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Stock Information System for All Smartphone Brands Using Barcode

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Abstract

In the era of globalization, rapid technological development brings convenience and speed in completing human tasks. A barcode is a collection of optical data read by a machine, consisting of widths and parallel line spacing. This research develops a web-based inventory system to minimize errors and manipulation of stock data using barcodes, facilitating accurate and accessible stock management. The results show a significant efficiency increase compared to manual methods, reducing data entry errors by 85% and accelerating stock management processes. Compared to manual and QR code systems, the barcode-based system offers higher efficiency for real-time stock updates and improved data accuracy due to its simplicity and scanning speed. The study uses the waterfall methodology, which follows clear phases: analysis, design, implementation, testing, and maintenance. This structured approach suits projects with well-defined requirements, providing thorough documentation and minimizing changes during development. Implementation at All Brand Smartphone demonstrates improved inventory management efficiency and operational accuracy, making it a reliable solution for modern stock management.

Keywords: Barcode Technology, Inventory System, Stock Management, Waterfall Methodology, Data Accuracy

1. Introduction

In the current era of globalization, the rapid development of technology and information has brought significant changes in various sectors, including in the management of company operations. Various modern development tools can now be used to transform manual methods into more efficient and automated systems [1]. Along with the increasing complexity of problems due to increasingly tight technological competition, innovation is needed that can minimize errors in problem solving [2]. One solution that is widely implemented is a computerized system, which helps reduce operational costs, reduces paper use, and facilitates the data collection process (Kusuma, 2020; Josi, Irwan, & Dani, 2022).

Computer-based systems have an important role in increasing work time efficiency and facilitating data management, especially in inventory management [3]. With the support of increasingly advanced software and hardware developments, data processing such as recording incoming goods, outgoing goods, and inventory becomes faster and more efficient. This will have a direct impact on the effectiveness and efficiency of the company's performance when compared to the manual system [4].

All Brand Smartphone, a company engaged in the sale of electronic goods, especially mobile phones, faces challenges in managing stock. Stock recording which is still done manually, such as sending text messages to superiors, is prone to data errors, especially if incoming or outgoing goods data is lost or deleted. In addition, manual stock calculations make it difficult for companies to monitor the number and condition of goods accurately, which can lead to a buildup of goods in the warehouse. To overcome these problems, a barcode-based input system is needed that can manage incoming, outgoing, and inventory data automatically. With this system, data will be stored more safely, accurately, and easily accessed.

Previous research conducted by Panjaitan and Utami [5] entitled "Implementation of Barcode Scanners in Stock of Goods at PT. Sari Pati" designed an Android-based application using Java and a MySQL database. The application allows each item to have a scannable barcode label, so that the stock management process becomes automatic and reduces the need for manual input. The results of the study showed an increase in the efficiency and accuracy of stock data.

Another study by Siregar et al. [6] also showed that the implementation of a web-based barcode system

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in retail companies succeeded in reducing the rate of stock recording errors by up to 85%. In addition, research by Pratama and Sulastri [7] highlighted the success of the integration of barcode technology in optimizing the inventory process in distribution warehouses. This study aims to implement a barcode system in stock management in All Brand Smartphone to reduce recording errors, speed up the process of recording incoming and outgoing goods, and increase the efficiency of stock management. With this system, it is expected to help companies manage inventory more effectively and efficiently.

The waterfall method was chosen in this study because it has a structured workflow with clear stages, namely needs analysis, system design, implementation, testing, and maintenance. This model is suitable for application because the system requirements are clear, with well-defined specifications from the start. In addition, the waterfall method allows for a neat and systematic documentation process, which is very important in developing barcode-based stock management applications [8]. Compared to other methods such as Agile which are more flexible but less suitable for needs with a defined scope, waterfall is more suitable for this research because it minimizes major changes in the middle of the development process.

2. Research Methods

2.1 Data Collection Techniques

The method used in this study is a method that focuses on observing data and collecting data using observation, interviews, and literature studies. However, there are several aspects where qualitative methods can also be used to improve the system [9]. In this method, the author uses several stages including data collection, software development and determining stock of goods.

