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Web-Based Warehouse Information System Case Study of CV. Bulu Utama Tobacco

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Abstract. This study aims to design and implement a Web-Based Warehouse Information System with Barcodes at CV. Bulu Utama Tobacco. The background of this study stems from the problems faced by the company, namely the manual recording of stock items. This method often causes problems such as the risk of recording errors (human error), delays in reporting, and difficulties in real-time tracking of goods. The literature review refers to previous studies on web-based inventory information systems, barcode systems, and warehouse management. The results of the study show that the implementation of a barcode-based system has been proven to improve accuracy, efficiency, and transparency in inventory management, although previous studies were limited to manual web-based recording without barcode integration. The research method used was a qualitative approach with a case study at CV. Bulu Utama Tobacco. Data collection techniques were carried out through observation, interviews, and documentation. The system was developed using the UML modeling method (Use Case, Activity Diagram, and Flowchart) and implemented with web technology (PHP/Python, MySQL, and Barcode Scanner). Testing was conducted using Black Box Testing to ensure the functionality of the system.The results showed that the system was able to automatically record incoming and outgoing goods through barcodes, generate real-time stock reports, and reduce manual recording errors. The discussion confirmed that this information system not only improved operational efficiency but also provided strategic benefits in supporting management decision-making.

Keywords: Information System, Warehousing, Barcode, Web, Inventory.

1 Introduction

In today's world, technology is developing rapidly. In many ways, modern globalization has contributed to social progress. The application of technology is very important in helping others complete their work. To become technology users, humans must be able to utilize technology in the present and in the future. The meaning of education is so important to help humans use new technologies that have been developed. This is done to ensure that in terms of new technologies, the next generation is not left behind. Thus, education and technology can develop together as a new generation emerges as the successor to the old generation. The Inventory Information System can be used to implement some of these modifications.[1]

CV. Bulu Utama Tobacco is a company in the tobacco industry (IHT), also known as the manufacturing industry. This industry processes tobacco into cigarettes, which include various types of cigarettes such as white cigarettes and kretek. Unfortunately, the company's finished goods reporting is still done manually using simple records. This causes various problems such as data errors, data inaccuracies, and difficulties in consolidating stock. Previous research has focused on developing a company storage information system. This research has usually succeeded in building a system capable of recording and storing digital inventory information. The raw material storage information system was built using qualitative data research methods that show quality or characteristics.[2]

Based on these issues, a web-based raw material storage information system is needed to help CV. Bulu Utama Tobacco manage storage data more effectively and efficiently. This system is designed to provide real-time inventory information, facilitate raw material tracking, and provide regular data backups to reduce the risk of data loss.In addition, this system is also expected to improve recording accuracy and support faster and more accurate decision-making processes. By designing and developing a web-based finished goods storage information system, this research aims to provide solutions to the problems faced by the company and support the creation of a more modern, integrated finished goods management system that is responsive to the company's operational needs.[3]

Qualitative data in qualitative research methods describes quality or characteristics. It is collected using

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questionnaires, interviews, or observations, and often appears in narrative form. [4]Based on these issues, a web-based raw material storage information system is needed that can help CV. Bulu Utama Tobacco manage storage data more effectively and efficiently. This system is designed to provide *real-time* inventory information, facilitate raw material tracking, and provide regular data backups to reduce the risk of data loss. In addition, this system is also expected to improve recording accuracy and support faster and more accurate decision-making processes. By designing and developing a web-based finished goods storage information system, this research aims to provide solutions to the problems faced by the company and support the creation of a more modern, integrated, and responsive finished goods management system that meets the company's operational needs.[4]

2 Method

2.1 System Development Method

This study uses a qualitative approach that focuses on the development of a web-based warehouse information system with barcodes at CV. Bulu Utama Tobacco. Qualitative research was chosen because it emphasizes a deeper understanding of the phenomena occurring in the field, rather than simply processing numbers or statistics. Through this approach, the researcher sought to explore in detail how the warehouse management process is carried out, the obstacles that arise, and the company's need for a more modern information system.

