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Design and Development of a Web-Based Audit Clearance Letter Application System Using PHP Framework at the Karanganyar Inspectorate

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Abstract

This research aims to design and develop a web-based Audit Clearance Letter application system at the Karanganyar Regency Inspectorate using the Laravel framework and MySQL database. The previous manual administrative process caused delays in verification, difficulties in tracking application status, and risks of data recording errors. This study adopted the Research and Development (R&D) methodology in conjunction with the Waterfall development model, which encompasses five sequential phases: requirements specification, system design, implementation, verification, and operational maintenance. The architectural foundation of the system was established upon the Model-View-Controller (MVC) pattern, selected to ensure a more organized, secure, and sustainable application structure. The results indicate that the system successfully integrates application submission, document upload, verification, letter issuance, and real-time status tracking within a single digital platform. Black Box Testing conducted on 14 testing scenarios achieved a 100% success rate and improved administrative efficiency from 2–3 working days to less than 1 working day in the verification and document monitoring process. In addition, User Acceptance Testing (UAT) achieved a User Satisfaction Index (USI) score of 88.2%, categorized as "Very Satisfactory." The novelty of this research lies in the integration of a web-based Audit Clearance Letter administrative service specifically designed to improve transparency and efficiency in government supervisory institutions.

1. Introduction

The proliferation of information technology has precipitated substantial transformations across multiple sectors, with government institutions emerging as primary beneficiaries of this digital evolution. Information systems have increasingly assumed a pivotal role in enhancing the efficiency, accountability, and transparency of public service delivery. The imperative of digital transformation has compelled public sector organizations to transition from conventional manual procedures toward technology-mediated administrative frameworks, thereby facilitating more streamlined workflows and elevated standards of citizen-oriented service delivery [1]. In addition, web-based information systems are capable of supporting

more structured data management, facilitating document retrieval, and improving overall administrative performance [2].

Beyond its infrastructural dimensions, the advancement of digital technology has fundamentally reconstituted organizational information management practices and catalyzed the development of more responsive, accessible, and technology-driven public service modalities. Research conducted by Kurniawan et al. showed that the implementation of digital technology through a structured approach is able to improve the effectiveness of technology utilization and support better information management [3]. This indicates that the implementation of digital-based systems not only improves work efficiency, but also supports the transformation of more modern and integrated services.

Within the domain of public administration, e-government adoption has emerged as a strategic imperative for elevating the quality, transparency, and accountability of governmental service provision. By facilitating digital interaction between citizens and public agencies, e-government systems enable more efficient and accessible delivery of administrative services. Previous studies have shown that web-based administrative systems are capable of improving administrative effectiveness, reducing processing time, and facilitating document management [4], [5]. In addition, usability, efficiency, and user satisfaction are important factors influencing the success of e-government implementation and digital public services [6].

Several previous studies have discussed the development of web-based administrative systems and e-government applications. Nugraha et al. developed a web-based internship information system using the Laravel framework to facilitate registration and reporting processes in higher education institutions [4]. The study successfully improved administrative efficiency; however, the system mainly focused on internship management and did not provide integrated real-time monitoring and document verification features. Another study conducted by Sengke et al. developed a web-based administration and archival information system to improve document storage and retrieval processes in educational institutions [5]. Although the system improved document management efficiency, the study mainly emphasized archival management and did not integrate end-to-end administrative workflows within a single platform.

Furthermore, previous research on e-government usability evaluation showed that usability, efficiency, and user satisfaction significantly influence the effectiveness of e-government services [6]. However, the study mainly focused on usability evaluation and did not discuss the integration of administrative workflows such as application submission, verification, and digital document issuance. In addition, Abdulkareem and Ramli explained that trust, service quality, and information quality significantly influence the success of e-government implementation and public service value [7]. Nevertheless, their study focused more on conceptual evaluation models and did not specifically implement an integrated administrative service platform within government supervisory institutions. These limitations indicate that previous studies have not comprehensively integrated administrative submission, document verification, digital letter issuance, and real-time monitoring within a single platform specifically designed for government supervisory institutions.

