

Information System for Consumables Control of the Department of Public Works, Roads, and Water Resources

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Abstract. This research aims to develop a web-based Information System for Consumable Goods Control at the Department of Public Works, Highways, and Water Resources of Sidoarjo Regency. The primary constraint in this institution lies in the manual inventory recording system, which is prone to data irregularities, reporting delays, and suboptimal stock control. To address these issues, this study employs the Research and Development (R&D) method with a Waterfall development model, encompassing the stages of preparation, system design, implementation, verification, and maintenance. The software is built using the PHP programming language and MySQL database, featuring master data management, transaction recording for incoming and outgoing goods, and real-time stock reporting. Based on the results of black-box testing, the system achieved a 100% success rate, proving that all functions operate according to specifications. The implementation of this system is expected to enhance data accuracy, operational efficiency, and transparency in managing consumable goods.

Keywords: Information Systems, Consumable Goods, Waterfall Model, Web Based, Black Box Testing

1 Introduction

Regional Property (BMD) refers to all goods obtained at the expense of the Regional Revenue and Expenditure Budget or from other legitimate sources in accordance with the Minister of Home Affairs Regulation Number 17 of 2007 concerning Technical Guidelines for the Management of Regional Property. Based on Sidoarjo Regency Regulation Number 1 of 2022 Article 10, the recording and inventory of BMD is carried out by the Goods Manager and/or Assistant Goods Manager. One component of BMD is consumables or supplies, which include consumables, non-consumables, and used goods[1]. In accordance with Sidoarjo Regency Regulation Number 1 of 2022, the procurement and use of consumables must be reconciled at the end of each quarter to the Regional Financial and Asset Management Agency through a stock-taking report. However, the recording and monitoring of consumables at the Sidoarjo Regency Public Works, Highways, and Water Resources Agency has not been integrated.

The recording process is still done manually using *Microsoft Excel*, with *log books* collected from each field at the end of each quarter. This condition has the potential to cause calculation errors, delays in report preparation, and the risk of data loss due to the lack of a database system[2]. In addition, manual recording is prone to *human error*, data duplication, and delays in updating information[3]. Inventory control is an important part of operational management to maintain the availability of goods, prevent stock shortages, and reduce storage costs[4]. Therefore, a web-based consumable goods control information system is needed that is capable of monitoring inventory in real-time to improve recording accuracy and support more effective decision making[5].

2 Method

This study uses a research and development approach to design and implement an information system for recording, issuing, and reporting consumables at the Public Works, Highways, and Water Resources Agency. The system was developed using the *Waterfall* model.

The *Waterfall* method is a method that measures regularly and sequentially in system development[6]. The *Waterfall* model was chosen because it applies a systematic and sequential approach that is in line with the conditions of field research[7]. The *Waterfall* method has advantages in terms of its strong structure and documentation, but has disadvantages when changes need to be accommodated because the stages cannot be returned to the previous stage. As part of the *System Development Life Cycle* (SDLC), the *Waterfall* stages include requirements analysis, system design, coding, testing, and maintenance, where each stage is completed sequentially before proceeding to the next stage[8]. The following is an illustration of the *Waterfall* method stages.

