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Information System for Managing Village-Owned Enterprises (BUMDes) in Bogoharjo Village with DevOps Method

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Abstract.
Purpose: The purpose of this research is to build a Bogoharjo Village-Owned Enterprises (BUMDes) Business Unit Management Information System to facilitate BUMDes managers in managing business units and providing available services to the community online.
Methods: The method used in this research is the DevOps method with the stages of plan, code, build, test, release, deploy, operate, and monitor. System design uses UML (Unifed Modeling Language), namely flowchart, use case diagram, activity diagram, class diagram, and sequence diagram. System development using the Laravel framework.
Results: The results showed that expert validation with an average percentage by content expert validation of 89% and media expert validation of 84% so that the BUMDes Management Information System (Village-Owned Enterprises) in Bogoharjo Village with the DevOps Method was very feasible to use. While the results of the practicality trial using 25 respondents produced an average percentage of 89% with a very practical category. Thus, the BUMDes Management Information System (Village-Owned Enterprises) in Bogoharjo Village with the DevOps Method is very practical to use.
Novelty: The novelty of this research is used to assist BUMDes managers in managing data or providing information related to the BUMDes itself. In addition, BUMDes management becomes more organized and structured so that services to the community become more effective and well managed.

Keywords: Information system, Management, BUMDes, Business unit, DevOps
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INTRODUCTION

BUMDes is a village business institution that is jointly managed by the village government and the community to improve the village economy [1]. The purpose of BUMDes is to improve the village economy, increase community businesses, improve community welfare, and economic equity [2]. This research is motivated by the management of business units at BUMDes Bogoharjo which is still done manually by writing data through paper or notebooks where each business unit is managed by different people, causing BUMDes managers to have difficulty in synchronizing data from various business units. The use of information systems to help manage BUMDes becomes more efficient and easier with the support of advances in information technology. Therefore, the management information system is very important for the success of the organization being run and successfully carrying out the initial objectives to be achieved [1]. Management that is carried out quickly, precisely, clearly, and regularly which can be presented in an application will certainly greatly support the smooth running of the village government in carrying out operational activities.

The management information system that will be created is a website for information on the management of Village-Owned Enterprises (BUMDes). A website is a component consisting of various media including text, images, animated sound so that the website becomes an attractive information media to be visited by others and can be accessed using an internet network connection [3]. Websites can be owned by individuals, organizations, or companies [4]. Websites can be fixed (static) or changing (dynamic) which are united in an interconnected structure connected through links or hyperlinks that can be accessed by other people through the internet network [5]. A website is an arrangement of pages with written content, animations,

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sounds, and still or moving images, as well as a mix of all of them, sweetened or not, that create a network of linked buildings and are interconnected [6].

The system development method used in the Village-Owned Enterprises (BUMDes) management system uses the DevOps development model. In general, DevOPs stands for Development and operations. The development area includes the plan, code, build, test stages and the operations area includes release, deploy, operate, monitor [7]. The DevOps method is proven to be able to reduce several stages of development that exist in the old method and DevOps is also able to shorten the time between software development and operation without reducing the quality of the software itself [8]. The main purpose of the DevOps method is to deliver and develop software faster and this is a practical strategy for obtaining efficient software according to the needs of users or developers [9].

Some research on BUMDes information systems including those conducted by [10] in the development of BUMDes information systems at BUMDes *Bina Mandiri Desa Minasa Baji Bantimurung* District Maros Regency. The results of the development and implementation of the system are that it can help record the loan of service business unit equipment, help record the redemption of fertilizer for agricultural business units, help record the income of convection business units and report business unit income to the BUMDes director. According to [11] in their research results that, information systems can help *sindangasih* villagers in managing the administrative administration of BUMDes in a computerized manner. The information system also makes it easy to process data and encourage the economic potential of the village in order to increase village and community income. With better data management, it will also provide benefits if the data is needed to be processed for various purposes, for example for decision-making purposes so that it can help universities achieve the vision and mission that has been set [12].

