

An SDLC-Guided Development of a Web-Based Organizational Information Platform Using CodeIgniter: Evidence from APTIKOM SUMUT

Zulfahmi Syahputra, Rian Farta Wijaya, Khairul, Ayu Husniyyah

Abstract

Digitalization has become increasingly essential for service-based micro and small enterprises, including businesses that provide party and event equipment rentals. Traditional rental workflows such as manual communication, inconsistent stock updates, and the absence of transparent availability information often hinder operational efficiency and customer satisfaction. To address these challenges, this study aims to develop a web-based digital rental platform for party and event equipment using a User-Centered Design (UCD) approach. UCD was selected because it emphasizes continuous user involvement throughout the system development lifecycle, ensuring that the resulting platform aligns with real user needs and usability expectations. The research was conducted through four key stages: user requirement analysis, iterative prototyping, system implementation, and usability evaluation. Data were collected through interviews, observation, and user testing involving both customers and rental administrators. The final system provides a structured equipment catalog, real-time availability display, an intuitive booking workflow, and an administrative dashboard for managing inventory and rental schedules. Usability evaluation using the System Usability Scale (SUS) yielded a score of 82.4, indicating excellent usability. Task completion rates improved significantly, and user feedback highlighted enhanced clarity, reduced interaction errors, and faster rental processing. The findings demonstrate that adopting UCD contributes to the development of a more intuitive, efficient, and user-validated rental platform. This study provides practical insights into the application of UCD in service-oriented digital systems and supports ongoing efforts to modernize rental operations through web-based solutions.

Keywords: *Web Based System, User Centered Design, Party and Event Equipment*

Zulfahmi Syahputra¹

¹Bachelor of Computer Systems, Universitas Pembangunan Panca Budi, Indonesia
e-mail: zulfahmi@dosen.pancabudi.ac.id¹

Rian Farta Wijaya², Khairul³, Ayu Husniyyah⁴

²Bachelor of Information Technology, Universitas Pembangunan Panca Budi, Indonesia

³Diploma of Computer Engineering, Universitas Pembangunan Panca Budi, Indonesia

⁴Bachelor of Computer Systems, Universitas Pembangunan Panca Budi, Indonesia
e-mail: rianfartawijaya@dosen.pancabudi.ac.id², khairul@dosen.pancabudi.ac.id³, ayuhus@gmail.com⁴

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Introduction

Digitalization has reshaped the way organizations manage and disseminate information, particularly those operating in academic and professional associations. Traditional methods such as manual document distribution, fragmented communication channels, and inconsistent information updates often result in inefficiencies and limited accessibility for members and stakeholders[1]. As organizational activities increasingly rely on timely and structured information, the availability of a centralized digital platform becomes essential for improving transparency, communication effectiveness, and operational coordination[2]. Web-based information platforms offer advantages in terms of accessibility, real-time updates, and cross-device compatibility, making them suitable for organizations seeking to enhance their digital presence and streamline information delivery. Previous studies indicate that web technologies significantly improve organizational workflows by automating routine processes, reducing administrative workload, and ensuring consistent dissemination of information across diverse user groups[3]. However, many existing organizational websites still fail to align with best practices in usability, information structure, and system maintainability. These limitations often stem from inadequate system design, absence of standardized development procedures, and lack of scalability in supporting organizational growth. To overcome these issues, the implementation of a systematic development methodology such as the System Development Life Cycle (SDLC) provides a structured approach for planning, designing, implementing, and evaluating information systems[4]. The SDLC framework ensures that every phase—from requirements analysis to maintenance—is conducted in a controlled and documented manner. This methodology has been widely adopted in system development projects due to its ability to produce well-structured, reliable, and easily maintainable applications[5]. In the context of organizational information systems, SDLC enables developers to identify essential features such as structured profile pages, activity documentation, announcements, membership information, and integrated communication modules[6]. These features are critical for associations such as APTIKOM SUMUT, whose members rely heavily on accurate and up-to-date information related to academic programs, collaborative activities, and institutional policies[7]. APTIKOM SUMUT, as a regional association overseeing higher education institutions in the field of Informatics and Computer Science, often faces challenges in distributing information uniformly due to the use of scattered communication channels such as social media, email, and messaging groups[8]. These channels, while useful, lack structured archiving, formal governance, and consistent presentation, making it difficult for members to retrieve historical data or access official information efficiently. Therefore, developing a centralized web-based organizational information platform becomes crucial to enhance accessibility, improve transparency, and strengthen the association's digital identity. The use of the CodeIgniter framework further supports this initiative by providing a lightweight, secure, and easily maintainable development environment based on the Model-View-Controller (MVC) architecture. MVC separates logic, interface, and data management, ensuring that the system can evolve over time without compromising stability. Studies show that CodeIgniter-based applications demonstrate improved performance, faster development time, and better maintainability compared to traditional procedural web development approaches[9]. Thus, this study focuses on developing a web-based organizational information platform for APTIKOM SUMUT using the CodeIgniter framework and the SDLC methodology. The platform aims to improve information accessibility, enhance organizational communication, and support administrative efficiency by implementing a structured and systematic development process. The results of this research are expected to contribute insights into the application of SDLC in developing organizational information systems and support the broader agenda of digital transformation in higher education associations.