The stages of data collection carried out in field research and library research.

a. Observation

Conducting direct observations at the All Brand Smartphone store in Tanjung Balai City. From the results of the observation, it was found that employees were still doing data collection manually. The author observed the process of recording purchases of goods (Goods in), the process of recording sales of goods (Goods out), and stock reports.

b. Interviews

Interviews were conducted directly with employees and store managers to obtain detailed information. The purpose of the interview was to collect the data needed to design an application on how to record incoming and outgoing goods, the process of making reports of incoming and outgoing goods, the process of making stock reports.

c. Literature Study

A literature study was conducted to obtain data with various references to obtain information relevant to the problem, both from books, journals, and previous research on inventory information systems.

In data collection, data results were found to facilitate the needs analysis process, data collection is divided into two parts, namely primary data and secondary data.

a. Primary Data

Primary data is data obtained directly from the first source or through direct observation in the field. In this study, primary data was obtained by interviewing employees. This interview aims to obtain information about the stock of goods in stores in Tanjung Balai City [7].

b. Secondary Data

Secondary data is data obtained from other sources such as journals, books, and websites to complement primary data. In this study, a literature study of the inventory information system [10].

2.2 System Development Method

The method used in this study is the waterfall method. The waterfall model is a systematic and sequential approach development method. There are 5 phases in the waterfall method, namely requirements analysis, system design, implementation, integration and system testing, and maintenance. In its implementation, the maintenance phase is not discussed in this study, so that the development stages used only up to phase four [11]:

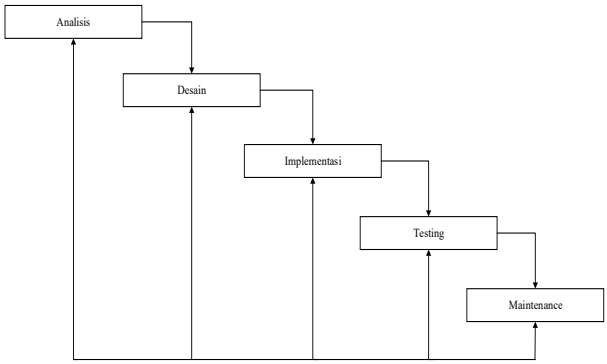

Figure 1 Waterfall Method

a. Analysis

The recruitment analysis or system requirement specification stage is a needs analysis based on user needs to solve existing problems. The stock information system for various smartphone brands plays a very important role in maintaining smooth business operations and ensuring that products are always available to customers. With efficient management, businesses can increase customer satisfaction, reduce waste, and maximize profits. However, to ensure the

success of this system, companies must face challenges related to demand fluctuations, stock complexity, and management of various distribution channels. Therefore, it is important for companies to choose the right system and continuously monitor and optimize their stock management. The analysis includes system services, system limitations and objectives described in a system specification [3].

1) Needs analysis
   A stock information system for all smartphone brands is very important to ensure efficient inventory management. This system must have key features such as product management, stock, transactions, and reports, and be supported by security, high performance, and ease of use. Implementation of this system can help businesses improve operational efficiency, reduce the risk of running out of or overstocking, and improve customer service. Functional requirements are the main features that must be possessed by the system in order to function according to its objectives. The functional requirements that must be possessed by the stock information system are product data management, stock management, supplier and distributor management, transaction management, and tracking and reporting management system requirements.
2) Security analysis
   The security of the stock information system on all smartphone brands must be taken seriously to prevent internal and external threats. By implementing strong authentication, data encryption, network security, and application protection, the system can remain safe and reliable in managing stock. Some strategies for system security are:
   - Access and authentication using multi-factor authentication, access according to its role, recording activity in the system.
   - Data security using data encryption, automatic data backup, database protection.
   - Network security using firewall and intrusion detection system, long-distance VPN, HTTPS and SSL/TLS security.
   - Application security using input validation, updates, security testing.
3) System performance analysis
   The performance of the stock information system for various smartphone brands is very important to ensure that the system runs quickly, efficiently, and can handle high workloads. System performance analysis covers various aspects, including response speed, scalability, resource efficiency, and resistance to high loads. The performance of the stock information system is highly dependent on infrastructure optimization, database design, application architecture, and resource management. By implementing strategies such as load balancing, caching, database optimization, and real-time monitoring, the system can work optimally, handle large transactions, and provide a fast and responsive user experience.
4) Feasibility analysis
   A feasibility analysis is conducted to assess whether the inventory information system is feasible to be implemented in an organization or business. This assessment includes several aspects such as technical, economic, operational, legal, and schedule to ensure that the system can run effectively and provide maximum benefits. The aspects of system feasibility include technical feasibility, economic feasibility, operational feasibility, legal and regulatory feasibility, and schedule feasibility.

