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Development of Sendudes Web-Based Application as a Digitalization of The Village Population Census

(Study Case : Desa Kota Pari)

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Abstract

This research aims to design and develop a web-based application called Sensudes as a digital record-keeping system for the population census in Kota Pari Village, using Agile Development Methods. Sensudes is created to facilitate the recording of population census data to obtain accurate and timely results. Agile Development Methods are utilized to produce a targeted product with a short development time. This research is expected to benefit the village officials in the Kota Pari Pantai Cermin subdistrict in recording population census data in an easier and more efficient manner. The research includes user requirement analysis, system design, application development, and application testing with users. The results of this research demonstrate that the web-based Sensudes application can ease and assist village officials in recording population census data. In addition, the findings of this research can be a reference for other villages and regions that want to develop efficient and user-friendly population census applications.

Keywords *– Sensudes, Census, Agile, Web-based application*

1. Introduction

Population census is a critical aspect of demographic analysis that is conducted periodically to collect information on the population and its characteristics. Census data is vital in developing policies and planning programs related to social and economic development[1], [2] Traditional paper-based census recording systems are time-consuming, labor-intensive, and prone to errors. The transition from paper-based to digital recording systems has improved the accuracy and efficiency of data collection.

The Agile Development Method is a modern software development approach that emphasizes flexibility and rapid delivery of software products. It involves a collaborative and iterative process that involves constant feedback and adaptation to changing user requirements[3], [4]. Agile Development Method has been used successfully in various software development projects and is becoming increasingly popular in web-based application development[5], [6].

Kota Pari is a village in the Pantai Cermin subdistrict that is facing challenges in the accurate and efficient recording of population census data. The current paper-based system used by village officials is time-consuming and prone to errors, leading to inaccurate and delayed results. Therefore, there is a need for a digital recording system that can simplify the census recording process and deliver accurate and timely results[7].

The purpose of this research is to design and develop a web-based application called Sensudes as a digital recording system for population census in Kota Pari Village. This research utilizes the Agile Development Method to produce a targeted product with a short development time. The Sensudes application is expected to benefit the village officials in Kota Pari in recording population census data in an easier and more efficient manner.

2. Research Method

By following these stages, the Agile Development Method ensures that the Sensudes application is developed efficiently, meets user requirements, and can

be easily adapted to changing needs and technologies[3].

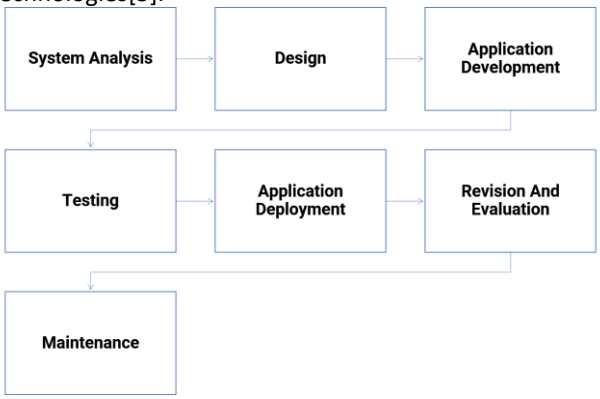

Figure 1. Agile Method Workflow

a) System analysis: In this stage, the requirements of the system are identified, and the functionality and user interface of the application are designed. The goal is to determine what the application should do, how it should behave, and what features it should have. This stage involves communication with stakeholders to understand their needs, preferences, and expectations.
b) Design: In the design stage, the application's architecture and visual design are developed. This includes creating wireframes, defining the user interface, and determining how the application will interact with other systems. The goal is to create a detailed plan for the application's development that takes into account the requirements identified in the previous stage.
c) Application development: In the application development stage, the actual coding and implementation of the application take place. Developers create the application's functionality and user interface using programming languages, software frameworks, and other tools. This stage involves a lot of teamwork, with developers collaborating to create the application's features and functionality.
d) Testing: In the testing stage, the application is tested for functionality, usability, and performance. The goal is to identify and fix any issues before the application is released to the public. This stage involves testing the application in various environments and situations to ensure that it works correctly.
e) Deploying applications: In this stage, the application is deployed to the target environment. This involves installing and configuring the application on the appropriate servers or cloud platforms. The goal is to ensure that the application is available to users and that it performs well under different load conditions.
f) Revision and evaluation: After deployment, feedback is obtained from users to identify areas of improvement or bugs that need to be fixed. The application is revised and evaluated to ensure that it meets the users' needs and expectations. This stage involves continuous improvement based on feedback from users and stakeholders.
g) System maintenance: In the maintenance stage, the application is monitored and maintained to ensure its proper functioning. This includes fixing bugs, updating software, and adding new features or functionality. The goal is to ensure that the application remains relevant and useful to its users over time.