Literature Review

2.1 Digitalization and Organizational Information Management

Digital transformation has become a crucial driver in enhancing how organizations manage, structure, and disseminate information. Studies on digitalization within professional and educational institutions show that adopting web-based technologies can expand communication reach, improve coordination efficiency, and strengthen institutional visibility in increasingly digital environments[10]. For organizations such as APTIKOM SUMUT, which oversees academic programs and collaborations among higher education institutions in Informatics and Computer Science, digital platforms play a significant role in ensuring that strategic information such as announcements, agendas, policy updates, and organizational documents is distributed consistently and transparently.

However, the level of digital adoption in many organizations remains limited due to resource constraints, lack of technical expertise, and the absence of systems designed to support structured and centralized information management. Research on digital empowerment within organizational settings indicates that technology solutions must be context-aware and aligned with organizational workflows to produce meaningful impact[11]. In the case of associations like APTIKOM SUMUT, digitalization is particularly beneficial for supporting activities such as documentation, member coordination, publication of events, and dissemination of academic information through a unified and accessible platform.

2.2 Web-Based Information Systems for Organizational Platforms

Web-based information systems are widely utilized in organizational environments because they offer centralized data management, consistent accessibility, and compatibility across various devices. Prior research demonstrates that web platforms significantly streamline organizational processes such as publishing announcements, documenting activities, updating membership information, and managing internal communication[12]. For instance, studies on academic institution websites indicate that well-designed web interfaces can enhance users' ability to access information efficiently and perform tasks such as viewing documents, navigating organizational structures, or following activity schedules. Similarly, existing works on information system development emphasize the importance of clear navigation structures, real-time update capabilities, and modular content organization to support users in locating relevant information with minimal friction. These findings justify the adoption of a web-based architecture for APTIKOM SUMUT, where multiple information categories such as profiles, programs, publications, and event documentation must be displayed transparently and updated consistently .

2.3 System Development Life Cycle (SDLC) in Web-Based Applications

The System Development Life Cycle (SDLC) is a structured methodology that guides the development of software systems through sequential phases, including planning, analysis, design, implementation, testing, deployment, and maintenance. SDLC ensures that the system is built in a controlled, documented, and systematic manner, reducing design errors and improving long-term maintainability. Literature in information system development consistently highlights that SDLC-based projects produce systems with higher reliability, clearer documentation, and better alignment with user and organizational requirements[13]. In the Indonesian context, several empirical studies have applied SDLC in developing organizational or institutional applications, demonstrating that its structured phases support the creation of systems that are robust, scalable, and easier to maintain. These studies confirm that SDLC is particularly effective in environments where information accuracy, system stability, and structured workflows are essential for operational success. Such characteristics make SDLC highly relevant for developing the APTIKOM SUMUT organizational information

platform, which requires controlled data management, consistent update mechanisms, and adherence to formal organizational structures[14].