The system development method used in this study applies a qualitative approach that focuses on a deep understanding of the needs and problems faced by CV. Bulu Utama Tobacco. The research was conducted through observation, interviews, and documentation to obtain detailed information related to the warehousing business process. System development was carried out using modern technology, including *a website* and *Warehouse Management System (WMS)* for real-time stock management, Database *Management System (DBMS)* such as MySQL or PostgreSQL for data storage, and barcode or RFID integration to automatically record incoming and outgoing goods. Additionally, the system is equipped with Cloud Storage for data security and backup, ERP and API integration for synchronization with other systems, and a user-friendly interface (UI/UX) design. The system was developed using several modern technologies, including:

a. Website & WMS (*Warehouse Management System*) for real-time inventory management
b. DBMS (*Database Management System*) such as MySQL/PostgreSQL.
c. Barcode/RFID for automatic recording of incoming and outgoing goods.
d. Cloud Storage for data storage.
e. ERP & API Integration for integration with other systems.
f. User-friendly UI/UX and *Security System* to maintain data security.
g. System design is supported by *Use Case Diagrams* (Admin, Warehouse Staff, Manager) and *Flowcharts* that illustrate the flow of goods in, out, and report generation.

During the design process, UML-based modeling such as case diagrams, activity diagrams, and flowcharts were used to show the flow of activities, user interactions, and current business processes. These diagrams helped developers understand system requirements and find the best solutions. The Black Box testing method was used to conduct the testing phase, which focused on testing the functionality of the system without regard to the program code. Each feature was tested in real-life situations. This included the login process, incoming goods input, outgoing goods recording, data search, and stock report generation. The test results showed that all features worked according to requirements, so the system was ready to be used to help manage the warehouse more efficiently and accurately.

2.2 Activity Diagram Design

An activity diagram is a type of diagram in *Unified Modeling Language (UML)* used to describe activity flows or business processes in a systematic and structured manner. This diagram is very important in the system design stage because it can visualize how an activity begins, is carried out, and ends, as well as showing the relationships between activities, decision making, and parallel workflows that may occur. In the context of this study, activity diagrams are used to model the workflow of a web-based warehouse information system with barcodes at CV. Bulu Utama Tobacco. These diagrams help researchers, developers, and users understand how the warehouse management process works, from user login, recording incoming goods, recording outgoing goods, to creating stock reports.[5]

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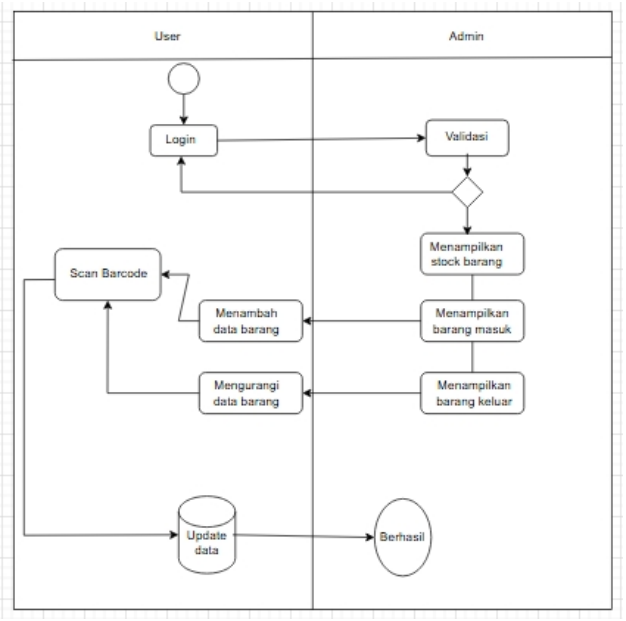

Figure 1. Activity Diagram

2.3 Use Case Diagram

Flowchart diagrams serve to visualize workflows or processes systematically using standard symbols (such as rectangles, diamonds, arrows, etc.). These diagrams help in understanding processes more easily and quickly, identifying problems or obstacles in workflows, designing systems or programs before the coding stage, and communicating ideas or procedures to teams or other users. *Flowcharts* are often used in programming, project management, and system documentation. In this system, the first step is to access the website by logging in. After logging in, you will enter the home page (*Dashboard),* then enter the incoming goods page, where there is a camera to scan the goods to be stored. Once validated, the goods data will be automatically updated according to the barcode. Once the data is correct, it can be printed in the report column and a print command can be used to print the report data to be submitted to the manager. The process for outgoing goods is the same as for incoming goods.[6]

