Journal of Information Systems and Informatics
Vol. 5, No. 3, September 2023 e-ISSN: 2656-4882 p-ISSN: 2656-5935
DOI: 10.51519/journalisi.v5i3.510 Published By DRPM-UBD

Inventory Information System Development to Improve Goods Data Collection Process

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Abstract

The study subject is a company operating in the iron industry, where its business processes are hampered by challenges in effectively managing its inventory. The existing inventory system is characterized by disorganized stock storage within the warehouse, leading to difficulties in monitoring stock availability. Moreover, the tracking of incoming and outgoing goods lacks consistency, further impacting inventory accuracy. Additionally, the generation of reports relies on manual processes, resulting in prolonged report completion times. To address these issues, this study developed a comprehensive inventory website aimed at enhancing the company's inventory management. The website serves as a platform to monitor incoming and outgoing goods, providing real-time visibility into stock levels. The development approach chosen for this endeavor was the Waterfall method, known for its systematic and structured nature. The outcomes of this research encompass the successful creation of an inventory website that proficiently records and manages incoming and outgoing goods data. The website also facilitates the automated generation of accurate purchase and sales reports, significantly reducing the time required for this task. Thorough testing, employing blackbox testing techniques, confirmed the robust functionality of the website, with all components performing effectively.

Keywords: Website, Inventory, Business Process, Waterfall

1. INTRODUCTION

The modern world now requires precise and reliable data information due to the rapid development of information technology[1]. This means that in order to carry out our work efficiently and produce the best outcomes, we must use technological sophistication, as well as speed, accuracy, and correctness in giving information. [2]. Information technology is used in business to establish effective and efficient operations for businesses, hence simplifying the lives of all businesspeople. The company will be able to compete in the global market and also create a competitive advantage [3]. One of the successes of a company is being able to manage the inventory of goods from the company, where in order for the implementation of storage of goods in the warehouse to be managed and organized properly, it is necessary to develop an application in the form of *inventory*[4] to anticipate in meeting consumer demand, so as to meet demand [5].

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

PT is engaged in the iron industry where the company provides project materials such as pipes and fittings to accommodate pipeline infrastructure. It is known that the company's business processes that are run still experience some difficulties in managing stock of goods because the stock of goods is not well organized in the warehouse so it is difficult to know stock availability. Then, the recording of incoming and outgoing goods is irregular so that it affects the stock of goods. This causes frequent human errors and takes a long time to complete the task at hand. Therefore, the inventory system is an option for problems that occur in PT Global rather than manually[6].

Waterfall approach is used by the author to assist this investigation. The reason the author uses this method is because this method is the most common and most frequently used method so it has many references that can be used. In addition, this method is suitable for projects that are simple and not too complex because of the clear structure because it has well-structured and sequenced stages and careful and detailed planning to minimize risk as the author applies where research starts from conducting needs analysis to testing. sequentially. Inventory itself can be interpreted as a process of data about the entry and exit of an item in a business field [7].

Information systems that manage production data must also provide information that is in accordance with the movement of goods that take place[8] to minimize time to be wasted and also remote operation. In addition, companies must also manage inventory in their company well to keep their business processes running smoothly [9]. This is due to the fact that a company's inventory of goods becomes crucial since it can control the stock of goods in the warehouse that will later be sold to customers [10]. Many studies have been conducted related to inventory applications with different purposes[11].

Based on the results of research from the journal "Design and Build Inventory Applications with Website-Based Qrcode at RSI Assyifa Sukabumi" written by Erni Ermawati, Tri Wahyuni, Indriyanti, Nurul Ichsan, and Haerul Fatah, it can be concluded that the inventory application is designed very well and according to user needs and is expected to support the goods management process [12]. Based on the results of research from the journal "Design and Build Material Inventory Application Construction Implementation Services PT. Bawan Permai Group Based Website" written by Veni Laola, Widiatry, Licantik, it can be concluded that the inventory application makes it easier for staff or employees to manage and record inventory and makes it easier to control for company leaders [13].