The Karanganyar Regency Inspectorate, as the Government Internal Supervisory Apparatus (APIP), has an important role in ensuring that government administration is carried out in accordance with regulations and free from audit findings [8]. One of the administrative services provided is the issuance of an Audit Clearance Letter, which is a document stating that an individual or institution has no audit findings. However, based on observations and interviews conducted at the administrative service division of the Karanganyar Regency Inspectorate, approximately 80% of the Audit Clearance Letter application process was still carried out manually through physical document submission and direct verification by officers. This condition caused the average administrative process to take approximately 2-3 working days for each application, particularly during document verification and data recording stages. In addition, the manual process increased the risk of data redundancy, service delays, recording errors, and difficulties in monitoring application status in real time.

Conventional manual systems are inherently susceptible to human error and present significant limitations in terms of data and document management efficiency [9]. Empirical evidence from prior research demonstrates that web-based systems built upon technologies such as PHP and MySQL substantially enhance data processing capabilities and facilitate more accessible information retrieval [10]. In addition, the use of modern frameworks such as Laravel enables the development of systems that are more structured, secure, and easier to maintain through the implementation of the Model-View-Controller (MVC) architecture [11].

Predicated upon the identified limitations of extant studies and the operational challenges observed at the Karanganyar Regency Inspectorate, this research proposes the development of a comprehensive web-based Audit Clearance Letter application system that consolidates application submission, documentary verification, letter issuance, and real-time status monitoring within a unified digital platform. Unlike previous studies that mainly focused on document management, archival systems, or usability evaluation separately, this research integrates administrative workflows comprehensively to support faster, more transparent, and more efficient public services in government supervisory institutions.

Therefore, this research aims to design and develop a web-based Audit Clearance Letter application system using the Laravel framework and MySQL database. The scientific contribution of this research lies in the development of an integrated administrative service platform that combines application submission, document verification, digital letter issuance, and real-time application tracking within a single system specifically designed for government supervisory institutions. The developed system is expected to improve administrative efficiency, minimize data processing errors, enhance transparency, and support the modernization of e-government services within the Karanganyar Regency Inspectorate.

2. Research Method

This study employed the Research and Development (R&D) methodology, which is oriented toward the systematic production of functional technological artifacts while concurrently evaluating their practical effectiveness within real-world administrative contexts. The R&D methodology was selected on account of its capacity to integrate comprehensive user requirements analysis, iterative system development, and rigorous functional evaluation, thereby generating implementable solutions tailored to the operational demands of government institutions [12], [13].

In developing the system, this research applies the Software Development Life Cycle (SDLC) approach using the Waterfall model as the software development method. The Waterfall model constitutes a structured and sequentially-ordered software development framework encompassing discrete phases of requirements specification, system design, implementation, verification, and operational maintenance [14], [15]. This model is particularly prevalent in government-oriented system development owing to its emphasis on comprehensive documentation and its suitability for projects characterized by clearly delineated and relatively stable functional requirements [16]. The stages of system development using the Waterfall model are illustrated in Figure 1.

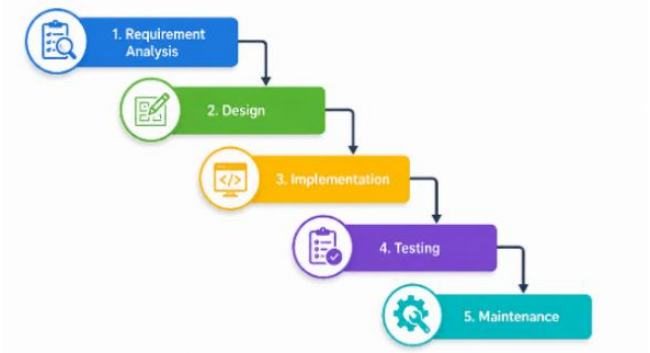

Figure 1. Waterfall SDLC Model Stages

The requirement analysis stage was conducted through observation, interviews, and documentation studies at the Karanganyar Regency Inspectorate. The interview process involved 5 participants consisting of 2 administrative officers, 1 supervisory staff member, 1 service operator, and 1 Audit Clearance Letter applicant. These data collection techniques were used to identify the main problems, such as manual administrative processes, verification delays, difficulties in data management, and constraints in tracking application status [17], [18].