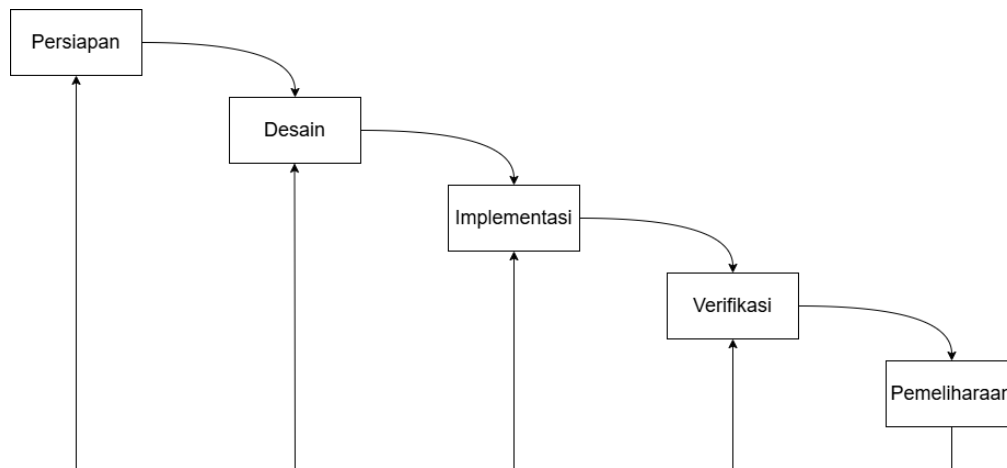


Figure 1. *Waterfall Method Stages*

2.1 Research Phase

2.1.1 Preparation

The analysis phase is the initial stage of system development aimed at identifying needs and problems. Data collection is conducted through direct observation, including interviews, to obtain information about the existing system workflow and the requirements for the system to be developed.

2.1.2 Design

The design phase is the stage of explaining the planned requirements in the form of a representation of the system to be created[9] . In this phase, the results of the requirements analysis are transformed into a comprehensive system blueprint. The design includes modeling workflows through flowcharts, user interface (UI) design, and database architecture. The researchers used *Draw.io* software to visualize the interface elements. The main focus of this design is to create an intuitive user experience, optimize the procurement and distribution procedures, and develop a transparent reporting format to improve the operational effectiveness of users.

2.1.2.1 System Design

A. System Use Case

A *use case diagram* is a diagram that illustrates the interaction between users (actors) and the system[12] . The purpose of creating this *use case diagram* is to illustrate the main functions of the system in accordance with the analyzed user needs. To facilitate understanding of the workflow of the information system at the Public Works Agency for Highways and Water Resources, the researchers designed detailed usage scenarios. The details regarding user interactions with the system are explained as follows:

Table 1. Access Rights Design in the System

No	Access Rights	Administ rator	Assistant Goods Manager	Inventory Manager	User
1	Manage Master Data	Yes	No	No	No
2	Manage Incoming Goods Data	Yes	Yes	No	No
3	Manage Outgoing Goods Data	Yes	Yes	No	Yes
4	Approval/Finalization	Yes	No	Yes	No
5	Reports	Yes	Yes	Yes	No

