
Web-Based E-Borrowing Information System PT. Telkom Access

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ABSTRACT

In the digital age, advancements in information technology play a significant role in optimizing business processes. This study presents the design and implementation of a web-based E-Borrowing Information System tailored for PT Telkom Akses to address inefficiencies in equipment borrowing management. The current manual borrowing process often leads to delays, data inaccuracies, and administrative errors, impacting productivity and transparency. The proposed solution integrates real-time features for booking, managing, and tracking equipment loans. The system employs PHP and MySQL for backend functionality and HTML, CSS, and JavaScript for the user interface, following the waterfall development methodology. To evaluate its effectiveness, the system underwent functionality testing (Black Box Testing) and usability assessments. Results confirm significant improvements in process efficiency, transparency, and administrative accuracy. The system enables users to complete borrowing transactions quickly, with features to monitor equipment status, register personal accounts, and manage data in a structured manner. Additionally, the "Admin Dashboard" enhances overall system supervision through real-time monitoring and efficient management tools. This research highlights the transformative impact of web-based technology on equipment loan management, demonstrating scalability for broader application in similar settings. The study underscores the potential of well-designed information systems to enhance operational efficiency, employee satisfaction, and organizational productivity.

Keywords: E-Borrowing, Web-Based System, Loan Management, PT Telkom Akses

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1. INTRODUCTION

Information technology has become a critical component in optimizing business processes across various sectors. PT Telkom Akses, a leading company in the telecommunication infrastructure field, faces challenges in managing equipment borrowing, which is still conducted manually. Issues such as delays, data inaccuracies, information loss, and lack of transparency negatively impact operational efficiency and employee satisfaction. The manual process makes it difficult for the company to effectively monitor the availability and status of equipment.

Previous studies have demonstrated the effectiveness of web-based information systems in addressing similar challenges. Research by (Andika, 2023) on web-based inventory systems highlights

significant improvements in accessibility, process automation, and error reduction, which directly enhance operational efficiency. Similarly, (Tyas & Shidqi, 2024) emphasize the importance of integrated systems in asset management, noting their ability to provide real-time data tracking and centralized management, which are critical for transparency and productivity.

Building on these findings, the development of a Web-Based Borrowing Information System (E-Pinjam) for PT Telkom Akses is both relevant and strategic. This system is designed to integrate the entire borrowing workflow, from reservations to tracking, to effectively address the company's challenges. The objective of this study is to demonstrate how the implementation of a web-based technological solution can enhance productivity, ensure data accuracy, improve employee satisfaction, and contribute significantly to the company's operational efficiency.

2. LITERATURE REVIEW

2.1. *Web-Based Information Systems*

A web-based information system utilizes web technology as its principal platform for the management, processing, and presentation of information. This method enables users to access data and services via a web browser with an internet connection, eliminating the necessity for further software installation on the user's device. The primary function of web-based information systems is to enable the storing, processing, and dissemination of real-time information to diverse consumers across numerous locations. This system facilitates data integration across departments or organizations, expedites business processes, enhances transparency, and promotes more efficient cooperation among users.

The influence of web-based information systems is considerable in multiple dimensions, encompassing both advantages and disadvantages. The system provides comprehensive accessibility, allowing users to access it at any time and from any location, given an internet connection. This enhances work efficiency, accelerates decision-making, and diminishes operational costs, including document printing and physical infrastructure maintenance. Furthermore, this approach enables enterprises or organizations to engage a broader audience, encompassing customers, business partners, and stakeholders. Conversely, the implementation of web-based systems has concerns, including susceptibility to cyberattacks, reliance on internet connectivity, and the risk of data breaches if security measures are inadequately enforced.

Web-based information systems offer efficient solutions for information administration and distribution in the digital era, facilitating more adaptable and responsive business operations. When effectively implemented, these systems can serve as a formidable instrument to enhance the productivity and competitiveness of organizations across diverse sectors, including education, industry, government, and healthcare. Nonetheless, effective data security management and robust network architecture are essential for mitigating risks and guaranteeing successful implementation.

