DEVELOPMENT OF INFORMATION SYSTEMS FOR SERVICE AND CUSTOMER COMPLAINTS USING THE EXTREME PROGRAMMING METHOD

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Abstract
The Regional Drinking Water Company (abbreviated as PDAM in Indonesian) Tirta Yapono strives to provide the best service for its customers by providing access to information and complaints for the general public. However, currently the provision of information about company programs uses the company's web portal. This is considered insufficient, because the web portal is static or only provides information without interaction with its users. Apart from that, for public complaints, only provide telephone numbers and email complaints. This system causes slow handling of complaints due to the accumulation of incoming complaints via telephone or email. For this reason, a website-based system is needed that can provide services to the community dynamically and the public can submit complaints directly and can communicate with related officers through the website. This study aims to develop a website-based customer service and complaint system using the Extreme Programming (XP) system development method, so that users can interact directly so that information and resolution of complaints can be handled immediately. The XP method is a method for developing an agile development system that is capable of producing a short system and is proven by short development results. The developed customer service and complaint information system can manage new installations, customer complaints, announcements and customer chats. The final application is in the "good" category because usability testing yields an average value of 90% in the "good" category, indicating that it is both useful and in line with the user's preferences.

Keyword: *agile development, extreme programming, system development methods, information systems, usability testing.*

1. INTRODUCING

One of the uses of today's internet technology is to access information. Information is very important for any individual or government agency to make decisions. Given the rapid circulation of information in the world, every government institution is expected to be able to quickly and accurately convey all the information it receives and has, as well as find and provide solutions to problems that arise in society. To realize this, improving public services is a part of receiving information for companies or agencies [1]. Companies have an obligation to serve complaints submitted by the public. Responding to every complaint submitted and providing solutions to problems conveyed by the public is the responsibility of the company [2]. Handling customer complaints properly can improve services for the company [3]. Then the service and handling of customer complaints is the focus for agencies or companies. Likewise, with the Regional Drinking Water Company (abbreviated as PDAM in Indonesian). PDAM is a locally held business entity that deals with providing the general people with clean water. Every province, district, and municipality in Indonesia is served by this business. In order to provide the greatest service for the community, the government supervises and monitors PDAM, a local business that provides clean water. PDAM Tirta Yapono is a regional clean water supply company in Ambon City. PDAM Tirta Yapono strives to provide the best service for its customers by providing access to information and complaints for the general public. However, currently the provision of information about company programs uses the company's web portal. This is considered insufficient, because the web portal is static or only provides information without interaction with its users. Apart from that, for public complaints, only provide telephone numbers and email complaints. This system causes slow handling of complaints due to the accumulation of incoming complaints via telephone or email. For this reason, a website-based system is needed that can provide services to the community dynamically and the public can submit complaints directly and can communicate with related officers through the website.

The use of good and adequate technology will make it easy to help work [4]. Currently, the technology that is developing rapidly is a website-based system, this is because website technology can provide convenience to access information anywhere with the help of a browser through an internet connection [5]. The web is a suitable technology for use, because it can help government agencies improve service quality and can generate trust between existing elements,

such as the public, officials or operators and service provider institutions [6]. Through a web-based information system, it will facilitate two-way communication and can support the delivery of information that can be used without being limited by space and time [7]. To carry out system development, stages are needed, which are called the system development methodology. The system development methodology is a framework that forms the basis for designing and developing professional software with the aim of producing a system or application that fits the business needs of an organization [8]. Extreme Programming (XP) is a subset of the system development methodology that is applied to meet development needs. XP is a strategy for software engineering development that aims to create small to medium-sized teams. It can also be used to create systems with ambiguous needs or with rapidly changing requirements [9].

Previous research regarding the application of system development using the extreme programming method resulted in an optimal system. The first research, regarding the development of information systems for population administration services using the Extreme Programming (XP) method [10]. In this study the XP method is able to produce a system that fits the needs and is fast in development. Subsequent research regarding the application of the Extreme Programming (XP) method to the development of web-based information systems that assist in agency services [11]. In this study, the XP method, with short development requirements and evidenced by short development results, is also capable of producing good software products. The next research, namely research on the development of public service information systems using the Extreme Programming method [12]. This study shows that the design of information systems using the XP method is the best solution for solving problems that exist in public services.