It is expected that with this research, Company's business processes will run faster and easier. In addition, the process of recording incoming and outgoing goods will also be easier and the data stored will be safer because access is needed to check

existing data. Then, for the process of making reports, it is also expected to be easier and faster and minimize human error.

2. METHODS

Data collection techniques and design approaches are the two methodologies used in this research method.

2.1 Data Collecting and Analysing Method

This study embraces a holistic approach that entails conducting direct interviews with company owners to uncover prevailing constraints within the organization. These interviews serve as a conduit for capturing pivotal insights into the intricate dynamics underpinning the processes of goods' inflow and outflow. Following the meticulous collection of data, a robust analysis unfolds, unfurling the complex intricacies woven into the fabric of ongoing business operations. Subsequent to this, the study delves into the nuanced terrain of identifying a system primed for proposal, building upon the foundational insights gleaned from the deconstructed business processes.

The zenith of this endeavor culminates in the painstaking design of an inventory application, meticulously tailored to meet the distinctive demands of the company. Within this phase, the study diligently engages in direct interactions with company owners, unveiling challenges, charting the contours of the organizational structure, elucidating system prerequisites, and pinpointing potential system users. Simultaneously, the research broadens its horizons through a comprehensive examination of pertinent literature—encompassing books, journals, and pertinent files—thus enriching the reservoir of insights associated with the inventory website.

2.2 Design Method

Employing the Waterfall method, this design approach encapsulates a systematic and sequential paradigm within software development. The Waterfall method orchestrates a meticulously orchestrated journey, where each phase unfurls in a progressive cascade. This journey commences with requirements analysis, advances through system and software design, culminates in implementation and integration, and ultimately extends to the critical stage of maintenance. It is within this framework that the nuanced contours of user demands are intricately delineated, serving as the guiding compass throughout the development process [14], [15]. A fundamental principle of this method lies in its sequential nature, which instills a disciplined rhythm to the software development lifecycle. With each phase building upon its predecessor, a holistic tapestry emerges, fostering a comprehensive understanding of user needs. This progression ensures that the end

product is not only aligned with these user demands but is also imbued with a cohesiveness that results from a methodical evolution. Thus, the Waterfall method stands as a testament to the harmonious fusion of systematic approach and sequential execution, ultimately paving the way for robust and tailored software solutions. The detail steps of Waterfall as shown in Figure 1.

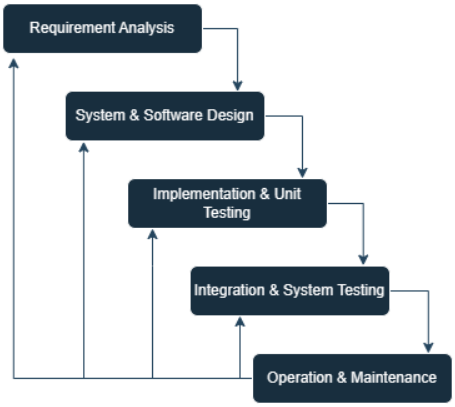

Figure 1. Waterfall Method [16]

The intricacies of this process are elucidated through the following stages within the Waterfall method [17].

1) Requirements Analysis, Through a meticulous interview process, the needs of company owners are scrutinized, generating a corpus of data essential for user-centric insights.
2) System & Software Design, Initiating the journey of system design, the author meticulously crafts data structure diagrams and software displays (wireframes) that map out the envisioned applications. Utilizing tools such as Data Flow Diagrams (DFD), encompassing context diagrams, function composition diagrams, overview diagrams, and detailed diagrams, a comprehensive blueprint takes shape.
3) Implementation & Unit Testing, Advancing to the implementation phase, the author translates plans into code, shaping the foundation of the inventory application in alignment with the pre-established wireframe.
4) Integration & System Testing, In this pivotal phase, the author conducts comprehensive blackbox testing on the assembled inventory applications, probing intricacies to ensure seamless functionality of the system.
5) Operations & Maintenance, Culminating in the deployment of the crafted application, this phase encompasses not just implementation but also entails vigilant maintenance aimed at rectifying errors detected in prior stages. A perpetual cycle of refinement ensures the application's sustained performance and efficacy.

