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Application of Waterfall model in development of family planning participants information system

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Abstract: The purpose of the family planning program is to improve the welfare of mothers and children, which is the basis for the realization of a prosperous society by controlling birth control as well as controlling population growth. The Department of Population Control and Family Planning in Labuhanbatu Regency has the task of carrying out family planning programs in the Labuhanbatu Regency area whose implementation is assisted by Family Planning Extension Officers in 9 existing sub-districts. District officers record and report family planning data in each sub-district every month. Recording and reporting of family planning data is still done manually. This manual system resulted in the process of submitting reports being delayed due to distance problems between sub-districts and districts. The delay in submitting this report has an impact on the performance of the institution itself. This study aims to overcome these problems with the solution of making a web-based family planning participant data collection information system. The system development method used is the Waterfall model. From the results of the implementation and testing of the system, it is found that the Codeigniter framework can be implemented in a family planning participant data collection information system quickly and easily. Tests using the Blackbox testing method also show valid results. From the results of this study, it can be concluded that to apply the waterfall method in designing and developing a KB participant data information system in Labuhanbatu Regency, it must go through five stages, namely, analyzing system requirements, designing systems using UML, implementing systems with a codeigniter framework, conducting trials with blackbox testing methods, and perform system maintenance. With this system, it is hoped that it can become a recommendation and reference for the Labuhanbatu Regency Population Control and Family Planning Service to implement it so that the problem of delays in reporting family planning data can be handled properly.

Keywords: Codeigniter; Family Plannning; Information System; Labuhanbatu; Web.

INTRODUCTION

Family Planning is the government's strategy in controlling the birth rate in order to increase population distribution and reduce mortality (Paulus & Lette, 2019). The family planning program is urgently needed to avoid a population explosion that could result in a population disaster (Najib, Triwijayanti, & Utomo, 2021). The results of the Indonesian Demographic and Health Survey (IDHS) show that the birth rate must be managed to support long-term development programs in Indonesia (Rahardja, Fadila, & Rahmadewi, 2021).

Labuhanbatu Regency is located in North Sumatra Province with a population of productive age (15-64 years) as many as 333,174 people (B. P. S. K. Labuhanbatu, 2020). The number of couples of childbearing age who are active family planning participants in Labuhanbatu reaches 73,324 people (B. P. S. K. Labuhanbatu, 2021). The Department of Population Control and Family Planning of Labuhanbatu Regency has the function of organizing, advocating, monitoring, and evaluating population control and family planning in the Labuhanbatu area (P. Labuhanbatu, 2019). In carrying out its task functions, Labuhanbatu DPPKB has human resources of 24

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civil servants and is assisted by 98 Family Planning Extension Officers spread over 25 clinics in 9 Districts (B. P. S. K. Labuhanbatu, 2021). In addition to providing counseling, PPKB Labuhanbatu is also tasked with recording and reporting data on family planning participants every month to the Labuhanbatu DPPKB. Recording and reporting of family planning participant data is still done manually, not using a computer system that is integrated with one another. This manual system causes the process of recording data reports to be late. The delay has an impact on the evaluation of the institution's performance appraisal. On the other hand, information technology tools and computers are available, but have not been used to solve the existing problems.

Information systems have become a solution in overcoming problems related to family planning participant data. Several previous studies have proven that. Information systems can simplify and minimize officer errors in recapitulating family planning patient reports (Faza, Widians, & Hairah, 2017). Information systems can also enable family planning participant data to be stored dynamically, documented (Permana & Wiguna, 2015), and reports can be accessed easily (Maria & Lubis, 2020). However, from some of these studies, none of the information systems have been developed by implementing a web-based framework. There are several advantages why the use of PHP framework is better than PHP Native. First, the framework can increase productivity and save time in code generation (Laaziri, Benmoussa, Khoulji, & Kerkeb, 2019). Second, the framework has written guidelines in the form of fully available built-in documentation (Benmoussa, Laaziri, Khoulji, Larbi, & Yamami, 2019). Third, the framework is superior in terms of security compared to native (Lakshmi & Mallika, 2017). There are a number of reasons why the CodeIgniter framework is used in this study. First, apart from being open-source, Codeigniter makes the web creation process fast and easy because the Model-View-Controller (MVC) concept in the framework separates data from presentation (Afuan, 2020). Second, Codeigniter is supported by a complete and ready-to-use built-in library (Somya, 2018). Third, with the MVC Codeigniter concept, it makes it easier for web developers to perform system maintenance (Utami, Zen, & Rauna, 2021).