Web-based information systems are applications that run on web servers and are accessed through internet or intranet networks. The advantages of these systems include wide accessibility, easier updates, and integration with other systems. In the context of equipment borrowing, web-based systems can facilitate the borrowing process, reduce administrative errors, and provide real-time tracking.

2.2. *Equipment Borrowing Management*

The use of equipment loan management with web-based applications has many virtues in managing the equipment loan process more efficiently, transparently, and structurally. Users, both borrowers and managers, can access the system anytime and anywhere as long as they have an internet connection thanks to web-based applications. This is particularly beneficial for organizations or companies with a large number of users and complex loan schedules. A web-based system automates the previously manual lending process, like recording in books or spreadsheets, to reduce the risk of errors like data loss or loan schedule conflicts. Another advantage is the increased speed and accuracy in monitoring equipment status. The system allows users to view the real-time availability of equipment, make reservations, and track other users' borrowing schedules. Managers can easily manage inventory lists, monitor equipment usage, and plan maintenance if any equipment becomes damaged or unfit for use with this system. Additionally, the web-based application can send notifications or reminders to users about equipment return deadlines, which can minimize late returns and guarantee timely equipment use.

The use of the app also increases transparency and accountability. The app systematically records all activities related to borrowing, returning, and evaluating equipment. Authorized parties can access this information, thereby reducing the risk of equipment loss or misuse. Managers can generate equipment usage reports quickly and accurately, simplifying periodic evaluations for decision-making, such as adding or replacing inventory. Overall, the implementation of web-based equipment loan management provides an effective solution to simplify the loan process, increase manager productivity, and ensure optimal equipment utilization. With simple access, a transparent system, and supporting automation features, organizations or companies can save time, reduce administrative costs, and improve the quality of equipment loan services to their users. Equipment borrowing management involves the processes of requesting, approving, distributing, and returning equipment. This process often faces challenges such as delays, equipment loss, and data inaccuracies. Implementing an effective borrowing information system can address these issues by providing features such as borrowing schedules, automatic notifications, and equipment status tracking.

2.3. *Case Studies in Telecommunication Companies*

Previous research in telecommunication companies has shown that efficient asset and borrowing management is key to supporting effective operations. The implementation of web-based information systems in telecommunication companies can enhance employee productivity and satisfaction, as well as ensure the availability of necessary equipment for daily operations.

2.4. *Security and Privacy in Web-Based Information Systems*

Security and privacy are critical aspects in the development of web-based information systems. Information systems that manage sensitive data, such as equipment borrowing records, must be designed with security considerations to protect information from unauthorized access and cyber-attacks. indicates that implementing security protocols such as HTTPS, data encryption, and multi-factor authentication can significantly reduce security risks. Additionally, clear and transparent privacy policies can enhance user trust in the system.

3. *METHODS*

This research uses the research and development (R&D) method, which aims to design and build a web-based application for PT Telkom Access web-based information system. This research method aims to create a new product or system that can provide solutions to existing problems, in this case

problems in library management and services. Specifically, this research follows the waterfall software development methodology with structured and incremental stages. This research method was chosen because its main focus is to create a new product or system that can provide solutions to existing problems, in this case problems related to library management and services. This method is well suited for application development, which requires clear and sequential steps, from needs analysis to system maintenance. The waterfall method is perfect for this type of application development because each phase in the software development process is performed in stages and sequentially. In other words, each stage must be completed before moving on to the next stage. This allows for more systematic and organized management. The research and development (R&D) method with the waterfall approach in this research allows developers to follow structured stages in the design, development, and implementation of Web-based applications for library information systems. Each stage is carefully executed, starting with needs analysis, design, development, testing, implementation, and evaluation. Through this approach, it is hoped that the resulting application can provide an efficient and effective solution for the management and services of PT Telkom Akses.

3.1. Research Approach

This study utilized the Research and Development (R&D) method, aimed at creating a new product or system to solve existing problems. Specifically, the waterfall software development methodology was adopted due to its structured and sequential nature, ensuring systematic progress through distinct stages: requirements analysis, design, implementation, testing, and maintenance.