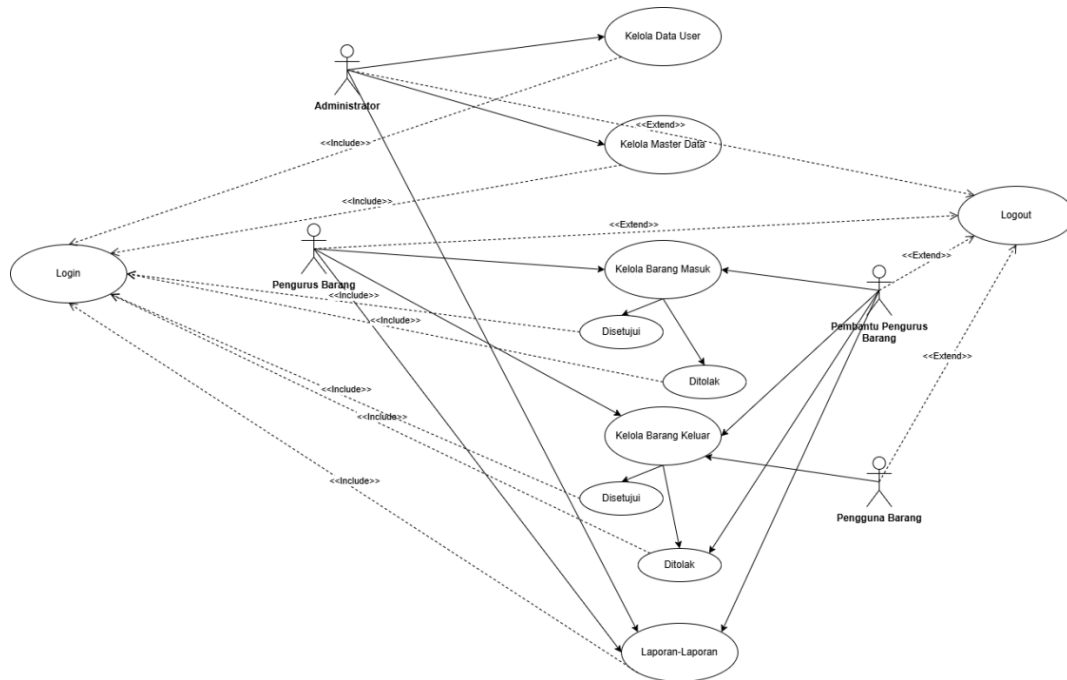


Figure 2. System Use Case

B. System Flow Diagram

The system flowchart shows the workflow for managing consumables based on user access rights, starting from master data management, recording incoming and outgoing goods, to printing reports. Details of the system flowchart can be seen in the following description:

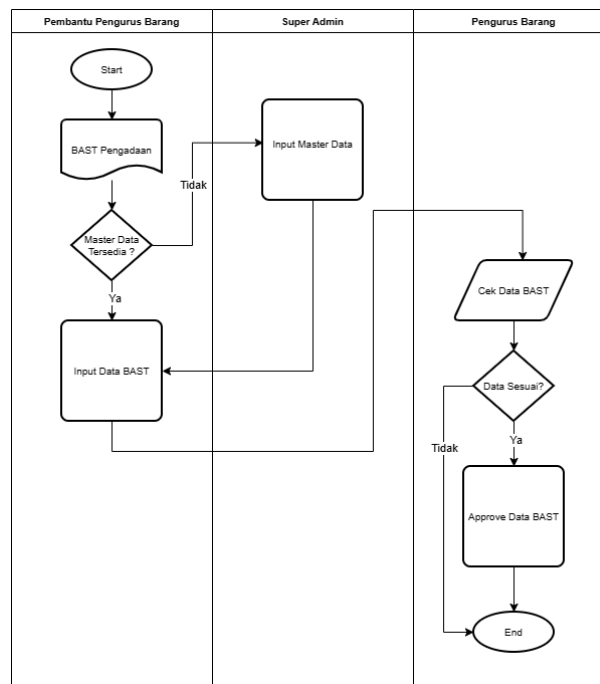


Figure 3. Goods Receipt Process

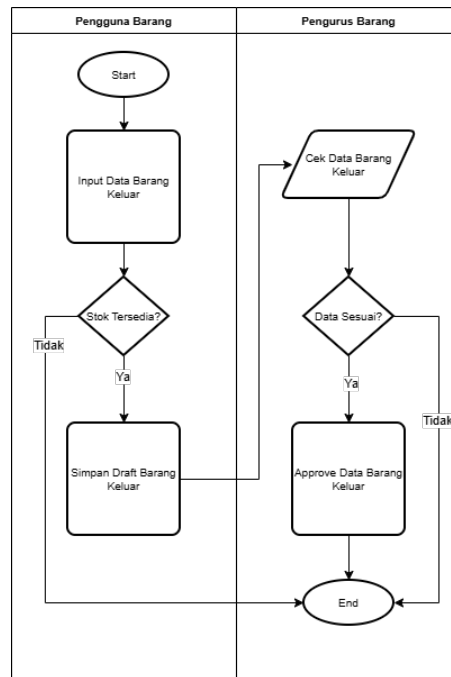


Figure 4. Goods Out Process

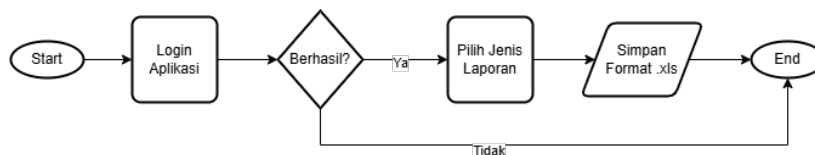


Figure 5. Report Printing Process

C. Data Flow Diagram

According to [10], a Data Flow Diagram (DFD) is a logical model that illustrates the flow of data in a system, including data sources, processing, data storage, and data flow directions.