This study aims to build a data collection information system for family planning participants in Labuhanbatu Regency by implementing the PHP programming language based on the CodeIgniter framework. This information system integrates the recording and reporting of family planning participant data carried out by PPKB in each sub-district with the results of data recapitulation that can be monitored directly by DPPKB in the District. The formulation of the problem in this study is how to apply the waterfall model in designing and building an information system for collecting data on family planning participants in Labuhanbatu Regency.

LITERATURE REVIEW

Family Planning is a program to control the birth rate of the population in Indonesia organized by the government through the National Population and Family Planning Agency (Hayadi, Sudipa, & Windarto, 2021). Family planning is the right of every individual in society to plan when and how the individual has a family (Astri Nurdiana, 2020). The implementation of the family planning program aims to minimize the rate of maternal mortality during childbirth by anticipating an unplanned pregnancy process (Sitorus & Siahaan, 2018) so as to create a quality family (Putri, Yuhandri, & Nurcahyo, 2021).

Codeigniter is a web-based framework developed with the PHP programming language by Rick Ellis in 2006 (Saputra et al., 2020). The Codeigniter framework divides program code into three components called the Model-View-Controller (MVC) concept (Vidal-Silva, Jiménez, Madariaga, & Urzúa, 2020). In web development, MVC separates the logical process from presentation (Afuan, 2020). The Model is a representation of the data implemented in the database, the View is implemented in the user interface, while the Controller is a component that controls the Model, and the View is interconnected (Elmatsani, 2019).

Waterfall model is a software development model that has five stages, namely: Requirement Analysis, Design, Coding, Testing, and Maintenance (Helling, Wahyudi, & Hasanudin, 2019). Requirement analysis is the stage of collecting data needed in making the system. At this stage, interviews or observations of users are usually carried out. The output of this stage is used at the design stage. Design is the stage of making the architecture of the entire system. At this stage, an image of the system design architecture will be generated. The coding stage is the stage of making program code based on the User Interface design that has been made in the previous stage. This stage is also known as back end implementation. The testing phase is the testing phase of the program code that has been created. At this stage, testing is carried out with the aim that the resulting source code can run perfectly according to the needs of the user and free from bugs. At this stage, testing of the system as a whole is also carried out. At the maintenance stage, an evaluation of what outputs are less than the system that has been made, and if there are errors, repairs will be made (Trisno & Chandra, 2018). Waterfall method

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METHOD

This study applies the Waterfall method (Nugroho & Kusuma, 2018) which is sequential (Nurjannah, Dar, & Bangun, 2021). There are 5 stages carried out in the waterfall method, namely: requirements analysis, design, implementation, testing, and system maintenance (Helling et al., 2019).

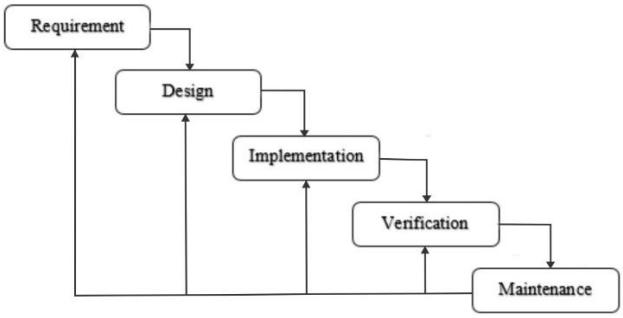

Fig 1. Waterfall Method

Requirement

At this stage an analysis is carried out to find out things related to system requirements. Then identify problems and solutions that can be implemented. At this stage, data is collected through an observation and interview process at the Labuhanbatu DPPKB office.

