



Design of a Web-Based Information System for Family Card and ID Card Referral Letter Services in Banyuadem Village

Rahma Angga^{1*}

¹ Student, Informatics Engineering, Muhammadiyah University of Magelang, Central Java, Indonesia

Email: rhama.angga90@gmail.com¹

*Corresponding Author Email: rhama.angga90@gmail.com

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Abstract

Population administration services, such as the issuance of Family Cards (KK) and Resident Identity Cards (KTP), are vital elements of village-level governance. However, at the Banyuadem Village Office, the process for requesting introductory letters is still handled manually. Residents are required to visit the hamlet head's home in person to obtain the letter, bring the necessary documents to the village office, and write their application on a sheet of paper, which is then manually recorded by staff in a ledger. This procedure results in lengthy service times and disorganized document management. This research aims to develop a web-based information system for processing KK and KTP introductory letter requests to improve time efficiency for residents and facilitate data management for village staff. The system is designed using the PHP (Hypertext Preprocessor) programming language and MySQL as the database server. The outcome of this research is a web-based platform that allows residents to submit applications without physically visiting the village office, while also enabling the village secretary to easily store data in the database and automatically generate monthly reports.

Keyword: Family Card, ID Card, Website, Information System, Village Services.

1. Introduction

The acceleration of information technology development in recent years has triggered significant changes in the design and development patterns of information systems in various sectors of life. In this digital era, the use of information systems is directed at providing convenience, speed, and efficiency in people's daily activities, including in the aspect of providing public services by government agencies (Pakaja et al., 2025; Stamoulis et al., 2001). Based on Law Number 25 of 2009 Article 1, public services are defined as activities or a series of activities in order to fulfill service needs in accordance with statutory regulations for every citizen and resident for goods, services, and administrative services provided by public service providers. Therefore, integrating information technology into the village government system is a highly relevant



strategic step to optimize bureaucratic efficiency and improve the quality of public services (Ismail et al., 2024; Pakaja et al., 2025; Shou et al., 2025).

Banyuadem Village is an administrative area located at the foot of Mount Merapi, specifically in Srumbung District, Magelang Regency. Geographically and administratively, Banyuadem Village is divided into seven hamlets: Trolikan, Cungkup, Bakalan, Dadapwangi, Banyuadem, Gandendan, and Gambrengan. With a total population of 2,439, the Banyuadem Village Office plays a crucial role as the central facility for providing administrative public services to all its residents. The provision of population administration services at the village level is one of the most important service pillars. In line with a study conducted by the Center for Regional Autonomy Studies, the quality of village government services—both internal and external, physical and administrative—must be continuously improved to achieve excellent and responsive service governance.

According to Law Number 23 of 2006 concerning Population Administration, identity documents such as the Resident Identity Card (KTP) and Family Card (KK) are mandatory instruments containing data on the composition, relationships, and official identity of family members, valid nationally. Although these documents are vital for every resident, field observations indicate that the service system for processing KK and KTP cover letters in Banyuadem Village still faces conventional operational challenges. Current procedures require residents to spend extra time physically visiting the hamlet head's house to request a cover letter. They must then return to the village office with the required documents and rewrite the application details on a sheet of paper. Furthermore, village service officers must manually re-record each applicant's data in a ledger. This manual service chain causes long document completion times and is vulnerable to disorganization of the documentation system in physical files (Pakaja et al; 2025; Putra, 2023).

To overcome existing service barriers, the Banyuadem Village Office administration requires a technological innovation in the form of an integrated information system that can simplify administrative processes. This research aims to develop a web-based information system for village-level family card (KK) and ID card (KTP) cover letter services. This system is designed to provide easy access for the community, eliminating the need to physically queue at the village office but instead simply submitting cover letter applications online through the website. In addition to shortening waiting times for residents, the implementation of this system aims to optimize the performance of village government officials. Through centralized data storage on a database server, this system facilitates the village secretary in securely documenting population data, minimizing manual recording in the ledger, and accelerating the process of producing accurate monthly application reports.