3. Result and Discussions

a. Analysis of System Requirements

1) Software & Hardware Requirements

The following is a table of software and hardware requirements for website-based Sensudes Application development method[8]:

Table 1. Software Requirements

Software	**Specification**
Operating System	Windows or MacOS
Server Web	Apache or Nginx
Database management system	MySQL
Bahasa Pemrograman	PHP, HTML, CSS, JavaScript
Framework web	CodeIgniter or Laravel

Table 2. Hardware Requirements

Hardware	**Specification**
Computer	Minimum : Processor Intel Core i5 or AMD Ryzen 5, RAM 8 GB, Hard Disk 500 GB
Server	Minimum : Processor Intel Xeon or AMD EPYC, RAM 16 GB, Hard Disk 1 TB

2) Users Identification

The following are the results of user identification for the Web-based Sensudes Application as a Digital Population Census Recording System in Kota Pari Village:

a) Admin of Kota Pari Village
- Has full access rights to the system

- Responsible for managing population census data
- Can add, edit, and delete population data
- Can set the access rights of other users on the system
- Has authority to produce reports on population census results

b) Population Census Officer
- Have limited access rights to the system
- Responsible for collecting population census data in the field
- Can add resident and family data that has not been registered in the system
- Can edit registered resident data if an error occurs
- Unable to delete resident data registered in the system

c) Residents of Kota Pari Village
- Have limited access rights to the system
- Be responsible for filling in personal and family data when conducting an online population census
- Can only access personal and family data related to himself
- Do not have the right to edit or delete resident data registered in the system.

With this user identification, we can understand the needs and expectations of each user for the Web-based Sensudes Application, so that it can simplify the process of designing and developing information systems that are better and in accordance with user needs.

3) Functional Requirements

The functional requirements of the Sensudes application are as follows:

a) Login system: used to differentiate user access rights based on their respective roles.
b) Data entry form: used to collect population data with various categories such as name, address, age, occupation, etc.
c) Data management: used to manage population data, such as adding, changing, deleting, and printing data.
d) Data search: used to search for population data with various specific categories.
e) Statistics: used to display census data and statistics, such as population per village, gender, education, etc.

4) Non-Functional Requirements

The non-functional requirements of the Sensudes application are as follows:

a) Data security: maintain the confidentiality and security of resident data from unwanted access.
b) Responsive: the application must be responsive and fast in providing services.
c) User-friendly: the application should be easy to use and have a clear and simple interface.

b. Database Design

The following is a database design in the form of a database table structure that can be used for the Sensudes Application[9], [10]:

Table 3. Penduduk

Field Name	Type	Length	Others
nik	int		primary key
nama	varchar	50	
jenis_kelamin	enum		('Laki-laki', 'Perempuan')
tanggal_lahir	date		
tempat_lahir	varchar	50	
alamat	varchar	100	
pekerjaan	varchar	50	
pendidikan	varchar	50	
status_kawin	enum		('Belum menikah', 'Menikah', 'Cerai')
kewarganegaraan	enum		('WNI', 'WNA')

Table 4. Keluarga

Field Name	Type	Length	Others
id	int		primary key, auto increment
nomor_kk	varchar	16	
alamat	varchar	100	

Table 5. Anggota_Keluarga

Field Name	Type	Length	Others
id	int		primary key, auto increment
keluarga_id	int		foreign key to keluarga.id
penduduk_id	int		foreign key to penduduk.id
hubungan_keluarga	varchar	50	

Table 6. Pengguna

Field Name	Type	Length	Others
id	int		primary key, auto increment
username	varchar	50	
password	varchar	255	hashed
nama_lengkap	varchar	50	
role			('Admin', 'Operator')

c. Interface Design

Information system interface design for a population census digital recording system may include the following[11]:

1) Login Page: Provides a login form for users who will conduct a population census.

Figure 2. Log In Page

2) Dashboard Page: Displays a summary of population census data and access to other features in the system.

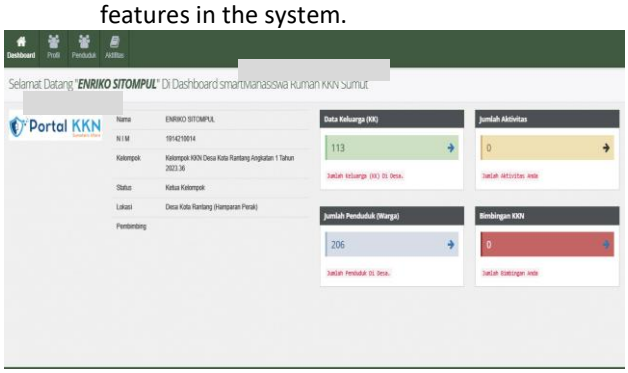

Figure 3. Users Dasboard

3) Data Input Page: Provides a form for entering population census data.