This study aims to develop a website-based customer service and complaint system so that users can interact directly so that information and complaint resolution can be handled immediately. XP is used because it is able to carry out system development with requirements that change requirements very quickly. The service and complaint system managed includes new installation services, customer complaint services, information announcements and communication media with customers in the form of chat.

2. RESEARCH METHODS

2.1 Research Stages

In this study the information system that was built was developed using the extreme programming (XP) methodology as a method in system development. Extreme programming (XP) is a technique for creating agile software development approaches that puts the emphasis on coding as the primary activity across the whole software development cycle [13]. The XP method can be applied with a short application development time and in accordance with the use of software development [14]. The XP approach provides brief and recurring stages for various portions depending on the goal to be accomplished [15]. The XP approach includes iterations that can be performed as often as necessary. The stages carried out in the development of the XP system can be seen in Figure 1 below.
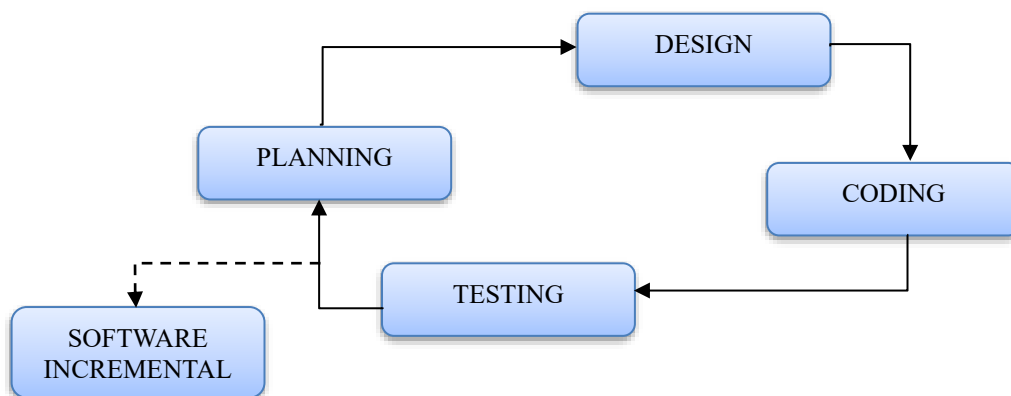

Figure 1. Extreme Programming (XP) Method Development Flow

Based on Figure 1 above, the phases in the extreme programming (XP) system development methodology are as follows:

1) Planning

This step involves choosing the system's overall functionality as it will be developed [16]. Furthermore, at this stage

identification of outputs, features in the application, functions of the application made, and the flow of application development are carried out.

2) Design

    The following step is design, when modeling tasks are carried out beginning with system modeling [17]. CRC (Class Responsibility Collaborator) and use case diagrams are tools that can be used for designing at this level.

3) Coding

    At this stage coding is carried out based on the design and analysis that has been done before. Coding or coding is the translation of a design into a language that can be recognized by a computer [18]. The PHP programming language was used for the investigation, together with the text editor Sublime Text 3 and the MySQL database.

4) Testing

    The created system needs to be tested to make sure it works properly and to detect any flaws (running application) [19]. This study uses usability testing, this test is carried out to obtain user information whether they can use and understand product navigation to achieve their goals and how satisfied they are in using the application and its uses [20].

3. RESULT AND DISCUSSIONS

The Extreme Programming (XP) system development approach was employed in the creation of the customer service and complaint information system. The stages of creating an information system that was constructed using the XP technique are as follows.

3.1 Planning

At this stage in the development of the system begins with problem identification. The main problem in this research is that PDAM Tirta Yapono provides information about company programs using the company's web portal. This is considered insufficient, because the web portal is static or only provides information without interaction with its users. Apart from that, for public complaints, only provide telephone numbers and email complaints. This system causes slow handling of complaints due to the accumulation of incoming complaints via telephone or email. For this reason, a website-based system is needed that can provide services to the community dynamically and the public can submit complaints directly and can communicate with related officers through the website. From these problems then carried out an analysis of functional requirements. Functional requirements are necessary to determine which processes the system can do as well as who can utilize it [21]. There are 2 identified users of this application, namely: admin and general users. The following is an analysis of the functional requirements of the customer service and complaint information system that will be developed:

Admins/operators:
1) Admin can login to the system by entering username and password.
2) Admin can do new installation management
3) Admin can manage customer complaints
4) Admin can manage announcements
5) Admin can chat with customers

General Users:
1) Users can register a new installation
2) Users can log into the system after registering by entering their username and password
3) Users can make customer complaints
4) User can view announcement information
5) Users can chat with officers

3.2 Design

At the design stage, researchers used Class Responsibility Collaborator (CRC). CRC aims to build classes that will be used. The following is a CRC design that was developed for a service information system and customer complaints:
1) Functions of the application

    The function of the application describes the usability of the application for the user. Table 1. The following is the function of the customer service and complaint information system.

