



Web-Based Warehouse Inventory System Using the Waterfall Method: A Case Study at Satria Wholesale Mart

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Abstract

In the digital era, manual warehouse inventory management is still challenging for many business people, including Satria Wholesale Mart. The main problems also faced are irregularities in recording incoming and outgoing goods, low accuracy of stock data, delays in reporting, and difficulties in tracking stock in real time. This finding aims to design and build an efficient and effective web-based warehouse inventory system using the Waterfall method. The finding method used is applied findings with a descriptive qualitative approach, which also aims to describe in detail and systematically the phenomena that also occur in the field and how new systems can be developed to solve these problems. The findings show that applying the waterfall method in developing a web-based inventory information system at PT Herso Ticep Indonesia has also yielded satisfactory results. The system that has also been developed has succeeded in meeting the needs of companies in inventory management, improving operational efficiency, and optimizing inventory management. These findings imply that companies can improve their operational efficiency and optimize inventory management by implementing this information system. The findings could also guide other companies that want to develop similar systems.

Keywords: *Inventory, Information Systems, Waterfall, Web, Warehouse.*

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1. Introduction

In today's digital era, information technology advances have also significantly impacted various aspects of life, including in the industrial world and logistics management [1]. One of the crucial aspects that is also greatly influenced by technological developments is the warehouse management system or inventory management. As centers for storing goods, warehouses play a vital role in the distribution process and meet market needs [2]. Therefore, an effective and efficient warehouse management system is an urgent need for companies, especially in increasing productivity, reducing operational costs, and minimizing human error [3]. One of the solutions that is also relevant and reliable is the implementation of a Warehouse-Based Inventory System Web by using software development methods Waterfall [4] [5].

An inventory-based system web is a modern solution that allows companies to monitor, manage, and manage stock of goods in real-time from anywhere and anytime, as long as they are connected to the internet network [6]. Unlike manual systems or local systems (desktop-based), which also have limitations in terms of accessibility and integration of data, the system-based Web provides convenience in sharing information centrally, speeding up work processes, and improving data accuracy. This is important, especially when many companies have to operate across branches or have an extensive distribution network [7] [8]. Such a system cannot only record data on incoming and outgoing goods. Still, it can also manage product categories, record supplier information, provide minimum stock notifications, and produce automatic reports that are also needed by management [9].

In designing and implementing complex systems such as warehouse inventory, a software development approach that is also systematic and structured is needed [10]. This is where the Waterfall is also the right choice, especially for projects with a scope that has also been clearly defined from the beginning. Method Waterfall Also known as the Waterfall Method, it is a classic software development model that is also sequential and linear [11] [12].

The main advantages of the waterfall method are that it is based on complete documentation and careful preliminary planning [13]. This also provides reasonable control throughout the project so each team member clearly understands their roles and duties [14] [15]. In the development of a warehouse inventory system, this approach allows developers and system owners to define in detail the needs of the system, such as the type of goods that are also managed, the item code system, the reporting mechanism, user access rights, and the needs of the user interface (user interface) which is also intuitive and responsive [16] [17] [18]. These needs are outlined in the functional specification document, which will also be used as a reference during the development process.

Using a warehouse-based inventory system on the Web also strongly supports the automation principle in Industry 4.0, where integrating information technology in the production and distribution process is becoming increasingly important. This system reduces companies' reliance on manual processes, which are prone to errors and data loss [19]. For example, in recording incoming and outgoing goods, this system can use the code barcode Or QR code to speed up the data input process while ensuring the accuracy of the information. In addition, the system is based on the Web. It also facilitates integration with other systems, such as accounting systems, purchasing systems, and customer management systems (CRM), thus creating a digital ecosystem that is also interconnected [20].

The application of a modern inventory system also has a positive impact on management's strategic decision-making [21]. Through real-time reporting and data analysis features, management can accurately know stock conditions, demand trends for goods, and potential shortages or excess stocks. Thus, decisions such as reordering, giving discounts, or rotating stock of goods can be made faster and on target [22]. This will undoubtedly increase operational efficiency and the company's competitiveness in an increasingly competitive market.

Challenges in developing an inventory-based system Web remain. One of the main challenges is ensuring data security and system stability in high-traffic conditions [23]. Therefore, in the system design stage, it is necessary to pay attention to the use of technology, such as the backend, which is also reliable, such as PHP Node.JSON Python, as well as the use of secure and structured databases such as MySQL Or PostgreSQL. In addition, thorough system testing must be carried out to ensure that there are no bugs or security loopholes that irresponsible parties can use. In applying the Waterfall, all development processes must be carried out with discipline and consistency. The needs analysis phase must actively involve stakeholders to identify all business needs fully. The developer must compile blueprint systems in the design phase, including data flowcharts (DFD), database design, and user interface design. After that, the implementation process is carried out according to the design that has also been made, followed by a testing phase to ensure that the system functions according to needs. The final phase, maintenance, includes system repairs, feature updates, and technical support for system users [24].