3.2. Research Stages

From this research, first there is data collection where from this data collection there are some data that are needed as follows:

1. Literature study, reviewing theories and previous researches related to library information systems, web-based system design and system implementation in educational institutions.
2. Observation, making direct observations at PT Telkom Akses to understand the existing work processes, types of services provided, and obstacles faced.
3. Interviews, conducting interviews with related parties such as warehouse managers, staff to get more in-depth information about the system needs.
4. Questionnaires, distributing questionnaires to potential users to find out their needs and expectations from the e-Borrowing system.

3.3. System Design

1. After analyzing the system requirements, the next stage is the system design. At this stage, researchers design the structure and architecture of the application, including user interface design and database design. System design involves several steps, such as
2. Designing the application workflow, starting with the login process, book search, borrowing, and book return.
3. Designing a user interface (UI/UX) that is easy to use and understand by students and faculty.
4. UML Unified Modeling Language, to describe and design the program. The author uses two UML for this program, namely Use Case Diagram and Activity Diagram.

3.4. Use Case Diagram

Use case diagram is one of the various types of UML (Unified Modeling Language) diagrams that describe the interaction relationship between the system and actors. Use Case can describe the type of interaction between the system user and the system.

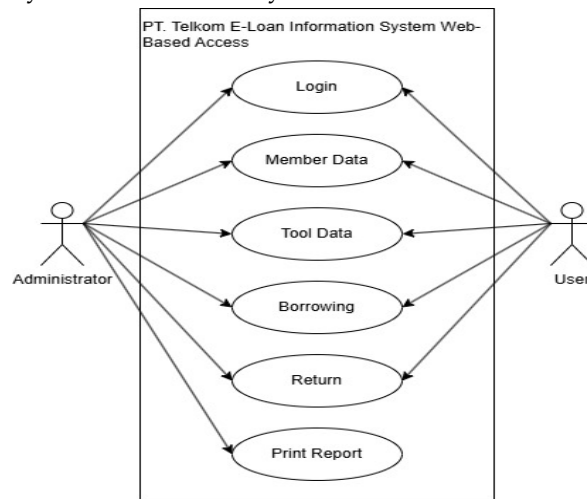


Figure 1. Use Case Diagram

The Use case Diagram for the system illustrates the interactions between the actors (Admin and Member) and the application. Two primary actors are involved: Admin and Member. The Admin oversees system management tasks such as managing member data, tool inventory, and loan requests. The Member, on the other hand, interacts with the system to borrow tools, return tools, and update personal information.

The first key functionality is the Login, which is accessible to both Admins and Members. Admins log in to access the Admin Dashboard, where they can manage system operations, while Members log in to access the User Dashboard for borrowing and returning tools. Once logged in, the Admin can perform actions such as managing member data, which includes adding, updating, or deleting member profiles. Admins can also manage the tool inventory by updating information about available tools, their conditions, and statuses.

For Members, the primary interaction is Borrow Tool, which allows them to browse the available inventory, select a tool, specify a loan date, and submit a borrowing request. The Admin then reviews the request and decides to either approve or reject it through the Approve or Reject Loan Requests use case. After using the tool, the Member can record its return via the Return Tool feature, including providing details about the tool's condition.

Additionally, Members can track the status of their borrowing requests (e.g., pending, approved, or rejected) through the Track Loan Status feature. They can also manage their personal information via the Update Profile use case, enabling updates to usernames, passwords, and contact details. For Admins, the system provides a Generate Reports feature, which creates detailed records of borrowing activities, tool inventories, and system performance for better oversight and decision-making.

Overall, the diagram highlights the structured interactions and clear roles of the actors, ensuring that the application meets the needs of both Admins and Members while maintaining efficiency and transparency in the borrowing process.

3.5. Activity Diagram

An activity diagram is a type of diagram used to describe the workflow or process in a system. This diagram describes the steps performed in the activity and the relationship between these steps.

