' proof of payment, and manage account data. For every action performed by the admin, the system will display the page corresponding to the selected feature and save the data entered by the admin to the database. The admin is also provided with a logout feature so that the system returns to the login page as a security measure.

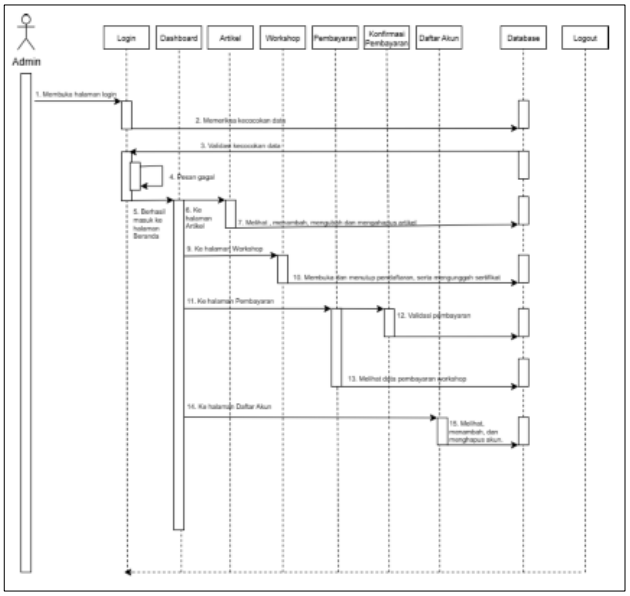


Figure 7. Admin Sequence Diagram

Figure 8 illustrates the steps a user takes when using the system. The user begins by logging in and is then directed to the main page if the login credentials are valid. On the main page, users are presented with several menu options, such as the "Training" menu for the registration process. After

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registering, users can proceed to pay for the training by uploading proof of payment. The proof of payment will be stored in the database, and the next step is validation by the admin. Other features users can access include editing profile data, checking payment status, and downloading e-certificates. All of these features will be processed by the system according to the function of the feature selected by the user.

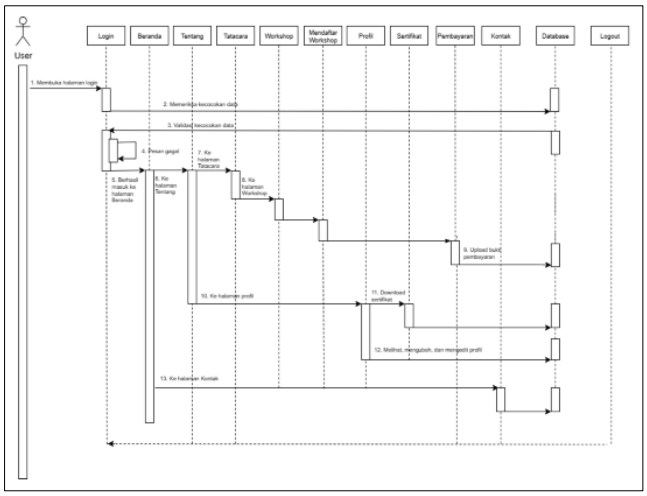


Figure 8. User Sequence Diagram

Figure 9 illustrates the Users class, which stores information about users acting as either administrators or participants. The Workshops class contains data on training activities created by the administrator. The Workshop_Sessions class represents the sessions of each workshop held. The `Registrations` class handles the registration process for training participants. The `Payments` class is used to manage participants' payment receipts and verification status by the admin. The `Articles` class displays articles or information written by the admin. Meanwhile, the `Settings` class contains general system configurations that can be updated as needed. The relationships between classes are shown with multiple lines because this system has complex data interdependencies; for example, a single user can create a workshop while simultaneously registering and making a payment.

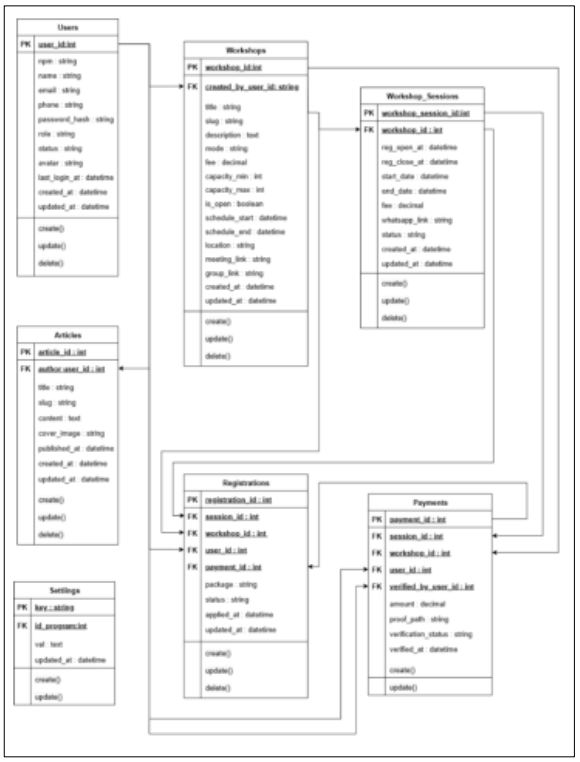


Figure 9. Class Diagram

The website's home page is shown in Figure 10, which displays the home page that serves as the main page when users access the system.