By following the flow of the Waterfall Disciplined method, the warehouse inventory system that is also developed will have good quality, minimal errors, and be easy to maintain in the long term. In addition, the system is based on the Web, which is also more flexible and adaptive to changes in future business needs [25]. Implementing a Warehouse-Based Inventory System Web Using the Waterfall is also the right strategy for answering the challenges of efficiency and accuracy of warehouse management in the digital era. The combination of ease of access, process automation, and systematic development structure makes this solution relevant and strategic to sustainably support the company's growth and competitiveness. Therefore, investment in developing an inventory system based on modern technology must be seen as a digital transformation step that cannot be avoided by companies that also want to remain superior in the industrial era 4.0 [26].

In warehouse operations, inventory management is a vital element that determines the efficiency of the distribution of goods and the sustainability of the supply chain (supply chain). However, in the field, many systems still run manually, including at Satria Wholesale Mart, a wholesale company that is also developing. They also face irregularities in recording incoming and outgoing goods, low accuracy of stock data, delays in reporting, and difficulties in tracking (tracking) stock in real time. In addition, systems that are also not digitized cause a high dependence on human labor, which also risks triggering human error, delays in the distribution process, and losses due to stock that is also not well controlled. This shows the need for a technology-based system to manage data automatically, quickly, and accurately.

The purpose of the discovery and development of this system is to design and build a web-based warehouse inventory system that is also integrated and user-friendly to help manage goods in the warehouse efficiently and effectively. Another goal is to produce a system that can be used in a multi-user manner with the distribution of access rights, providing automatic and real-time stock reports, and supporting data-based decision-making that is also actual and accurate.

From the academic side, there is also a significant research gap, namely the lack of documentation and in-depth scientific studies on implementing a web-based inventory system in Indonesia's medium and medium wholesale sector with the Waterfall method approach. Most of the findings focus more on manufacturing companies or use Agile methodologies, so this study provides a new perspective on the effectiveness of the Waterfall approach in medium-scale retail business environments. In addition, the limited system that prioritizes integration between a simple user interface and data analytics capabilities makes this finding a valuable contribution to applied information technology.

The urgency of developing this system is very high considering the dynamics of the retail business, which is also increasingly competitive, as well as customer demands for speed and accuracy of service. In today's digital era,

adapting to technology is the key to business success, including inventory management. If they do not transform immediately, companies like Satria Wholesale Mart risk falling behind in market competition, experiencing operational cost inefficiencies, and losing growth opportunities. Therefore, developing this web-based warehouse inventory system is not only a short-term solution to internal problems, but also a long-term strategy in strengthening the company's competitiveness in the digital transformation era.

2. Research Methods

This type of finding is applied research, which also focuses on using science and technology to solve real problems faced by Satria Wholesale Mart, especially in the warehouse inventory management process. The findings are carried out with a descriptive qualitative approach, which also aims to describe in detail and systematically the phenomena that also occur in the field and how new systems can be developed to solve these problems.

Data Collection Methods

1. Observation and Field Study: The researcher conducted direct observations of the Satria Wholesale Mart warehouse to understand the ongoing workflow. Observations are carried out for daily activities such as recording incoming and outgoing goods, processing stock reports, and managing the database of goods. In addition, the researcher also paid attention to user interaction with the existing manual system and obstacles that often arise during the recording process.
2. Documentation Study: The researcher also studied documentation used in the running system, such as item recording forms, stock report books, and report files in spreadsheets. This study helps in designing the database structure and determining the needs of the information system that is also suitable.

Waterfall System Development Methods

The system development method that is also used in this finding is the Waterfall method, which is a classic approach in software development that also has a structured and sequential process. This method was chosen because the system needs at Satria Wholesale Mart have been well-defined and have a development scenario that is also linear. The stages of the Waterfall method are explained as follows:

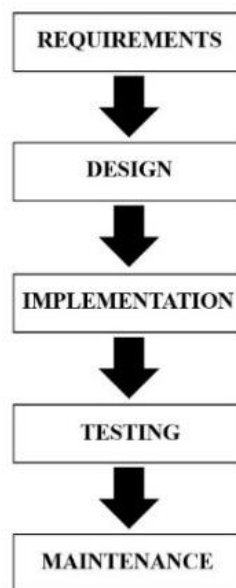


Figure 1. Waterfall Method Process

1. Requirement Analysis: The first stage is to analyze the needs of users and systems. Information was collected from observations, interviews, and documentation. The results of this analysis are used to compile the Software Requirements Specification (SRS), which is also a reference in system development.
2. System Design: Once the system needs are determined, the next stage is system design, including designing the User Interface (UI), database structure, and overall system architecture. The design ensures ease of use, process efficiency, and optimal data integration.
3. Implementation (Coding): At this stage, the system begins to be developed according to the design that has also been made. The programming language is PHP with the CodeIgniter framework, while the

database uses MySQL. The system was developed on a web-based basis to be accessed flexibly using browsers from various devices.