2. Literature Review

2.1 Analysis of Relevant Research

A review of previous research plays a crucial role as a comparative basis for identifying the strengths and weaknesses of the system to be developed. The first study by Zahrani & Amelia (2023) developed a web-based population administration information system using PHP and a MySQL database to manage demographic data, births, deaths, and print application letters. The weakness of this system lay in the lack of a document upload form, requiring residents to bring physical documents to the village office. The second study by Siman & Wiratama (2023) designed a web-based population service system using the System Development Life Cycle (SDLC) method, dividing system access into a front-end for residents and a

back-end for village operators. The third study by Rahman & Taufiq (2024) implemented a desktop-based population service system equipped with a computerized database to eliminate ledger recording and provide a fast data search feature. Based on these studies, the information system for population cover letter issuance services in Banyuadem Village was designed to integrate the advantages of the previous system's web-based self-service system while addressing gaps in the digital file upload feature, simplifying bureaucracy for residents and village officials.

2.2 Concept of Information Systems and Public Services

Theoretically, an information system is defined as a set of integrated components that work together to collect, process, store, and disseminate information to support decision-making, coordination, control, and problem analysis within an organization through input, process, output, and feedback activities (Karnia & Purbasari, 2025; Perdiansyah, 2025). Within the village government, this system is implemented through the Population Administration Information System (SIAK), an integrated information and communication technology designed to optimize population registration and civil registration, and provide accurate and easily accessible population data at both the local and national levels. The implementation of this system fulfills the mandate of Law Number 25 of 2009 concerning Public Services, which requires state administrators to provide responsive administrative services to every citizen. Based on Law Number 23 of 2006 concerning Population Administration, official identity documents such as the Resident Identity Card (KTP) and Family Card (KK) are mandatory for every family as proof of national legal citizenship. To process these population documents, a Village Introduction Letter is required, namely an official document issued by the village agency that contains the official letterhead, the applicant's identity, the purpose of the letter, and the signature of an authorized official as a sign that the resident's application has been acknowledged and approved.

2.3 System Development Life Cycle (SDLC) Methodology

In designing this information system, the System Development Life Cycle (SDLC) methodology is used as a structured framework to gradually translate organizational problems into software solutions (Meneses & Varajão, 2022). This system development life cycle consists of seven iterative phases (Langer, 2008), namely:

- Planning: Includes estimating physical requirements and human resources, a feasibility study, and determining technology priorities and system scope.
- Analysis: Conducting a survey of the existing system and identifying information requirements using requirements elicitation tools.
- Design: Translating requirements into data structure designs, software architecture, and user interface details.
- Development: Converting logical designs into coding activities and creating physical databases.
- Testing: Testing the overall functionality of the program code, database structure, and system interface to ensure they are free from technical errors.
- Implementation: Preparing physical facilities, training personnel, operating the program code, and ensuring the new system runs optimally.
- Maintenance: Conducting system audits, correcting operational errors, and continuously developing features. The use of the SDLC methodology is considered highly effective because it includes a comprehensive testing phase that ensures system integrity before full operation by village service agencies.



2.4 System Modeling with Unified Modeling Language (UML)

To describe, visualize, and document object-oriented system specifications, this design utilizes the Unified Modeling Language (UML) modeling tool (Cavique et al., 2022). UML modeling is categorized into static and dynamic diagrams (Otero & Dolado, 2004). In the static aspect, Use Case Diagrams are used to describe the functional interaction relationships between users (actors) and features within the system (Singh et al., 2016). Furthermore, Class Diagrams are used to define a set of classes, attributes, operations, and structural relationships between database tables (Otero & Dolado, 2004). Meanwhile, in the dynamic aspect, Sequence Diagram is applied to model the interaction between objects based on the time sequence of message delivery in a service process (Singh, et al., 2016). Finally, Activity Diagram is used to describe the flow of procedural activities from the beginning of the process to the end of the system, including the logical branching that occurs within the application (Perdiansyah. 2025).

2.5 Web and Database Server Technology

The construction of this web-based administrative service application relies on a collaboration of advanced programming and database management technologies. The primary programming language used is PHP (Hypertext Preprocessor), a server-side scripting language integrated with HTML to generate dynamic web pages (Apiag et al., 2023). PHP's advantages lie in its high security aspect, as the program code instructions are executed on the server, making them invisible to users in browsers. It also offers extensive support for various types of web servers (Sahu, 2024). For persistent population data storage, the MySQL relational database management system is used (Putri et al., 2022). This relational database is managed using a Database Management System (DBMS) to facilitate the storage of structured information that can be securely added, modified, or deleted by authorized users with specific access rights (Rawat & Purnama, 2021).