Figure 10. Home Page

The Instructions page is shown in Figure 11, displaying the Workshop Instructions page, which serves as a guide for participants before they register.

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Figure 11. Instructions Page

Figure 12 displays the Registration modal that appears when a participant wishes to register. The Registration modal contains the participant's profile data, which is retrieved from and linked to their account to ensure consistency. Participants can also view training details, including the training date, training cost, and payment account information. Additionally, there is a form for uploading proof of payment in image or PDF format, subject to specific size limits. The "Submit Proof" button initiates the payment verification process, while the "Cancel" button allows participants to cancel the form-filling process. This modal's design is kept simple for ease of use and represents an improvement over previous iterations, making it more practical and minimizing input errors in line with the *Agile* SDLC approach.



Figure 12. Registration Modal Page

Figure 13 shows the User Dashboard, which serves as an information hub for participants. On the User Dashboard page, users can view their status as training participants, the validation status of their payment proof, the training schedule, links to training participant groups, and the availability of e-certificates. The top section of the User Dashboard features options to edit profile data, view account details, and upload a profile photo. The User Dashboard presents information concisely and in a structured manner, making it easy for participants to monitor the progress of their administrative and training statuses in real time.

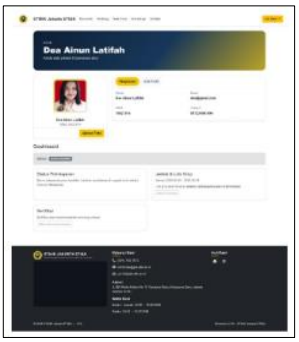


Figure 13. User Dashboard

Figure 14 shows the admin dashboard page, which serves as the system's control center. On the admin dashboard page, the features available to the admin include the ability to view data on the number of users, the number of registrants, pending payment data, and validated payment data. Additionally, there is information on registration status (open/closed) that the admin can change directly as needed. The bottom section of the admin dashboard page provides the latest payment proof data in real time, along with the participant's name, payment amount, validation status, and training name.

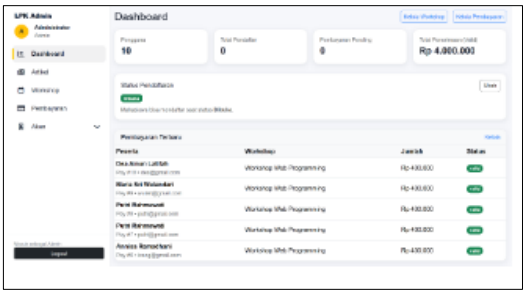


Figure 14. Admin Dashboard Page

Figure 15 shows the Workshop Admin page, which is used to manage registration data. On the Workshop Admin page, administrators can view the list of participants who have provided complete information, such as their names, email addresses, phone numbers, registration dates, payment validation status, and data verification status. These features make it easier for administrators to monitor and manage the entire training administration process.

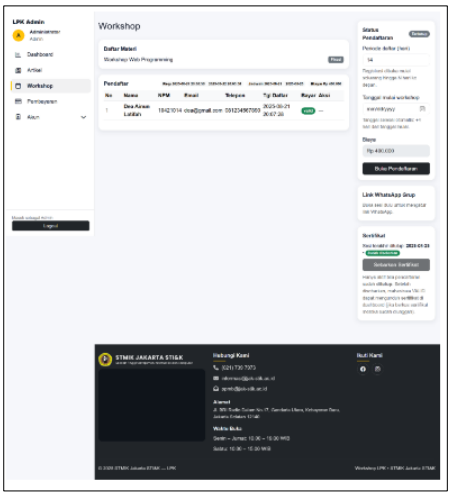


Figure 15. Admin Workshop Page

Figure 16 shows the Admin Payments page, which is used to verify participants' transactions. In addition, admins can filter by status, making the verification process faster and more accurate. In the payment proof column—which displays image files—admins can visually verify participants' transfer receipts before proceeding with validation.

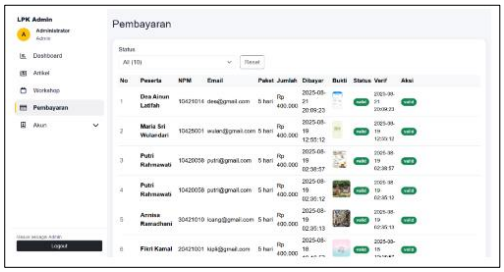


Figure 16. Admin Payment Page

Black-box Testing was conducted to evaluate whether each function of the web-based information system operated according to the specified functional requirements. The testing process focused on system inputs, expected outputs, and actual system responses without examining the internal program code. The main functions tested included user authentication, participant registration, training registration, payment proof submission, payment verification, training management, and certificate distribution. The results of the *Black-box Testing* are presented in Table IV.