4. Testing: Testing is carried out in stages, from unit testing and integration testing to user acceptance testing (UAT). This test aims to ensure that the system runs as it functions, free from logical errors, and according to the user's needs.
5. Maintenance: Once the system is implemented, the next stage is maintenance. Based on user feedback, the development team will monitor, fix bugs, and develop additional features if needed.

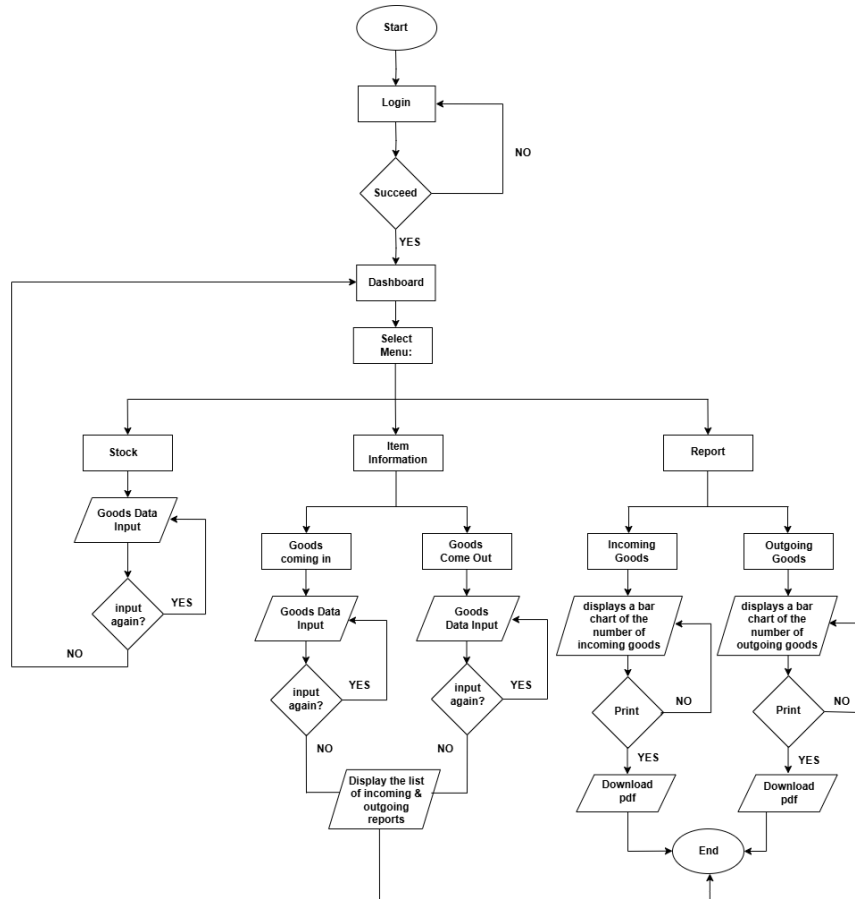


Figure 2. Flowchart of Running Systems

The following flowchart illustrates the manual system workflow that has also been used at Satria Wholesale Mart. The process starts at the Start stage, where the user performs the login process. The system will verify the credentials that are also entered. If the login is successful, the user is directed to the main menu or Dashboard. In the Dashboard, there are three main menus, namely Stock, Item Information, and Report. On the Stock menu, users can input new item data. If there is more than one data set, the user can select the "Input Again" option, but if not, the process ends.

Furthermore, on the Goods Information menu, there are two sub-menus: Incoming Goods and Outgoing Goods. Users manually record data for each transaction entering and exiting the warehouse through this sub-menu. The exact process also ends if there is no follow-up data. In the Report menu, the system will display two types of reports, Incoming Goods and Outgoing Goods, as a bar chart. Users can then choose to print the report, which will generate a PDF file. The entire process ends when the user finishes entering and publishing the report. This flowchart is the primary reference in designing a new system that is also more efficient and automated, with a focus on simplifying the input process, integrating goods data, and automating reporting. After the system is developed based on this flow, the system validation process uses black-box testing to ensure that all functions run according to the specifications. Furthermore, the system is further tested through user acceptance testing (UAT) by involving warehouse staff as the primary user. The results of the UAT show that the system can speed up the input process, reduce the potential for recording errors, and significantly simplify the process of making daily and monthly reports.