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

3. RESULTS AND DISCUSSION

3.1 Requirement Analysis

3.1.1 Business Process Flow

During the Needs Analysis phase, a comprehensive evaluation is conducted to ascertain the requisite data collection procedures that will inform the design of application features. In this context, data collection follows a dual-pronged approach, encompassing both interviews and an in-depth exploration of relevant literature. Direct interviews with the company owner serve as a primary source of information. Subsequently, the insights gleaned from these interviews shed light on the intricate contours of the company's business processes, as depicted in Figure 2.

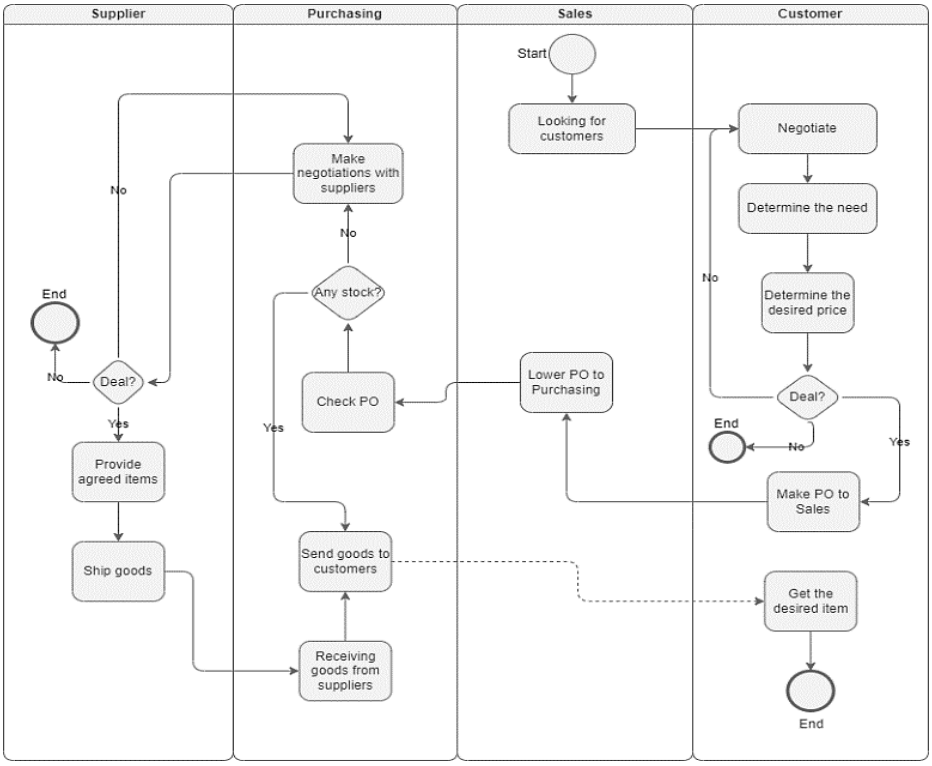

Figure 2. Business Process of iron sales company

Figure 2 illustrates the intricate trajectory of the company's business process, commencing with sales representatives engaging with customers to propose relevant materials for construction projects. Subsequent to this initial interaction, a collaborative negotiation ensues to pinpoint the precise requirements of the

customer, culminating in the establishment of an agreeable price point. Once a mutual understanding is reached, the customer generates a Purchase Order (PO) outlining their specific needs, which is then relayed to the sales department.

Within the sales department, a meticulous inventory check is conducted to ascertain the availability of the desired products. If the requested items are on hand, the sales team orchestrates the prompt dispatch of the products to the customer. Conversely, in instances where the products are not readily available, the Purchase Order is transmitted to the purchasing department. Here, the procurement team liaises with suppliers, initiating Purchase Orders for the necessary products aligned with the customer's requirements. Upon the arrival of the products from the suppliers, each shipment is accompanied by an invoice, serving as confirmation of the dispatched items. Once the products are in-house, the final step of the process transpires. The products are promptly conveyed to the customer's location, and concurrently, a Delivery Order (DO) is generated to signify successful product delivery, thus concluding this intricate series of operational transactions.