Table 1. CRC Application Function

Document Name	Application Function
App name	Service Information System and Customer Complaints
Username	Admin and General Users
Activity	Functions of the system
No	**Description of the application created**
1.	The function of the development of customer service information systems and complaints 1) Facilitate the company in providing services 2) Facilitate companies and communities in providing and receiving information 3) Facilitate the service of complaints and submit complaints

2) Determining Time

At this stage the developer estimates the time in application development. The schedule for the implementation of the system development carried out is presented in Table 2.

Table 2. CRC Implementation Schedule

Document Name	Time
App name	Service Information System and Customer Complaints
Username	Admin and General Users
Activity	Functions of the system
Implementation	1 September 2022 to 23 November 2022
No	**Description of the application created**

1. Application development time is 3 months

Year 2022											
September				October				November			
1	2	3	4	1	2	3	4	1	2	3	4
iteration	iteration	iteration	iteration	iteration	iteration	iteration	iteration	iteration	iteration	iteration	iteration

Furthermore, the system is designed using one of the UML diagrams, namely use case diagrams. The use case diagram illustrates the interaction between system users and the system being developed. Use case diagrams of service information systems and customer complaints can be seen in Figure 2.
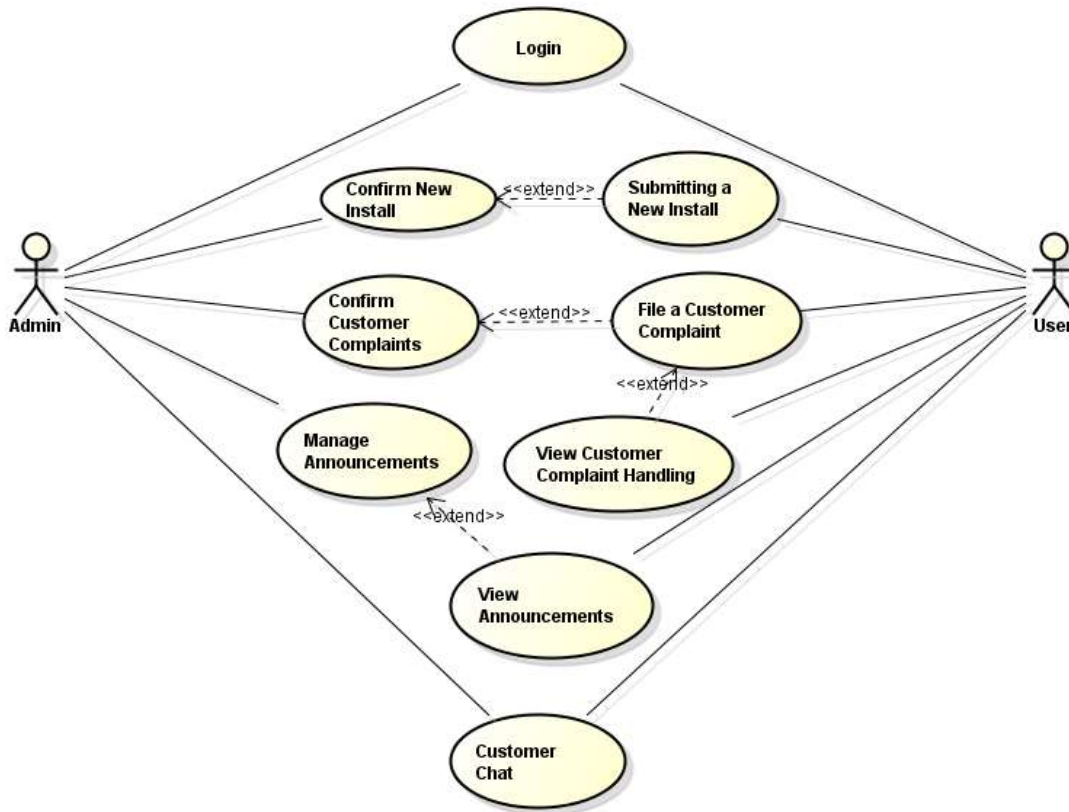
Figure 2. Use Case Diagram of Service Information System and Customer Complaints

Based on Figure 2, it can be seen that there are two actors who use the service information system and customer complaints, namely, the administrator and the user. Before carrying out management activities on the system, the admin begins by logging in first. Then the admin can confirm new installations, confirm customer complaints, manage customers, and chat with customers. For user actors, like admin users, they must log in first to enter the system. After entering the system, the user can submit a new complaint, submit an existing complaint, view the progress of the complaint, view announcements, and chat with the admin.