3. Results and Discussion

In developing internship management and research application systems, user interface design ensures user comfort and efficiency in interacting with the system. Therefore, the app's interface is designed using Figma, a web-based design tool that allows for real-time collaboration and interactive prototyping. The system's design adopts the principle of user-centered design, focusing on ease of navigation, consistency of visual elements, and responsiveness of the interface. Each page is designed with the user's needs in mind, ensuring the information presented is easy to understand and access.

Table 1. SAGRO User Interface Page Description

No.	Page Name	Main Functions	Interface Elements
1	Login Page	Authenticate the user before accessing the system.	Input form for username and password, "Login" button, and "Forgot Password" option.
2	Dashboard Page	Presents a summary of important information such as stock, outbound goods, goods information, and reports.	Information panel, progress graphs, and quick navigation menus.
3	Item Stock Page	Displays stock information of goods that are also available.	Stock data tables, input forms, and search features.
4	Incoming Goods Page	Record the data of goods that are also entered into the system.	Incoming item input form, incoming item history table, and search feature.
5	Outbound Goods Page	Displays data on goods that have also been out of stock.	Table of outbound goods data, input forms, and search features.
6	Item History Page	Displays a complete history of incoming and outgoing data.	Item history tables, data filters, and search features.
7	Incoming Goods Report Page	Displays a graph report of incoming goods into the system.	Bar graph of incoming goods, data filters, and the option to download reports in PDF format.
8	Outbound Goods Report Page	Displays a graph of the report of goods exiting the system.	Outbound bar graphs, data filters, and the option to download reports in PDF format.

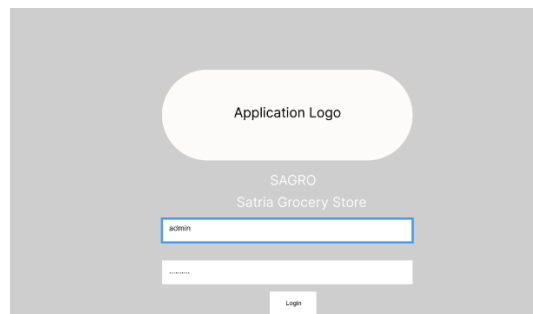


Figure 3. Login Page System Design (Indonesia)

This page is the entrance to the SAGRO system, where users must enter a username and password that is also valid to access the system's features.

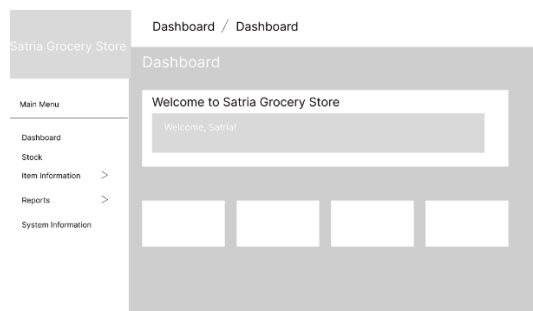


Figure 4. Dashboard Page System Design

Displays a summary of important information such as stock goods, outbound goods, goods information, and reports. The design is simple yet informative for easy navigation and decision-making.

Figure 5. Item Stock Page System Design

Displays a stock list of items that are also available, complete with the name of the item, brand, and number of stock. Users can add, edit, or delete item data as needed.

Figure 6. Outbound Goods Page System Design

Displays data on goods that have also been out of stock, including the item's name, brand, date of exit, unit, quantity, and selling price. It makes it easy to monitor sales activity.

Figure 7. Item Entry and Exit Page System Design

Presents a complete history of the movement of goods in and out, with information on the name of the goods, brands, quantities, status (entry/exit), the date of recording and the last update.

Figure 8. Incoming Goods Report Page System Design

Displays a graph of incoming goods reports based on data that has also been recorded. Each bar on the chart represents the number of items accepted for each type.

System Implementation

Implementing information systems in a trading business is crucial to improve operational efficiency, manage stock of goods, and support more precise decision-making. SAGRO (Satria Grocery Store) is designed to help manage the grocery store's operations, especially in working stock of goods, incoming and outgoing goods transactions, and related reports. This system was built to provide convenience for store managers in monitoring and managing stock, making it easier to record transactions and provide structured reports for business evaluation purposes.

Every part of this system is implemented with features that make it easier for users. The system design is also user-friendly and interactive, making the user experience more efficient and enjoyable. Data security is a top priority when developing this system. That way, only users with access rights can access and modify the data.



Figure 9. Login Page

In Figure 9, you can see the login page of the SAGRO system. This page is the main door that also restricts access to the system. Users are required to enter a username and password that has also been registered. This login page uses an input form-based authentication method with two primary columns: a column for entering a username and a column for a password. After the data is entered, the system will verify that the information provided matches the data in the database.