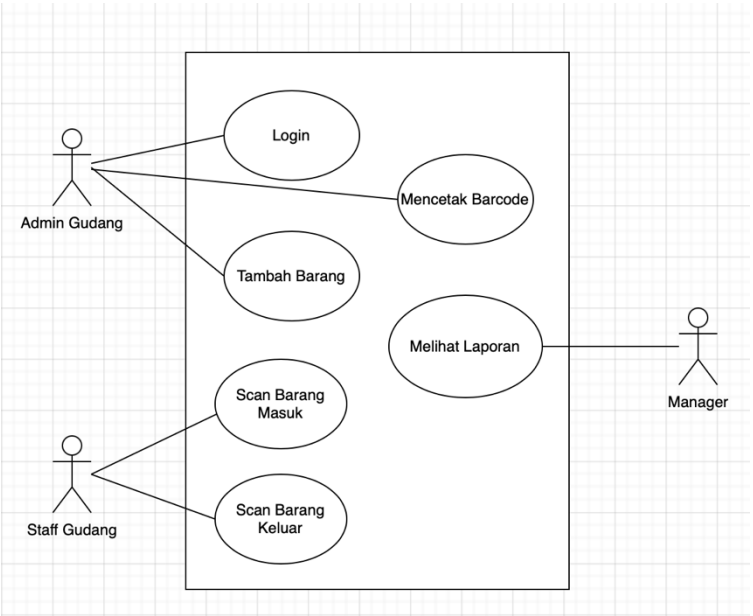

Figure 2. Use Case Diagram

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3 Results and Discussion

With this web-based warehouse information system, CV. Bulu Utama Tobacco can obtain more accurate and transparent data, which supports faster decision-making. The following explanation will describe the stages of using the system, starting from the Dashboard to the preparation of stock reports, providing a comprehensive overview of the benefits of implementing this system.

A. Login

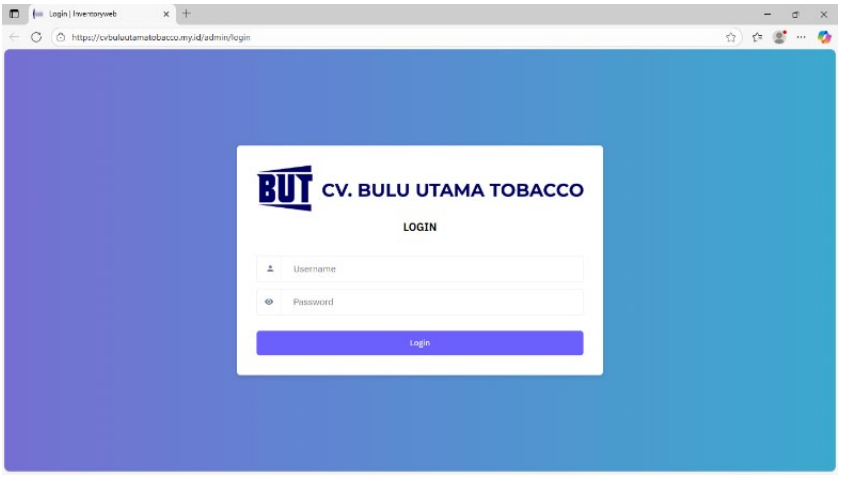

Figure 3. Login

A login page is a screen that appears on a website. This page serves as the main gateway to enter the system. Just like a door that can only be opened with the right key, the login page also requires user identification in the form of a username or email address, as well as a password, so that the system can verify that the person trying to log in is the actual account owner. The purpose of the login page is to maintain user security and privacy. Each account has access to certain features that should not be accessed by others. With a login, the system can distinguish between users. In addition, the login page also helps the system in managing who has certain rights, whether they are regular users, administrators, or parties with other special access.