The system design stage was carried out using Unified Modeling Language (UML) to visually model the system. UML was used to describe user interactions with the system and the existing process flow through diagrams such as Use Case Diagrams, Activity Diagrams, and Class Diagrams [19], [20].

The implementation stage was carried out by developing a web-based system using the Laravel framework and MySQL database. Laravel was selected because it provides a well-structured architecture through the implementation of the Model-View-Controller (MVC) concept, which facilitates system development, maintenance, and future scalability. In addition, Laravel offers security features such as authentication, authorization, session management, and protection against SQL Injection to support user data security. The framework also supports system scalability through efficient routing, middleware management, and database migration features [21], [22].

The system testing stage used the Black Box Testing method, which focuses on system functionality based on input and output without examining the internal structure of the program code. This testing aimed to ensure that all system features functioned properly according to user requirements [23], [24].

The final stage was system maintenance, which was carried out to fix errors and perform further development based on evaluation results and user feedback. Through these stages, the developed system is expected to improve efficiency, accuracy, and transparency in administrative services [25].

3. Result and Discussions

3.1 System Analysis Results

Based on the results of observations, interviews, and documentation studies conducted at the Karanganyar Regency Inspectorate, it was found that the Audit Clearance Letter application process is still carried out manually. Applicants are required to visit the office directly to submit physical documents, after which officers perform manual data recording and verification.

This condition causes several problems, including delays in the verification process, difficulties in searching archival data, the risk of data duplication, and the lack of transparency regarding application status. In addition, the manual system increases the potential for human error and the risk of document loss. Therefore, an integrated web-based system is needed to overcome these problems.

3.2 System Design

System design was undertaken through the application of Unified Modeling Language (UML) as a standardized visual notation for articulating system requirements, operational workflows, and underlying data structures of the Audit Clearance Letter application. The modeling framework employed in this study encompasses three principal diagram types: Use Case Diagrams, Activity Diagrams, and Class Diagrams.

The Use Case Diagram was used to model the relationship between actors and the system. This system involves three main actors, namely applicants, officers, and administrators. Applicants have access rights to register, log in, submit applications, upload documents, view application status, and download the letter once the application process has been completed. Officers are responsible for verifying application data, processing applications, and uploading the Audit Clearance Letter. Meanwhile, administrators have access rights to manage user data, officer data, and monitor all incoming applications.

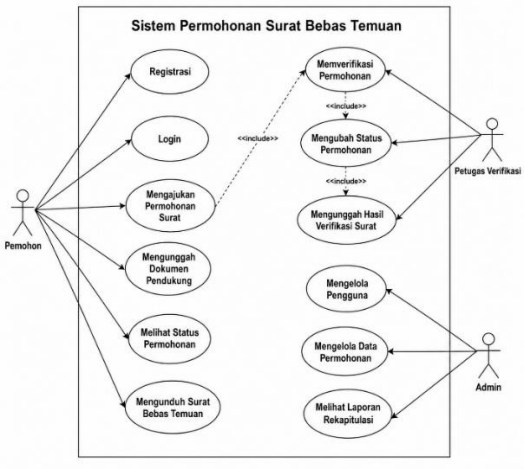

Figure 2. System Use Case Diagram

The Activity Diagram was used to describe the system workflow starting from the application submission process to the issuance of the Audit Clearance Letter. The process begins when the applicant logs into the system, fills out the application form, and uploads the required supporting documents. After that, the officer verifies the submitted data and documents. If the submitted data is incomplete or invalid, the application may be rejected or returned for revision. If the data is declared complete and valid, the officer processes the application and uploads the issued letter. Once the process is completed, the applicant can view the application status and download the letter through the system.