The main features on this login page are:

1. Secure Authentication: The system uses encryption to store passwords to protect the data sent during the login process from potential data theft.
2. Password Recovery Feature: If users forget their password, they can use the Forgot Password feature to reset it via the email that is also registered.

The login page serves as the first layer of security of the system, ensuring that only users with access rights can access all the data and information in the application.

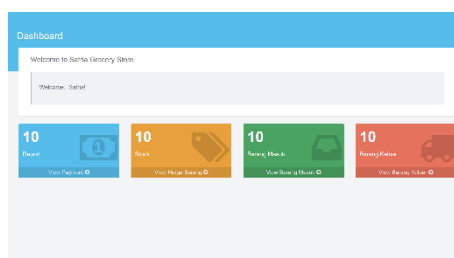


Figure 10. Dashboard Page

Figure 10 shows the Dashboard page, which also provides an overview of the store's operational conditions. This Dashboard integrates various vital data that can also be accessed directly. Some of the main information displayed on this page includes the stock status of goods, incoming and outgoing goods reports, and goods distribution charts.

The Dashboard is equipped with:

1. Data Visualization: Charts and sales reports also show the development of the stock of goods, which makes it easier for users to see the trend of goods movements.
2. Easy navigation: The well-structured navigation menu allows users to quickly move between pages, such as to stock pages, reports, or in/out items.

3. Information Summary: This page displays critical information in a summary form that is also easy to digest. Users can instantly see the current status of various aspects of the store's operations with a single view.

This Dashboard allows managers or store owners to make decisions faster based on data that is also presented in real time.

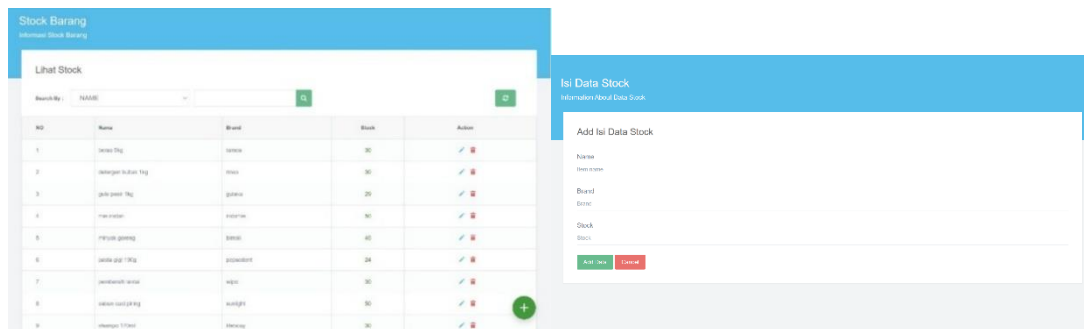


Figure 11. Stock Page

Figure 11 shows a page that also manages stock data of goods. On this page, users can see a complete list of items that are also available, complete with details such as the name of the item, brand, the number of stock that is also left, and the price per unit. Every time a transaction of goods enters or exits, the data on this page will be updated automatically. Some of the notable features on this page are:

1. Item Search: Users can search for items by name or category to make it easier to find items in large stock.
2. Automatic Stock Update: Every item that also enters the system (either through purchase or delivery transactions) will automatically increase the number of stock items that are also registered.
3. Goods Data Management: Users can edit goods data if there are changes related to price, stock quantity, or other information.

This stock page gives users complete control to monitor the inventory of goods that are also available and ensure that the stock of goods is always in an organized condition.

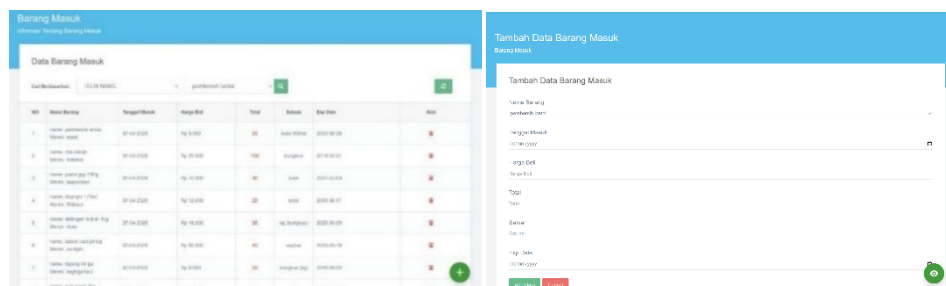


Figure 12. Entry Information Page

Figure 12 illustrates the page used to record every item that enters the store. This page is significant because it records all the goods received from suppliers or agents. Each incoming item entry includes information such as the item's name, the quantity also received, the purchase price from the agent, and the expiration date (if any). The main features on this page include:

1. Input Item Data: Users can easily enter information on newly received goods, including the number of goods and the price per unit.
2. Incoming Item History: Each transaction will be recorded in the history list, making it easier for users to track the items received in a given period.
3. Edit and Delete Options: Users can easily edit or delete the data if there is an input error or change in the incoming transaction.