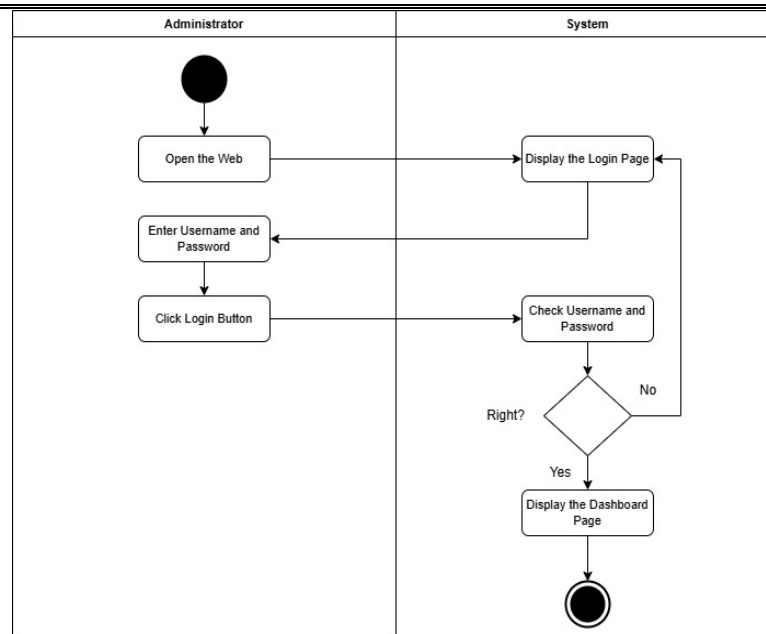


Figure 2. Activity Diagram Login

This diagram illustrates the process of an administrator logging into a system. First, the administrator opens a web browser and navigates to the system's login page. Next, the administrator enters their username and password, and then clicks the "Login" button. The system then checks the entered username and password against its stored records. If they match, the system displays the dashboard page, indicating successful login and granting the administrator access to the system. If the username or password is incorrect, access is denied, and the administrator cannot log in. In essence, this diagram depicts the flow of interaction between the administrator and the system during a simple login process.

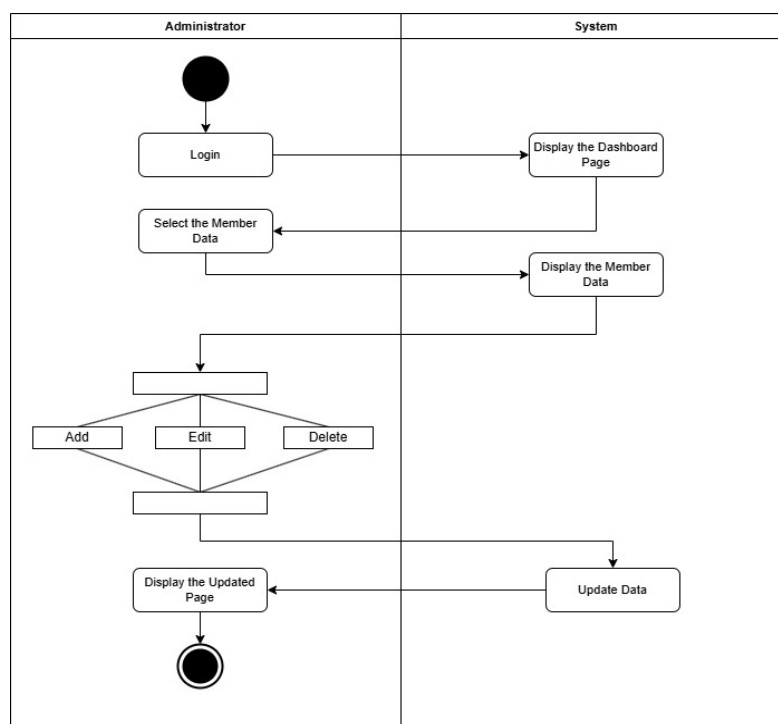


Figure 3. Member Activity Diagram

This diagram illustrates the process of an administrator managing member data within a system. It starts with the administrator logging into the system, which then displays the dashboard page. From there, the administrator selects the "Member Data" option to view and manage member information.