2.6 System Testing Method (Black Box Testing)

To ensure proper system functionality before its full implementation in the village office, the developed software must undergo configuration evaluation and functionality testing. Testing is conducted using the Black Box Testing method, which focuses on identifying malfunctioning functionality, interface errors, data structure errors, database access errors, and performance errors (Júnior et al., 2022). Specifically, this testing applies the Equivalence Partitioning technique, a testing method that divides the system's input domain into several representative data classes (both valid and invalid input classes) to design efficient test scenarios for optimal error detection with a measurable number of test cases (Bhat & Quadri, 2015).

3. Method

3.1 System Development Model (System Development Life Cycle - SDLC)

In designing and building the administrative service system at the Banyuadem Village Office, this study applied the System Development Life Cycle (SDLC) methodology. The SDLC methodology was chosen because it provides a highly structured, methodical, and systematic framework for transforming operational problems into reliable information technology solutions. The system development process was carried out sequentially through seven stages of the system life cycle:

- Planning: Estimating the physical requirements and workforce capacity required to support the operation of the new system, including conducting a feasibility study to limit the scope of the population information system design.

- Analysis: Conducting a comprehensive survey of the existing letter delivery service system at the Banyuadem Village Office, analyzing identified problems, and identifying the system's functional requirements using requirements elicitation tools.
- Design: Translating the village's administrative needs into a logical software blueprint, including system architecture, user interface design, and data storage structure in a relational database.
- Development: Realizing the logical design into a physical form by writing program code and creating a computerized database.
- Testing: Evaluating all button functionality, data flow, interface integration, and data storage functionality in the database to ensure the system is free from errors or visual glitches.
- Implementation: Preparing supporting infrastructure, simulating the system, and training implementing personnel at the village office to ensure the new system can run optimally.
- Maintenance: Conducting regular system audits, making repairs if operational problems are encountered, and designing the ongoing development of additional features according to population service needs.

3.2 Data Collection Methods

Data accuracy in the design of this information system was obtained through field observations at the Banyuadem Village Office, Srumbung District, Magelang Regency. This direct observation method aimed to map the actual workflow used by the community and village officials when processing population application letters. Through this observation, empirical evidence emerged that residents still had to visit the hamlet head's residence to request a physical letter of introduction before going to the village office. Furthermore, in-depth observation revealed time inefficiencies resulting from the applicant's data being written on a piece of paper, which had to be manually recorded by officers into a ledger. All administrative data from this observation was then analyzed and converted into the basis for determining user requirements for designing a web-based information system.

3.3 System Modeling with Unified Modeling Language (UML)

Given that this system was built using an object-oriented programming approach, the software design visualization and specifications were documented using Unified Modeling Language (UML). The static structure of the system's functionality was defined using Use Case Diagrams to clearly describe the procedural interactions between villagers, the village secretary, and the system administrator with the features provided by the application. Meanwhile, the logical relationships between tables and the data structures within the database were modeled in detail using Class Diagrams. For the dynamic behavior of the system, this design implemented Sequence Diagrams to show message delivery scenarios and the chronological sequence of interactions between objects during the letter of introduction application process. Finally, an Activity Diagram is used to illustrate the end-to-end procedural flow of the service system, from the citizen's account registration process, through uploading required documents, through verification by officers, and through to the successful processing of the population cover letter.

3.4 Design Support Tools and Development Environment

This cover letter service application was developed using a combination of software and modern web programming languages. The primary programming language used is PHP (Hypertext Preprocessor), a server-side scripting technology integrated with HTML to create dynamic web pages. PHP's primary advantage is its high level of security, as all program code instructions are executed server-side, preventing



users from viewing the original code from their browsers. For persistent and structured population data storage, a MySQL database server is used.