2.4 CodeIgniter Framework and MVC in Organizational Systems

A growing number of studies have applied the CodeIgniter framework based on the Model-View-Controller (MVC) architecture to develop web-based information systems due to its lightweight nature, development efficiency, and strong security features. CodeIgniter's MVC structure separates application logic, interface components, and data operations, enabling developers to manage content updates, modify interface elements, and add new features without disrupting existing functionalities. Research on CodeIgniter-based systems shows that the MVC approach enhances system maintainability, reduces redundancy, and supports faster development cycles[12]. This is particularly beneficial for organizational platforms that require frequent updates to information such as announcements, events, and administrative content. In previous works related to academic organizations, the use of CodeIgniter facilitated the creation of responsive, user-friendly information systems capable of supporting diverse user interactions, including administrators, members, and general visitors. Collectively, these studies affirm that integrating the CodeIgniter framework with SDLC methodology provides a strong foundation for designing and developing the APTIKOM SUMUT web-based organizational information platform. This combination improves usability, system structure, scalability, and information accessibility making it suitable for supporting the digital transformation needs of educational associations[7].

Research Methodology

This study adopts the Software Development Life Cycle (SDLC) Waterfall model as the primary methodological framework to guide the systematic development of the organizational information platform for APTIKOM SUMUT. The Waterfall approach is chosen because it provides clear, sequential phases that ensure structured documentation and traceability two essential components for system development in institutional environments. The methodology consists of five major stages: Requirement Analysis, System Design, Implementation, Testing, and Deployment & Evaluation.

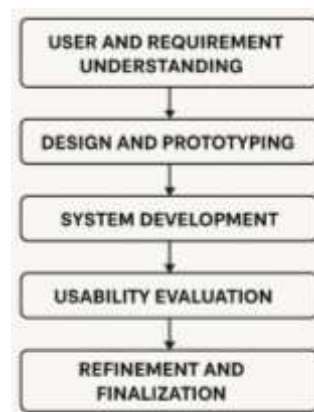


Figure 1. Illustrates The Overall Sdlc Methodology

3.1 Requirement Analysis

This stage focuses on identifying the functional and non-functional requirements of the system. Data were collected through interviews with APTIKOM SUMUT administrators, observations of existing workflows, and document analysis of organizational procedures. The key functional requirements identified include:

- a. Member registration and management
- b. Announcement and event publication

- c. Activity documentation and archival system
- d. Administrative dashboard
- e. Secure role-based access control

Non-functional requirements were also defined, including system usability, data security, performance efficiency, and compatibility with commonly used devices.

3.2 System Design

The system design phase converts requirements into technical blueprints. Several modelling tools and architectural components were used:

- a. Architectural Design, the platform is built using the CodeIgniter MVC framework, which separates the system logic into three components Model, View, and Controller to improve maintainability, modularity, and scalability.
- b. Database Design, A relational database schema using MySQL was developed. The design includes tables for users, roles, announcements, activities, documents, and organizational metadata. Entity Relationship Diagrams (ERD) were used to visualize data relationships.
- c. Interface and Navigation Design, Wireframes and UI flow diagrams were developed to map out user interaction, focusing on administrative usability and clarity of information distribution.
- d. Use Case Modelling, Use Case Diagrams were created to capture the interactions between users (admin, member, public) and system functionalities.

3.3 System Development

The platform was implemented using a web-based architecture, consisting of:

- a. Front-end: HTML5, CSS3, JavaScript
- b. Back-end: PHP/Node.js (depending on implementation choice)
- c. Database: MySQL or similar relational database
- d. Frameworks: Bootstrap/Laravel/Express.js (optional based on development environment)

Development followed an iterative UCD cycle, meaning that feedback from each evaluation round was used to refine features, improve interface clarity, and adjust workflows. Core features implemented include:

- a. Equipment catalog with images and categories
- b. Real-time availability tracking
- c. Online booking and confirmation
- d. Rental scheduling
- e. Dashboard for administrators

This incremental process ensured that the system evolved based on actual user input rather than developer assumptions.

3.4 Usability Evaluation

Usability testing was conducted with representative users from both customer and administrator groups. The evaluation applied:

- a. Think-Aloud Protocol
- b. Task Completion Analysis
- c. System Usability Scale (SUS) questionnaire
- d. Qualitative feedback sessions

3.5 Refinement and Finalization

Based on usability test results, improvements were made to:

- a. Navigation clarity

- b. Page responsiveness
- c. Information visibility (pricing, stock, schedule)
- d. Workflow consistency

Results

This section presents the results obtained from the development and evaluation of the web-based digital rental platform for party and event equipment. The findings are organized into four areas: (1) requirement discovery outcomes, (2) prototype evaluation results, (3) system implementation outputs, and (4) usability testing performance.