B. Dashboard

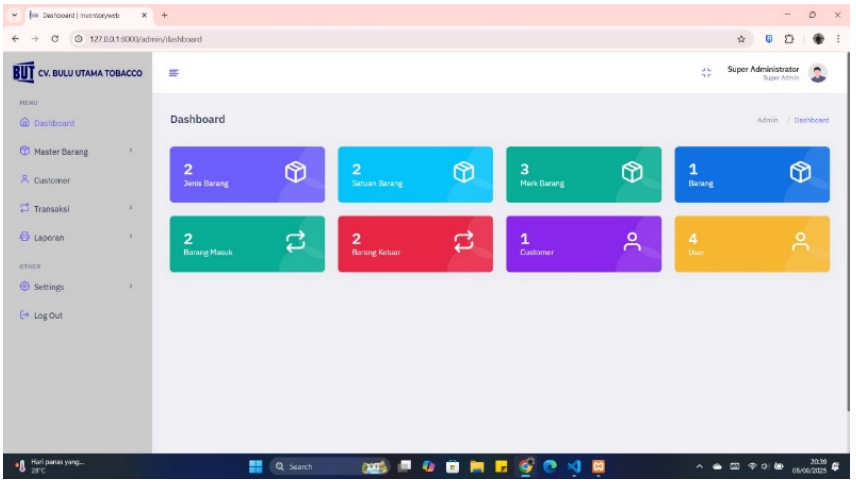

Figure 4. Dashboard

The dashboard is the main page after the user has successfully logged in. This page functions as the system control center, displaying a summary of important data such as the number of items in stock, items received today, items shipped, and notifications if any items are running low on stock[7] . For administrators, the dashboard also provides quick access to the item management menu, user data, and reports. Meanwhile, warehouse staff usually only see information related to operational activities, and managers focus more on summary reports displayed in graphs or tables.[8]

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C. Transactions/Input of incoming goods

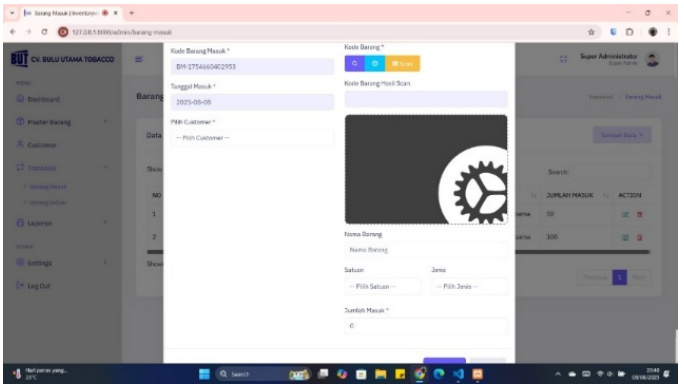

Figure 5. Incoming Goods Transactions

The goods receipt menu is used to record all products that have just arrived at the warehouse. The recording process is done by scanning the barcode on the product using a barcode scanner. Once the barcode is scanned, the system automatically recognizes the product based on the existing database. The data entered includes the item code, item name, quantity, and time of recording. With this method, the input process is faster, more accurate, and minimizes errors compared to manual recording.[9]

D. Outgoing Goods Transaction/Input

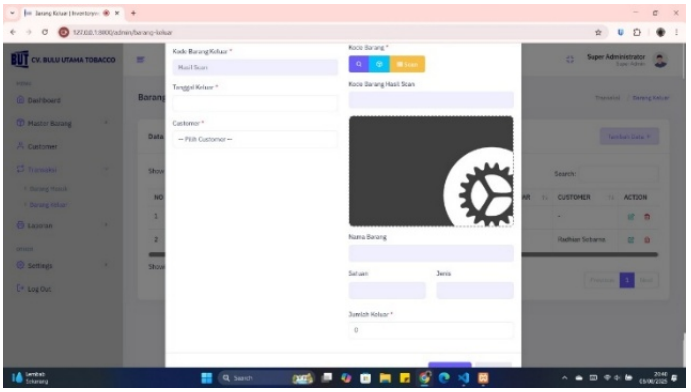

Figure 6. Outgoing goods transactions

The goods out menu is used when products are removed from the warehouse, for example for distribution or sales purposes. Just like goods in, warehouse staff only need to scan the barcode of the goods to be removed. The system then automatically reduces the stock according to the number of goods removed. This process is also recorded in detail (date, time, and number of goods removed), making it easier to track in case of problems with distribution.[7]