DATA FLOW DIAGRAM

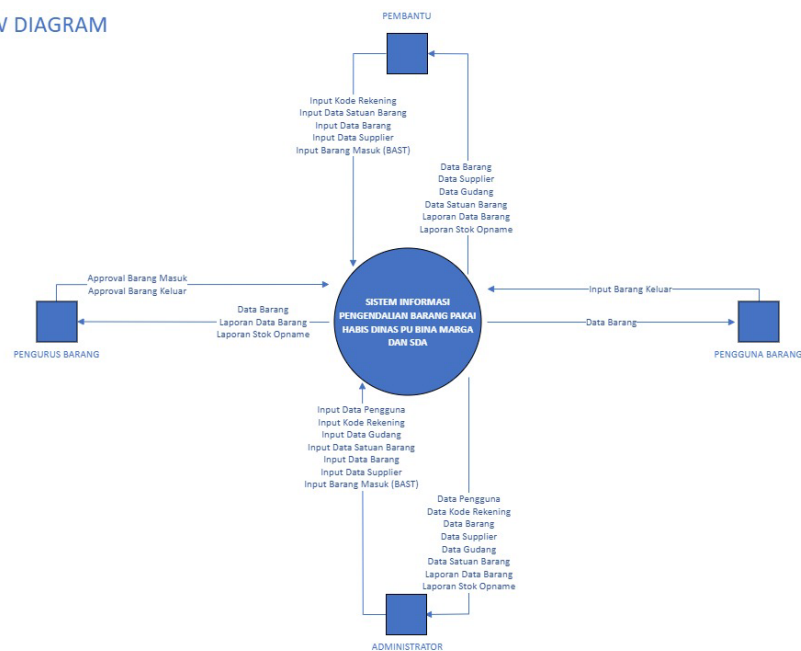


Figure 6. Data Flow Diagram

D. Input-Process-Output Hierarchy (HIPO)

According to [10], HIPO (Hierarchy Input Process Output) is a tool for compiling program specifications in the form of a diagram that illustrates input, process, and output. The following are the inputs and outputs in the consumable goods control information system of the Public Works, Highways, and Water Resources Agency:

Hierarki Input-Proses-Output (HIPO)

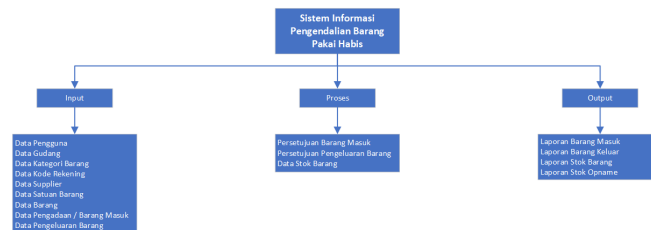


Figure 7. Input-Process-Output Hierarchy

E. Database Design

is a collection of tables used to store and manage data in the Consumable Goods Control Information System, including user data, warehouse data, goods data, category data, unit data, *supplier* data, as well as transaction data for incoming and outgoing goods ().