TABLE IV. *BLACK-BOX TESTING* RESULTS

No.	Tested Feature	Test Scenario	Expected Result	Actual Result	Status
1	Participant Registration	Participant enters valid registration data	The system successfully creates a new participant account and stores the data in the database	Participant account was successfully created and data were stored	Passed
2	Participant Registration	Participant leaves required fields empty	The system rejects the submission and displays a validation message	Validation message was displayed and registration was not processed	Passed
3	Login	User enters a valid username/email and password	The system authenticates the user and redirects the user to the appropriate dashboard	User successfully logged in and was redirected to the dashboard	Passed
4	Login	User enters an incorrect username/email or password	The system rejects the login attempt and displays an error message	Login was rejected and an error message was displayed	Passed
5	Training Registration	Participant selects an available training program and submits the registration	The system records the participant in the selected training program	Participant registration was successfully recorded	Passed
6	Training Registration	Participant attempts to register when registration is closed	The system prevents registration and informs the participant that registration is closed	Registration was rejected and the appropriate notification was displayed	Passed
7	Payment Proof Upload	Participant uploads a payment proof file in the permitted format	The system successfully uploads and stores the payment proof	Payment proof was successfully uploaded and stored	Passed
8	Payment Proof Upload	Participant uploads an unsupported file format	The system rejects the file and displays an appropriate validation message	Invalid file was rejected and a validation message was displayed	Passed
9	Payment Verification	Administrator verifies a participant's valid payment	The system updates the participant's payment status to verified	Payment status was successfully updated to verified	Passed
10	Payment Verification	Administrator rejects an invalid payment submission	The system updates the payment status and records the rejection	Payment status was successfully updated according to the administrator's action	Passed
11	Training Management	Administrator opens registration for a training program	The selected training program becomes available for participant registration	Registration status was successfully changed to open	Passed
12	Training Management	Administrator closes registration for a training program	Participants can no longer register for the selected training program	Registration status was successfully changed to closed	Passed
13	Participant Data Management	Administrator views participant data	The system displays participant information stored in the database	Participant data were displayed correctly	Passed
14	Certificate Management	Administrator uploads a participant certificate	The certificate is stored and becomes available to the corresponding participant	Certificate was successfully uploaded and associated with the participant	Passed
15	Certificate Download	Eligible participant downloads an available certificate	The system provides the certificate file for download	Certificate was successfully downloaded	Passed
16	Certificate Download	Participant attempts to download a certificate that is not yet available	The system prevents the download and displays an appropriate notification	Download was prevented and the appropriate message was displayed	Passed
17	Logout	User selects the logout function	The system terminates the active session and redirects the user to the login page	User session was successfully terminated	Passed

The results show that the system achieved a 100% functional success rate based on the tested scenarios. All major functions, including participant registration, authentication, training registration, payment administration, participant data management, and certificate distribution, operated according to the defined functional requirements.

The system also responded appropriately to invalid inputs, such as incomplete registration data, incorrect login credentials, unsupported payment proof files, closed training registration, and unavailable certificates. In these conditions, the system prevented invalid processes and displayed appropriate validation or notification messages.

These findings indicate that the web-based information system is functionally reliable for supporting the administrative management of computer training participants. The successful implementation of the tested functions demonstrates that the system can integrate participant-related administrative activities into a centralized platform. However, *Black-box Testing* in this study primarily evaluates functional correctness. Further testing, such as usability testing, User Acceptance Testing (UAT), performance testing, or comparative evaluation of administrative processing time, is required to provide stronger evidence regarding improvements in overall administrative effectiveness.

V. CONCLUSION

Based on the design, implementation, and testing processes, it can be concluded that the web-based information system developed in this study is able to support and improve the effectiveness of administrative management for computer training participants. The system integrates several administrative activities into a single platform, including account registration, training registration, payment confirmation, payment verification, and certificate distribution.

For participants, the system simplifies the administrative process by enabling registration, training participation, payment receipt submission, and certificate downloading to be carried out online without relying on complicated manual procedures. For administrators, the system facilitates the management of training registration periods, verification of participant payments, management of participant data, and distribution of certificates in a more structured and centralized manner. Therefore, the implementation of the web-based information system contributes to reducing repetitive administrative activities and improving the accessibility, organization, and efficiency of participant administration.

The results of *Black-box Testing* indicate that all main system functions operate according to the specified requirements. The system is also able to respond appropriately to invalid input by displaying relevant validation messages. These findings indicate that the implemented system is functionally feasible to support the administrative management of computer training participants.

Further development of the system is recommended to strengthen its contribution to administrative management effectiveness. A reporting feature should be added to provide summarized information regarding participant data, training activities, payment status, and financial records. This feature would assist administrators and institutional management in monitoring administrative activities and preparing reports more efficiently.

In addition, an automatic notification feature could be implemented to provide participants with real-time information regarding payment verification, registration status, training schedules, and certificate availability. Future studies are also recommended to evaluate the system from the users' perspective by measuring aspects such as usability, user satisfaction, administrative processing time, and system effectiveness. Such evaluations would provide stronger empirical evidence regarding the extent to which the web-based information system improves administrative management compared with the previous manual procedures.

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