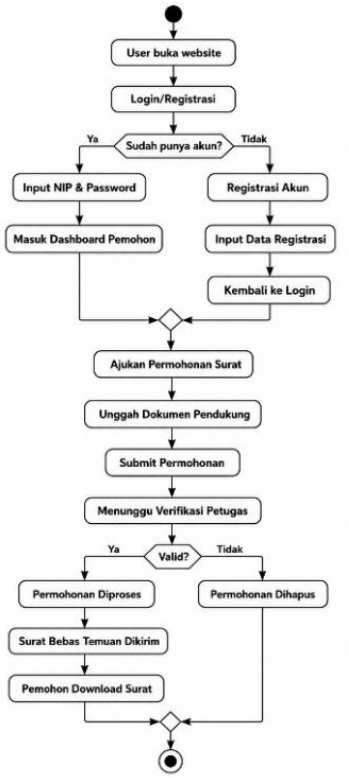

Figure 3. System Activity Diagram

The Class Diagram was used to describe the system structure, which consists of several main classes, namely User, Applicant, Officer, Administrator, Application, Document, and Letter. The User class serves as the basis for user data management with attributes such as name, employee identification number (NIP), email, password, and role. The Application class functions as the core of the system because it stores Audit Clearance Letter application data, including submission date and application status. The Document class is used to store supporting documents uploaded by applicants, while the Letter class is used to store the issued Audit Clearance Letter files uploaded by officers.

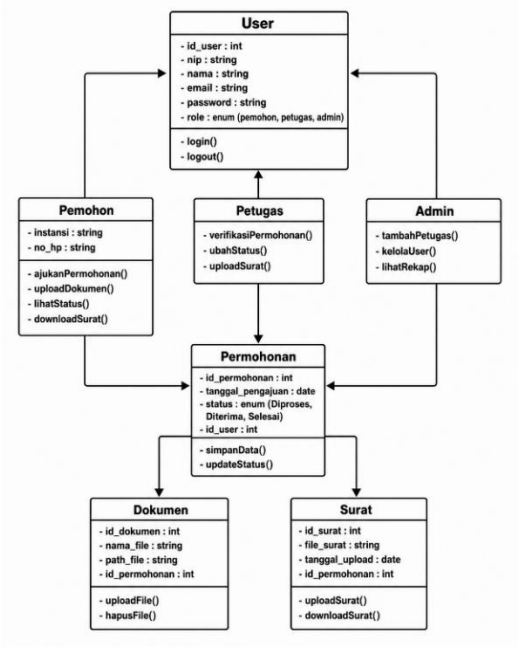

Figure 4. System Class Diagram

Based on the system modeling, the designed system is capable of integrating the application process, verification, letter issuance, and status tracking within a single web-based application. This integration makes the administrative workflow more structured, efficient, and easier to manage according to each user's access rights.

3.3 System Implementation

The developed system is a web-based application using the Laravel framework and MySQL database with the Model-View-Controller (MVC) architecture. System implementation focuses on integrating digital administrative processes, including application submission, document upload, data verification, and real-time Audit Clearance Letter issuance. The implementation of the MVC architecture enables structured management of program logic, user interfaces, and data processing, thereby facilitating system development and maintenance. In addition, the system improves data management efficiency and accelerates administrative service processes compared to the previous manual procedures.

The login interface is used as the main gateway to access the system according to the user's access rights. Furthermore, applicants can submit applications through the provided form by completing the required data and uploading supporting documents. In addition, the system also provides a dashboard that displays application information and application status in real time.