4. Result and Discussion

4.1 UML-Based System Analysis and Design

This web-based Family Card (KK) and Resident Identity Card (KTP) cover letter service information system was designed using the Unified Modeling Language (UML) object modeling tool. The visualization of the system's functional design is documented in several main diagrams to illustrate the static and dynamic aspects of the application:

1. Use Case Diagram: Used to map the functional interactions and functionalities available within this population information system. This diagram defines the roles of actors (users) in utilizing features such as independently submitting cover letters, managing data, and verifying documents.
2. Class Diagram: Depicts a set of classes, interfaces, and logical and structural relationships between tables in a MySQL relational database. This model ensures the integrity of structured data storage on the server.
3. Sequence Diagram: Used for system analysis and design purposes, focusing on identifying the message delivery workflow and the chronological sequence of interactions between population objects during the cover letter submission process.
4. Activity Diagram: Describes the systematic flow of procedural activities in the population service system, starting from the initial state (start state), service activities, logical branching (decision), and ending with the final state (end state).

4.2 User Access Rights Flow and Service Implementation

This information system design provides specialized access rights or user roles to optimize the performance of village officials while simplifying community services. Based on the system's workflow, there is a clear distinction between the roles of village residents and service officers (village secretaries):

- Village Residents (Applicants): Through this web-based platform, village residents can directly submit applications for Family Card (KK) and ID Card (KTP) cover letters online without having to visit the hamlet head's house or queue physically at the village office. Residents simply enter their population data and upload the required documents directly to the website.
- Service Officers (Village Secretaries): This system facilitates the village secretary's processing of residents' requests because all applicant files are directly recorded in a persistent computerized database. This eliminates the need for officers to manually record applicant data into a physical ledger. Furthermore, the village secretary can quickly search for population data and generate monthly application reports automatically and accurately, as the number of monthly application transactions is already calculated by the system.

4.3 System Testing Scenario (Black Box Testing)

To ensure the feasibility and reliability of the system before its full implementation at the Banyuadem Village Office, the system was comprehensively tested using the Black Box Testing method. This testing focused on evaluating the external aspects of the software without having to examine the program code in depth. The goal was to detect:

1. Incorrect or missing population system functions;
2. Interface errors;
3. Errors in the population data structure and access failures to the MySQL database;
4. System performance errors;
5. Errors during system initialization and termination.

Specifically, the test case design in this study was designed using the Equivalence Partitioning technique. This technique works by dividing the program's input domain into several representative data classes, including valid and invalid input classes (such as numeric value specifications, applicant data ranges, or Boolean conditions). This testing evaluates the suitability of storing application data to ensure it is stored correctly in the database, disables menu buttons, and ensures that printed cover letter drafts are free from formatting errors.

The implications of designing and implementing this web-based service information system at the Banyuadem Village Office significantly shift the paradigm of public administration governance at the village level from a conventional, bureaucratic approach to a digital, participatory approach. In practice, residents no longer need to physically mobilize to visit the hamlet head's residence or queue at the village office carrying piles of required documents. This directly cuts down on bureaucratic red tape, saves residents transportation costs, and dramatically shortens document processing time. For village officials, the shift from repetitive paperwork to a computerized MySQL database system not only eliminates the risk of damage and loss of physical records but also transforms work efficiency in preparing reports.

5. Conclusion

Based on the analysis, design, and testing results, it can be concluded that the implementation of this web-based service information system has successfully provided a concrete solution to public service challenges at the Banyuadem Village Office. This platform has proven effective in simplifying citizen application submissions and shortening document processing times, as residents no longer need to physically visit the village office but can simply access services online through the website. Furthermore, this system simplifies the village secretary's process of handling public requests; service officers no longer need to manually record application data in the population ledger, as all data is stored in a structured computerized database. This also simplifies the recapitulation process and the automatic generation of monthly reports based on the number of applications received.

Although this information system has successfully achieved its primary functional objectives, several operational limitations must be acknowledged in this study. The primary limitation lies in the limited scope of administrative services for population documents, where the currently developed system only accommodates the creation of cover letters for Family Cards (KK) and Identity Cards (KTP). Furthermore, the visuals and user interaction features, facilities, and functionality of the user interface integrated within this application are acknowledged to be very simple. This limits the flexibility of village officials in managing requests for other types of administrative documents routinely required by the community in an integrated manner.

To address these limitations, future research is expected to innovate and continuously develop the system, both in terms of aesthetics and application functionality. Further development is recommended to update the user interface design to make it more attractive, interactive, and responsive, improving comfort and ease of navigation for the general public. Furthermore, future research should expand the system's functionality by integrating and adding request menus for various types of population administration documents applicable in the village, so that this web platform can become a complete and comprehensive one-stop digital service center for village administration.



Acknowledgments

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