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MD5 in a web-based population data management application to improve account security

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ABSTRACT

This research focused on designing and implementing a population data management information system by applying the MD5 algorithm as account security. The population data management information system itself is an information system to make it easier to manage population data to find out and make reports on the number of village residents, as well as make it easier to make certificates. The research case study was carried out at the Jatisari village office, there were several obstacles in the ongoing population data management process in Jatisari village, namely that the management of population data was still in the form of physical files which were vulnerable to damage and loss, and this way of management created the problem of difficulty in finding population information. In addition, information systems are vulnerable to hacking, so a process is needed to verify who can obtain population data or information. Therefore, the aim of this research was to create a population data management application (SIDAKEP) that can simplify the process of managing population data, by implementing the Message-Digest 5 (MD5) algorithm as account security to protect the system from irresponsible parties. By using a qualitative method approach and the SDLC Waterfall development model in application design. The results of this research were the population data management application can help the Jatisari village office government, especially the Head of the Government Section, make population data management easier, more effective and efficient.

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1. INTRODUCTION

The rapid development of information technology has made all private and government agencies try to keep up with these developments by providing information technology that can manage data quickly (Kraus et al., 2021; Widianto, 2023; Yamin, 2019). An information system is a system for providing information or reports quickly to an organization or government which can be said to be a system of assistance in conveying an event or information to the general public quickly, easily and accurately (Apridiyanti et al., 2020; Putri et al., 2021).

Implementation of information systems in public sector organizations is different from the private sector (Apridiyanti et al., 2020). In government information systems, apart from focusing on efficiency, quality and fairness, they must also combine accountability and public trust (Astawa, 2023; Nulhusna et al., 2017). The difference in the application of information technology in the private sector and the public sector is in the legal aspect, and political influence is higher in public sector organizations. Supervision of its implementation is important because it involves the community (Oktavia & Sofyani, 2019; Roztocki et al., 2022). Almost every government agency uses information systems. According to the Instruction of the President of the Republic of Indonesia Number 3 of 2003 concerning National Policy and Strategy for EGovernment Development, it considers: The use of information technology with systems or activities will become an information system that increases efficiency, effectiveness, transparency and accountability. governance, and implementing good governance.

Basically, the population administration system is a sub-system of state administration which has an important role in government and development in the implementation of population administration(Kusuma et al., 2022; Supriyanto et al., 2021). The population information system is an information system that has an important function in government and administering population data collection. Population data collection is directed at the situation of fulfilling data from one resident and family which is the responsibility of the district or city government, even down to the village level(Nurul Latifah & Arizona Firdonsyah, 2021).

Based on the results of interviews in Jatisari Village, there are several general population services provided at the sub-district office, such as recording population data, requesting or submitting a letter of change of domicile, death certificates are still made in the form of physical documents, so errors often occur and physical documents are often lost or damaged. Processing data like this will cause problems such as difficulty in finding population information, village officials have to search physical documents one by one and difficulty knowing how many residents there are in the village. In addition, the level of security of data or information with this management method will easily be stolen by irresponsible parties, so a process is needed to verify people who can obtain population data or information.

Research conducted by Mustari S. Lamada et al (2022) also found the same problem, namely recording population data which is still stored in document archives or in hardcopy form, and also mail management still uses Microsoft Word, which slows down the process of adding, changing or accessing data, considering that population data changes every month and must be updated. So an information system for population registration and letter writing is needed. Nevertheless, within the established information system, various potential research gaps have surfaced. For instance, the current information system lacks coverage of potential challenges associated with data security and privacy in systems containing sensitive information, along with ensuring adherence to protective regulations. (Mustari S. Lamada et al., 2022).

The study conducted by Akbar et al (2023) identified a similar issue. They observed that the current paper-based system employed by village officials is both time-consuming and susceptible to errors, resulting in inaccurate and delayed outcomes. Consequently, there is a demand for a digital recording system capable of streamlining

the census recording process and delivering precise and punctual results. Nevertheless, the information system currently in place reveals several potential research gaps. Especially, it lacks coverage concerning potential challenges associated with data security and privacy in systems containing sensitive information, as well as ensuring compliance with protective regulations. (Akbar et al., 2023)

In line with government programs, the existence of special websites in villages is increasingly needed to support citizen mobility and make it easier for villages to provide services to the community and process data(Khairuldi et al., 2020). Talking about information systems, security is an important and main problem in computer systems connected to a network, where the data and information contained in the system is the target of attacks by irresponsible parties so that an authentication process is needed to verify the identity of people. who access the system (Hasibuan, 2016).