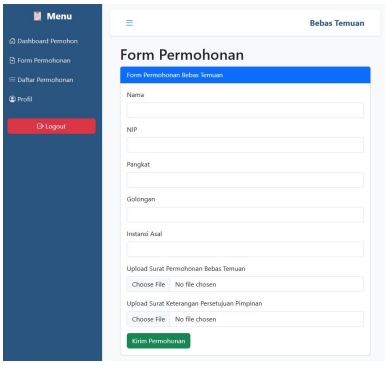

Figure 5. Audit Clearance Letter Application Form Interface

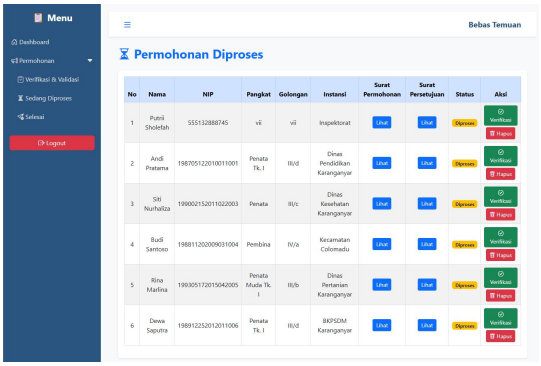

Figure 6. Application Verification Interface for Officers

3.4 System Testing Results

Functional verification of the developed system was conducted through the application of Black Box Testing methodology, which systematically evaluates system behavior on the basis of predefined inputs and their corresponding expected outputs, independently of the internal computational architecture of the program. This methodological approach was applied to verify that each system module performed in accordance with the functional specifications delineated during the initial requirements analysis phase. The testing procedure encompassed a comprehensive examination of the principal functionalities accessible to the three primary user categories within the system, namely applicants, verification officers, and system administrators.

Table 1. Functional Testing Results for Applicants

No	Function Tested	Testing Scenario	Expected Result	Result
1	Registration	Input complete registration data	Account successfully created	Successful
2	Login	Input valid email and password	Successfully enter dashboard	Successful
3	Application Submission	Complete application data entered	Data successfully stored	Successful
4	Document Upload	Upload valid supporting document	File successfully uploaded	Successful
5	View Application Status	Open application status page	Status successfully displayed	Successful
6	Letter Download	Download issued letter	File can be downloaded	Successful

Table 2. Functional Testing Results for Officers

No	Function Tested	Testing Scenario	Expected Result	Result
1	Officer Login	Input valid officer account	Successfully enter dashboard	Successful
2	Application Verification	Validate application data	Application status updated	Successful
3	Reject Application	Reject invalid application data	Rejection status displayed	Successful
4	Upload Letter	Upload Audit Clearance Letter	Letter successfully uploaded	Successful

Table 3. Functional Testing Results for Administrators

No	Function Tested	Testing Scenario	Expected Result	Result
1	Admin Login	Input valid admin account	Successfully enter dashboard	Successful
2	Manage User Data	Add and update user data	Data successfully updated	Successful
3	Manage Officer Data	Add officer data	Data successfully stored	Successful

No	Function Tested	Testing Scenario	Expected Result	Result
4	Monitor Applications	View all application data	Application data successfully displayed	Successful

Based on the testing results, all functional scenarios for applicants, officers, and administrators operated according to their expected functions without any significant functional errors. A total of 14 testing scenarios were conducted, and all scenarios achieved successful results, indicating that the developed system successfully fulfilled all functional requirements defined during the analysis stage.

The implementation of role-based access control also functioned properly, ensuring that each user could only access features according to their authorization level. This result indicates that the developed system is reliable and suitable for supporting digital administrative services at the Karanganyar Regency Inspectorate.

The findings of this study are consistent with previous research demonstrating that Black Box Testing effectively validates system functionality through input–output evaluation without requiring analysis of the internal code structure [23]. A high success rate in functional testing indicates that the developed system is functionally reliable and feasible for implementation.

Furthermore, the successful implementation of features such as online application submission, document upload, verification, and real-time status tracking demonstrates that the developed system is capable of improving administrative efficiency and reducing manual processing errors. Therefore, the system can be considered feasible to support the digital transformation of administrative services at the Karanganyar Regency Inspectorate.