E. Goods Receipt Report

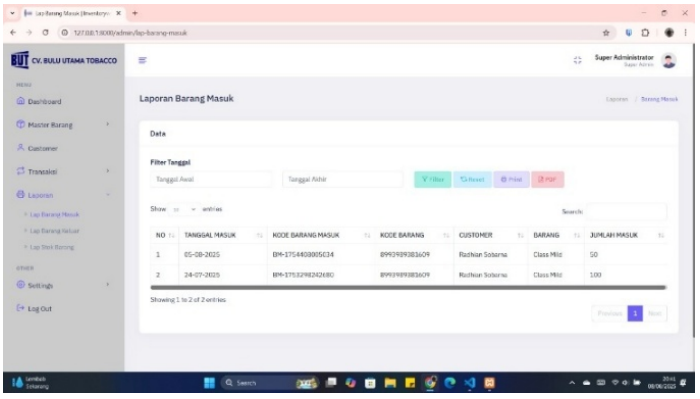

Figure 7. Goods Receipt Report

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The system automatically generates an incoming goods report based on barcode scan data. This report can be filtered by date, item category, or specific code. Managers and administrators can export the report to PDF or Excel format, making it easy to share with other departments. This report is important for evaluating the supply of raw materials and finished goods entering the company.

F. Outgoing Goods Report

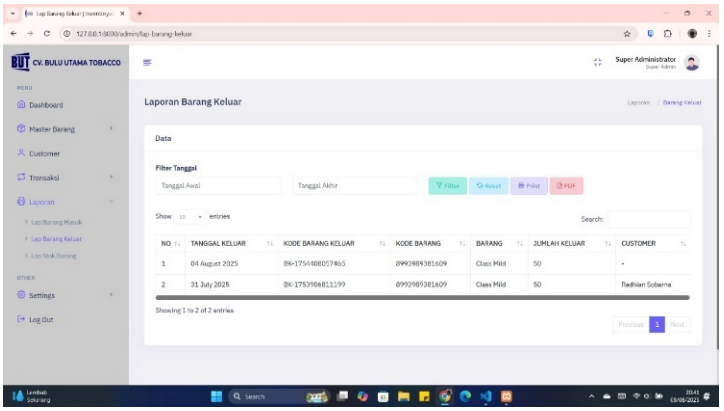

Figure 8. Goods Out Report

In line with the goods receipt report, the system also prepares an goods issue report containing detailed records of products that have been distributed. This report helps management monitor how quickly goods are leaving the warehouse and ensures that distribution is in line with market demand or the company's operational needs.

G. Goods Stock Report

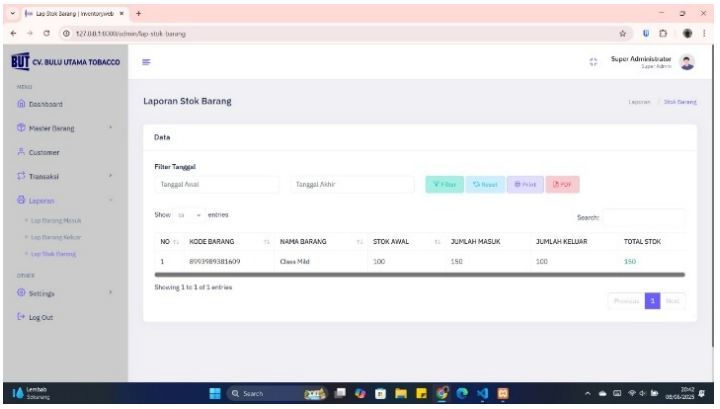

Figure 9 . Inventory Report

This is the core feature that adds value to the system. The inventory report displays the latest stock quantities in real time, as every incoming and outgoing transaction is immediately updated in the database. The inventory report can be displayed in table or graph form for easier analysis.[4] With this report, managers can directly monitor inventory conditions, detect items with low stock levels, and make business decisions more quickly. The benefits of the system for CV. Bulu Utama Tobacco can be detailed as follows:

a. Operational Efficiency
   The process of inputting and recording goods becomes faster and simpler because it only requires barcode scanning. This cuts down on the time previously wasted on manual recording.
b. Data Accuracy
   With a barcode-based system, the risk of recording errors (human error) can be minimized. Data on incoming and outgoing goods is recorded automatically according to the information in the database.
c. High Accessibility
   Data can be accessed anytime and anywhere as long as the device is connected to the internet, making it easy to monitor warehouse stock.
d. Real-Time Reporting
   The system provides real-time reports on stock, incoming goods, and outgoing goods. These reports can also be downloaded or exported to PDF or Excel formats for analysis or management meetings.

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e. Data Security
   Data is securely stored on a centralized server, equipped with login authentication and encryption to prevent data loss, damage, or misuse.
f. Fast and Accurate Decision Making
   With up-to-date and accurate inventory information, management can make faster and more informed decisions, such as in procurement or distribution.

With this system, CV. Bulu Utama Tobacco has gained several significant benefits, including:

a. Operational Efficiency: The goods input process is much faster because it only requires scanning barcodes.
b. Data Accuracy: The risk of errors due to manual recording can be minimized.
c. High Accessibility: Data can be accessed anytime and anywhere.
d. Real-time Reporting: Management can make quick business decisions based on up-to-date reports.
e. Data Security: The system ensures data is not easily lost or damaged as it is stored on a centralized server.

This web-based warehouse information system with barcodes has a number of advantages, such as multi-platform access, barcode integration for speed and accuracy, and clear access control. However, the system also has limitations, such as dependence on a stable internet connection and the need for user training at the beginning of implementation.[1]

Overall, the web-based warehouse information system with barcodes is an innovation that has a positive impact on inventory management at CV. Bulu Utama Tobacco. This system not only improves accuracy and efficiency but also supports transparency and better decision-making in company operations.[5]

This system was developed to automate the process of recording, tracking, and reporting inventory. The system can be accessed via computers, laptops, and smartphones as long as they are connected to the internet at[6] .

Key features of the system include:

a. Inventory Data Management – Automatic recording of incoming and outgoing goods through barcode scanning.
b. Data Search and Filter – Search for goods by category, product name, or item code.
c. Automatic Inventory Reports – The system generates real-time inventory reports that can be exported to PDF or Excel formats.
d. User Access Control – Admins, warehouse staff, and managers have different access rights according to their needs.
e. Data Security – The system is equipped with login authentication and data encryption to protect inventory information.

Before the web-based warehouse information system with barcodes is fully implemented at CV. Bulu Utama Tobacco, a testing process is required to ensure that all designed functions can run properly according to user needs. This testing is an important stage because it can show the extent to which the system meets software quality standards, in terms of reliability, security, ease of use, and accuracy in processing data.

In this study, the testing method used is *Black Box Testing***.** This method was chosen because it focuses on testing the functionality of the system without regard to the program code within it. In other words, testing is carried out by providing certain inputs to the system, then evaluating whether the output produced is as expected. This approach is very relevant because the main objective of system development is to provide applications that are able to support warehousing activities in a practical and efficient manner for non-technical users.[9]

Through *Black Box Testing,* each feature is tested based on real scenarios that often occur in the warehousing business process. For example, testing is performed on user login features, incoming goods data input processes, outgoing goods recording, data searches, and stock report generation. Each scenario is tested to ensure that the system is able to provide the correct response, reject incorrect inputs, and display accurate information. In this way, it can be determined whether the system meets the expected functional requirements.

