

Designing and Building an Irrigation Management Information System Using the Prototype Method

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ABSTRACT

In the current system, agricultural extension workers manually collect and summarize extension outcome data using spreadsheets (Microsoft Excel). The weaknesses of this manual system are errors in data entry, duplicate data, and a rather long time for recapitulation. This research aims to develop and implement a web-based Irrigation Management Information System that is integrated and easy for agricultural extension workers at the sub-district level to use. The method used in this research is Research and Development, with a prototype model that allows interaction between developers and users during the creation process. The results of functional testing on this system show that the system has met user needs and no errors were found in any of the functions. Additionally, the limited trial involved 35 users who rated the system as very easy to use. It is hoped that with this irrigation management information system, water resource management can be carried out more effectively, supporting agricultural productivity and the overall well-being of farmers.

Keywords: Management Information System; Irrigation Management; Prototype Method

INTRODUCTION

One important instrument in irrigation management is agricultural extension conducted by agricultural extension workers at the sub-district level. Agricultural extension workers play a strategic role in surveying and monitoring the condition of irrigation networks, and they also educate farmers to support the development of farmer groups. Each extension worker is responsible for several assisted villages, under the coordination of the District Agricultural Extension Coordinator. In the current system, extension workers collect data on the condition of the irrigation network and manually summarize it in a spreadsheet/Microsoft Excel format. This data is reported to the district extension worker coordinator and then to the Technical Implementation Unit of the Jombang District Agricultural Extension Service.

This process has weaknesses, namely that it takes a considerable amount of time, is prone to errors in data entry, data duplication, and has high operational costs for data verification and validation. This condition led to the initial idea of the need to utilize an integrated information system that could be accessed by all stakeholders, from agricultural extension workers in the villages to the heads of UPTs at the district level.

This research will focus on developing a user-friendly irrigation management information system that is accessible to all relevant parties and capable of providing accurate and timely information. Thus, the development of this system is expected to make a positive contribution to increasing agricultural productivity, sustainable water resource management, and the well-being of farmers.

METHOD

The research method used is Research and Development using the prototype development model. Prototyping is a widely used system development technique that also facilitates interaction between developers and users during the creation process, allowing developers to easily model the software to be built, as of 2017 (Kurniati, 2021). According to Novitasari (2020), the Prototype Method is one of the system lifecycle methods based on the concept of a working model. The stages of the Prototype Method

consist of: requirements gathering, building the prototype, evaluating the prototype, coding the system, testing the system, system evaluation, and using the system, as illustrated below:

- Requirements Gathering
- Building the Prototype
- Evaluating the Prototype
- Coding the System
- Testing the System
- System Evaluation
- Using the System

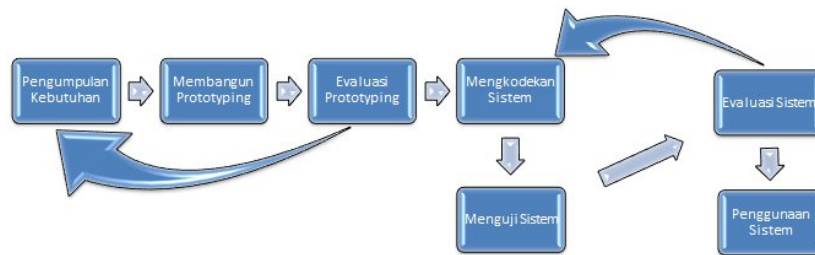


Figure 1. Prototype Methode

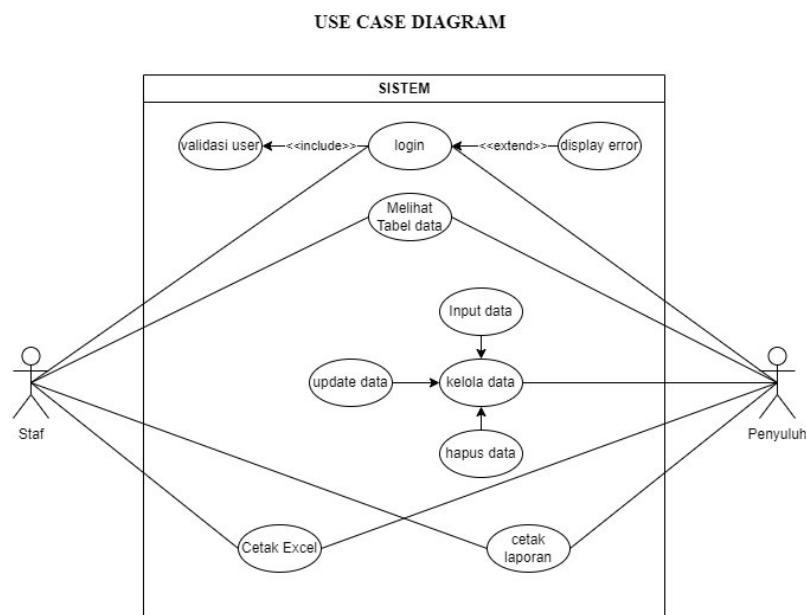


Figure 2. Usecase Diagram

The use case diagram above shows that:

- Login: The login system can be accessed by users with the roles of extension workers and staff. This system will validate users and grant access rights based on their respective roles. If successful, the user will be logged into the main dashboard, and if unsuccessful, the user will receive an error message.
- Viewing the data table: after logging in, all users will be able to access the same data table page.
- Manage data: only users with the extension worker role can access the data management system, which includes data input, data updates, and data deletion.
- Print reports: users with staff and extension worker roles can print reports in PDF format provided by the system, with data filtering features according to the required region and type.
- Print Excel: all users can also print reports in Excel format.

RESULT AND DISCUSSION

This product testing was conducted to determine the syntax, algorithms, logic, and processes, output, and working principles of the irrigation management information system. The performance of the irrigation management information system is objectively measured based on the system's ease of use and its effectiveness in managing irrigation network data.

Product testing

Product testing in this study was divided into two stages. The first stage was to test the product's functionality using the blackbox testing method. The second stage involved limited testing with 35 users with basic IT and non-IT backgrounds, using data analysis techniques with the Likert scale format.

Table 1 Likert scale format

Positive Statement		Negative Statement	
Question Form	Score	Question Form	Score
Strongly Agree	5	Strongly Agree	5
Agree	4	Agree	4
Somewhat Agree	3	Somewhat Agree	3
Disagree	2	Disagree	2
Strongly Disagree	1	Strongly Disagree	1

Product testing result

- Functional Test Results using Blackbox Testing

In the final results of the black box testing conducted on the irrigation management information system application program, the program was declared to have met the system requirements and no errors or bugs were found in any of the functional testing processes of the system. All predetermined indicators are declared valid with evidence that the program can be run according to their respective functions.

- Limited test results

Based on the responses from 35 respondents, the average score is 4.33, which means the respondents have categorized it as Very Easy.

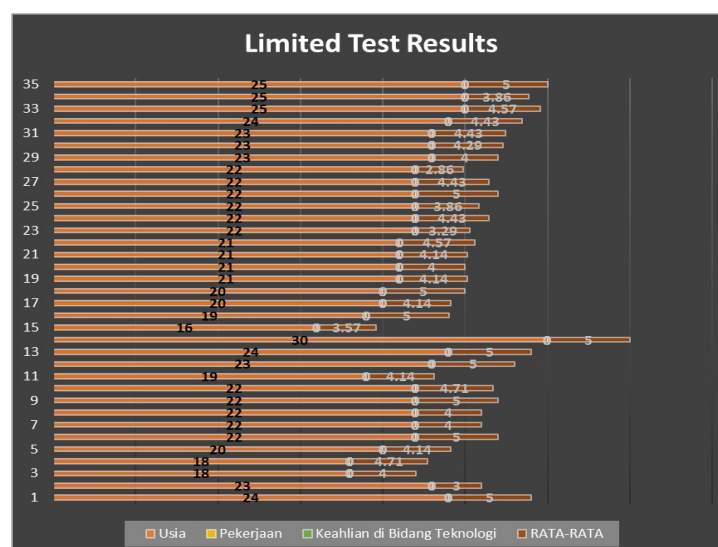


Figure 3. Limited Test Results

CONCLUSIONS

Based on the discussion regarding the design of the irrigation management information system that has been carried out, the following conclusions can be drawn:

- Based on the final results of black box testing conducted on the irrigation management information system application program, the program has been declared to meet system requirements and no errors or bugs were found in each functional testing process of the system. Therefore, the irrigation management information system is ready to be used.
- Based on the results of limited testing on users, in this case 35 people who have or do not have basic skills in the field of technology, the results were very valid. Therefore, it can be concluded that the irrigation management information system is very valid and easy to use.

It is necessary to develop a program related to direct location determination, so that when irrigation data is searched, the location is displayed in the program interface at the same time. With this, the monitoring process can be carried out more efficiently, and the process of determining priorities for the repair and development of irrigation network infrastructure can be done more accurately.

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