This page ensures that the data about the goods that also enter the store is recorded accurately and can be easily monitored by the user.

#	Nama Barang	Tanggal Keluar	Jumlah	Harga	Total	Aksi
1	Barang Keluar 1	01-01-2025	10	1000	10000	[Edit] [Hapus]
2	Barang Keluar 2	02-01-2025	20	2000	40000	[Edit] [Hapus]
3	Barang Keluar 3	03-01-2025	30	3000	90000	[Edit] [Hapus]
4	Barang Keluar 4	04-01-2025	40	4000	160000	[Edit] [Hapus]
5	Barang Keluar 5	05-01-2025	50	5000	250000	[Edit] [Hapus]
6	Barang Keluar 6	06-01-2025	60	6000	360000	[Edit] [Hapus]
7	Barang Keluar 7	07-01-2025	70	7000	490000	[Edit] [Hapus]
8	Barang Keluar 8	08-01-2025	80	8000	640000	[Edit] [Hapus]
9	Barang Keluar 9	09-01-2025	90	9000	810000	[Edit] [Hapus]
10	Barang Keluar 10	10-01-2025	100	10000	1000000	[Edit] [Hapus]

Figure 13. Outbound Goods Information Page

In Figure 13, you can see the page used to record goods that are also out of stock. The data that is also recorded includes the name of the item, the amount spent, the selling price per unit, and the date of the transaction. This system allows users to monitor the sales of goods directly and see which items are also in the most demand by customers. Some of the key features on this page are:

1. Sales Transaction Recording: Every time an item is sold, the transaction data is automatically recorded in the system, complete with the selling price and the number of goods also issued.
2. Sales Analysis: By recording the goods that also come out, users can find certain goods' sales patterns and demand trends.
3. Search and Delete Feature: Users can easily search for specific transactions and delete data if needed.

This page is beneficial in monitoring sales and distribution activities so store managers can find out which items are sold the most.

#	Nama Barang	Tanggal Masuk	Jumlah	Harga	Total	Aksi
1	Barang Masuk 1	01-01-2025	10	1000	10000	[Edit] [Hapus]
2	Barang Masuk 2	02-01-2025	20	2000	40000	[Edit] [Hapus]
3	Barang Masuk 3	03-01-2025	30	3000	90000	[Edit] [Hapus]
4	Barang Masuk 4	04-01-2025	40	4000	160000	[Edit] [Hapus]
5	Barang Masuk 5	05-01-2025	50	5000	250000	[Edit] [Hapus]
6	Barang Masuk 6	06-01-2025	60	6000	360000	[Edit] [Hapus]
7	Barang Masuk 7	07-01-2025	70	7000	490000	[Edit] [Hapus]
8	Barang Masuk 8	08-01-2025	80	8000	640000	[Edit] [Hapus]
9	Barang Masuk 9	09-01-2025	90	9000	810000	[Edit] [Hapus]
10	Barang Masuk 10	10-01-2025	100	10000	1000000	[Edit] [Hapus]

Figure 14. Item History Page (Incoming and Outgoing Items)

Figure 14 shows a history page that records all the movements of goods, both incoming and outgoing. Each transaction is recorded in detail, including the name and brand of the item, the number of goods, and the transaction date. This page provides a comprehensive overview of the stock flow of goods in the system. Some of the essential features on this history page include:

1. Transaction History: All incoming and outgoing goods transactions are recorded, allowing users to view the track record of the movement of goods.
2. Search Filters: Users can search for specific transactions using various search filters, such as date, item type, or transaction status.
3. Data Management: Users can delete or edit irrelevant entries, keeping the data accurate and organized.

This history page helps store managers track the overall movement of goods and ensure that no transactions are missed.



Figure 15. Report Page – Incoming Item Diagram

Figure 15 shows a report page with a graph of the incoming goods. This graph illustrates the number of goods received from different types of goods in a given period. Each bar in the graph represents the volume of goods

received, allowing users to analyze the comparison between goods against each other. Some of the key features on this report page are:

1. Clear Data Visualization: By using bar graphs, incoming goods data can be easily viewed, clearly showing which products are most commonly received.
2. Report Download Option: Users can download the report in PDF format to related parties for documentation or reporting purposes.
3. Period Filter: Users can select a specific period to analyze incoming goods data within that time range.