Although various efforts have been made to improve the efficiency of Village-Owned Enterprises (BUMDes) management, there are still obstacles in terms of information disclosure and the effectiveness of managing available business units. Current information systems are often unable to meet the needs of BUMDes managers in providing services that are easily accessible to the community. Therefore, this research aims to address this gap by developing a website-based BUMDes Management Information System that can facilitate managers in managing business units and providing information related to available services to the community online. With this system, it is expected that BUMDes management can be more efficient and transparent, and provide easy access to information to the community.

METHODS

This research employs the Research and Development R&D method, a development approach designed to create products and assess their effectiveness. R&D is a series of processes or steps to develop a new product or improve existing products. The product can be in the form of objects, hardware, and software [13]. Research and Development R&D is used to produce certain products, and test the effectiveness of these products [14]. Bogoharjo BUMDes Management Information System uses the DevOps method as an information system development. DevOps can be said to be a practical strategy for obtaining efficient software according to user needs. The main goal of the DevOps method is to deliver software faster, which requires collaboration to develop and maintain software [15]. DevOps is a new trend that emerged (in 2009) from the collision of two old trends: Agile Systems and Agile Operations, the stages of DevOps are plan, code, build, test, release, deploy, operate, and monitor [16].

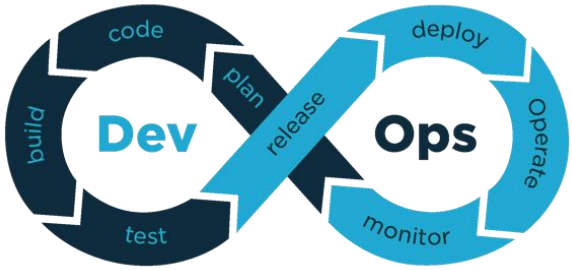

Figure 1. DevOps stage recycle [16].

Based on Figure 1, there are 8 stages in the DevOps method. The selection of the DevOps method is to deliver and develop software faster and this is a practical strategy for obtaining efficient software according to user or developer needs [9].

Plan, The plan or planning stage is the process of identifying goals and requirements for the design and development of application software .This stage includes all the planning and design of the software to be developed [17]. At this stage all rules, requirements, feedback from stakeholders or users will be collected and used to create a project road map [7]. This stage consists of planning the system to match the desired scenario by collecting data through observations, interviews and literature studies and designing a system consisting of flowcharts, usecase diagrams, activity diagrams, sequence diagrams and class diagrams.

Code, Furthermore, after designing, namely the code stage, at this stage the developer will start writing the code of the application being built [7]. This stage is carried out programming of the DevOps initial system so that it runs smoothly in accordance with the Devops working principles [16]. Researchers design system code using VSCode as a text editor. Researchers use Laravel as a framework in making the system. Laravel uses the PHP programming language. Laravel Framework is a PHP programming language framework that implements the Model View Controller (MVC) concept and is open-source [18]. Laravel uses the php programming language. PHP is interpreter programming, which is the process of translating lines of source code into machine code that the computer understands directly when the lines of code are executed [19]. Laravel framework is used for the backend because it is a free and open source PHP framework, because it is a PHP framework that is open source and free, a PHP framework that is free, open source and easy to use by developers because it has the ability to summarize the PHP program code to be used compared to other PHP frameworks [20].

Build, This stage involves the integration of various software modules to create product functionality or fully developed and executable products, there is an evaluation process that measures how well the software development results meet the specified requirements [16]. At this stage, researchers compile the recourse and code that has been made using Laravel as in the previous stage. At this stage the code and resources will be built into a BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method. The fourth stage is test, at this stage automation testing is carried out continuously to ensure the quality of the software that has been developed [8]. The purpose of testing is to ensure that potential errors that arise in the developed software have been eliminated and to ensure the software can run properly [7].