Design

After that, model the system requirements using a unified modeling language, namely use case diagrams to define the functions of the system, and class diagrams to show the classes on the system.

Implementation

At this stage, an application is made based on the design in the previous stage using the PHP Framework Codeigniter programming language and MySQL DBMS.

Verification

This stage is a system test. At this stage, the functionality of the system that has been built is tested. System testing using the Blackbox Testing method.

Maintenance

At this stage, maintenance is carried out on the system that has been created. If there are deficiencies or additions to applications or functions that have not been seen before, improvements will be made. Further maintenance will be carried out if this application has been implemented.

RESULT

1. **Requirement**

   After analyzing the system requirements, the functional requirements for the system are obtained which are presented in Table 1 below.

Tabel 1. Kebutuhan Fungsionalitas Sistem

Class	Description
Login	Used to login or enter into the system by entering the username and password
Manajemen User	It is a function performed by the admin to add, view, edit and delete users
Mengelola Data KB	It is a function performed by the user to input, view, change and delete KB data
Mengelola Laporan	It is a function performed by the Admin to view and print report data
Logout	Used to logout or exit the system

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2. Design

a. Context Diagram

From the proposed system there are two interrelated entities, namely DPPKB Admin entities, and District PPKB Users. The DPPKB admin and PPKB users will input login data into the system which is then processed into admin and user accounts. Then the District PPKB user will input the KB participant data into the system which is then processed into a report that can be seen by the DPPKB admin. The system context diagram is shown in Figure 2 below.

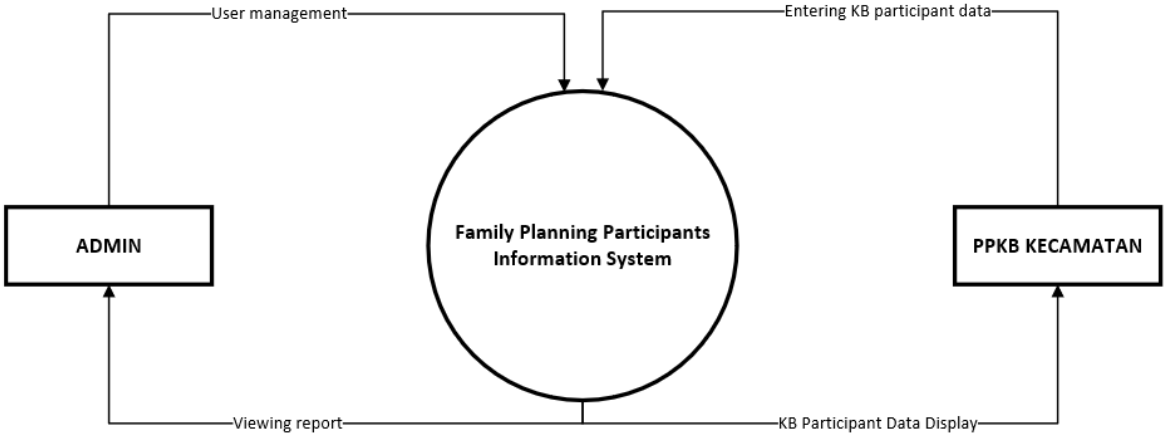

Fig 2. Context Diagram

b. Use Case Diagram

The use case diagram in the study explains that the District Admin and PPKB can login by entering a username and password to be able to access the system. Admin can manage users which includes data in the form of managing Name, District, Username, Password and User Level. Management that can be done includes adding, changing and deleting user data. Admin can also manage reports at DPPKB Labuhanbatu in the form of viewing and printing reports. Meanwhile, the District PPKB can manage family planning data. Management that can be carried out includes adding, changing, deleting and sending KB data to the Admin. The use case diagram is shown in Figure 3.