4.1 Form Login

The interface displays a simple and clean login form consisting of two main input fields and two action links/buttons. At the top, there is a text field labeled “Username”, where users can enter their account username. Below it, a second text field labeled “Password” allows users to input their password securely.

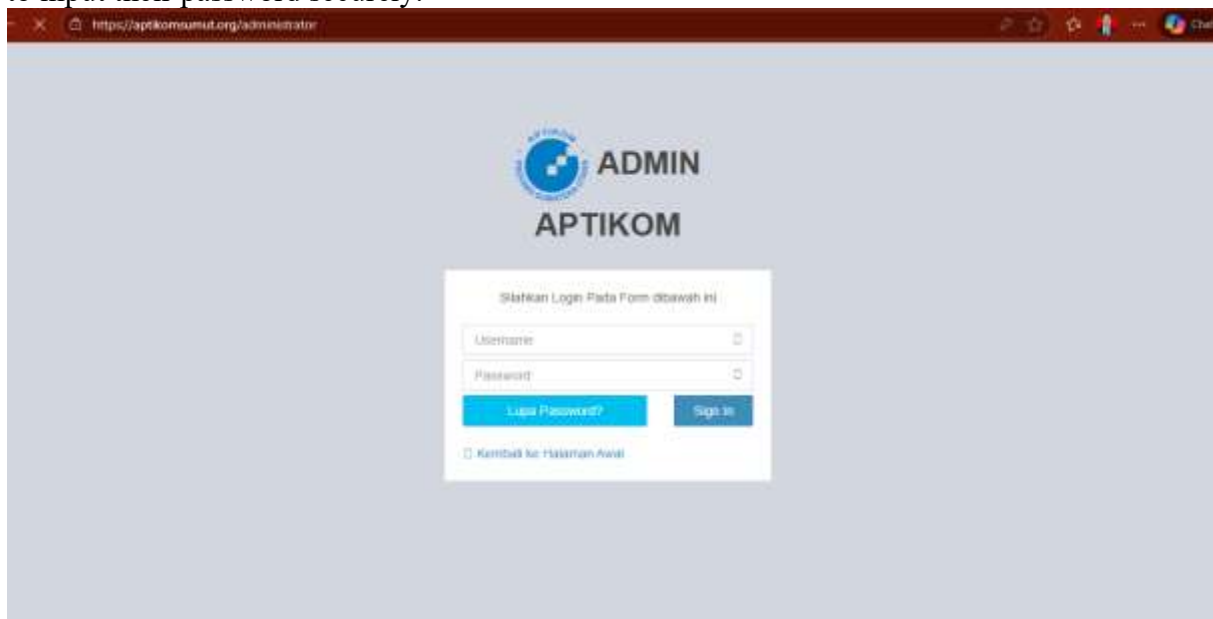


Figure 2. Form Login

4.2 Dashboard Interface Description

The displayed interface represents the homepage of the web-based organizational information platform for APTIKOM SUMUT (Asosiasi Pendidikan Tinggi Informatika dan Komputer Provinsi Sumatera Utara). The homepage functions as the primary entry point for users to access all public-facing information and organizational updates. At the top section, the header features a horizontal navigation menu consisting of the main links: Depan (Home), E-Learning, Download, and Kontak. This navigation provides direct access to the essential modules of the platform, supporting intuitive user movement across different sections of the system.

Below the header, the platform prominently displays the APTIKOM SUMUT logo and organizational name, ensuring strong branding and immediate recognition. The logo is positioned on a clean background with subtle geometric patterns, reflecting a professional and academic identity that aligns with the association’s role in higher education institutions.



Figure 3. Dashboard Interface Description

4.3 Content Dashboard Section

This interface represents the content dashboard section of the APTIKOM SUMUT organizational information platform. It provides users with quick access to the latest agenda, organizational updates, related links, announcements, and job vacancy information. The layout is designed to organize multiple types of information into clear, modular panels, ensuring accessibility and ease of navigation.

