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WEBSITE INVENTORY MANAGEMENT SPARE PART INDUSTRY USING SCRUM METHOD

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Abstract

The application of goods inventory in a warehouse for a company is one of the information technologies that help human life in carrying out their daily activities. Applying information technology can support company performance to compete with competitors, making it easier for them to manage and store data. Observation, interview, and literature studies is the several data collection methods used in research. In carrying out its business processes, there are problems experienced by companies, namely they have difficulty managing stock of goods, goods that arrive at the company are directly stored in warehouses that are not arranged in an orderly manner resulting in difficulties in searching, incoming and outgoing goods are not properly recorded, they do not know how many goods are in stock left or have run out due to the many types of spare part goods. This is what causes the goods ordered by customers to be delayed in the delivery process. In addition, repairs to heavy equipment, generators and ships requiring replacement of spare parts by company partners (customers) are delayed. The operational part of the company works not only in the office, but sometimes at home or even in a container depot. The solution to the problems that occur is that companies need a website-based inventory management application. This application was development using the Scrum method. This method is carried out for 4 months as many as 8 sprints. Then, the programming languages used in development applications are PHP code, HTML, CSS, JavaScript, Bootstrap Framework, and MySQL database management system. Application testing uses the black box method in accordance with the test scenario. The application's main menu consists of a dashboard, stock goods, incoming goods, outgoing goods, goods data, types, units, supplier, customer, and user settings, and reports. Applications are made for companies as a solution to solve problems.

Keyword: *application, website, inventory, management, scrum.*

1. INTRODUCING

At present the impact of information and communication technology which is developing is very large in all aspects of human life, including business competition in the increasingly fierce industrial world [1]. Information technology plays an important role as a supporter in making the right decisions based on available information. There are many information technologies that help human life in carrying out their daily activities, one of which is the application of goods inventory in a warehouse for a company or organization [2]. Applying information technology can support company performance to compete with competitors, making it easier for them to manage and store data [3], [4].

Inventory is related to stock keeping [5]. The inventory application is one of the solutions offered to assist companies in documenting data related to the availability and sale of goods to customers [6]. Inventory control is a very important management function for determining the level of inventory that must be maintained so that you don't run out of goods (out of stock) or otherwise experience excessive inventory [7]. The benefits of using this application are saving time in data recording, searching, and information is presented accurately, quickly, precisely [8].

Website-based applications can connect business functions in real time data exchange used on various devices, anywhere and anytime [9]. The use of websites as company information technology can make them faster in sharing data because of its network (online) nature. An inventory website has many uses, such as storing data on incoming and outgoing goods, responding to customer requests, storing information on the availability of goods in warehouses, and displaying reports of existing stock [10]. One of the methods used in developing web-based applications is Scrum. The Scrum method is a methodology included in agile software development [11]. The Scrum method is widely used because it has high productivity, aims to produce application quickly and can adapt to changes, and achieve the expected targets [12], [13].

A company that procures, repairs, maintains spare parts for heavy equipment, generators and ships, which was founded in 2018, has a mission to prioritize customer satisfaction. The main business process it carries out is selling spare parts that meet customer needs to make a profit. In carrying out its business processes, there are problems experienced by

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companies, namely they have difficulty managing stock of goods, goods that arrive at the company are directly stored in warehouses that are not arranged in an orderly manner resulting in difficulties in searching, incoming and outgoing goods are not properly recorded, they do not know how many goods are in stock left or have run out due to the many types of spare part goods. This is what causes the goods ordered by customers to be delayed in the delivery process. In addition, repairs to heavy equipment, generators and ships requiring replacement of spare parts by company partners (customers) are delayed. The operational part of the company works not only in the office, but sometimes at home or even in a container depot.

Thus, the solution to the problems that occur is that companies need a website-based inventory management application so they can manage inventory properly and goods can arrive on time according to customer requirements [14]. This application was developed using the Scrum method which is known to be agile in responding to uncertain conditions, such as changes in user requests during the development process, so that they can be resolved more quickly [15].

2. RESEARCH METHODS

2.1 Application Development

The method used in application development is Scrum consisting of the 5 stages.

2.2 Report

The last step contains the process carried out and the results obtained during the research.

The research method is shown in figure 1. When the application development process has been carried out, there is a condition whether the developed application has been completed. If yes, then proceed to the last step, namely making a report. If not, does the application have new requirements. If yes, then the product backlog creation process will be continued and if not, then the sprint planning meeting process will be carried out.