Account security is very important for government information systems for several main reasons, namely data confidentiality because it often stores very sensitive and confidential data including citizens' personal information(Kanaan et al., 2023; Widigdo & Rosando, 2023). Protection against cyber-attacks, government information systems are often the main target of cyber-attacks because the data they manage is very valuable. Information integrity, account security helps ensure that only authorized parties can access and modify information in the system(Khaled et al., 2022; Li & Liu, 2021; Tariq et al., 2023). Access control, which means that only users who have permission can access certain information in accordance with their respective responsibilities and duties (Rahma & Mayesti, 2019). Legal and regulatory compliance, account security is an integral part of complying with these regulations and can help the government avoids legal sanctions and reputational harm. Fraud prevention, account security helps prevent fraudulent practices, including unauthorized use of accounts for certain purposes (Amrizal, 2015). By prioritizing account security, the government can minimize the risk of information leaks, cyber at By prioritizing account security, the government can minimize the risk of information leaks, cyber a By prioritizing account security, the government can minimize the risk of information leaks, cyber-attacks and system disruptions, maintain public trust, and carry out government functions more effectively and efficiently tacks and system disruptions, maintain public trust, and carry out government functions more effectively and efficiently tacks and system disruptions, maintain public trust, and carry out government functions more effectively and efficiently (BSSN, 2019). So, from the three cases above, a discussion of population data management was explained and tools were developed in the form of computer-based applications to make it easier to manage population data to make it more efficient and effective, and implemented the MD5 algorithm to protect accounts from irresponsible parties.

Therefore, it is a consideration for the author to conduct research at the Jatisari Village office with the title "Web-Based Population Data Management Application (SIDAKEP) Using the MD5 Algorithm for Account Security in Jatisari Village". The purpose of this study is to design and develop an information system for managing population data, with the hope that this application can simplify, speed up and increase efficiency managing population data and maintaining data security. In making this application, the author chose the Bootstrap framework for its attractive and responsive appearance, the CodeIgniter framework because of its ease of development using the MVC concept, and the MD5 algorithm as a complex and difficult to penetrate encryption method to maintain data security. The advantage of this study in formulating theories that researchers can utilize, contributing positively to the advancement of science. This is particularly relevant to the field of develop population management information systems, with potential utility for subsequent future research.

2. RESEARCH METHOD

This research adopted the waterfall method as the main approach in developing a website-based population data management information system (SIDAKEP) for Jatisari Village. This method is known as the system development life cycle (SDLC) which has certain steps to ensure that the system development stages a structured and measurable manner (Hossain, 2023).

The first stage in creating the SIDAKEP information system was problem identification, interviews were conducted with a question-and-answer process with the parties concerned with the problems at the Jatisari village office, then the researcher made observations by directly observing the work system running at the Jatisari village office to get accurate information regarding management and population at the Jatisari village office. After that, carry out a literature study, namely by collecting data and documents taken from several sources such as books, articles, news with the aim of supporting the creation of this information system.

The second stage in creating the SIDAKEP information system was software development using the waterfall SDLC method, planning and designing the SIDAKEP information system which is carried out by analyzing software and hardware requirements that will be used in the SIDAKEP information system design process. Then at the design stage, researchers used Unified modeling language (UML). Several research studies have demonstrated that UML is widely recognized as a modeling language with effective capabilities for system visualization and documentation. UML modeling has the additional capability of generating programming code that is ready for implementation (Nistrina & Sahidah, 2022; Sonata, 2019). UML used in this research consists of use case diagrams to find out the general picture of the relationship between actors and users, activity diagrams are used to model the activities in the system, class diagrams are used to describe system structure in terms of defining the classes to be created, interface design is created with the help of the balsamiq mockup application to illustrate the information system being built.

After designing the diagram and interface, the next stage is building an information system based on the design that has been created, using the PHP, HTML, CSS programming languages using the bootstrap and CodeIgniter framework. Then carry out testing using the black box method to ensure whether the application results are in accordance with the expected design or not.

3. RESULTS AND DISCUSSIONS

3.1 Analysis

Problem analysis was carried out to analyze the system that is running with the aim of finding out more clearly how the system works and the problems faced by the system to become the basis for system design proposals. Based on the results of observations and interviews conducted at the Jatisari village office, population data management was still carried out in the form of physical documents, so data errors often occur and even physical documents were often lost and damaged, and population data management becomes ineffective and inefficient.