Test, After the application is completed, the researcher conducts system testing using content validation, media expert validation and system testing using a blackbox test to determine the feasibility level of the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method. At this stage, testing is carried out using expert validation using a Likert scale to determine the assessment analysis of the system. Black Box Testing was chosen because it has the advantage of being carried out based on user needs, so if there is an incomplete function or unexpected function that does not run, it can be easily identified and can be overcome by software development because Black Box Testing is carried out based on the end user's perspective to test the validity of a system [21]. The way Blackbox Testing works is by ignoring the control structure so that it only focuses on domain information. In Blackbox Testing software developers create a collection of input conditions that will test the functionality of the program being created [10] . The Blackbox approach refers to testing that is done without knowledge of how the system code is implemented but focuses on the inputs and outputs produced by the system [22]. The next test is using usability testing is a category of usability evaluation methods used to evaluate products by testing them directly with users [23]. Usability testing uses a Likert scale which is tested directly on villagers. The Likert scale is a psychometric method commonly used in the preparation of questionnaires and is frequently applied in surveys. There are two types of questions in the Likert scale: positive questions, which aim to measure positive interest, and negative questions, which are designed to measure negative interest. Scores are assigned to positive questions in the order of 5, 4, 3, 2, and 1, while negative questions receive the opposite scoring, namely 1, 2, 3, 4, and 5, as illustrated in Table 1 [24].

Table 1. Likert scale positive and negative statements

Description	Positive Score	Negative Score
Strongly Agree (SS)	5	1
Agree (S)	4	2
Undecided (RG)	3	3
Disagree (TS)	2	4
Strongly Disagree (STS)	1	5

So that the determination of the score used for each instrument can be done with the following Formula (1):

$$\text{Percentage of Total Score} = \frac{\text{Total Score}}{\text{Total Maximum Score}} x\ 100\% \quad (1)$$

In this Formula (1), the "Percentage of Total Score" represents the percentage value calculated from the total score achieved divided by the total possible maximum score, multiplied by 100 to convert it into a percentage.

Scoring on questionnaires and questionnaires using a checklist (V) using a Likert scale, then there are aspects used in the instrument, namely as follows:

Table 2. Content validation assessment instrument

Aspects assessed	Total of aspect criteria	Number of aspect criteria
Usability aspect	16	1-16

Table 3. Media validation assessment instrument

Aspects assessed	Total of aspect criteria	Number of aspect criteria
Usability aspect	5	1,2,3,4,5
Satisfaction aspect	3	6,7,8
Media presentation aspect	4	9,10,11,12
Language feasibility	5	13,14,15,16

Table 4. Respondent practicality test assessment instrument

Aspects assessed	Total of aspect criteria	Number of aspect criteria
Usability aspect	15	1-15

Then the calculation results from the content validation instrument, media expert validation, and respondent practicality using a Likert scale, the results can be seen in Table 5:

Table 5. Category percentage

Percentage	Category
0% - 20%	Very Unfit
21% - 40%	Not Feasible
41% - 60%	Decent Enough
61% - 80%	Feasible
81% - 100%	Very Decent

Release, after successful testing, the software is ready for release. The release process includes the distribution of applications for use by end users [7]. At this stage, the initial publication of the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method is carried out with the aim that it can be accessed online by BUMDes managers and Village residents.

Deploy, Deploy is the process of implementing applications that are made so that they can be accessed by user [16]. This stage focuses on the continuous re-deployment of software in the production environment. This stage involves configuration management issues on the platform as well as target resources. Deploy is the process when the created application is placed or distributed so that it can be accessed by users [7]. At this stage, researchers place the system on hosting so that the BUMDes Management Information System

(Village-Owned Enterprises) with the DevOps Method can be accessed online by BUMDes managers and Villagers.

Operate, at this stage the operation consists of infrastructure installation, scalability changes and database management [17]. At this stage the operations team manages the production environment, monitors application performance, manages workloads, and responds to problems that may arise. If an error occurs in the application, users can provide feedback or feedback which will later become an evaluation for developing the application [7]. At this stage, the operation of the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method is carried out by directly running the system that has been built at BUMDes.

Monitor, this stage is very important from the DevOps method because application performance needs to be continuously monitored [8]. This stage is the last stage, namely the monitoring stage which is carried out continuously on the software. This stage is carried out to detect potential problems before they affect the end of use [16]. At this stage, supervision is carried out through server monitoring and system logs in order to know the system can run well, quickly and responsively.

RESULT AND DISCUSSION

This research was conducted in accordance with development procedures that refer to DevOps. In connection with this research, the results of the research are divided into 8 stages, namely: The design stage (plan) is carried out at the beginning of system development to provide an overview of the system as a whole.