This report page allows store managers to monitor the movement of incoming goods in detail and compile the necessary reports easily.



Figure 16. Report Page – Outbound Item Diagram

Figure 16 shows the output report, which is also presented as a bar graph. This graph provides information about the number of items left the store in a given period. Users can see which items are sold the most or used by customers. The main features on this outgoing goods report page include:

1. Outbound Goods Comparison Graph: Allows users to see which items sell the most in a given period.
2. Download Report: Like the incoming goods report, the outbound goods report can also be downloaded in PDF format for administrative and reporting purposes.
3. Select Period: Users can select a specific period to view outbound goods data in that time range.

This page is handy for analyzing sales activities and the distribution of goods from the store to customers.

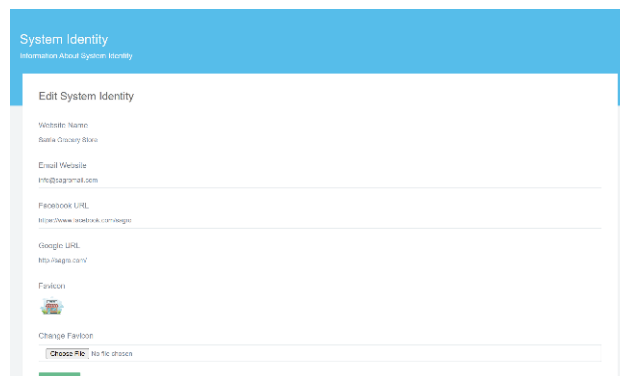


Figure 17. System Identity Page

In Figure 17, you can see a page to manage the identity of the system or application. This page allows admins to update system-related information, including website names, official email addresses, and links to social media accounts such as Facebook and Google.

Key features on this system identity page include:

1. Website Information Management: Admins can update the website name or contact information displayed on the application.
2. Replace Favicon: Admins can change the favicons that appear in the browser tab when the app is opened.
3. Social Media Settings: Admins can also add or update links to the app's social media accounts to make it easier to interact with users.

This identity page allows admins to manage system information easily and efficiently, keeping the app up-to-date.

System Validation Test Results and Display Testing

Validation Test Results

The system validity test is carried out to ensure that every function and feature in the application runs as expected. This testing process involves checking the various menus and functionalities in the system, from the login page to the creation of reports.

Table 2. Results of the SAGRO System Validity Test (Satria Grocery Store)

Yes	Tested	Method	Result	Output
1	Login Page	Enter the username and password and click login	Displays the main page if the data is correct, displays an error message if the data is incorrect	Successful
2	Home	Access the main page after logging in	Displays a dashboard with Incoming Goods, Outbound Goods, Goods History, and Report menus	Successful
3	Dashboard - Incoming Items	Select the Incoming Items menu	Go to the Incoming Items page	Successful
4	Dashboard - Outbound Goods	Select the Outbound Items menu	Go to the Outbound Items page	Successful
5	Dashboard - Item History	Select the Item History menu	Go to the Item History page	Successful
6	Dashboard - Report	Select the Report menu	Go to the Report page	Successful
7	Stock - Input Data	Input data of new goods (Item Name, Brand, Stock)	Goods data is successfully stored in the stock table	Successful
8	Stock - Edit Data	Edit existing item data	Item data is successfully updated	Successful
9	Stock - Delete Data	Delete existing item data	Item data was successfully removed from the stock table	Successful
10	Goods Information - Incoming Goods	Incoming goods data input (Item Name, Date of Arrival, Selling Price, Total, Qty)	The data is successfully stored in the Incoming Goods table	Successful
11	Item Information - Outgoing Goods	Input data of outbound goods (Item Name, Date of Exit, Purchase Price, Total, Qty, Exp Date)	Data successfully stored in the Outgoing Goods table	Successful
12	Item Information - Item History	Access the Item History page	Automatically display incoming and outgoing goods data	Successful
13	Item Information - Delete Data	Delete data on one of the item information tables	Data was successfully deleted from the selected table	Successful
14	Reports - Incoming Goods	Select the Incoming Goods menu	The incoming goods report is available for download in PDF format	Successful
15	Reports - Outgoing Goods	Select the Outgoing Goods menu	Outbound reports are available for download in PDF format	Successful

Based on the results of the validity test, which is also listed in the table above, it can be concluded that all functions in the SAGRO system function well and are following expectations. Every feature, from login to report creation, has been tested and successfully displayed results according to the instructions.

1. The Login page works well in verifying user data and ensuring access is only granted to users who are also registered.
2. The Main Dashboard displays a complete menu and provides easy access to essential features, such as Incoming Items, Outgoing Items, and Reports.
3. Every other feature, such as entering goods data, editing and deleting goods data, and reporting incoming and outgoing goods, has been successfully tested and can be easily accessed by users.