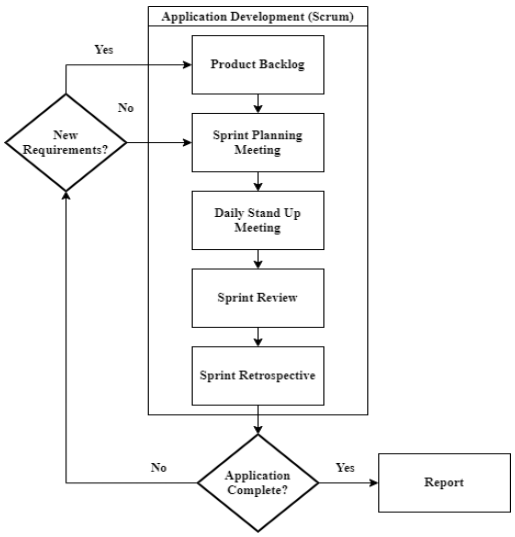

Figure 1. Research Methods [16]

3. RESULT AND DISCUSSIONS

This section contains the results and discussion based on the research methodology used, namely the Scrum method which is shown in figure 2 for developing website-based inventory management applications for companies, the following are the stages [17]:

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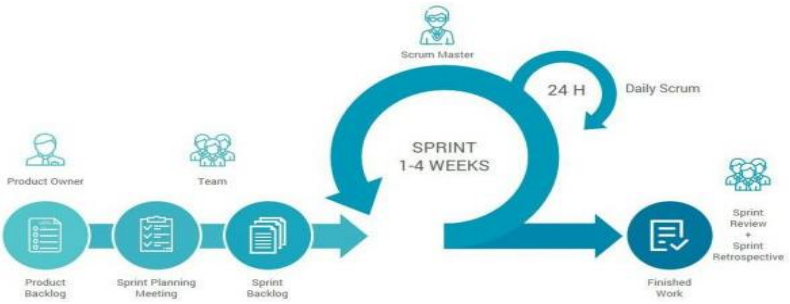

Figure 2. Scrum Method [18]

3.1 Product Backlog

The product backlog in application development which consists of activities or tasks, including the first search and permission for research, then data collection, problem analysis, database design, wireframe design, application development, testing and documentation shown in table 1.

Table 1. Product Backlog

No.	Activity
1	Search and permission to research
2	Data collection
3	Problem analysis
4	Database design
5	Wireframe design
6	Application development
7	Testing and documentation

3.2 Sprint Planning Meeting

This stage is carried out by identifying tasks from the product backlog to produce a sprint backlog. Table 2 is showing the sprint backlog in application development.

1. Search and permission to research
   The research place is a company to obtain data used as research material conducted in the first week of January, sprint 1.
2. Data collection
   There are several data collection methods used in research, namely observation researchers make direct observations in the company to find out the ongoing business processes, interview researchers conducted interviews directly with the General Manager of Operations from the company, and literature studies researchers collect data and information through books, journals, and other sources related to research conducted in the first week of January, sprint 1 [19].
3. Problem analysis
   The process of identifying problems obtained in research to find solutions conducted in the second week of January, sprint 1.
4. Database design
   The process of determining what data should be stored and how the data elements relate to each other conducted in the third and fourth week of January, sprint 2. Where does the data flow come from, where does it go out, is it stored, what are the processes that produce data from the system, and between the data stored, what interactions occur, as well as the process is Data Flow Diagram (DFD) as a diagram used in application design [20], [21]. Entity Relationship Diagram (ERD) used for relational database modeling [22].
5. Wireframe design
   Create a blueprint for compiling the interface display components of an application conducted in the first and second week of February, sprint 3 [23].
6. Application development

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Website-based Inventory Management applications for companies are made using the Scrum method using the PHP code, HTML, CSS, JavaScript, Bootstrap Framework, and MySQL database management system conducted in the third and fourth week of February, sprint 4 and in the first and second week of March, sprint 5.

7. Testing and documentation
   The method used is black box testing to test the functionality of the application based on the test scenario whether it is in accordance with the expected results conducted in the third week of March, sprint 6 [24], [25].

Activity 1 and 2 are the same, the difference is only in the execution time. The activity is repeated due to new requirements from the user.

Table 2. Sprint Backlog

Activity	2023															
	Jan				Feb				Mar				Apr			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	S-1		S-2		S-3		S-4		S-5		S-6		S-7		S-8	
Search and permission to research																
Data collection 1: • Observation • Interview • Literature studies																
Problem analysis 1																
Database design 1 • DFD • ERD																
Wireframe design 1																
Application development 1: • Login and logout • Profile • Dashboard • Goods stock • Incoming goods • Outgoing goods • Goods • Settings • Reports																
Testing and documentation 1: • Create a test scenario • Test apps according to scenario																
Data collection 2																
Problem analysis 2																
Database design 2																
Wireframe design 2																
Application development 2																
Testing and documentation 2																

3.3 Daily Stand-Up Meeting

Evaluate tasks that have been done every day in about 15 minutes with users who are included in the research using Google Meet.