Plan, at this stage, a system design is made so that the system can run according to the desired scenario the system design in this study was built using the Unified Modeling Language (UML) which consists of flowcharts, use case diagrams, activity diagrams, sequence diagrams and class diagrams.

a. Flowchart
   Flowchart on BUMDes Management Information System (Village-Owned Enterprises) with DevOps Method there are two flowcharts, namely user flowchart and admin flowchart. The following is a user and admin flowchart on the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method.

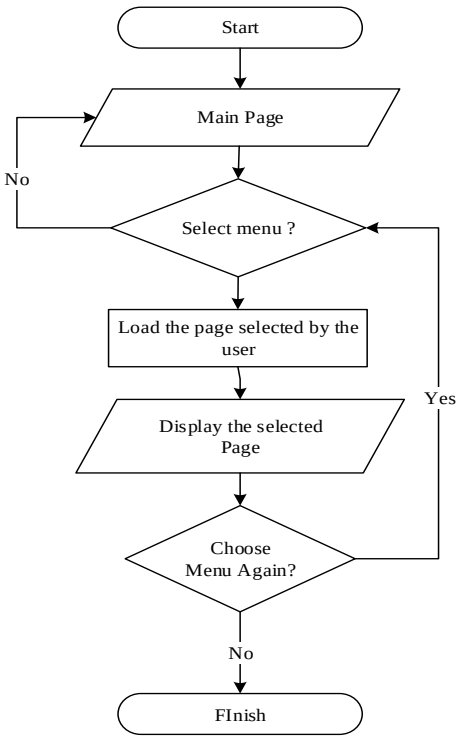

Figure 2. Flowchart user

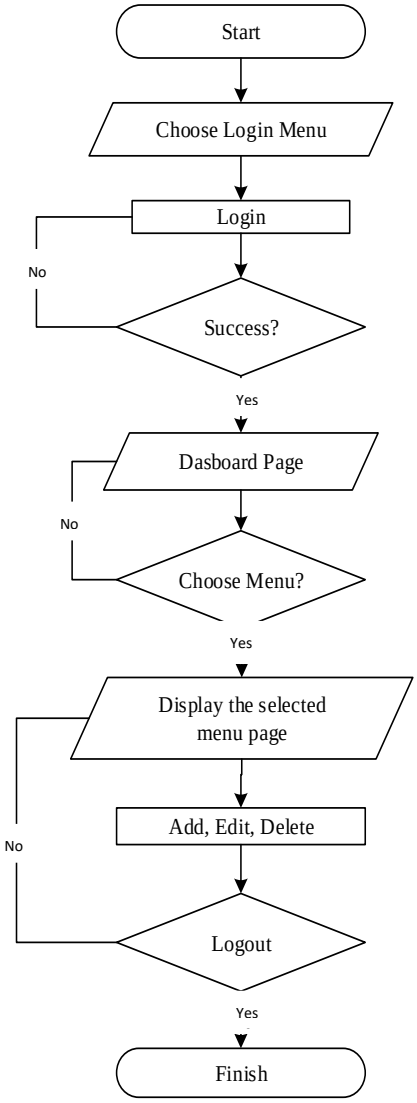

Figure 3. Flowchart admin

Code, from the design of this stage, the researcher designs the system code using VSCode as a text editor. Researchers use Laravel as a framework in making the system. Laravel uses the PHP programming language.

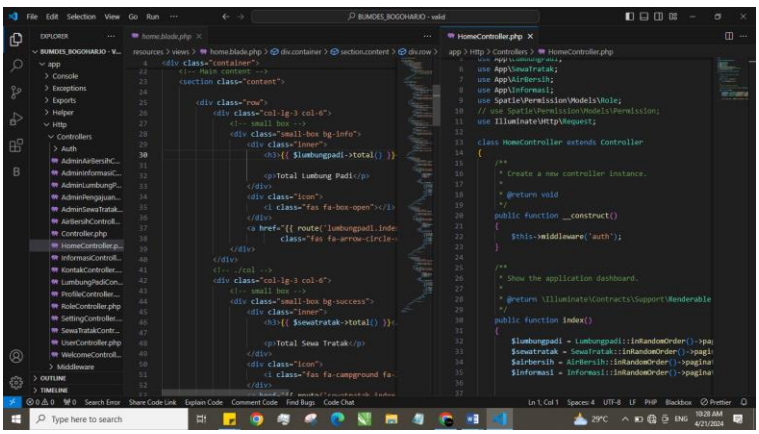

Figure 4. Resource code in the editor

Build, at this stage, researchers compile the recourse and code that has been made using Laravel as in the previous stage. At this stage the code and resources will be built into a BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method. So as to produce a display like this:

1. User Page Display
   Home page interface system display on the BUMDes (Village-Owned Enterprises) Management Information System with DevOps Method.