3.3 Coding

After the design stage, it will then be implemented in the form of program coding. At this stage coding is carried out based on the design and analysis that has been done before. Coding or coding is the translation of a design into a language that can be recognized by a computer. This customer service and complaint information system was developed using the PHP programming language with the Sublime Text 3 text editor and MySQL database. The system is built on a website basis with the aim of making it easy to use, and besides that website use can be accessed anywhere and anytime. The system is built based on the functional requirements that have been made at the planning stage. The system begins with a login menu interface, where the user can enter the system by entering a user name and password. There are 2 (two) users of this system, namely: admin and general user. General users can register a new installation, via the new installation form. In this form the user completes the registration requirements for a new installation. After the data has been filled in the user will get a username and password to enter into the system. After getting the user name and password, the user can enter the system and the system will display the main menu form. Figure 3 below is the main menu interface for the user.
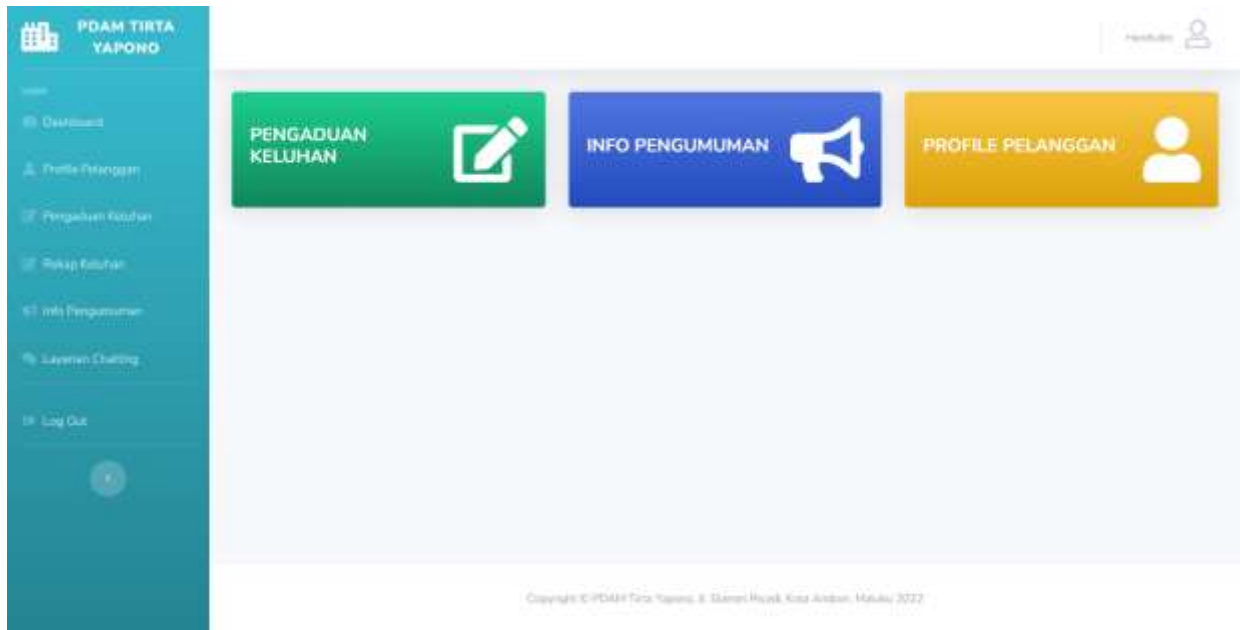
Figure 3. Main Menu Interface for Users