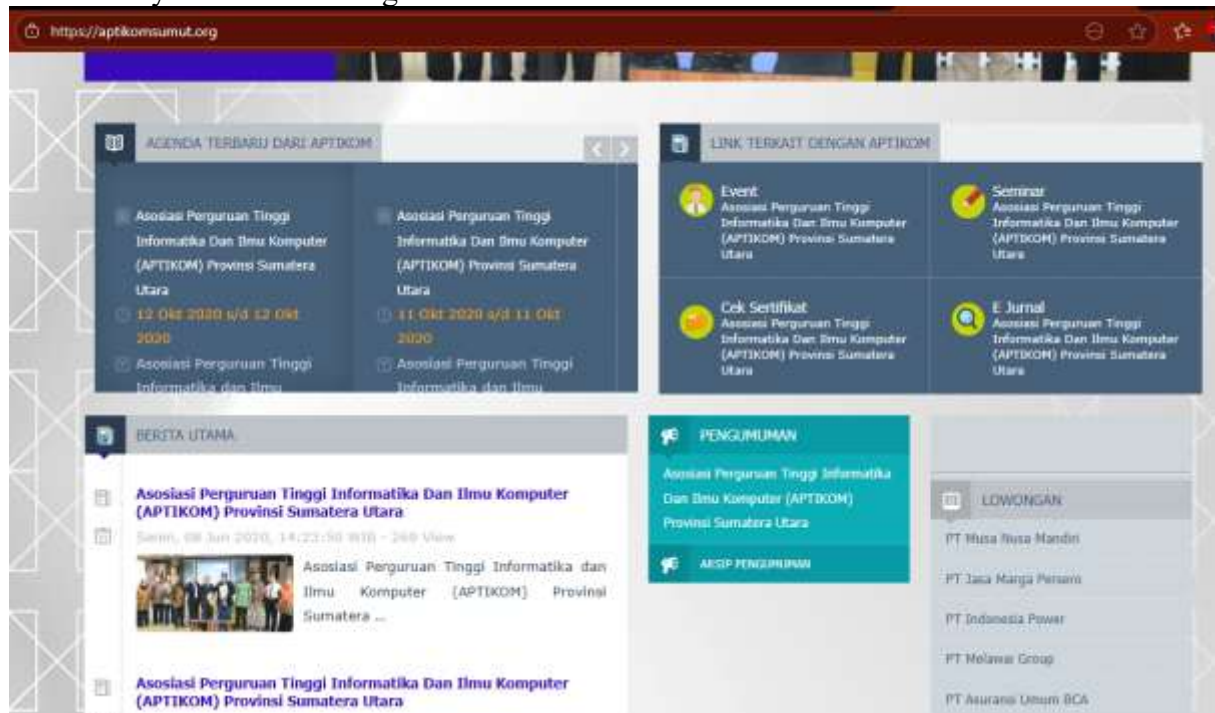


Figure 4. Party Equipment Rental Detail Page Description

One of the key results of the system development is the successful implementation of the Organizational Information Detail Module, which enables users to access comprehensive information related to various organizational components, including events, announcements, member data, and institutional activities. This module was developed following the SDLC requirement analysis phase, emphasizing structured information access, clarity of content

presentation, and improved user interaction. The design reflects the organizational needs of APTIKOM SUMUT, ensuring that each information item such as event details, documents, and publication records can be viewed in a complete, organized, and easily navigable format.

Conclusion

This study successfully developed a web-based organizational information platform for APTIKOM SUMUT using the CodeIgniter framework and the SDLC Waterfall methodology. The structured development process enabled the system to be built systematically—from requirement analysis and system design to implementation, testing, and deployment. The resulting platform provides an integrated environment for managing organizational information, including events, announcements, member data, documents, and related institutional activities. The evaluation results demonstrate that the platform functions effectively and meets the needs identified during the requirement analysis phase. Users reported improved accessibility, better information organization, and faster retrieval of organizational data. The use of CodeIgniter's MVC structure also contributed to system maintainability, modularity, and scalability, making the platform suitable for future enhancements. Overall, this research contributes a practical and replicable model for developing organizational information systems within educational associations. The platform not only enhances digital communication within APTIKOM SUMUT but also provides a framework that can be adopted by similar organizations aiming to modernize their information management processes.

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