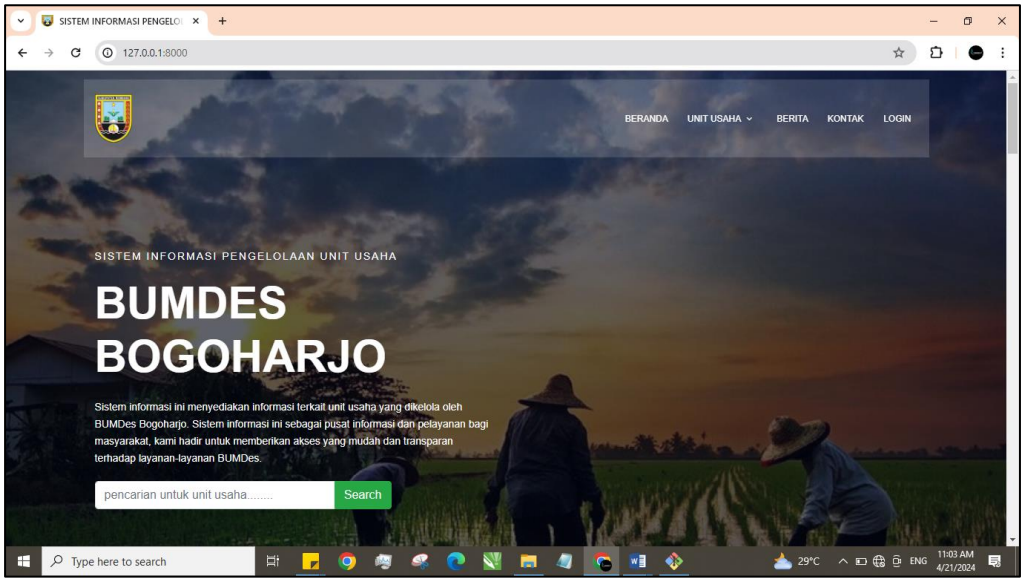

Figure 5. Main view

2. Display of Rice Barn Page
   System display of the rice granary page interface on the BUMDes Management Information System. Information System for BUMDes Management (Village-Owned Enterprises with DevOps Method.

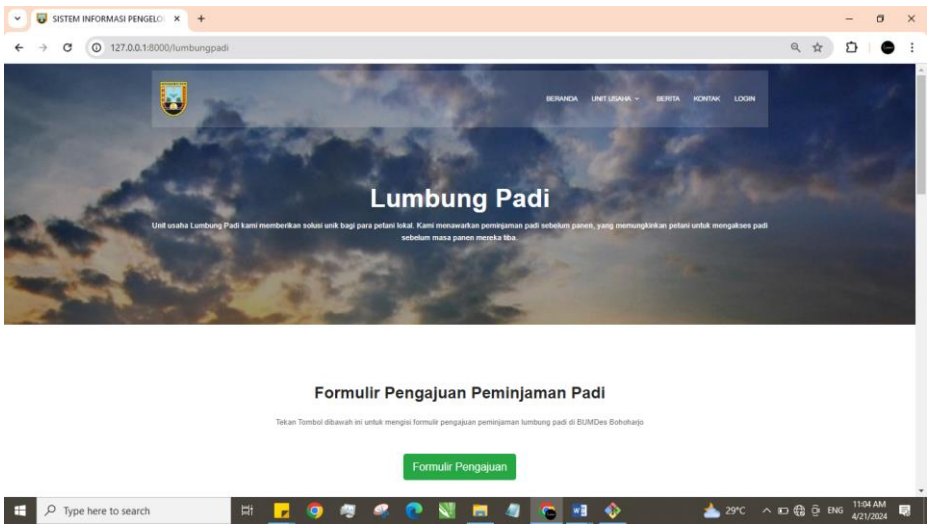

Figure 6. Rice barn page display

3. Admin Login Page Display
System interface view of the admin login page on the Information System for BUMDes Management (Village-Owned Enterprises) with DevOps Method.