The diagram then presents three possible actions the administrator can take: "Add," "Edit," or "Delete" member data. These actions allow the administrator to modify the member information as needed. After performing any of these actions, the system updates the data and displays the updated page, reflecting the changes made.

Essentially, this diagram outlines the interaction between the administrator and the system, highlighting the administrator's ability to manage and update member data through a series of actions. It showcases a simple yet crucial aspect of system functionality, emphasizing data management capabilities within the system.

3.6. *System Implementation*

The next stage is system implementation, where the application begins to be built according to the previously created design. In this stage, researchers will choose the appropriate technology to build web-based applications. The technologies that will be used in this research include

1. PHP as the programming language for server-side development (backend).
2. MySQL as a database management system for storing data.
3. HTML/CSS and JavaScript for user interface development (frontend).

At this stage, development is done using the Model-View-Controller (MVC) principle, where:

1. The model is used to manage data such as books, loans, and returns.
2. View is used to display an easy-to-use user interface.
3. Controller provides the link between the model and the view and handles the application logic.

After the application is developed, the system is internally tested to ensure that all functions are working properly.

3.7. *System Testing*

Black box testing focuses on testing the system's functionality without peering into its internal code structure. Testers interact with the system as users would, providing various inputs and observing the outputs. The goal is to ensure the system meets the specified requirements and functions as expected. Some of the tests that will be carried out on the equipment loan application will focus on:

1. Login Page
Verified successful login with correct credentials and denied access with incorrect credentials.
2. Member Registration
Confirmed new member registration with the required information.
3. Admin Dashboard
Validated the functionality of managing member data, tool inventory, and loan requests. Also checked the generation of reports.
4. Member Dashboard
Tested borrowing tools, returning tools, and updating personal information. Also, the tracking of loan status was verified.
5. Borrowing Page
Ensured accurate recording of borrowing requests with necessary details.

6. User Profile

Confirmed the functionality of viewing and editing personal information.

All functionalities were tested with various inputs, and the system responded as expected. No errors were encountered during the testing phase. The Black Box Testing method confirmed that the system meets the functional requirements and operates effectively.

4. RESULTS AND DISCUSSION

4.1. Login Page Display

The system login display is professionally designed to match PT Telkom Access' corporate identity. The background features a red theme, Telkom's corporate color, with the Telkom Access emblem interwoven into the design. This demonstrates brand consistency in the system implementation.

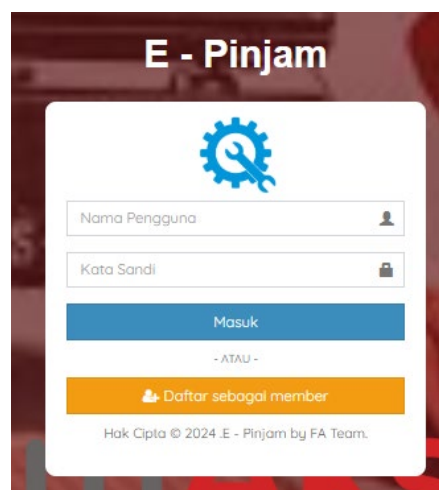


Figure 4. Login Page View

The login system implements standard security components consisting of the "Username" and "Password" fields. The "Login" button serves as the user authentication gateway. The system also provides a new registration option through the "Register as a member" button, facilitating new users. Implementing the login form demonstrates the application of basic security aspects by separating user authentication into two factors: username and password. The lock icon on the password field indicates that the input is hidden to protect data confidentiality.

The login interface is crafted with a focus on user-friendliness, featuring straightforward Indonesian language and a clean, organized layout. This thoughtful design ensures that users of all skill levels can effortlessly access the system, enhancing their overall experience.

4.2. Display Registering an E-Pinjam Member Account

Figure 6 illustrates the registration interface implemented in the web-based E-Borrowing information system developed for PT Telkom Access. This system follows a user-centered design approach, emphasizing both functionality and user experience. The registration interface includes essential elements necessary for new user registration. It is designed to align with the corporate identity of Telkom Access, evident through the use of a red-themed background that reflects the company's corporate color.