3.1.2 System Design

1) Context Diagram

The system's architectural blueprint takes tangible form through the utilization of Data Flow Diagrams (DFD). Within this framework, the owner commands a multifaceted suite of capabilities, orchestrating the oversight of Customer Data, Supplier Data, User Data, Category, Unit, Product Data, Purchase Order Data, Purchase Return Data, Delivery Order Data, Sales Return Data. Additionally, they enjoy unobstructed access to a spectrum of analytical insights, including Stock Reports, Purchase Reports, Sales Reports, Purchase Return Reports, and Sales Return Reports. Feedback directed towards the owner serves as a conduit for nuanced insights encompassing customer data, supplier data, user data, categories, units, product data, purchase order data, purchase return data, delivery order data, sales return data, stock reports, purchase reports, sales reports, and comprehensive reports on purchase returns and sales returns.

Sales personnel, in contrast, are bestowed with distinct privileges. This encompasses the realm of Customer Data administration, unfettered entry into Delivery Order Data, Sales Return Data, alongside a strategic vantage point to observe Product Data. In response, feedback tailor-made for the sales team envelops a spectrum of information including customer data, product data, delivery order data, and sales return data. Meanwhile, the purchasing department yields precise authorizations, entrusting them with dominion over Supplier Data, Product Data, Categories, Units, Purchase Order Data, and Purchase Return Data. In tandem, feedback directed towards this segment embodies granular insights

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

concerning supplier data, product data, categories, units, purchase order data, and purchase return data. These intricate roles and interactions are meticulously showcased in the tapestry of Figure 3, wherein diverse user profiles seamlessly intermingle, guided by the distinct contours of their respective account types.

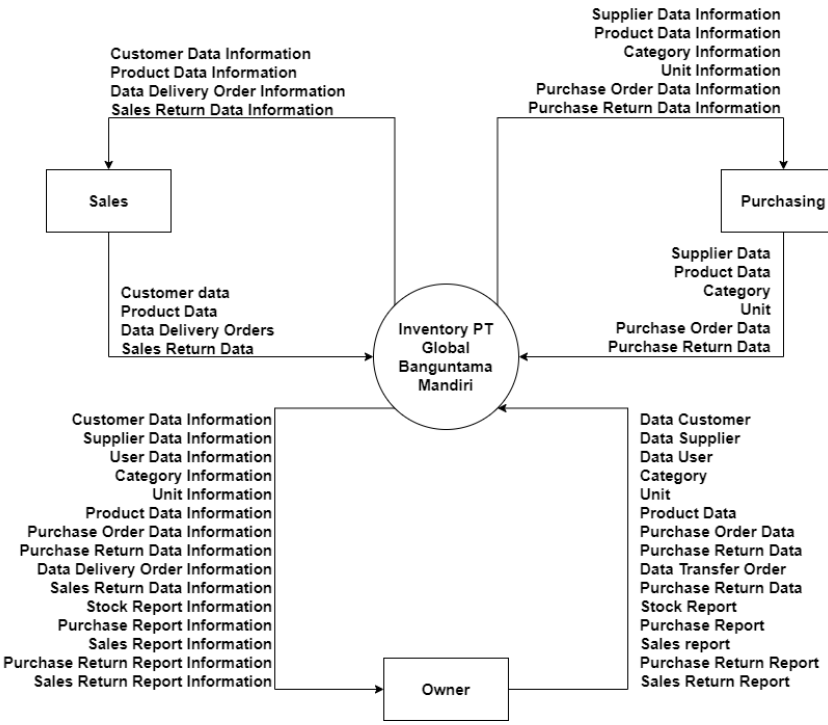

Figure 3. Context Diagram

2) Entity Relatianship Diagram

The Entity-Relationship Diagram (ERD) assumes a crucial role in the realm of data modeling. Its primary function lies in the classification of project data into discrete entities, a process intertwined with the establishment of intricate connections that interlink these entities. Presented visually, an ERD distills the fundamental nature of data relationships, thereby nurturing a heightened comprehension of the underlying system structure.