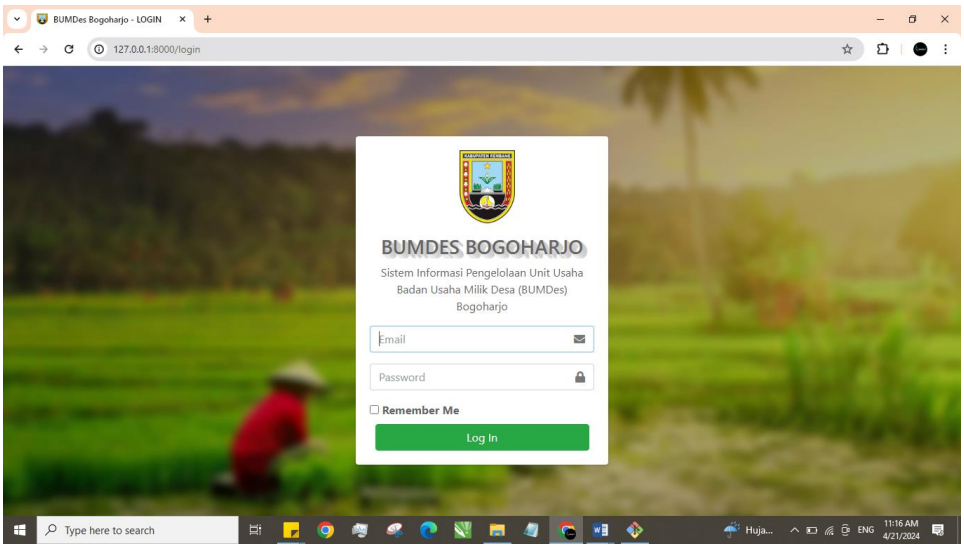

Figure 7. Admin login page display

4. Admin Dashboard Page Display
Interface system view of the admin dashboard page on the BUMDes Management Information System. Information System for BUMDes Management (Village-Owned Enterprises) with DevOps Method.

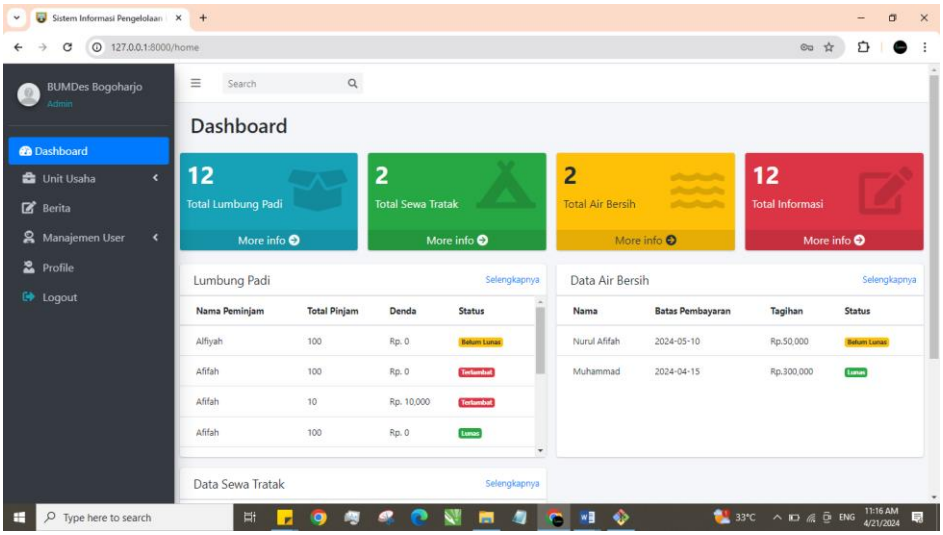

Figure 8. Admin dashboard page view

5. Display of Rice Barn Management Page
System interface view of the rice granary management page on the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method.