In addition, this testing also aims to assess the extent to which the system can minimize *human error*. For example, errors in goods recording that often occur in manual methods can be reduced through barcode scanning that directly inputs data into the system. Therefore, the system's success in passing this testing stage will be a strong indicator that the application is ready for use in daily operations at the CV. Bulu Utama Tobacco warehouse. Testing was conducted using the *Black Box Testing* method to ensure that every function in the system runs as required.[7]

Table 1. Testing of the CV Bulu Utama Tobacco information system

No	Feature Tested	Expected Results	Test Results	Status
1	Login	Users can log in according to their access rights	Successful	Valid
2	Dashboard	Users can choose which one to run	Success	Valid
3	Transaction/Input of Incoming Goods	Outgoing goods are automatically recorded after scanning the barcode	Successful	Valid

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4	Transaction/Input of Goods Out	Incoming goods are automatically recorded after scanning the barcode.	Successful	Valid
5	Goods Receipt Report	The report is displayed in real-time and can be downloaded and printed immediately	Successful	Valid
6	Outgoing Goods Report	Reports are displayed in real time and can be downloaded and printed directly.	Successful	Valid
7.	Stock Goods Report	Reports are displayed in real time and can be downloaded and printed directly.	Success	Valid

System testing is an important stage in the software development cycle, as it ensures that the system runs according to *user requirements* and previously designed functional specifications. In this study, the testing method used is *Black Box Testing*. *Black Box Testing* is a software testing method that focuses on the external functions of the system without considering the internal structure or program code used. In other words, the tester only tests the input given to the system and the output produced to see if it is as expected. This method is considered relevant because the main objective of a web-based warehouse information system is to ensure that each feature can be used properly by users according to their access rights.[10]

In this test, each system feature was tested by providing specific inputs, then observing whether the results *(outputs)* were as expected. If the results were as expected, the test status was declared Valid, whereas if there were discrepancies, the feature was declared Invalid and needed to be corrected.[11]

The results of the study show that the implementation of a web-based warehouse information system with barcode technology at CV. Bulu Utama Tobacco has had a significant positive impact on the company's business processes, particularly in inventory management. The implementation of this system has been proven to improve efficiency, accuracy, and data security when compared to the manual methods previously used.[12]

a. Relevance of Research Results to Theory
   In information systems theory, a system is considered effective if it is able to assist organizations in processing data into information that is useful for decision making. The results of this study indicate that the system implemented is in line with this principle. The web-based system with barcodes is able to automate the recording of incoming and outgoing goods, as well as generate *real-time* stock reports. This supports the theory that the use of information technology can improve the quality of information and reduce the risk of human error.[7] Furthermore, from an inventory management perspective, theory suggests that good inventory control will have an impact on the smooth distribution of goods and the efficiency of operational costs. With this system in place, company management can accurately monitor stock levels, anticipate shortages or excess inventory, and make more informed decisions regarding the procurement of goods.
b. Advantages of the New System
   1. Based on the results of testing using the Black Box Testing method, it can be confirmed that all the main features of the system are functioning according to user requirements. Some of the notable advantages of this system include:
   2. Process Speed: The system is able to speed up the process of recording incoming and outgoing goods through barcode scanning. This is in stark contrast to the manual method, which takes much longer.
   3. Data Accuracy: With automatic recording, recording errors can be minimized. Stock data is always updated in real-time.
   4. Information Security: Login authentication protects data from unauthorized access.
   5. Cost Efficiency: The system reduces the need for paper and stationery, thereby lowering operational costs.
   6. Real-Time Reports: Inventory reports can be accessed at any time and exported in various formats, supporting management needs in decision-making.
c. System Limitations
   Despite its many advantages, this system still has limitations that need to be considered. Some of the limitations found include:
   1. Dependence on Internet Connection: Because the system is web-based, its operational continuity is greatly affected by the stability of the internet network. If the connection is interrupted, data access may be disrupted.
   2. User Training Requirements: Not all warehouse staff are familiar with barcode technology and web-based systems. Therefore, intensive training is still needed to optimize the use of the system.
   3. Possibility of Technical Disruptions: As a technology-based system, the risk of server disruptions or software errors remains, albeit small. Companies need to have a technical team ready to handle such issues.
   4. These limitations do not diminish the significant benefits of the system, but they are important notes for future improvements.