Figure 6. Register E-Pinjam Member Account

Additionally, the company logo is integrated into the design to enhance brand recognition. In terms of functionality, the registration form features three main input components required for the registration process: a field for the full name to ensure formal user identification, a username field for access credentials, and a password field for system security. (Wahyudin & Rahayu, 2020)

Each input field is accompanied by an icon that represents the type of data being entered, which improves the intuitiveness of the interface. The system also incorporates a navigation feature that guides users with a "Register Now" button to initiate the registration process, as well as an alternative link to the login page for users who already have an account. (Wahyudi et al., 2022)

The footer of the system includes copyright information, addressing the legal aspects of implementation. Overall, the design of this interface exemplifies user interface design principles that prioritize security, ease of use, and corporate visual identity within an integrated system.

4.3. Admin Dashboard Display

Figure 7 shows the implementation of the administrator dashboard on the E-Borrowing information system developed for the management of LTE CS equipment loans at PT Telkom Access. This dashboard demonstrates a design approach that prioritizes functionality and system management efficiency. The dashboard interface implements a well-organized layout consisting of several major components. On the left side, there is a navigation panel containing essential menus for system management, including Dashboard, Master Data, Tool Catalog, and Loan Reports.

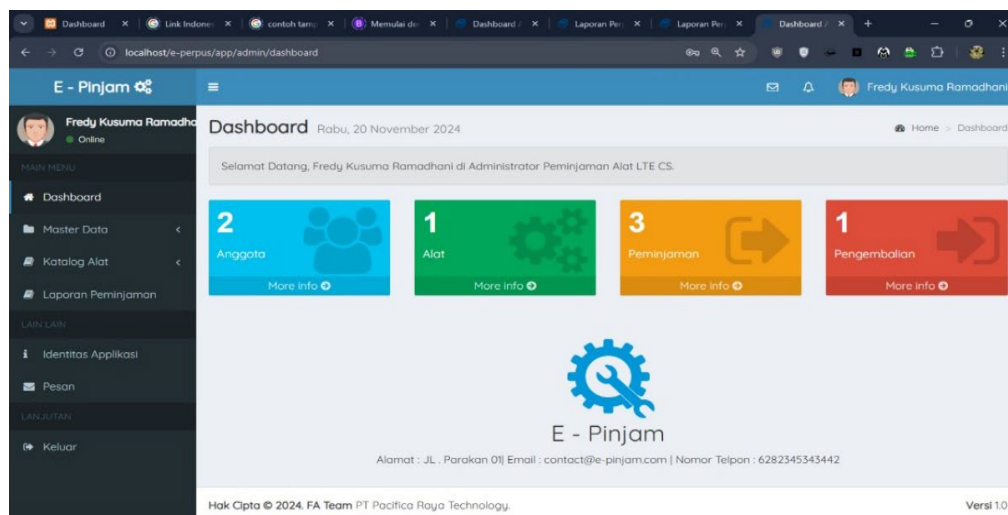


Figure 7. Admin Dashboard

The panel also displays the active administrator's profile information, including their photo and activity status. The middle section of the dashboard displays four main information cards presenting the system's key metrics: Number of Members (2 registered members) Number of Tools (1 available tool) Number of loans (3 transactions) Number of Returns (1 transaction) Each information card uses a different color scheme for easy visual identification: blue for members, green for tools, orange for loans, and red for returns (Marwah & Puspitorini, 2021).

A "More Info" button on each card allows access to more detailed information. The bottom section of the dashboard lists the system's contact information, including the physical address, email, and phone number, and displays the E-Pinjam logo, reinforcing the system's visual identity. The implementation of this dashboard demonstrates the application of effective interface design principles, allowing administrators to monitor and manage the borrowing system efficiently in a single integrated view (Juniarti & Patimbang, 2023).