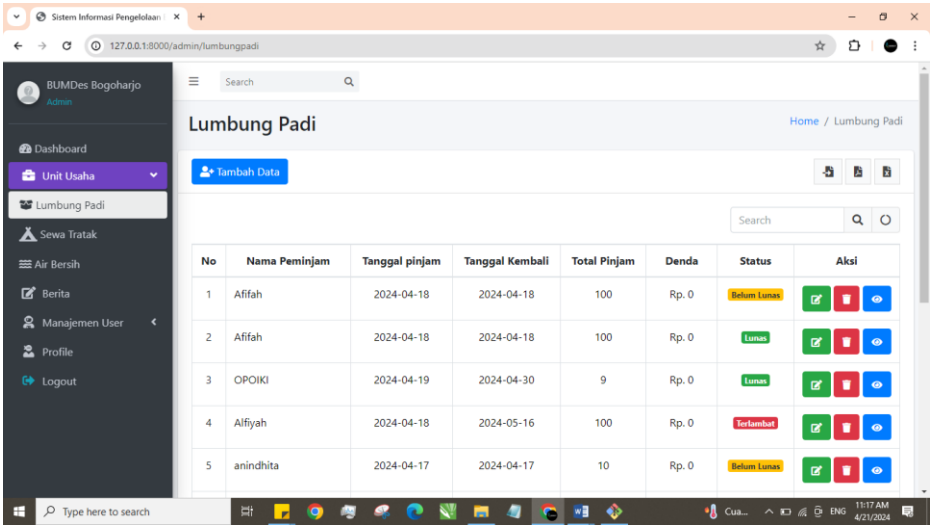

Figure 9. Management admin rice barn page view

Test, After the application is completed, researchers conduct system testing using media expert validation and system tests using blackbox tests to determine the feasibility level of the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method. The results of the content expert validation test, media expert validation, and respondent test are as Table 6.

Table 6. Results from content expert validation testing by village heads and BUMDes managers

Content Expert	Aspects	Value	Percentage	Category
Content Expert Validation 1	Usability	75	93%	Very Feasible
Content Expert Validation 2	Usability	69	86%	Very Feasible

Based on table 6 the average percentage results of the two content validators on the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method, the average is 89% with a very feasible category.

Table 7. Media expert validation test results

Content Expert	Aspects	Value	Percentage	Category
Media Expert Validation 1	All Aspects	65	81%	Very Feasible
Media Expert Validation 2	All Aspects	70	87%	Very Feasible

Based on the Table 7 average percentage results of the two media expert validators on the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method, the average is 84% with a very feasible category. The results of the calculation of the assessment of the villager respondents by taking a sample of 25 villagers resulted in an overall average assessment of 89% so that the BUMDes Management Information System (Village-Owned Enterprises) in Bogoharjo Village with the DevOps Method has a very feasible category. The results of black box testing on the BUMDes Management Information System (Village-Owned Enterprises) Village with the DevOps Method are valid or feasible to use. Because every page menu from the BUMDes management website functions properly.

Release, after conducting a series of testing stages and getting feedback that is very important for developers. The next step is the release of the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method by introducing the application to end users. At this stage, the initial publication of the BUMDes Management Information System (Village-Owned Enterprises with the DevOps Method is carried out with the aim that it can be accessed locally by managers and Village residents.

Deploy, in this stage researchers apply applications that have been built to BUMDes widely. At this stage researchers place the system on hosting so that the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method can be accessed online by BUMDes managers and Bogoharjo

Villagers. The results of the deployment of the BUMDes Management Information System (Village-Owned Enterprises) in Bogoharjo Village with the DevOps Method with the domain address can be seen in the following Figure 10.

Operate, the operation stage is carried out after implementation or application in BUMDes Management. At this stage, the operation of the BUMDes Management Information System (Village-Owned Enterprises) with the DevOps Method is carried out by running the system that has been built directly on BUMDes.