Beyond its visual appeal, the ERD method plays a pivotal role in facilitating effective stakeholder communication and contributing to the holistic design of databases. Scholarly discourse attests to its significance in amplifying database efficiency and overall comprehension of complex systems [18].

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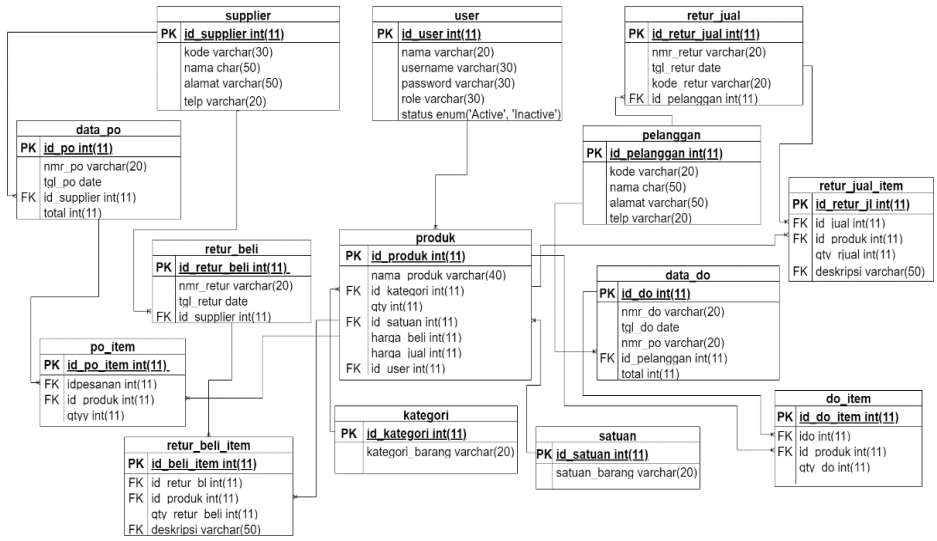

Figure 4. Entity Relationship Diagram

3) Wireframe

The depicted wireframe offers a comprehensive visualization of the login page's structural layout. Here, users are prompted to provide their personal credentials, including their name, username, and password. Additionally, they are tasked with selecting a role from the available options of 'Owner', 'Sales', or 'Purchase'. This intricate process establishes a pivotal access point, granting entry to the subsequent dashboard or homepage. The crucial verification step involves cross-referencing the provided information with the database records. Accurate input aligns with the database and grants unfettered access, whereas discrepancies act as a barrier, limiting user entry. To gain a more tangible insight into this interface, one can turn to Figure 4, where the login page wireframe is visually depicted, encapsulating its design essence.

Transitioning to Figure 6, a more in-depth perspective comes into view when the 'Owner' role is selected. Upon this selection, the dashboard materializes, revealing an array of pivotal sections. The home menu takes a central position, accompanied by sections dedicated to customer, supplier, and product data. This forms a comprehensive information hub for critical business components. Further enhancing its utility, the dashboard features analytical reports covering stock levels, sales figures, and purchasing insights. Moreover, a holistic overview is presented, encompassing cumulative metrics such as purchase orders (PO), delivery orders (DO), and returns – both sales and purchase related. A noteworthy inclusion in this interface is the user count, providing a gauge of the platform's engagement. Notably, this dashboard also incorporates a direct pathway to a

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product data table, streamlining user accessibility and engagement with essential data components.