b. Design

The next stage is system design, at this stage the developer produces an overall system architecture, in addition at this stage will create a software flow, requirements for hardware and software and the flow of the system being built [12].

c. Implementation

The next stage is the implementation stage, which is the stage where the resulting design is implemented into program codes. The program code created produces program modules which will later be integrated into a complete system to ensure that the software requirements have been met [13].

d. Testing

The next stage is integration and system testing by carrying out integration of module integration and final testing by users, namely assigned company employees, including installation and training for the use of the system that has been created [14].

e. Maintenance

The next stage is maintenance, which is the process of maintaining, repairing, and improving the system so that it continues to function properly and according to needs. Maintenance is the last step of the waterfall procedure where the system that has been designed and built is ready to use.

2.3 Stock Support Method

For technology systems to process transactions, record sales data, and manage stock using the Perpetual method (Perpetual Inventory System). The Perpetual method (Perpetual Inventory System) is an inventory management system where stock records are updated continuously and in real-time every time there is a transaction that affects the amount of stock, such as sales, purchases, returns, or transfers of goods. The perpetual method is usually integrated with the point of sale system because every time there is a sale, the stock

will be updated automatically, this ensures that management always has the latest stock data.

3. Results and Discussion

3.1 System Design

A use case diagram is used to develop an information system to describe the advantages of the system, and there are 2 use cases used, namely admin and employee.

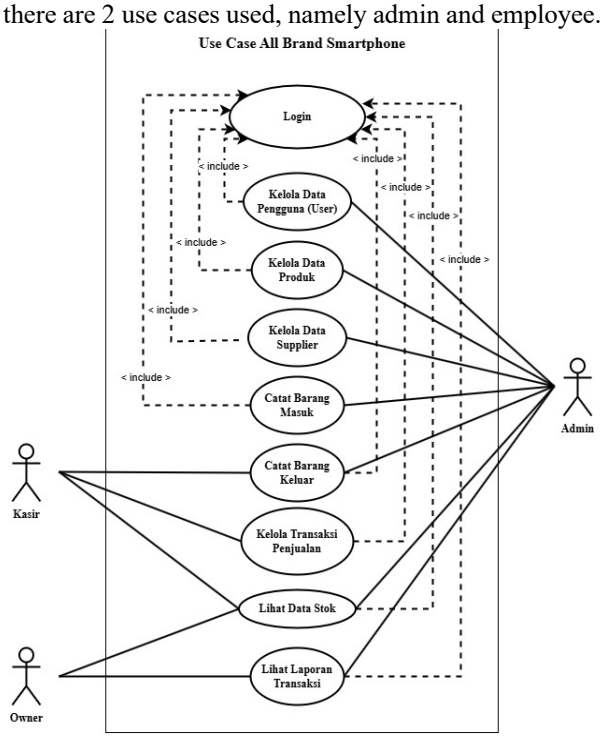

Figure 2 Use Case

3.2 System Implementation

The next stage is the implementation stage, which is by implementing the design results in the previous stage into a program consisting of a login form, incoming goods form, outgoing goods form, stock of goods form, incoming goods report form, outgoing goods report form.

1. Login Form

The login page display, the user must first log in by entering a username and password.

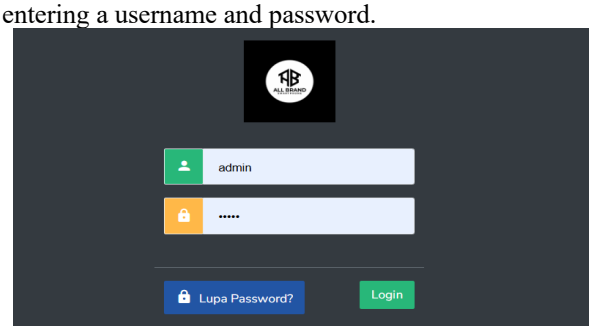

Figure 3 Form Login

2. Dashboard Form

The dashboard display displays all activities that occur starting from new products, second products, total products, total stock, total transactions, total stock sold, incoming stock, and outgoing stock.