4.4. User Dashboard display

This system aims to make it easier for users to manage borrowing, returning, and communication with the admin. The system's interface has a simple structure with the main navigation on the sidebar. In that section, there are several menus such as Dashboard as the main page, Equipment Loan to access the loan feature, Equipment Return for the return feature, as well as other menus like Messages for communication, My Profile for user information management, and Logout to exit the system.

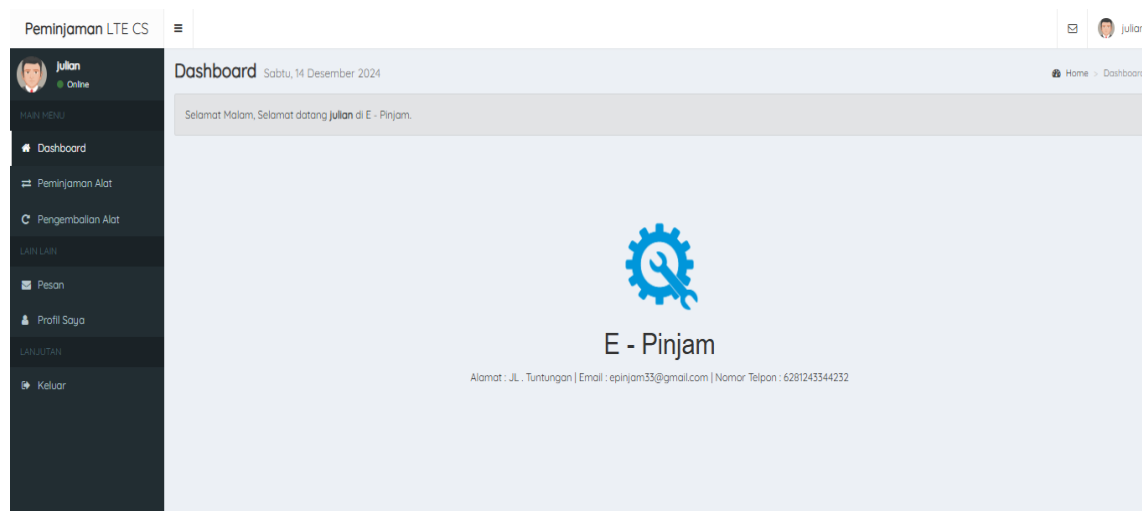


Figure 8. User Dashboard Display

The main section on the dashboard page displays a personalized greeting, such as "Good Evening" and the username (in this case, "julian"), as well as the system logo as a gear icon with an adjustable wrench symbolizing tool management. At the bottom of the page, we provide system contact information including the address, email (epinjam33@gmail.com), and phone number (6281243344232). At the top, there is a header displaying the current date, which is Saturday, December 14, 2024, and a user profile icon in the upper right corner. The system design uses a simple and professional theme of gray, white, and blue (Muhasshanah & Qamariyah, 2021)

The layout is designed to be user-friendly with intuitive navigation and the use of clear icons and text, making it easy for users to understand each available function. A system summary, quick

access to tool borrowing and returns, and a personalized greeting greet users upon logging in. Overall, the “E-Pinjam” system functions as an effective tool management platform to assist users in organizing the borrowing and returning of tools in a structured manner (Simatupang et al., 2024).

4.5. Display of The Equipment Borrowing Page

Figure 9 shows the implementation of the equipment borrowing interface in the E-Pinjam PT Telkom Access information system. This page displays the equipment loan form designed to facilitate the loan application process systematically and structured.

Figure 9. Borrowing Page

The borrowing interface displays two main navigation tabs: “Equipment Loan Form” and “Equipment Loan History,” allowing users to switch between submitting a new loan request and browsing previous loan history. The left navigation panel provides access to various system functions, including Dashboard, Equipment Borrowing, and Equipment Return.(Panduan et al., 2021)

The borrowing form implements four essential input fields, member Name, this field displays the name of the user currently logged in (in this example, “julian”), providing a clear identification of the borrower. Tool Name, using a dropdown selection with the placeholder “Please select the money to be borrowed,” allowing for a structured selection of available tools. Loan Date, this field displays the actual date (14-12-2024), ensuring accurate recording of the loan time. Document the equipment’s condition before borrowing using the dropdown selection.