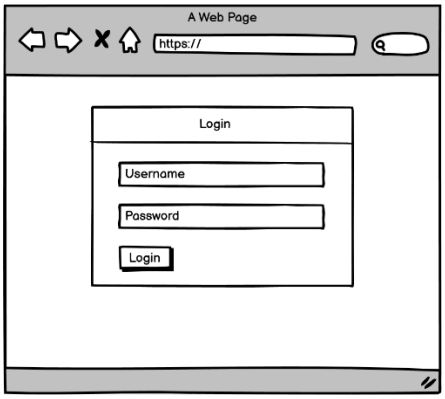

Figure 5. Login Page Wireframe

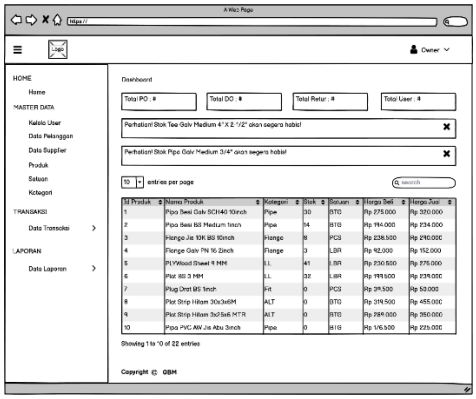

Figure 6. Owner Dashboard

3.2 Implementation and Testing

The fruition of the implementation unfolds by capturing the essence of the envisioned system. It commences with a portrayal of the login page within the company's inventory ecosystem, where the alignment between the tangible UI design on the website and the abstract wireframe is strikingly seamless. In this pivotal moment, users encounter an interface that prompts them to furnish their unique username and password. These credentials function as the master key, unlocking distinct dashboards meticulously curated to harmonize with their specific roles and access privileges. This tailored approach intricately orchestrates their journey, facilitating an intuitive navigation across the breadth of the system's functionalities, as artfully depicted in Figure 7.

Directing our attention to Figure 8, a vivid and meticulous portrayal of the home page experience tailored for owners materializes. The design acutely preserves the fidelity of the original wireframe, engendering a visual continuum that resonates seamlessly. Within this panoramic vista, a tapestry of pivotal elements unfurls: a prominent home menu, repositories hosting critical customer and supplier data, and a comprehensive compendium of product listings. Expanding its repertoire, this virtual canvas seamlessly integrates essential modules such as purchase orders, receive orders, purchase returns, delivery orders, and sales returns, seamlessly interlinking components for an effortless navigation and an adept management experience.

Figure 9 ushers us into a unique realm, one that offers a tantalizing glimpse into the product pages, ushering in a newfound accessibility primarily tailored for users

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

occupying the pivotal roles of Owner and Purchasing. This dedicated domain empowers these key personas to not only enrich data but to also harness the capability of initiating nuanced edits and executing intricate data searches, facilitated by the integration of a versatile embedded search box. This dynamic search facet imbues their interactions with a layer of versatility, enabling the retrieval of data through the nuanced input of keywords. Worth noting is the prism through which the Sales role engages with the product data – while possessing the ability to view data, their participation in data augmentation and editing is thoughtfully curtailed. This meticulous calibration of access privileges ensures an equilibrium between the potential for data utilization and the imperative of system maintenance, thus safeguarding the overarching integrity of the entire system architecture.

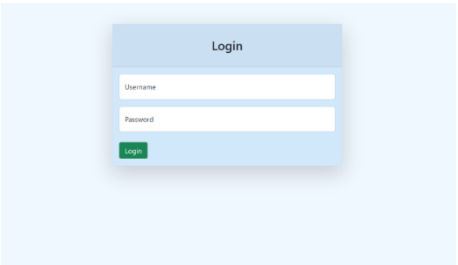

Figure 7. Login Interface

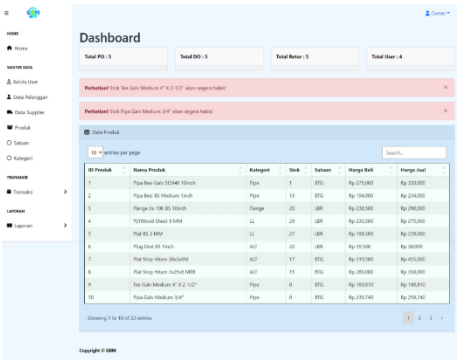

Figure 8. Homeowner Interface

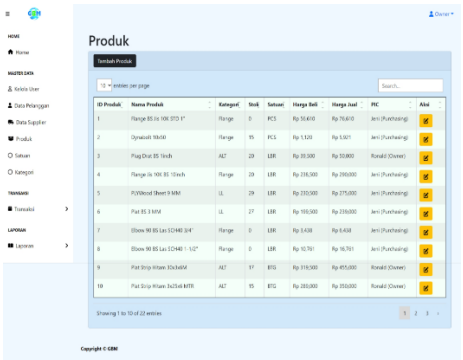

Figure 9. Product Data Interface

The post-development phase of an inventory system involves a crucial testing endeavor aimed at verifying its operational efficacy. This validation process, following the system's creation, adopts the black box testing methodology. In this approach, the developed program is executed, and attempts are made to input data through each interface. The objective is to rigorously scrutinize the program's behavior and ascertain that it aligns precisely with the company's operational