3.4 Sprint Review

Demonstrate completed tasks in each sprint. In sprint 1, the problems experienced by the company that became the research site were found, namely:

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1. Difficulty managing stock of goods.
2. Goods that arrive at the company are directly stored in warehouses that are not arranged in an orderly manner resulting in difficulties in searching.
3. Incoming and outgoing goods are not properly recorded, they do not know how many goods are in stock left or have run out due to the many types of spare part goods.
4. This is what causes the goods ordered by customers to be delayed in the delivery process.

In sprint 2, a solution to the problem was found, namely developing an inventory management application for the company. Figure 3 shows a context diagram that describes all the inputs and outputs of an overview of the entire system and is the highest level of DFD [26]. In the inventory management application there is an entity Director of Operational that can edit profiles, CRUD incoming goods, outgoing goods, goods, types, units, suppliers, customers, users, print incoming and outgoing goods reports, print delivery orders. Then, for the General Manager of Operational entity there is only a difference, he cannot do CRUD users. The application will display a dashboard, stock of goods, list of incoming and outgoing goods, goods, types, units, suppliers, users, incoming and outgoing goods reports, and delivery orders to entities.

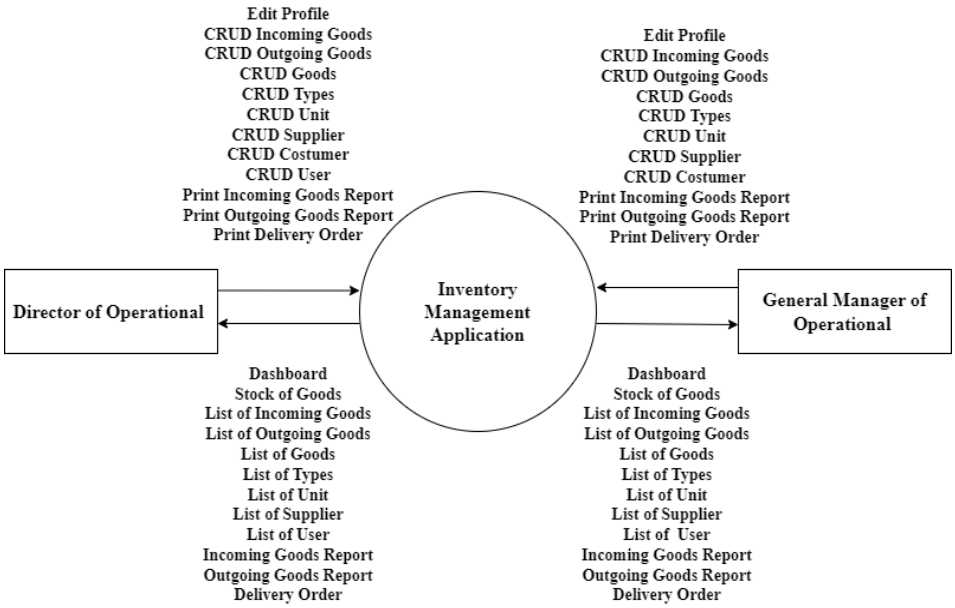

Figure 3. Context Diagram Inventory Management

Figure 4 shows the ERD of the application to be developed which has 8 entities namely users, customers, suppliers, goods, types, units, incoming goods, and outgoing goods. Each entity has attributes along with the data types it uses.

Figure 5 shows the wireframe of the dashboard page. This page is the first page that is displayed when the user successfully login. The header section contains the company name and profile icon for editing and logout of the application for users. Then, the navigation bar on the left contains dashboard menus, stock goods, incoming goods, outgoing goods, goods, settings, reports, and logout.

Figure 6 shows the user interface (UI) design view of the actual dashboard page for the user. The contents of this page are the amount of data on goods, customers and suppliers. Then, displays goods with less than 5 in stock.