With the results of the validity test that are also successful at every step, this system can be said to be ready to be used in daily operations and provides an effective solution for managing a grocery store.

Display Testing

The test on the front end of the SAGRO (Satria Grocery Store) System uses the System Usability Scale (SUS) in the form of a questionnaire. This test aims to determine the user's perception of the suitability of the application. The number of respondents used was 20 respondents. The Satria Agent Shop owner and several Universitas Buana Perjuangan Kararawang students completed the questionnaire.

Table 3. Results of the SUS Questionnaire of the SAGRO System (Satria Grocery Store)

Respond	SUS Statement Score										Total Score	Score SUS
	1	2	3	4	5	6	7	8	9	10		
Answer 1	3	4	4	3	4	4	3	4	3	4	36	90
Answer 2	4	4	3	4	4	3	4	3	4	4	37	92.5
3 answer	3	3	3	3	4	4	4	4	3	3	34	85
4 answer	4	4	4	4	3	4	3	3	4	4	37	92.5
5 answer	3	4	3	4	4	4	3	4	3	3	35	87.5
6 Answers	4	4	4	3	3	4	3	4	4	3	36	90
7 Answers	3	3	3	4	4	4	3	3	4	4	35	87.5
8 Answers	3	4	4	4	4	3	3	4	3	4	36	90
9 Answer	4	4	4	4	3	4	4	3	3	4	37	92.5
10 answer	3	3	3	4	3	3	4	4	4	3	34	85
11 Answer	4	3	4	3	4	3	3	4	4	3	35	87.5
12 Answer	3	4	4	4	4	3	4	3	3	4	36	90
13 Answer	4	3	3	4	3	3	4	3	4	4	35	87.5
14 Answer	3	3	4	4	3	3	3	4	4	4	35	87.5
15 Answer	4	4	3	3	4	3	4	4	3	3	35	87.5
16 Answer	3	4	4	3	4	3	4	3	3	4	35	87.5
17 Answer	4	3	4	3	3	4	3	3	4	3	34	85
18 Answer	3	4	3	4	4	4	4	3	3	4	36	90
19 Answer	3	3	4	4	3	4	3	4	4	3	35	87.5
20 Answer	4	4	3	4	4	3	3	3	4	4	36	90
Sum											1760	

After the SUS score is obtained from all respondents, the score is summed up, and then the average is taken using the following equation:

$$\bar{x} = \frac{\sum x}{n} = \frac{1760}{20} = 88$$

Information:

$\bar{x}$ = average score

$\sum x$ = total SUS score

n = number of respondents

Based on testing on the Satria Voting Agent website conducted on 20 respondents, an average SUS score of 88 was obtained. Based on the System Usability Scale (SUS), the scores obtained from the UMM satria agent web test results are in a position with an EXCELLENT rating.

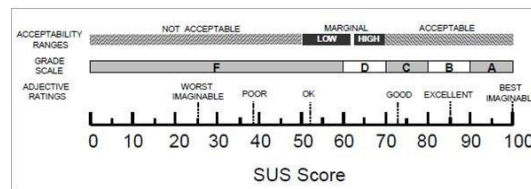


Figure 18. Rating: SUS Score

4. Conclusion

Based on all the data and explanations that have also been submitted regarding the implementation of the SAGRO (Satria Grocery Store) system, it can be concluded that the development of this system aims to improve warehouse operational efficiency through the application of web-based technology that also automates the recording and reporting of goods. The system, which is also designed using the waterfall method, has various features that greatly support the smooth management of stock, incoming and outgoing goods, and goods distribution reports. A secure login process, an informative dashboard display, and menus that make it easier for users to manage stock and goods transactions, are important aspects that support the system's ease of use. In addition, each page in the system is designed in detail, such as an item information page that also separates incoming and outgoing data on goods and the history of goods movements that facilitate real-time stock monitoring. The report feature, which is also presented as a bar chart, provides visual analysis that is very useful in evaluating the flow of goods that are entering and exiting.

In contrast, the report download system in PDF format speeds up the documentation process. System testing through black-box testing and user acceptance testing (UAT) methods shows that the system can improve data accuracy, speed up the input and report process, and make warehouse staff work easier. The implementation of this system has succeeded in improving operational performance at Satria Wholesale Martin in a way that is also efficient, safe, and more automated, providing an appropriate solution to stock management problems previously carried out manually. In addition to functional testing, tests were also carried out on the appearance of the system interface using the System Usability Scale (SUS) questionnaire. Based on the tests conducted on 20 respondents, an average SUS score of 88 was obtained. According to the SUS interpretation standard, the score is rated Excellent, which indicates that the system interface is excellent, easy to use, and acceptable to users.

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