3.2 Design

Before entering into application creation, it is necessary to design the application in UML form which consists of use cases, activity diagrams and class diagrams.

a. Use case diagram

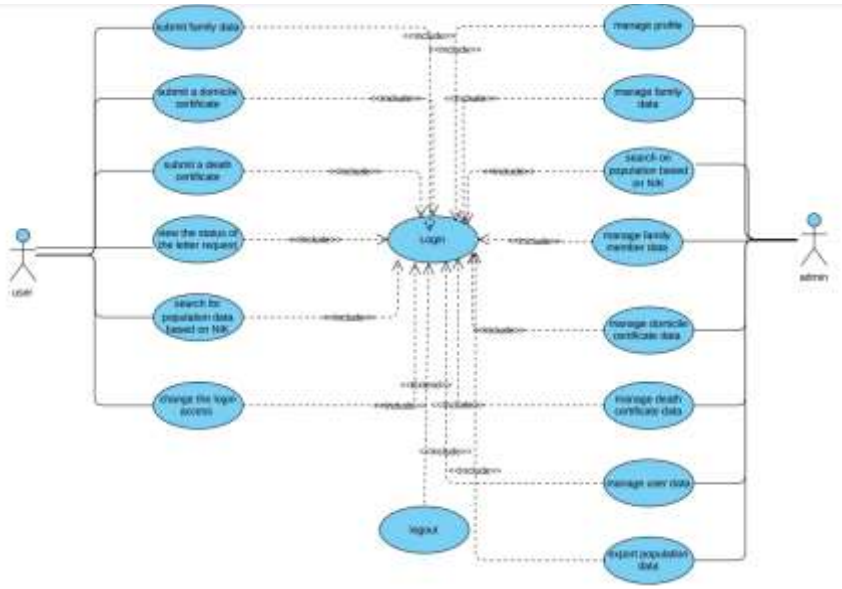

Figure 1. Use case diagram

Use case diagrams describe an interaction between one or more actors and the system that will be created to find out what functions are in the system and who uses these functions.

b. Activity diagram

Activity diagrams describe the sequence of process activities in a system, the following is the activity diagram in the SIDAKEP information system.

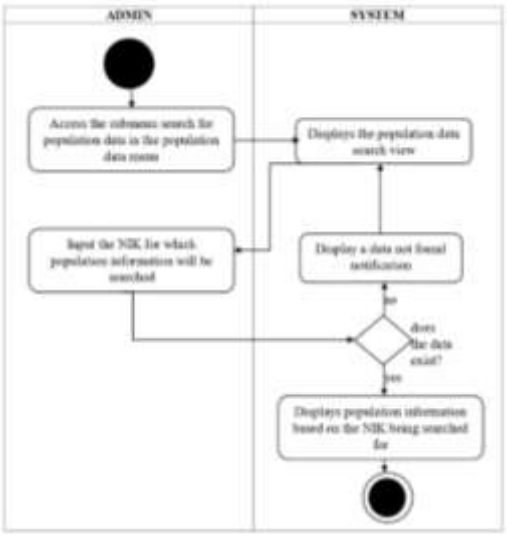

Figure 2. activity diagram submenu search for population data

In the activity diagram, the search for population data submenu explained that if the user clicks on the population data menu and clicks on the search for population data submenu, the system will display the search for population data page. On this page, users can search for information on a citizen's population data by typing their NIK in the form provided and clicking the search button. If the population data you are looking for is available, the system will display the population information you are looking for, but if it is not found, the system will display a notification that data was not found.

c. Sequence diagram

A sequence diagram is a visual representation that illustrates how objects interact with each other in a system for each action carried out by an actor or user, following a sequence of events. By using sequence diagrams, it is hoped that you can describe the scenario or series of steps that occur when the user interacts with the system.

The following is the sequence diagram of the SIDAKEP application:

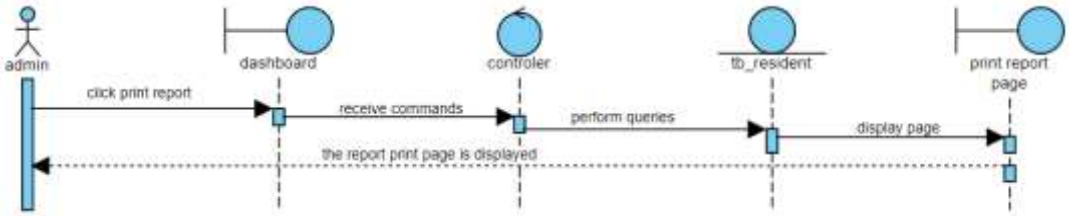

Figure 3. sequence diagram of dashboard

The sequence diagram of the dashboard illustrates the process involved in generating a population report.

d. System Design

This section contains the design of the SIDAKEP application interface which displays sketches of what components are in the user interface that can be used by users. The interface design of the population data management application as follows:

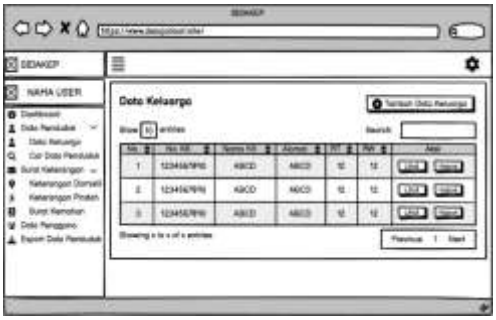

Figure 4. family data interface design

The image above is the family data interface design for the SIDAKEP application that will be built

3.3 Implementation of the user interface

This section is an implementation of the design that was created previously

Figure 5. dashboard page

If the user successfully logs in, the first display that appears is the dashboard page. The dashboard page contains information about the number of residents, the number of residents who died, the number of residents who moved, details of the number of residents by gender per RW, and a button to print a report on the number of residents by gender per RW.

Figure 6. page for changing family data

Users can change family data by pressing the view button on the line of family data to be changed, then the system will display the view family data page, then press the change family data button, then the system will display the change family data page as shown above.

3.4 Web-based population data management application testing

In the web-based population data management application testing process, there is a process of testing the functionality of the population data management application using black box testing. Blackbox testing is carried out to determine whether the application functions are running according to their objectives and evaluate the suitability of the application to user needs. This is the result of Blackbox testing

Table 1. Blackbox testing of the web-based population data management application

No	item	Scenarios testing	Expected results	Test result	Conclusion
1	Login Form	Fill in the username and password	Users can enter the SIDAKEP application	As expected	Valid
2	Dashboard Page	Click login or click the dashboard menu	Users can access the dashboard page	As expected	Valid
3	Print Report	Click the print population report button on the dashboard page	Users can print population reports on the dashboard	As expected	Valid
4	Domicile certificate page	Click on the domicile certificate submenu	Users can access the domicile certificate page	As expected	Valid
5	Transfer certificate page	Click the transfer certificate submenu	Users can access the transfer certificate page	As expected	Valid
6	Death certificate page	Click the death certificate submenu	Users can access the death certificate page	As expected	Valid

Based on the result of the black box testing presented in Table 1, it can be elucidated that among the six evaluated elements, the login form exhibited results in line with expectations. Similarly, the remaining five components demonstrated conformity with anticipated standards, specifically in terms of the information system's alignment with its designated functions. Notably, the login form aligns its functionality with the addition of MD5 to enhance account security. Subsequent to the login process, users are directed to the dashboard page, wherein the displayed elements also align with expectations. The dashboard features include a print report function for generating

reports within the information system. Furthermore, there is a dedicated page for generating various letters, including certificates, death certificates, and transfer letters, accessible to both users and administrators.

3.5 Discussion

The primary objective of this study is the design and implementation of an information system for proficient population data management, aiming to simplify, expedite, and enhance the efficiency of data management while ensuring data security. Previous research emphasizes that a population census information system serves as a viable alternative for village offices in streamlining the processing of population data (Akbar et al., 2023; Mustari S. Lamada et al., 2022). A comparative analysis with prior studies underscores the significance of a web-based population data management application that prioritizes account security, thereby minimizing the risk of unauthorized data access. Beyond resident data processing, the information system offers the functionality to generate various letters, including domicile letters, death certificates, and transfer letters. Village office officers are relieved from the manual task of letter writing, and residents can conveniently submit requests for necessary letters through the information system, eliminating the need to visit the village office in person. This information system was developed using the waterfall method with several stages. The implementation is carried out in stages. The model development process is one by one phase, thereby minimizing errors that might occur (Wahid, 2020).

4. CONCLUSION

The SIDAKEP application has been designed, developed and implemented at the Jatisari village office where in this application there is a dashboard menu, family data, search for population data, domicile certificate, move certificate, death certificate, user data, user profile and export of population data. Through black-box testing, the application has been validated and shown to function well under different scenarios. The evaluation criteria have shown that Web-based population data management application is a suitable solution for digitalizing the population data management in the village, and has the potential to be implemented in other areas. Overall, the development of Web-based population data management application has provided a digital solution that can improve the accuracy and efficiency of the census process. It can save time and resources for the village authorities, and contribute to the overall development of the village. The success of this project highlights the importance of utilizing technology to improve governance and management in rural areas. In this research there are still limitations, especially regarding population input which can only be carried out by the village office admin. The suggestion for further research is re-developing the information system by adding a RW head user so that population data is input by each RW head without the need to collect photocopies of family cards to the Jatisari village office, you can also add a population data import menu and add several creation menus. other letters so that the application can be utilized by the village services department.

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