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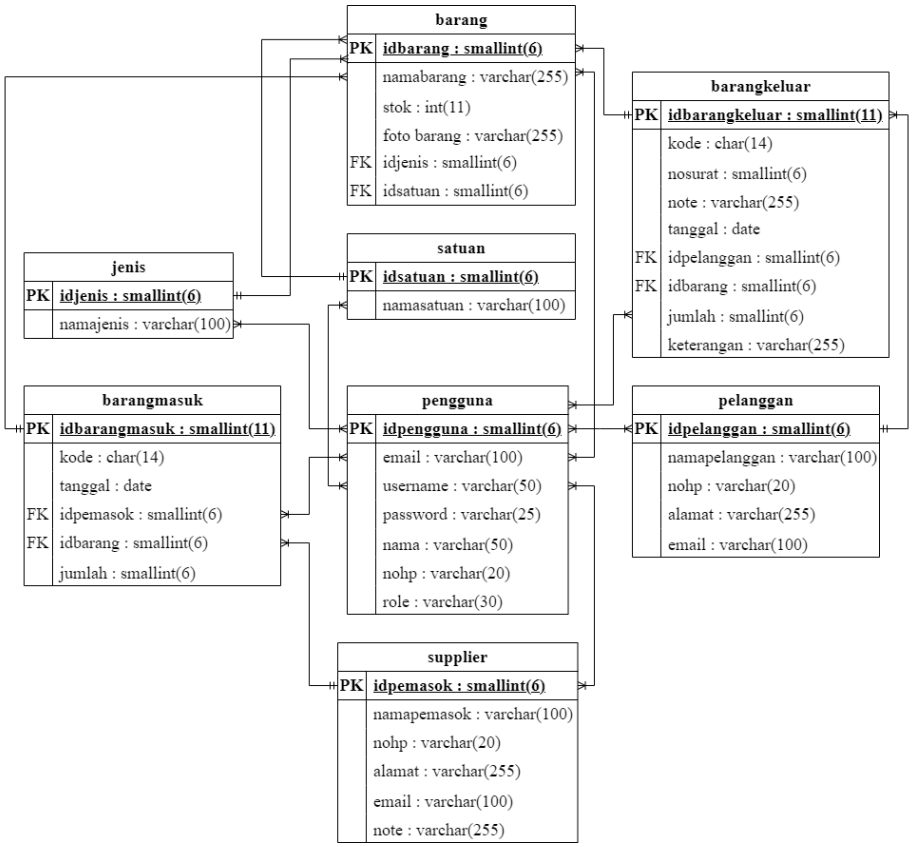

Figure 4. Entity Relationship Diagram

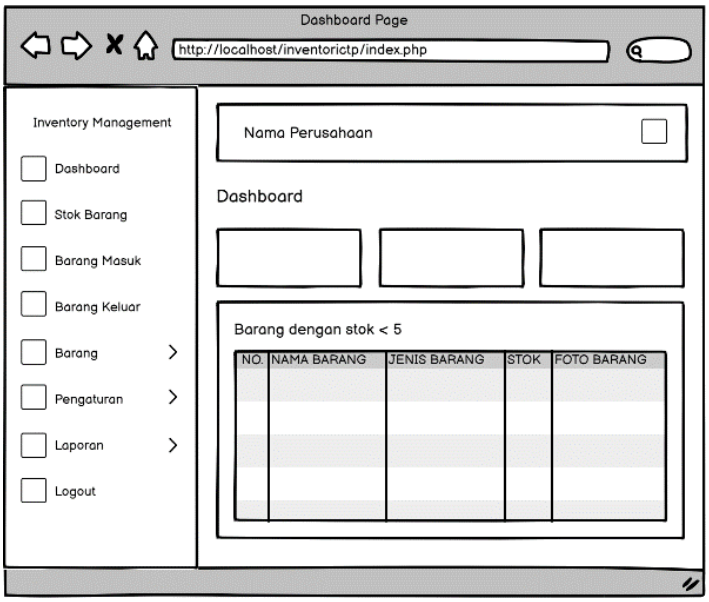

Figure 5. Wireframe Dashboard

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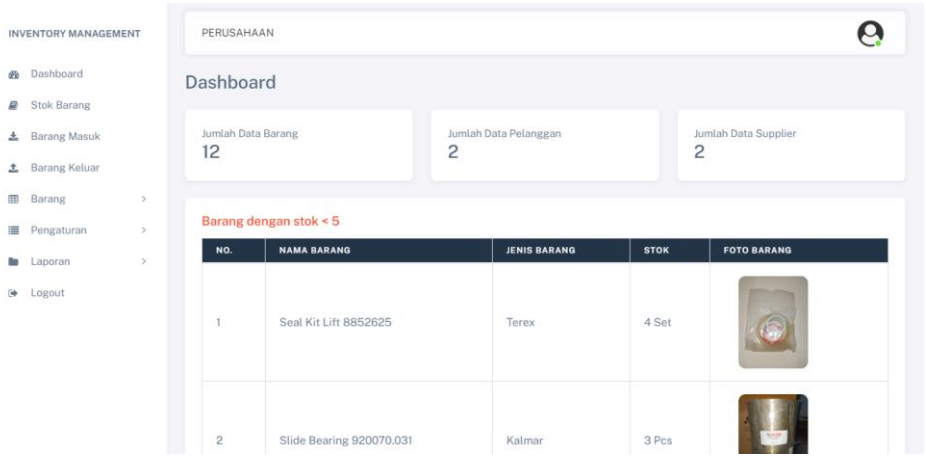

Figure 6. Dashboard UI Design

Table 3 shows the scenarios and test results on applications using functionality test.