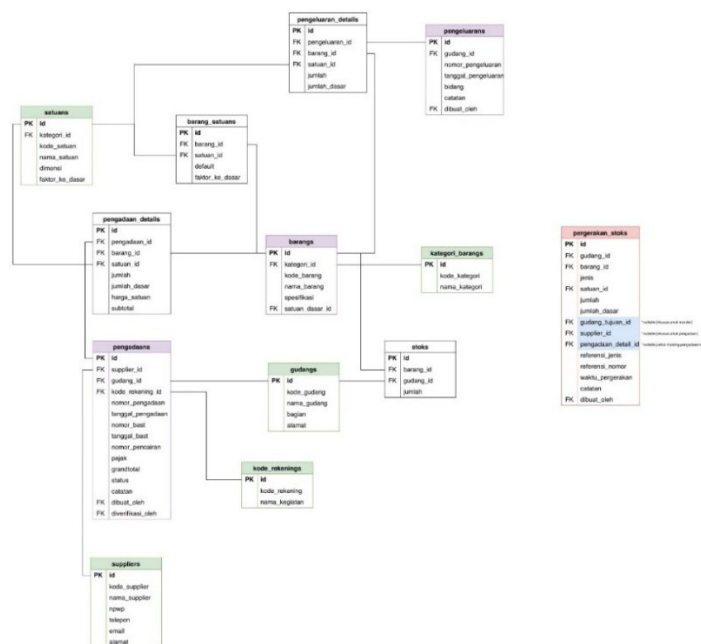


Figure 8. MySQL Database Table Design

F. Interface Design

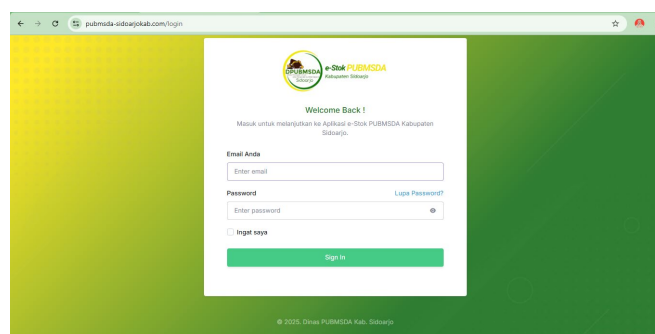


Figure 9. Login Display

Figure 9 shows the *login* page display, which contains a *login form* with email and *password* fields. Only users who have been registered by the Administrator can access the application. This *login* feature is designed to maintain the security and privacy of data stored in the system[6] .

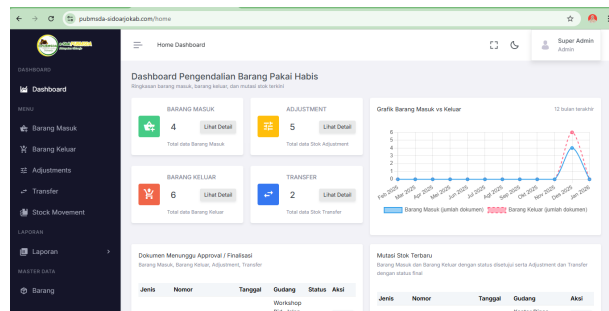


Figure 10. Dashboard Display

Figure 10 shows the *dashboard* page, which contains the application menu, graphical information on incoming and outgoing goods within a one-year period, notifications for incoming goods approval requests, outgoing goods, goods *adjustments*, and *transfers* between warehouses.

Figure 11. Add Item Form Display

Figure 11 displays the goods addition *form* page. This form is one of the master data that can only be accessed by users with Administrator level, this process is implemented to prevent duplication of goods data.

Figure 12. Incoming Goods Form Display

Figure 12 shows the goods receipt *form* page. This *form* can be accessed by users with Administrator and assistant goods manager levels. The amount in the *budget* column must be the same as the amount in the goods details. Goods receipt data requires the goods manager to approve/finalize it so that the goods stock can be stored in *the database*.

Figure 13. Outgoing Goods Form Display

Figure 13 shows the goods out *form* page. This *form* can be accessed by users with Administrator, assistant goods manager, and goods user levels. In *the* select goods *dropdown*, there is information about the remaining stock quantity. Goods out data requires the goods manager to approve/finalize so that the reduction in stock can be saved in *the database*.

2.2 Implementation

After the design phase is complete, the next step is to implement the design into the *program* code. The inventory control system was developed using the PHP programming language with a MySQL database.