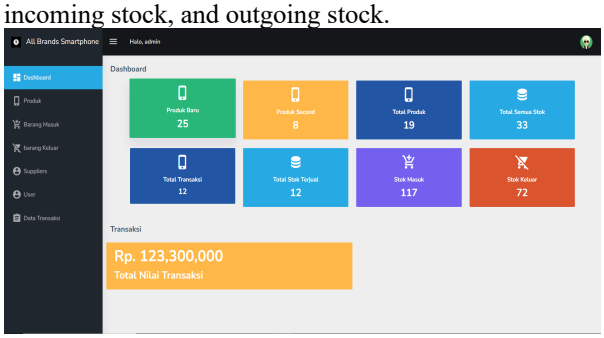

Figure 4 Dashboard Form

3. Product Data Page

The product data page display, a page that displays item data such as item barcode, item name, item warranty, item product stock, item data input date and a place to monitor remaining or item stock.

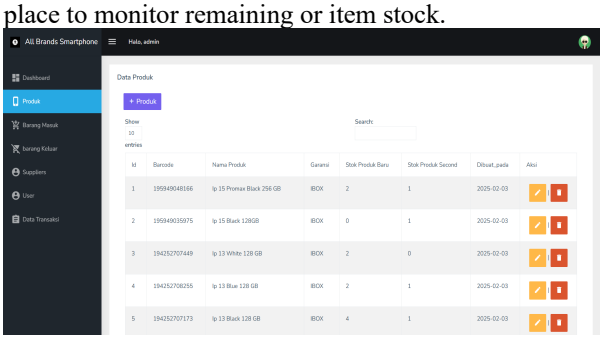

Figure 5 Product Data Page

4. Incoming Goods Display

The incoming goods page display, there is a page that displays all types of incoming goods such as supplier, barcode, incoming product name, product condition, warranty, product purchase price, product selling price, incoming goods stock, description, incoming date and there are edit and delete goods features.

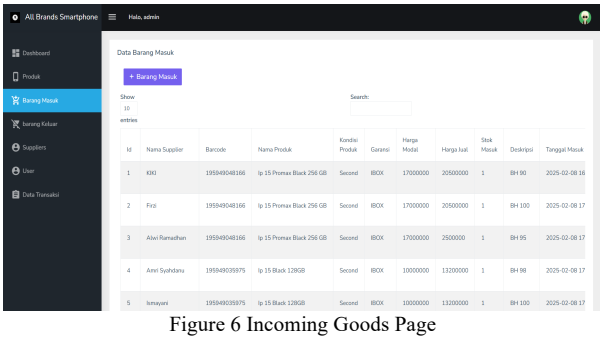

Figure 6 Incoming Goods Page

5. Outgoing Goods Page

The outgoing goods page displays the name of the outgoing goods, the stock of goods to be issued, notes, the date of issue, and there are edit and delete features.

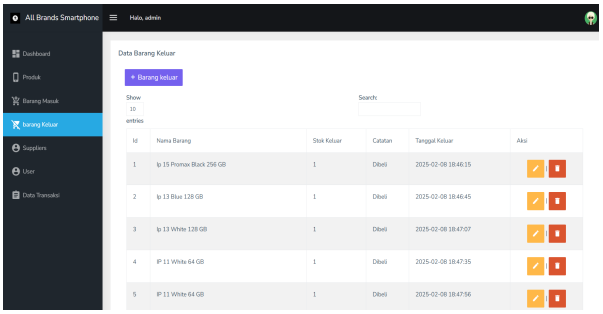

Figure 7 Outgoing Goods Page

6. Supplier Page

The supplier page display displays supplier data that sells the products we will buy such as supplier name, supplier phone number, supplier address, date the supplier sold the goods and there are edit and delete action features.