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d. Implications of Research Results
The implementation of this warehouse information system has positive implications for the company. Warehouse managers can now monitor inventory in real-time, enabling faster and more accurate decision-making regarding distribution and procurement. In addition, warehouse staff feel more supported as their manual workload has been reduced.[1] The company also benefits from cost efficiency and increased reliability of reports for management and internal audit purposes. Another impact is increased professionalism within the company. With a technology-based system, the company is able to compete better in the digital era and adapt to modern industry standards that demand efficiency and data transparency. "Barcode and QR Code Scanning System for Library Visitor Lists."[13]

When compared to similar studies discussing the application of barcode systems in warehouse management at other companies, the results of this study show consistency. Previous studies have also proven that barcodes and web-based systems can improve recording accuracy and reduce human error. Thus, the results of this study are not only relevant in the context of CV. Bulu Utama Tobacco, but also reinforce the findings of previous studies.Before the web-based warehouse information system with barcodes was implemented at CV. Bulu Utama Tobacco, stock recording activities were still carried out manually. This recording used notebooks and simple spreadsheet applications. This method caused various problems, ranging from a high risk of human error and delayed reports to difficulties in tracking goods. Input and writing errors often occurred because all data was entered manually. In addition, stock reports could not be obtained in real time, but had to wait for periodic data recaps, which were time-consuming.[14]

This condition certainly hinders work effectiveness, especially considering that the tobacco industry has a large production volume and wide distribution. If stock recording errors occur, the impact can affect the availability of goods, distribution speed, and even the trust of business partners.After the web-based system with barcodes was implemented, significant changes could be seen in terms of recording, reporting, searching for goods, time efficiency, and data security. Goods entering and leaving the warehouse can now be recorded automatically as soon as they are scanned with a barcode scanner. This process has greatly improved data accuracy because the system reads the unique codes on the goods without the need for manual input.[15]

Inventory reports, which were previously generated periodically, can now be accessed in real-time**.** This facilitates managers in making quick and accurate business decisions. Searching for items, which used to take a long time because it required searching through manual records, can now be done instantly with search and filter features based on product name, category, or item code.[16] In terms of time efficiency, the new system is clearly superior. Administrative processes that previously took a long time can now be done in just seconds. Data security has also improved because the system stores information on a centralized server equipped with encryption and login authentication.[2] Data is no longer easily lost or damaged as it was when manual recording was used. Overall, this comparison shows that the implementation of a web-based warehouse information system with barcodes has a very positive impact on the company, especially in improving the accuracy, speed, and transparency of warehouse management.[17]

4 Conclusion

Based on the results of the research, design, implementation, and testing of the web-based warehouse information system with barcodes at CV. Bulu Utama Tobacco, the following conclusions can be drawn:

a. The web-based warehouse information system with barcodes is able to overcome the problems of manual recording. The process of recording incoming and outgoing goods, which was previously done manually and was prone to errors, can now be done automatically through barcode scanning. This increases the speed of recording and reduces the risk of human error.
b. Inventory reports can be generated in real time and accurately. Before the system was in place, reports could only be obtained periodically and took a long time. With the new system, reports on incoming goods, outgoing goods, and warehouse stock can be accessed directly by management and can even be exported in various formats (PDF and Excel).
c. The system improves time and operational cost efficiency. Warehouse administration processes are faster, paper and stationery requirements are reduced, and goods distribution can be better monitored, thereby supporting the company's business efficiency.
d. Data security is more guaranteed. The system is equipped with login authentication and user access rights settings (admin, warehouse staff, and manager), so that data is better protected from errors and misuse.
e. Black Box Testing results show that the system runs 100% according to user requirements. All key features, such as login, goods entry/exit input, search, reporting, and login security, function properly and validly.

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Therefore, it can be concluded that the web-based warehouse management system with barcode technology developed has proven capable of enhancing accuracy, efficiency, security, and transparency in warehouse management at CV. Bulu Utama Tobacco.

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