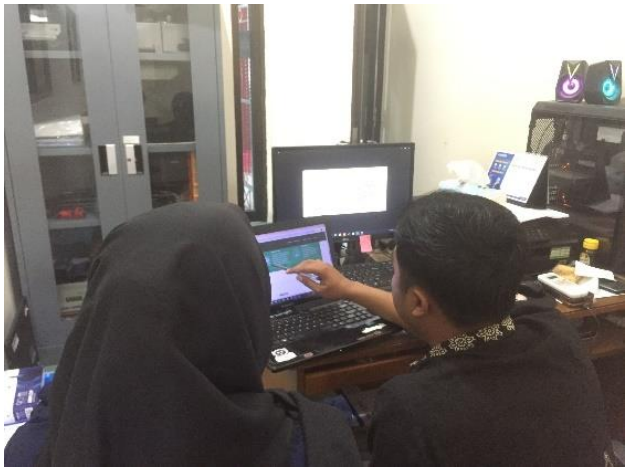

Figure 11. Running the system that has been built directly at BUMDes.

Monitor, after the operation, researchers supervised the use of the BUMDes Management Information System (Village-Owned Enterprises) DevOps Method. Supervision is carried out using server monitoring and system logs from log files in Laravel. The following are the results of the server monitor or log of the BUMDes Management Information System (Village-Owned Enterprises):

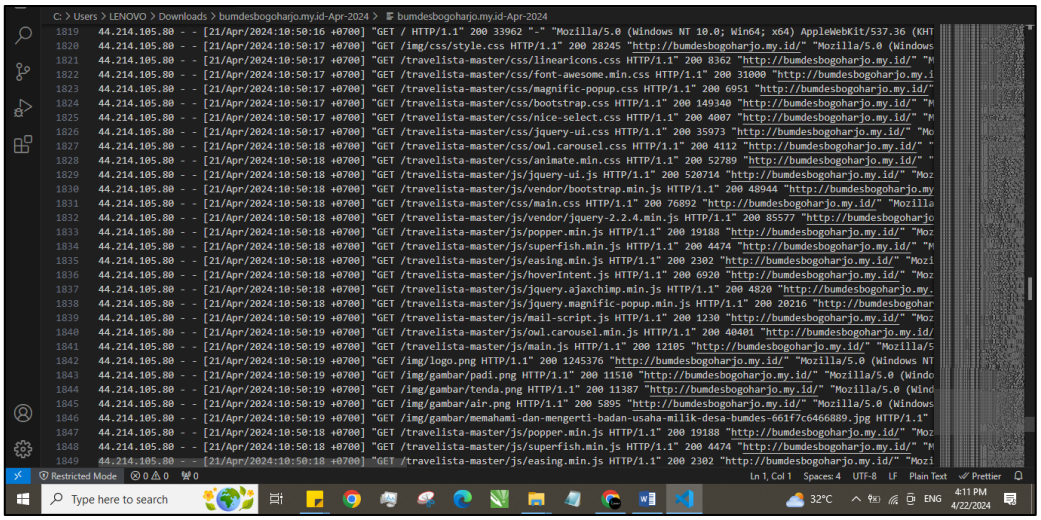

Figure 12. Monitor results or system logs

CONCLUSION

BUMDes Management Information System (Village-Owned Enterprises) in Bogoharjo Village with DevOps Method using the DevOps (Development and Operation) system development method which has 8 stages, namely plan, code, build, test, release, deploy, operate, monitor. Based on the results of the content validation calculation, the results obtained by content validator 1 with a percentage of 93% and content validator 2 with a percentage of 86% so that the average of the percentage results is 89%. The results of the calculation of media expert validation obtained from media validator 1 with a percentage of 81% and media validator 2 with a percentage of 87% so that the average of the percentage results is 84%. Therefore, the

average results of the two validations are 89% and 84% so that the BUMDes Management Information System with the DevOps Method is very feasible to use. The results of the respondent trial using a Likert scale of 25 respondents by villagers resulted in an average respondent trial with a percentage of 89% and included in the very practical category. Therefore, the BUMDes Management Information System with the DevOps Method is very practical to use. However, this research has a weakness in terms of testing coverage which is limited to one village, so the results may not be generalizable to all villages. In addition, the DevOps method applied may require further customization to fit the specific conditions of other villages. For future research, it is recommended that more villages be tested and adjustments be made to the DevOps stages to improve the adaptability and effectiveness of this system in different village conditions.

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