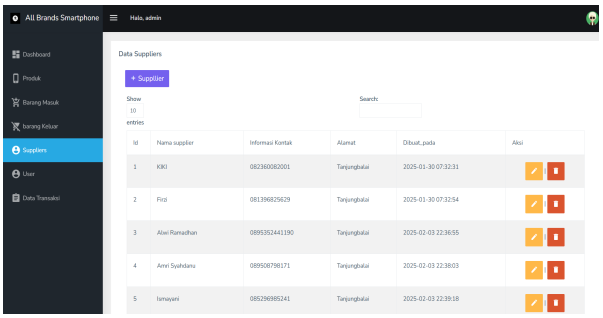

Figure 8 Stock Page

7. User Page

The user page display shows who can access this system, such as the admin who inputs everything that happens at that time, the owner who monitors all types of goods that come in and out, usually this is only owned by the boss or company owner, and there is a cashier who is to display only goods that come out or goods sold.

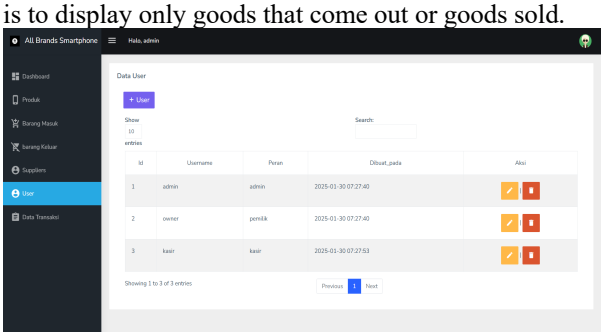

Figure 9 Incoming Goods Report Page

8. Transaction Data Page

Display of outgoing goods report, contains the names of goods sold and can be printed.

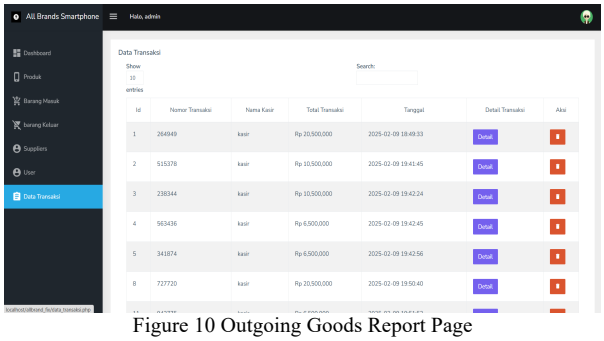

Figure 10 Outgoing Goods Report Page

3.3 Testing

The inventory information system must be designed to handle various extreme scenarios, such as high transaction spikes or barcode scanning errors. The strategies used to overcome transaction spike handling situations include dividing work to several other servers, using caching indexes, and sharding to speed up data access, handling transactions in parallel and quickly so that the system does not pile up. The strategies used in handling barcode scanning errors are data validation, manual input, real-time error notifications and multi-scanner support. The strategy for handling stock errors due to double scanning or input errors can use a duplication detection mechanism, transaction confirmation, and audit logs or history tracking. The strategy for handling system failures or internet connections is that the system can be run in offline mode, backing up and failing over, or using a backup system when the main server fails.

In testing the stock information system using barcodes, a series of tests have been conducted to ensure its optimal functionality. Testing begins by checking the ease of use of the website by the admin. The system successfully identifies the admin through a secure process and the admin can upload data without facing technical obstacles. The system also successfully verifies the data inputted by the admin.

a. Admin System Testing

The system testing process on the admin menu can be seen in the table.

Table 1. Admin System Testing

No	Scenario	Input	Next Stage	Result
1	Login Admin	Username and Password	Dashboard Page	Valid
2	Dashboard	Displaying report data in numerical form	Product Page	Valid
3	Product Data	Enter data and categorize according	Incoming Goods Page	Valid

		to type such as Barcode, Product Name, Warranty, New Product Stock, and Second Product Stock			7	User Data	Enter username and password according to each data	Transaction Data Page	Valid
4	Incoming Goods Data	Entering complete input data such as Supplier Name, Barcode, Product Name, Product Condition, Warranty, Capital Price, Selling Price, Incoming Stock, and Description	Outgoing Goods Page	Valid	8	Transaction Data	Displays products sold in the cashier system such as Transaction Name, Cashier Name, and Total Transaction	Exit Admin	Valid
					9	Admin Exit	Sign out	Exit the system	Valid
5	Outgoing Goods Data	Enter data according to the products sold in full such as Item Name, Outgoing Stock, and Notes	Supplier Page	Valid					
6	Supplier Data	Enter the name of the person who transacts with the store such as the person who sells the product to the store such as Supplier Name, Contact Information, and Address	User Page	Valid					