Users can submit complaints through the Complaint form. On this form, users can make complaints by filling in complete data and submitting complaints and can attach photos as proof of complaints. Figure 4 below is the customer complaint form interface.
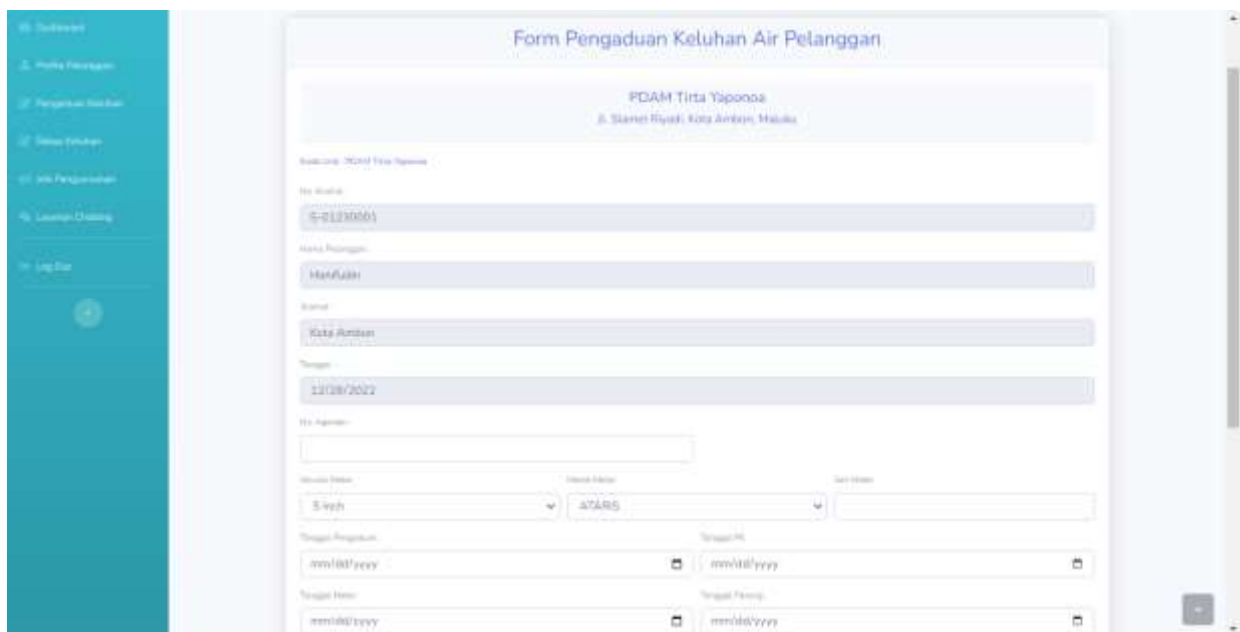

Figure 4. Customer Complaint Form Interface

After customer complaints are submitted, users can monitor their complaints on the Complaint Recap form. On this form the user can see whether his complaint has been responded to by the officer or not. In addition, users can view announcements from officers through the Announcement Info form. If the user wants to communicate with officers, the user can use the Chat Service facility.

As for the admin, can enter into the system by entering the user name and password that has been given. After successfully entering into the system, the system's main menu form will be displayed. Admin can manage customer complaints on the Customer Complaint Confirmation form. On this menu the admin can see a list of customer complaints.