Table 3. Black Box Test Scenario

ID	Test Case	Pre-Condition	Test Steps	Expected Result	Actual Result	Status
LO1	Login	The user has not login to the application	1. User input email/username and password. 2. Press the login button.	Login successful	Login successful	Success
LO2	Logout	The user has logged in the application and want to log out.	1. The user select the logout menu. 2. Click OK on the pop up.	Logout successful	Logout successful	Success
P1	Profile	The user needs to edit profile.	1. Select the profile icon on the navbar. 2. Select the edit profile menu.	Edit Profile successful	Edit Profile successful	Success
D1	Dashboard	The user wants to see the contents of the main page.	1. The user selects the dashboard menu on the navigation bar.	Successfully login to the main page	Successfully login to the main page	Success
SB1	Goods Stock	The user wants to see the contents of the goods stock page.	1. The user select the goods stock menu on the navigation bar.	Successfully login to the goods stock page	Successfully login to the goods stock page	Success
BM1	Incoming Goods	The user needs to see and edit the contents of the incoming goods page.	1. Selects the incoming goods menu on the navigation bar. 2. Perform Create, Read, Update, Delete (CRUD).	Successfully login and edit the incoming goods page	Successfully login and edit the incoming goods page	Success

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BK1	Outgoing Goods	The user wants to see and edit the contents of the outgoing goods page.	1. The user selects the outgoing goods menu on the navigation bar. 2. Perform CRUD.	Successfully login and edit the outgoing goods page	Successfully login and edit the outgoing goods page	Success
B1	Goods	The user wants to see and edit the contents of the goods page.	1. The user selects the goods menu on the navigation bar. 2. Perform CRUD data on goods, types, and units.	Successfully login and edit the goods page	Successfully login and edit the goods page	Success
PT1	Settings	The user wants to see and edit the contents of the settings page.	1. The user selects the settings menu on the navigation bar. 2. Perform CRUD suppliers, customers, and users.	Successfully login and edit the settings page	Successfully login and edit the settings page	Success
L1	Reports	The user wants to browse and print a report.	1. The user selects the reports menu on the navigation bar. 2. Select the Incoming/Outgoing Goods report menu. 3. Click download reports according to month and year.	Successfully login and edit the reports page	Successfully login and edit the reports page	Success

3.5 Sprint Retrospective

Express opinions and joint evaluations regarding the performance that has been carried out while implementing the Scrum method.

4. CONCLUSION

Based on the problems obtained through the data collection method, the solution provided for the company is the development of a website-based inventory management application using the Scrum method which is carried out for 4 months as many as 8 sprints. Sprint 1 produces the results of the analysis of the problems that occur, sprint 2 produces the database design in the form of DFD and ERD, sprint 3 produces wireframes, sprint 4 and sprint 5 produces the website application. The programming languages used in development applications are PHP code, HTML, CSS, JavaScript, Bootstrap Framework, and MySQL database management system. In the first week sprint 6 produces the results of functionality tests and on the following the second week and subsequent sprints are iterative processes to complete the application. This application has 2 users, namely the Director of Operational and the General Manager of Operational who can manage stock goods and access all pages in the application. The difference is in the Director of Operational who can manage the list of application users. In the application there is a dashboard page that displays data on the number of goods, customers and suppliers, as well as a list of goods that are less than 5 as a minimum stock to anticipate problems running out of goods which results in delays in the process of sending goods to customers, then the stock page displays a list of existing stocks including name, type, stock, photo, and equipped with a search feature as a solution to the problem of difficulty in finding goods. Furthermore, the incoming goods page displays a list of incoming goods and the outgoing goods page displays a list of outgoing goods, the goods page displays goods, type, and unit data, the settings page displays

supplier, customer, and user data where on all of these pages the user can manage all data with CRUD, as well as report pages. Users can print incoming and outgoing goods reports according to the specified month and year. On the list of outgoing goods and outgoing goods reports there is a delivery order printing feature that is automatically generated by the application in accordance with the outgoing goods list to help the process of purchasing goods transactions by customers.

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