3.5 User Acceptance Testing (UAT)

In addition to Black Box Testing, this study also implemented User Acceptance Testing (UAT) to measure the level of user acceptance of the developed system. UAT was conducted to evaluate the extent to which the system fulfills operational requirements and user expectations within the Karanganyar Regency Inspectorate environment. The testing involved 20 respondents consisting of applicants, verification officers, and system administrators who were directly involved in the Audit Clearance Letter administrative process.

The evaluation instrument employed a five-point Likert scale questionnaire, wherein a score of 1 denoted 'Strongly Disagree' and a score of 5 denoted 'Strongly Agree,' providing a structured continuum for measuring respondent perceptions. The instrument comprised a series of evaluative statements systematically organized across five principal assessment dimensions, encompassing system usability, functional capability, interface clarity, information accuracy, and system response speed.

The User Satisfaction Index (USI) percentage was calculated using the following formula:

$$USI = (\Sigma S / (N \times I \times R)) \times 100\% \quad (1)$$

Description:

- ΣS = Total obtained score,
- N = Maximum Likert scale score,
- I = Number of evaluation indicators,
- R = Number of respondents.

The interpretation criteria for the User Satisfaction Index (USI) are presented in Table 4.

Table 4. User Satisfaction Index (USI) Interpretation Criteria

USI Percentage	Category
81% – 100%	Very Satisfactory

USI Percentage	Category
61% – 80%	Satisfactory
41% – 60%	Fair
21% – 40%	Unsatisfactory
0% – 20%	Very Unsatisfactory

The respondent characteristics are presented in Table 5.

Table 5. UAT Respondent Characteristics

No	User Type	Number of Respondents
1	Applicants	10
2	Verification Officers	5
3	System Administrators	5
	Total	20

The UAT results are presented in Table 6.

Table 6. User Acceptance Testing (UAT) Results

No	Evaluation Dimension	Total Score	Percentage (%)	Category
1	System Usability	88	88%	Very Satisfactory
2	System Functionality	90	90%	Very Satisfactory
3	Interface Clarity	86	86%	Very Satisfactory
4	Information Accuracy	92	92%	Very Satisfactory
5	System Response Speed	85	85%	Very Satisfactory
	Overall USI Score	441	88.2%	Very Satisfactory

Based on the UAT results, the User Satisfaction Index (USI) was calculated as follows :

$$\begin{aligned} \text{USI} &= \left(\frac{441}{(5\ x\ 5\ x\ 20)}\right) \times 100\ \% \\ &= \left(\frac{441}{500}\right) \times 100\ \% \\ &= 88.2\ \% \end{aligned} \qquad (2)$$

The testing results indicate that the developed system achieved a User Satisfaction Index (USI) score of 88.2%, which falls into the "Very Satisfactory" category. The highest score was obtained in the information accuracy dimension at 92%, indicating that the system was capable of providing accurate and reliable information according to user needs. Furthermore, the system functionality dimension attained a score of 90%, substantiating that the features incorporated within the developed system comprehensively addressed the operational demands of administrative workflows. Collectively, the UAT findings affirm that the developed system is both viable and capable of underpinning the digitalization of Audit Clearance Letter administrative services at the Karanganyar Regency Inspectorate, delivering measurably superior levels of effectiveness, operational efficiency, and procedural transparency.

The implementation results of the developed system indicate a significant improvement in administrative efficiency compared to the previous manual process used at the Karanganyar Regency Inspectorate. In the previous system, the Audit Clearance Letter application process was conducted using physical documents,

resulting in longer verification processes, difficulties in data retrieval, and limited transparency in monitoring application status. The implementation of the web-based system enabled administrative services to be carried out in a more integrated and real-time manner, thereby accelerating document verification, simplifying data management, and improving service transparency for both applicants and administrative officers.