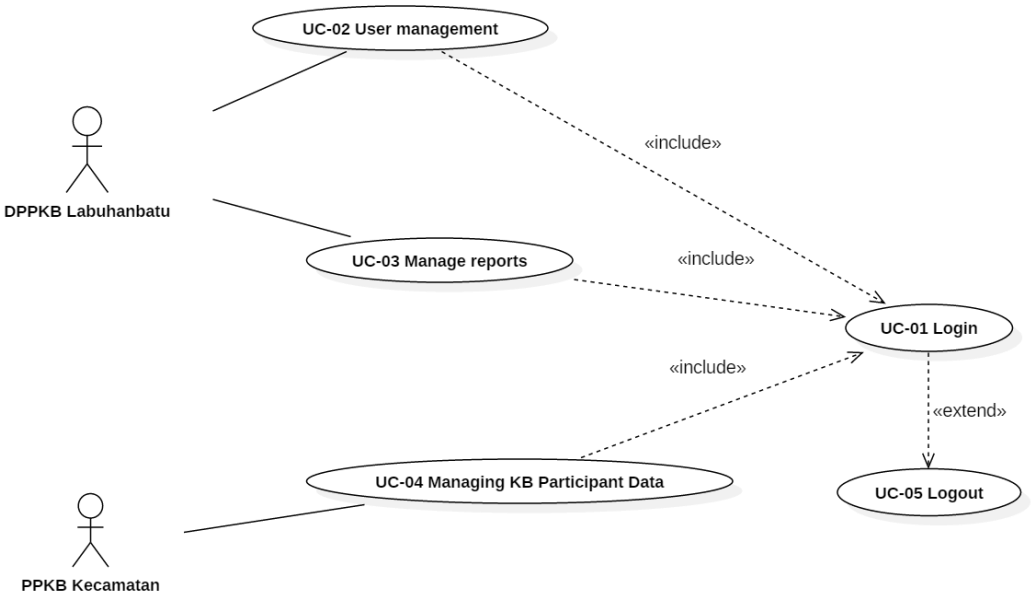

Fig 3. Use Case Diagram

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c. Class Diagram

The class diagram in this study shows the relationship between three tables, namely the User, KB, and Report classes. The User table shows the level of users consisting of Admin and District PPKB who have different access rights. Where the user table is related to the family planning table, because each district PPKB will perform CRUD on family planning data. Meanwhile, the report table can only be accessed by Admin.

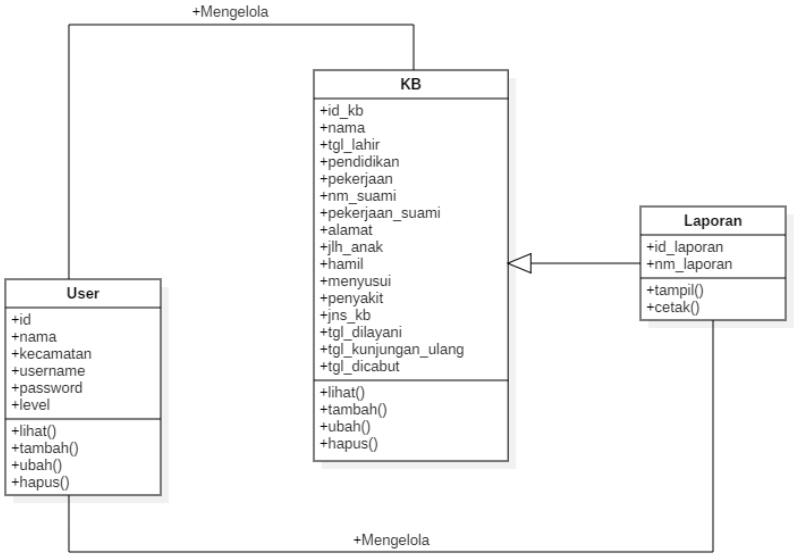

Fig 4. Class Diagram

3. Implementation

In this section, we will first show the implementation of the MVC (Model, View, Controller) Codeigniter architecture on the PHP file structure of the information system in this study.

a. Model

This section is the PHP program code related to the database.