2.3 Verification

The next stage is verification or testing using the *black box testing* method, which is functional testing of the system without considering the internal structure. This test aims to ensure that all system features are working properly and to make improvements if errors are found[12] . The *Black Box Testing* method is considered effective for ensuring system compliance with functional specifications, especially in *web-based* applications[9] . The following is the black box testing *form*:

Table 2. Black Box Testing Scenarios

No	Test Form	Expected Results	Test Results
User Login			
1	Login Form	Display <i>Username</i> and <i>Password</i>	Successful
2		Successful login according to <i>User Level</i>	Success
3		<i>Username/Password</i> Error Warning Appears	Successful
Processing Admin Master Data			
4	<i>Dashboard</i> Menu	Displaying the Number of Incoming Goods, Outgoing Goods, Adjustments, and Goods Transfers	Success
5		Displaying Notifications Pending Approval/Finalization	Success
6		Displaying Incoming Goods vs. Outgoing Goods Chart	Success

7		Displaying the Latest Stock Movement Data	Successful
8	Item Master Data Form	Displaying Product Master Data	Successful
9		Can add new items	Success
10		Can change item data	Successful
11		Can delete items with stock = 0	Successful
12		Error message when deleting items with available stock	Successful
13	Category Master Data Form	Displaying master data for product categories	Successful
14		Can add new categories	Success
15		Can change category data	Successful
16		Can delete Category data	Success
17	Unit Master Data Form	Displaying Unit Master Data	Successful
18		Can add new units	Success
19		Can change unit data	Success
20		Can delete unit data	Successful
21	Warehouse Master Data Form	Displaying Warehouse Master Data	Successful
22		Can add new warehouse	Success
23		Can change warehouse data	Success
24		Can delete warehouse data	Successful
25	<i>Supplier</i> Master Data Form	Displaying <i>Supplier</i> Master Data	Successful
26		Can add new <i>suppliers</i>	Success
27		Can change <i>supplier</i> data	Successful
28		Can delete <i>supplier</i> data	Successful
29	Account Code Master Data Form	Displaying account code master data	Successful
30		Can add new account codes	Success
31		Can change account code data	Success
32		Can delete account code data	Successful
33	User Menu Form	Displaying user data	Successful
34		Can add new users	Success
35		Can change user data	Successful
36		Can delete user data	Successful
37	Access Rights Menu Form	Display access rights data	Successful
38		Can add new access rights	Success
39		Can modify access rights data	Successful
40		Can delete access rights data	Successful
Goods Receipt, Adjustment, and Transfer Process Assistant Goods Manager			
41	Goods Receipt Form	Displaying goods receipt data	Successful
42		The incoming goods filter feature is working properly	Success
43		The incoming goods detail feature is working properly.	Success
44		Can add new incoming goods along with item details.	Success
45		Error message when the item details amount does not match the BAST amount	Successful
46	Item Adjustment Form	Displaying item adjustment data	Successful
47		The item adjustment filter feature is working properly	Successful

48		The item detail adjustment feature works well.	Success
49		Can add new item adjustments along with item details.	Success
50	Goods Transfer Form	Displays goods transfer data.	Successful
51		The goods transfer filter feature is working properly	Success
52		The goods transfer details feature works well.	Success
53		Can add new goods transfers along with goods details.	Successful
User Goods Out Process			
54	Goods Out Form	Displaying goods out data	Success
55		The goods out filter feature is working properly	Success
56		The outgoing goods detail feature works well.	Success
57		Can add new outgoing items along with item details and information on available stock	Successful
Approval/Finalization Process by Goods Manager			
58	Dashboard Menu	Displays the number of incoming goods, outgoing goods, adjustments, and goods transfers.	Success
59		Displaying the list of incoming goods, outgoing goods, adjustments, and goods transfers that require approval/finalization.	Success
60		Displaying a graph of incoming goods compared to outgoing goods.	Success
61		Displaying the Latest Stock Movement Data	Success
62	Approval of Goods Received	Displaying goods receipt data	Successful
63		The incoming goods filter feature is working properly	Success
64		The incoming goods detail feature works well.	Success
65		Can approve incoming goods	Success
66		Can reject incoming goods	Successful
67		Can return incoming goods data	Successful
68	Approval of Outgoing Goods	Displaying outgoing goods data	Successful
69		The goods out filter feature is working properly	Success
70		The outgoing goods detail feature works well.	Success
71		Can approve goods out	Success
72		Can reject outgoing goods	Successful
73		Can return outgoing goods data	Successful
74	Goods Adjustment Approval	Displaying goods adjustment data	Successful
75		The goods adjustment filter feature is working properly.	Success
76		The item detail adjustment feature works well.	Success
77		Can approve goods adjustments	Successful
78		Can delete goods adjustments	Successful
79	Goods Transfer Approval	Displaying goods transfer data	Successful
80		The goods transfer filter feature is working properly	Success
81		The goods transfer details feature works well.	Success
82		Can approve goods transfer	Successful
83		Can delete goods transfer	Successful