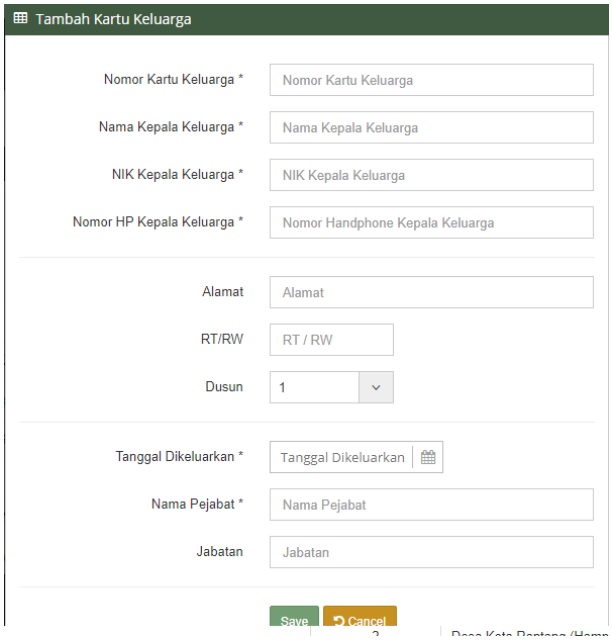

Figure 4. Form Add Kartu Keluarga

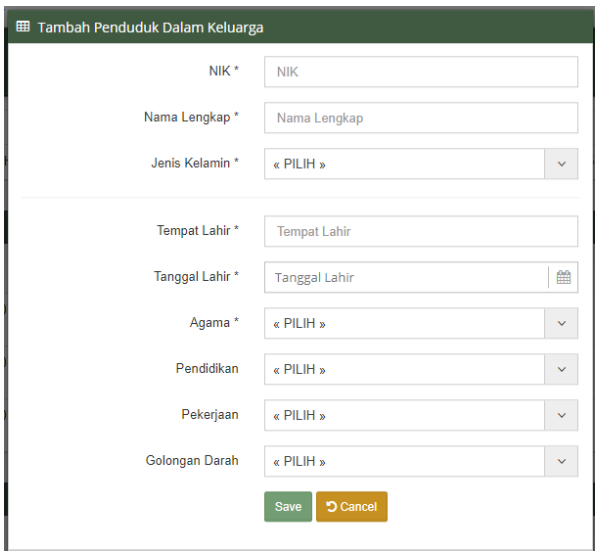

Figure 5. Form Add Penduduk

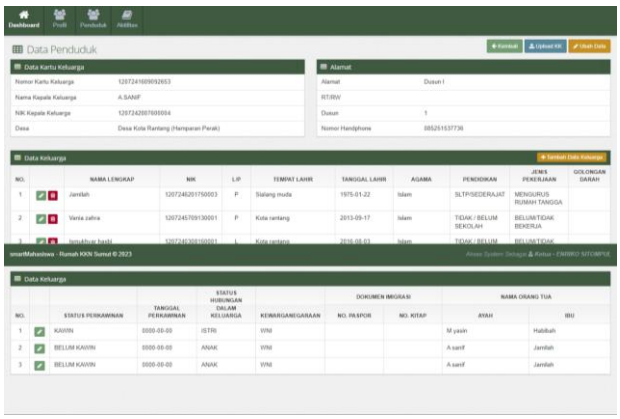

Figure 6. Detail Data Input Page

4) Data View Page: Displays population census data that has been entered in tabular form.