Tabel 2. CodeIgniter Model Implementation

Class	Description
User_model.php	Is a query function that is used to add, display, change, and delete data on the user
Kb_model.php	Is a query function that is used to add, display, change, and delete KB data

b. View

This section consists of PHP program code related to the system interface. Source code related to system interface creation is organized in the Codeigniter view folder. The files are dashboard.php and login.php. Kb, reports, and user folders contain php files to run CRUD functions on each entity.

c. Controller

This section contains a php program code file that is used as a control that connects the Model to the View.

Tabel 3. Codeigniter Controller Implementation

Class	Description
Auth.php	Contains program code used to manage system authentication functions (login, logout, and access rights)
Dashboard.php	Function to control the dashboard on the system
Kb.php	Serves to control and connect the existing kb data in the model with the kb data display in the view

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Laporan.php	Serves to control and connect the report data in the model with the report data display in the view
User.php	Serves to control and connect the existing user data in the model with the user data display in the view

Fig 6. Display of the Family Planning Participant Data Collection Information System

The design of the system in the previous section has been implemented through application development. In this system there are login pages, admin and user main menus, reports, KB data, and logout menus. DPPKB admins and sub-district PPKB users can login to the system by filling in their username and password, then click the login button, after that admins and users can manage KB participant data. On the main page of the Labuhanbatu DPPKB Admin there is a user management menu, and reports. The user management menu functions to manage admin user accounts, and sub-district PPKB users. Meanwhile, on the report menu, you can see reports from KB participant data that have been processed by the PPKB Sub-district user and can also print reports based on the specified date.

The main user page is the page for processing data on the sub-districts in Labuhanbatu. The family planning data is managed by the sub-district PPKB user. The main user page consists of the Dashboard and KB Data. On the page for managing family planning data, district PPKB users can view, add, change and delete family planning data in this system.

4. Verification

System testing is carried out using the blackbox testing method which is focused on testing the functions that exist in the system. Table 4 shows the scenario and test results of the system that has been created.

Table 4. Blackbox Testing Result

Test Module	Testing Scenario	Expected Results	Results Obtained	Information
Login	Admin and User enter username and password	Admin and User will enter the main menu	The main menu page appears	Valid
Laporan	Admin selects the report menu and selects the report date	The system displays the report menu	Report page appears	Valid
Logout	Admin and User select the logout button	Admin and User will exit the system and display the login page again	The login page appears again	Valid

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This research has produced an information system for data collection of family planning participants at the Labuhanbatu DPPKB Office based on a web with the Codeigniter framework. This information system has two users with different access rights, namely, Regency DPPKB Admin and PPKB Users for each District. DPPKB admin functions to manage users and manage reports. Meanwhile, PPKB users are tasked with processing KB participant data in each sub-district.

DISCUSSIONS

System design, implementation, and testing have been carried out. From the results of the stages of the waterfall method, it can be concluded that the CodeIgniter framework can actually be implemented in a web-based family planning participant data collection information system. This information system is expected to be a recommendation to be implemented in data collection for family planning participants at the Department of Population Control and Family Planning in Labuhanbatu Regency, so as to provide convenience for Regency Admins and Subdistrict Users in managing and reporting family planning participants data. This information system was developed on a web-based platform with the CodeIgniter 3 framework. The selection of CodeIgniter was made for several reasons which were explained in the previous introduction.

To determine whether the Codeigniter framework is better than other frameworks (Symfony, Laravel, etc.) in the context of the KB participant data collection information system, it is necessary to conduct research to compare the performance tests of each of these frameworks. As a form of advice and suggestions, this system can be further developed on Android and iOS-based platforms.

CONCLUSION

After the design, implementation and system testing stages have been carried out. From the results of this study, a conclusion can be drawn that to apply the waterfall method in designing and developing a data information system for family planning participants in Labuhanbatu Regency, it must go through five stages, namely, analyzing system requirements, designing systems using UML, implementing systems with a codeigniter framework, conduct trials with the blackbox testing method, and perform system maintenance. Hopefully the information system for data collection on family planning participants at the Web-based Labuhanbatu DPPKB Office is able to provide convenience for admins and users in managing family planning data reporting.

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