The improvement in administrative efficiency and the User Satisfaction Index (USI) score of 88.2% were influenced by several important factors within the developed system. One of the main contributing factors was the implementation of real-time application status tracking, which enabled applicants to monitor the progress of their submissions without requiring direct interaction with officers. In addition, the digital document upload feature reduced the dependency on physical documents and minimized delays caused by manual verification processes. The implementation of centralized data management also improved document accessibility and reduced the risks of data redundancy and document loss that frequently occurred in the previous manual system.

Another factor contributing to the high level of user satisfaction was the implementation of role-based access control for applicants, officers, and administrators. This feature enabled each user to access only the functionalities relevant to their responsibilities, thereby improving system usability and operational efficiency. Furthermore, the use of the Laravel framework supported the development of a more structured, secure, and maintainable system through the implementation of the Model-View-Controller (MVC) architecture. These findings are consistent with previous studies demonstrating that Laravel enhances the efficiency and maintainability of web-based application development by providing a structured framework and modular architecture [21].

The outcomes of the present study are further supported by previous research demonstrating that Laravel-based monitoring systems enhance data management effectiveness and streamline administrative workflows [22]. However, unlike previous studies that mainly focused on monitoring systems or document management separately, the system developed in this research integrates application submission, document verification, digital letter issuance, and real-time application tracking within a single administrative service platform. This integration enables administrative workflows to become more efficient, transparent, and accessible for both applicants and administrative officers.

Previous studies have demonstrated that Unified Modeling Language (UML) provides a structured approach to information system development [19]. Consistent with these findings, the present study employed UML not only as a system modeling tool but also as a means of comprehensively representing actor relationships and administrative workflows through Use Case Diagrams, Activity Diagrams, and Class Diagrams. Compared to previous studies, this research demonstrates a broader implementation scope because the developed system integrates end-to-end administrative services within a government supervisory institution.

Despite the positive outcomes achieved, several implementation challenges and limitations were identified during the development and deployment process. One of the primary challenges was the adaptation process for users who were previously accustomed to manual administrative procedures. In addition, the implementation scope of this system was limited to the Karanganyar Regency Inspectorate and has not yet been integrated with other government information systems. The evaluation process also involved a limited number of respondents and primarily focused on functionality and user satisfaction aspects. Therefore, further studies are needed to evaluate system scalability, interoperability, and long-term implementation effectiveness in broader government environments.

The implementation of this system also demonstrates important practical implications for public service modernization and e-government initiatives. The integration of administrative workflows into a digital platform contributes to improved transparency, accountability, and efficiency in government administrative services. In addition, the developed system reduces administrative burdens associated with manual document processing and supports faster public service delivery. Therefore, this research may serve as a

reference for other government institutions seeking to implement digital transformation and modernize administrative services through integrated web-based information systems.

4. Conclusions

This research has successfully accomplished the design and deployment of a web-based Audit Clearance Letter application system at the Karanganyar Regency Inspectorate, developed utilizing the Laravel framework in conjunction with a MySQL relational database management system. The resultant system effectively consolidates the entirety of the administrative service workflow encompassing application submission, documentary evidence uploading, multi-role officer verification, digital letter issuance, and real-time application status monitoring within a singular, integrated digital platform.

The implementation results indicate that the system improves administrative service efficiency, accelerates verification processes, reduces manual data recording errors, and enhances service transparency for applicants and officers. Based on the Black Box Testing results, all system features operated according to user requirements without significant functional errors. Moreover, the User Acceptance Testing (UAT) evaluation yielded a User Satisfaction Index (USI) of 88.2%, placing the system within the 'Very Satisfactory' classification, thereby affirming its viability and dependability as a platform for advancing the digitalization of administrative service delivery at the Karanganyar Regency Inspectorate.

Notwithstanding the positive outcomes, this study is subject to certain constraints, most notably the restricted deployment scope confined to the Karanganyar Regency Inspectorate and the relatively small respondent sample utilized in the evaluation process. For future development, the system can be enhanced through integration with other government systems, implementation of automatic notification features, and improvement of data security mechanisms to support more optimal administrative services.

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