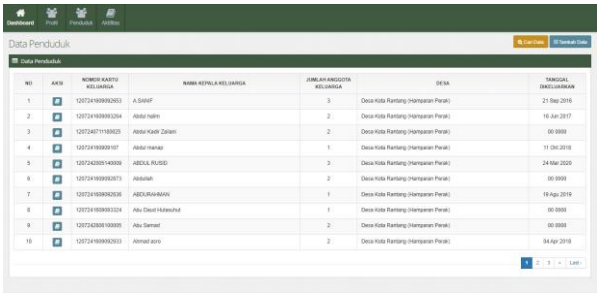

Figure 7. Data View Page

5) Report Page: Provides a population census report that can be accessed

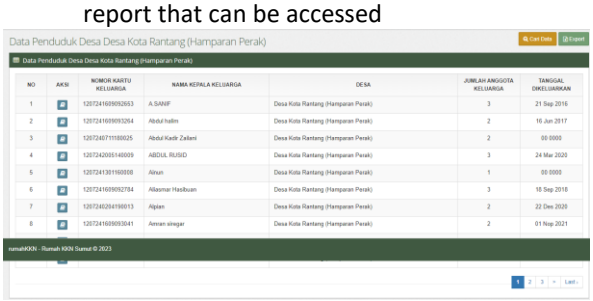

Figure 8. Report Page

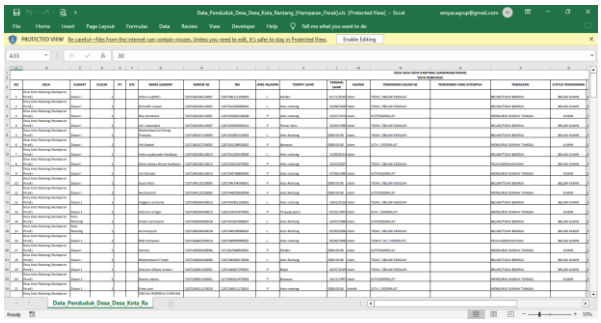

Figure 9. Export Report to Excel

6) Testing

The result of black-box testing for sensudes web-based applications[12] :

Table 7. Testing

Test	Description	Test Steps	Expected Results	Pass/ Fail
1	Testing User Login	1. Open the Sensudes application 2. Enter valid login credentials 3. Click login button	User is successfully logged in and redirected to the dashboard	Pass
2	Testing User Registration	1. Open the Sensudes application 2. Click the registration button 3. Fill in all required information 4. Click the register button	User registration is successful and user can log in using the registered account	Pass
3	Testing Adding New Resident Data	1. Log in to the Sensudes application 2. Click the add resident button 3. Fill in all required information 4. Click the save button	The new resident data is added to the database and can be viewed in the resident list	Pass
4	Testing Updating Resident Data	1. Log in to the Sensudes application 2. Click the edit button on a resident's data 3. Update the required information 4. Click the save button	The resident's data is updated in the database and the changes can be viewed in the resident list	Pass
5	Testing Deleting Resident Data	1. Log in to the Sensudes application 2. Click the delete button on a resident's data 3. Confirm the deletion	The resident's data is removed from the database and can no longer be viewed in the resident list	Pass
6	Testing Generating Census Report	1. Log in to the Sensudes application 2. Click the	A report is generated according to the chosen parameters	Pass

		generate report button 3. Choose the desired report type and date range 4. Click the generate button	and can be downloaded as a XLS file	

7) Evaluation

Evaluation of Sendudes Web-Based Application as a Digitalization of The Village Population Census can be presented in the following table:

Table 8. Evaluation Criteria

Criteria	Description
Functionality	How well does the application meet its functional requirements?
Ease of use	How easy is it to use the application?
User interface	How attractive and intuitive is the user interface?
Performance	How fast and responsive is the application?
Security	How secure is the application against unauthorized access or data breaches?
Reliability	How reliable is the application in terms of its ability to perform its intended functions without errors or failures?
Scalability	How well does the application handle increasing amounts of data or users?
Accessibility	How accessible is the application for users with disabilities?
Compatibility	How compatible is the application with different browsers, devices, and operating systems?
Customer support and service	How well does the application provider support and serve its customers?

8) Maintenance

This table shows several system maintenance activities that need to be carried out to maintain the performance of the Web-based Sensudes Application:

Table 9. Maintenance Activities

System Maintenance Activities	Description
Backing Up Data	Regular backup of the system's data to ensure that important information is not lost in case of system failure.
Monitoring System Performance	Consistent monitoring of the system's performance to detect any potential issues that may affect its functionality.
Updating System Software	Periodic updates of the software used in the system to ensure that it is running on the latest version and optimized for performance.
Fixing Bugs and Errors	Addressing any bugs or errors in the system that are detected during use, either through user reports or system logs.
Managing User Accounts	Ensuring that user accounts are managed properly, including adding and removing users as needed, updating user information, and resetting passwords when necessary.
Providing Technical Support	Offering technical support to users who experience issues with the system, either through online resources or direct contact with technical support staff.
Conducting Security Audits	Regularly conducting security audits to identify potential vulnerabilities in the system and take appropriate measures to prevent security breaches.

4. Conclusion

In conclusion, the development of Sendudes Web-Based Application as a Digitalization of The Village Population Census using Agile Development method has successfully provided an efficient and accurate way to record and manage census data. The application has met the functional requirements and provided ease of use with an intuitive user interface. It has demonstrated good performance, reliability, scalability, and accessibility. The application has also ensured data security and compatibility with different devices and browsers.

Through black-box testing, the application has been validated and shown to function well under different scenarios. The evaluation criteria have shown that Sendudes Web-Based Application is a suitable solution for digitalizing the census process in the village, and has the potential to be implemented in other areas.

Overall, the development of Sendudes Web-Based 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.

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