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requisites [19]. The ensuing outcomes are meticulously documented and outlined in Table 2, encapsulating the empirical test results.

Table 2. Blackbox Test Results

No	Pre-condition	Expected Result	Actual Result	Status
1	A username and password are typed in by the user	The user will access the home page if all the information is accurate	When all information is accurate, the user accesses the home page	accepted
2	User signs out	The user exits the website and returns to the login page	After successfully logging out, the user goes back to the login screen	accepted
3	User presses Add Data button to add customer data	Customer information will be kept in the database, and new information will show on the screen	The customer data has been successfully stored in the database and the added data appears on the screen	accepted
4	The user presses the Add Data button to add supplier data	Supplier information will be kept in the database, and newly additional information will show up on the screen	The added information is visible on the screen when the supplier data was successfully saved in the database.	accepted
5	The user presses the Add Data button to add product data	The database will include the product data, and the screen will display the additional info	The database successfully stores the product data, and the additional data displays on the screen	accepted
6	The user presses the Add Data button to add a category	The database will include the category data, and the interface will display the newly added data	The category data is successfully saved in the database and the added data appears on the screen	accepted
7	The user presses the Add Data button to add units	The database will hold the unit data, and the additional data will display on the screen	The unit data is successfully saved in the database and the added data appears on the screen	accepted

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

No	Pre-condition	Expected Result	Actual Result	Status
8	The user presses the add data button to add PO data	The database will be used to store PO data, and additional data will display on the screen	The additional data is displayed on the screen after the PO data is successfully stored in the database	accepted
10	The user presses the add data button to add DO data	The database will have the DO data, and the screen will display the new data	The new data is displayed on the screen after the DO data is successfully stored in the database	accepted
12	The user presses the add data button to add user data	User information will be kept in the database, and new information will show on the screen	The user data has been successfully saved in the database and the added data appears on the screen	accepted

The paramount conclusion drawn from the aforementioned black box testing lies in its pivotal role of affirming the system's capability to discern and resolve issues linked to the recording of both incoming and outgoing goods. This bears critical importance since the company's current operational landscape relies on manual paper-based recording practices. The meticulous testing regime is orchestrated to guarantee not only the seamless functional rendition of the system but also to eliminate any potential anomalies or errors, encompassing scenarios like functional discrepancies, failure to integrate item data into the system, and any concerns regarding system performance. This comprehensive testing regimen serves as a vital steppingstone towards enhancing operational efficiency and fortifying the transition from manual to automated record-keeping practices.

4. CONCLUSION

In an endeavor to enhance business operations, an inventory application was meticulously designed and crafted for companies, fueled by the aspiration to streamline their operational dynamics. This purpose-driven creation embodies the potential to effectively address prevailing challenges tied to stock management, seamlessly furnishing comprehensive stock information at the company's disposal. Moreover, its robust architecture facilitates the efficient management of incoming and outgoing goods, bridging a critical operational gap. As a concluding recommendation, it is advised to augment the Company's inventory website with additional features, thereby fortifying its ability to drive operational excellence moving forward. Providing comprehensive training on the website's functionalities is imperative, ensuring a seamless user experience for employees and mitigating any potential usage hindrances. Additionally, a proactive approach to routine maintenance of the inventory website is pivotal, preemptively averting

the onset of errors and operational inconsistencies. By steadfastly adhering to these recommendations, the envisioned inventory application stands poised to not only refine but also revolutionize the company's operational ecosystem, steering it toward sustained growth and enhanced efficiency.

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