Based on table 1, the admin menu stock system test shows valid results on every page, including the login page, dashboard page, product page, incoming goods page, outgoing goods page, supplier page, user page, transaction data page, and sign out. Create, Read, Update, Delete (CRUD) was successfully executed and proved that the system is ready to use.

b. Cashier system testing

The system testing process on the cashier menu can be seen in the table.

Table 2. Employee System Testing

No	Scenario	Input	Next Stage	Result
1.	Login Admin	Username and Password	Transaction Page	Valid
2.	Transactions	Entering the product to be sold such as Scan Barcode, Selecting Product Condition, and Entering the Nominal Value	Dashboard Page	Valid
3.	Dashboard	Displaying report data in numerical form	Transaction Data Page	Valid
4.	Transaction Data	Displays transactions that have been entered on the transaction page and displays the Transaction Number, Cashier Name,	Product Data Page	Valid

		and Total Transaction MenampilkaDisplays data that has been inputted by the admin such as Supplier Name, Barcode, Product Name, Product Condition, Warranty, Capital Price, Selling Price, Incoming Stock, and Description		
5.	Product Data		Exit Cashier	Valid
6.	Exit Cashier	Sign out	Exit the system	Valid

Based on table 2, the system test shows success for login access, transaction page, dashboard page, transaction data page, product data page and logout. Create, Read, Update, Delete (CRUD) was successfully executed and proved that the system is ready to use.

c. Owner System Testing

The system testing process on the owner menu can be seen in the table.

Table 3. Employee System Testing

No	Scenario	Input	Next Stage	Result
1.	Login Admin	Username and Password	Dashboard Page	Valid
2.	Dashboard	Displays all transaction data that takes place in the admin and cashier systems in the form of numbers.	Product Data Page	Valid
3.	Product Data	Displays data that has been inputted by the admin such as Supplier Name, Barcode, Product Name, Product Condition, Warranty, Capital Price, Selling Price, Incoming Stock, and Description	Transaction Data Page	Valid
4.	Transaction Data	Displays transactions that have been entered on the transaction page such as Transaction Number, Cashier Name, and Total Transaction	Incoming Goods Data Page	Valid
5.	Incoming Goods Data	Displays data that has been inputted by the admin such as Supplier Name, Barcode, Product Name, Product Condition, Warranty, Capital Price, Selling Price, Incoming Stock, and Description	Outgoing Goods Data Page	Valid
6.	Outgoing Goods Data	Displays Goods Name, Outgoing Stock, and Notes	Supplier Data Page	Valid
7.	Supplier Data	Displays the name of the person who transacts with the store such as the person who sells the product to the store such as Supplier Name, Contact Information, and Address	Exit Owner	Valid
8.	Exit Cashier	Sign out	Exit the system	Valid

Based on table 3, the system test shows success for login access, dashboard page, product data page, transaction data page, incoming goods page, outgoing goods page and logout. Create, Read, Update, Delete (CRUD) was successfully executed and proved that the system is ready to use.

4. Conclusion

From the results of the author's research, several conclusions can be drawn from the Stock Information System Using Barcodes, namely that it can input incoming and outgoing goods and can display stock of goods. The application that is designed can display reports of incoming goods, outgoing goods reports and stock history reports will make it easier to access the information needed in processing, inputting or in making reports for checking incoming and outgoing goods data.

From the results of research and implementation of the Stock Information System Using Barcode, this system is able to increase efficiency in managing stock by reducing recording errors that often occur in manual processes, the use of barcode technology accelerates the process of recording and searching for stock data, thereby minimizing human error and increasing accuracy in inventory management, the system provides real-time stock monitoring features, allowing management to know the number and condition of goods accurately and produce stock reports faster and more systematically, with automation in the process of recording and tracking stock, employees can work more effectively and focus on other more strategic tasks, this system is designed to be easy to use by various levels of users, and can be integrated with other systems such as sales systems or warehouse management to improve its functionality.

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