The “Submit” button at the bottom of the form serves as the last action to submit the borrowing request. The header of the page displays the identity of the currently active user along with the connection status, providing a visual confirmation of the active session. This interface implements a systematic approach to tool borrowing management, ensuring that the system records each transaction with the necessary details for effective inventory management (Ramadhani, 2022).

4.6. User Profile Display

The E-Pinjam system’s “My Profile” page: This allows users to view and edit their personal information. Displayed on the interface are two main sections: a profile editing form (left) and a profile information summary (right). The profile editing form displays several input fields, including the unchangeable Member Code, NIS, Full Name, Username, Password, Division, and Full Address (Lusianto et al., 2022).

The screenshot shows the 'Profil Saya' (My Profile) page in the E-Pinjam application. The page is divided into two main sections: a form for editing the profile and a summary of the profile data.

Form Section (Left):

- Edit Profil Saya** (Sabtu, 14 Desember 2024)
- Kode Anggota** *Tidak dapat diubah: AP006
- NIS** *wajib diisi: 5646434233
- Nama Lengkap** *wajib diisi: julian
- Nama Pengguna** *wajib diisi: julian
- Kata Sandi** *wajib diisi: julian
- Divisi** *wajib diisi: XII - Teknik Sepeda Motor
- Alamat Lengkap** *wajib diisi: Kemayoran
- Update** button

Summary Section (Right):

- Profil Saya**
- Kode Anggota**: AP006
- NIS**: 5646434233
- Nama Lengkap**: julian
- Nama Pengguna**: julian
- Kata Sandi**: julian
- Kelas**: XII - Rekayasa Perangkat Lunak
- Alamat Lengkap**: Kemayoran

Figure 10. Profile Display

The system indicates required fields with the label “Required,” showing users must complete all requested information. At the bottom of the form, there is a blue “Update” button that functions to save the data changes. The right side of the page displays a summary of the user’s profile data in a more concise format, including Member Code (AP006), NIS (5646434233), Full Name (julian), Username (julian), Password, Class/Division (XII - Motorcycle Engineering), and Full Address. (Kemayoran). In addition, there is a user avatar image displayed at the top of the profile summary, providing a visual sense of personalization.

The interface design uses a neat and simple two-column layout with a dominance of light gray, white, and blue accents. The system navigation remains available on the left sidebar, with menus such as Dashboard, Equipment Borrowing, Equipment Return, Messages, and Logout. This ensures that users can easily switch between features within the system. Overall, the “My Profile” page in this system is designed to make it easy for users to manage and update their personal information with an intuitive and user-friendly interface.

5. CONCLUSION

The underlying problem of this research is the lack of an effective tool borrowing management system in certain environments. The process of borrowing and returning equipment, which was previously done manually, has caused various obstacles, such as data inaccuracies, difficulty in monitoring equipment status, and the risk of losing borrowing information. This hampers the efficiency of equipment management and causes delays in service. This research begins with a needs analysis to understand the problem and formulate the appropriate solution. The next stage is system design, which includes user interface (UI/UX) design and database architecture. The application development process uses web-based coding methods with specific technologies, such as HTML, CSS, and PHP as programming languages, as well as MySQL for database management. Following development, testers perform a series of functionality and user tests to ensure the application runs well and meets user needs. The E-Pinjam application functions as a web-based tool borrowing management system. Users can log in first to access the salient features, such as borrowing tools, returning tools, and managing personal profiles. User’s input the data of tools they wish to borrow in the borrowing menu and report returned tools in the returning menu. The system will store the input data in the database and display it on the

dashboard page to help the admin monitor the tools' status in real-time. Additionally, the "My Profile" feature allows users to update personal information, such as NIS, full name, and address.

Based on the testing results, the E-Pinjam application functions successfully according to the initial design. The Black Box Testing method ensured that each feature operated without errors. Users can use well the borrowing, returning, and profile data management features. User testing results show that this application is easy to use with an intuitive interface, and it can address the issues of equipment loan management that were previously done manually.

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