Report Processing			
84	Report Menu	Displaying report data to be downloaded	Success
85		The filter feature in the report menu is working properly	Success
86		Reports can be downloaded in Excel format (.xls)	Success
User logout			
87	Logout User	Display the login page again after the logout process	Success

$$Skor = \frac{\text{Jumlah Berhasil}}{\text{ItemPertanyaan}} \times 100\%$$

$$Skor = \frac{87}{87} \times 100\% = 100\%$$

2.4 Maintenance

The final stage is maintenance, which involves potential users through the implementation of suggestions and input from the feasibility test results. At this stage, the system is evaluated and refined as necessary to ensure that it meets requirements and to identify potential improvements.

3 Results and Discussion

3.1 System Development Results

The Consumables Control Information System was developed using the *Waterfall* method through the stages of requirements analysis, design, implementation, and testing to ensure that the system runs according to user needs. This system is designed as a digital solution to overcome the problems of recording and controlling consumables inventory, which was previously done manually at the Public Works and Water Resources Office of Sidoarjo Regency. The information system was created using the Laravel Framework with a MySQL database. This makes it easier for staff to monitor data online and anywhere[13]. The main features that have been successfully developed include master data management, recording of incoming and outgoing goods based on user access rights, automatic stock control, and inventory reporting. Functionally, all system features can be accessed and operate smoothly by administrators, assistant inventory managers, inventory managers, and inventory users. Every transaction performed is recorded integrally in the database, supporting data accuracy, management efficiency, and ease of report generation.

3.2 Discussion

Based on the results of functional testing using the black box testing method on 87 test items, all system features achieved 100% of the expected results. This shows that the Consumable Goods Control Information System has met user needs functionally. Testing was conducted on all user interfaces, namely administrator, maker, approval, and goods requesters. The implementation of this system is able to overcome manual recording problems, such as data errors, late reporting, and the risk of data loss. Inventory control is carried out in an integrated manner through the recording of incoming and outgoing goods, which has an impact on increasing stock accuracy and reporting process efficiency.

The key to inventory control lies in the feature that allows users to view stock levels when submitting an outbound goods request, enabling requests to be adjusted according to availability. With a simple interface and stable system, it can be concluded that this system successfully supports the effective and efficient management of consumables and is suitable for use in relevant institutional environments.

4 Conclusion

This research resulted in a web-based Consumable Goods Control Information System designed to improve the effectiveness of inventory management at the Public Works, Highways, and Water Resources Agency of Sidoarjo Regency. Through a research and development (R&D) approach using the *Waterfall* method, this system is capable

of integrating the processes of recording incoming goods, issuing goods, controlling stock, and centralized inventory reporting. The results obtained from this test were compared with the expected results to determine whether there were any errors[14]. The results of the functional testing of the system using the black box testing method showed that all system functions ran according to user requirements specifications with a success rate of 100%. This indicates that the developed system has optimally fulfilled the functionality aspects and is capable of supporting the effective and integrated management of consumables. The purpose of this inventory information system is to facilitate and improve the performance of warehouse staff in inputting incoming goods, managing inventory data, and generating relevant reports[15]. After implementation, this system can improve operational efficiency, speed up the reporting process, and reduce dependence on manual recording mechanisms, thereby supporting the application of the principles of transparency and accountability in the management of Regional Property.

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