In addition, the admin can answer these complaints and make snacks. Admin can fill in proof data that customer complaints have been handled. Admins can also provide important information to customers by making announcements to customers via the Announcement Input form. Figure 5 below is the Announcement form interface.
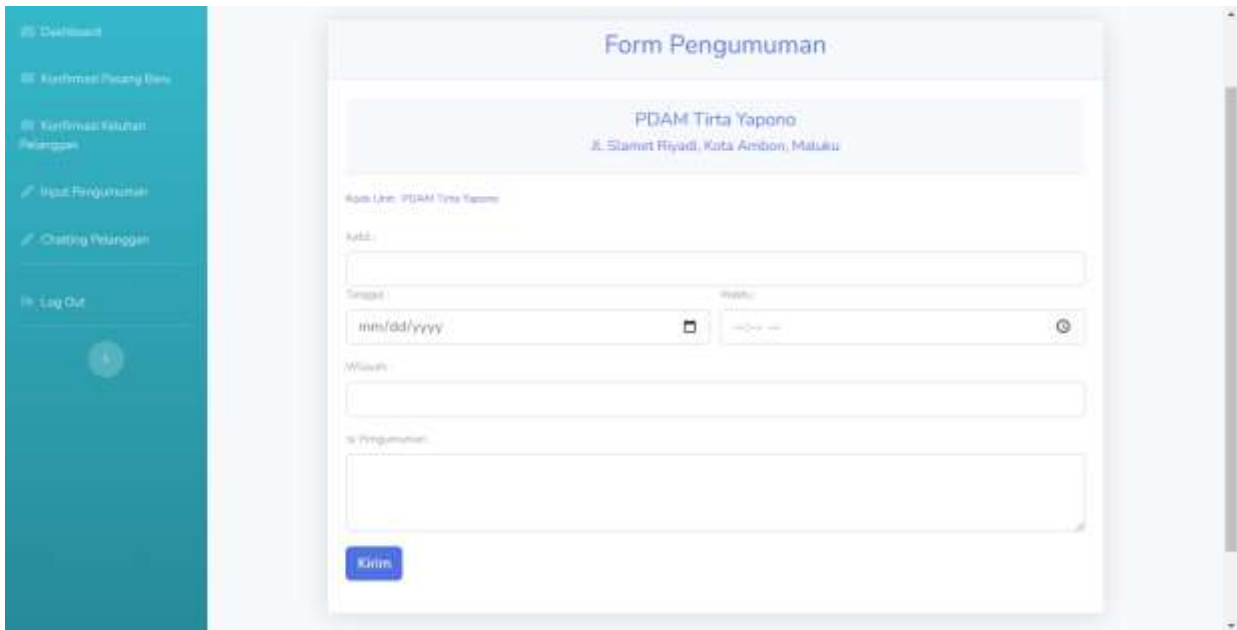

Figure 5. Announcement Form Interface

3.4 Testing

The built application will go through testing based on usability testing before being used by the community. According to ISO 9126, usability is a component of software quality. An application development standard known as ISO 9126 is a methodology for testing the quality of software. The Usability aspect has 4 sub-criteria, namely: understandability; learnability; operability; attractiveness. There are 10 (ten) questionnaire-style questions for the 4 (four) sub-criteria. The Guttman scale was used to create the survey. The Guttman scale is a statement that is more severe than others; hence, there are only two possible outcomes on this scale: Agree and Disagree. There were 50 responders from the general public who received questionnaires. Figure 6 below is the result of usability testing.
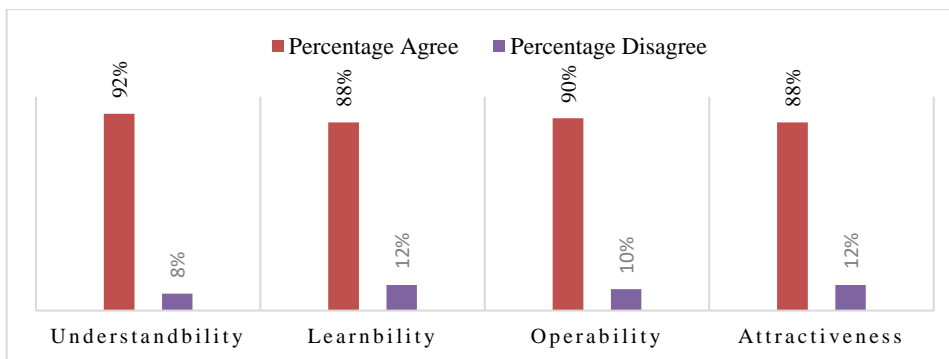

Figure 6. Usability Testing Results

From the test results in Figure 6, respondents said they agreed with the understandability criteria as much as 92%; learnability as much as 88%; operability as much as 90%; attractiveness as much as 88%. The overall average for respondents saying they agreed to usability testing was 90%. The following percentage criteria are then applied to the results: Having a value between 76% and 100%, Good; 56% to 75%, Sufficient; Very Not Good has a value of less than 40%, whereas Not Good has a number between 40% and 55% [22]. These conversion requirements place the population management system that was created in the "good" category. This demonstrates that the Extreme Programming (XP)

method-created customer service and complaints information system has good usability.

4. CONCLUSION

Based on the research that has been done, this research has developed a service information system and customer complaints through the population administration system using extreme programming (XP) system development. XP is able to produce software for 3 (three) months, in accordance with the planned implementation schedule in the Class Responsibility Collaborator (CRC) that has been made. This means that the XP method can carry out system development in a short time and is proven by short development results. The developed customer service and complaint information system can manage new installations, customer complaints, announcements and customer chats. The final application is in the "good" category because usability testing yields an average value of 90% in the "good" category, indicating that it is both useful and in line with the user's preferences.

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