

Design and Construction of Goods Inventory Information System Using First in First Out Method

Nunu Nugraha P¹, Slamet Rahayu^{2*}, Rian Hermawan³

¹²Politeknik Negeri Subang

³Universitas Mandiri

nunu@polsun.ac.id¹, Slamet@polsun.ac.id^{2*}, stmik.rian@yahoo.com³

Abstract

PT SEA in managing incoming goods and outgoing goods data is currently done manually. So that several problems were found including the possibility of missing data, damage to data recording. From this matter, it is necessary to have a Goods Inventory Information System using the First In First Out method. This system was made referring to the SDLC (System Development Life Cycle) method with the waterfall model. An information system is produced that can store data, manage data easily. Tests are carried out with blackbox and UAT types aimed at determining the success of the system. Blackbox testing obtained 100% success. The UAT test obtained an average score of 98% which stated that the system was feasible to use. The final result of this final project is the design and implementation of an inventory information system that is able to assist the parties concerned in managing the inventory of goods.

Keywords: *Information Systems, Inventory, FIFO, Websites*

1. Introduction

Every organization requires a reliable information system to deliver accurate, timely, and up-to-date data that supports operational performance and enhances overall organizational quality. One example is the use of an inventory information system, which serves as an innovation to help inventory staff efficiently control and access information on incoming and outgoing goods [1]. PT Subang Energi Abadi (SEA), a company operating in the natural gas sector, currently relies on Microsoft Excel for recording incoming goods. This manual approach often leads to formula errors that affect data accuracy across columns, resulting in flawed data processing. Moreover, requests for new items and the recording of used stock by technicians are still documented on physical forms, which are prone to being lost or damaged [2]. Another issue lies in the reporting process. The administrative staff frequently experience delays due to the need to manually cross-check and re-enter item data into Excel before submitting reports to management. Additionally, the company often faces shortages in item availability, disrupting the field technicians' operational needs. Compounding the problem, the warehouse lacks a system to regulate the flow of stock. As a result, newly received items are sometimes dispatched before older stock, increasing the risk of losses due to potential obsolescence or depreciation if unsold for extended periods.

To address these challenges, a new system is required to assist various stakeholders, including inventory staff, technicians, and administrators. The proposed system enables administrators to manage inventory transactions automatically using integrated stock management features. It also allows for efficient handling of item requests based on current stock levels [3]. Technicians can utilize the system to submit requests for new items and record data on used items. Meanwhile, directors can access real-time reports on inventory transactions and item requests submitted by administrators [4]. Additionally, the system includes low-stock notifications to prevent stockouts. This research proposes the development of an inventory information system using the First In First Out (FIFO) method [5]. FIFO is a widely used inventory approach in which the oldest stock (first in) is dispatched or sold before newer stock (last in). This method is expected to minimize existing issues and improve inventory accuracy and control.

2. Research Methodology

This research methodology adopts the System Development Life Cycle (SDLC) approach using a modified Waterfall model, tailored to the development needs of the inventory information system at PT Subang Energi Abadi (PT SEA). The Waterfall model was selected because it provides a systematic and sequential process—from requirements analysis to system testing [6]. Additionally, this study incorporates the First In First Out (FIFO) method during the implementation stage, aimed at determining which items should be released first based on the order of their entry [5]. The combination of these two methods is intended to produce a system that is both structured and capable of effectively addressing inventory congestion.



Fig. 1: Stages of system completion

During the requirement analysis stage, data collection was conducted through literature review, interviews, and direct observation. The literature review included relevant academic sources such as journals and previous documents, while interviews and observations involved inventory staff, system administrators, and technical coordinators at PT SEA. The gathered information was analyzed to document user requirements, which then served as the foundation for the system design stage. In the design phase, the system was modeled using UML diagrams including use case, class, activity, and sequence diagrams, and the user interface was designed using Balsamiq Mockup to ensure clarity and usability for end users[7].

The implementation phase involved the development of a web-based system using PHP and the CodeIgniter framework, with MySQL as the database. Coding was performed using Visual Studio Code. At this stage, the FIFO method was integrated into the outbound goods feature to ensure that the first items entered into inventory are the first to be released, with sorting based on entry date. This implementation of FIFO helps prevent item overstock and facilitates technicians in selecting the appropriate items, making the inventory process more efficient and well-controlled[8].

The final stage was system testing, which was carried out using two methods: Black Box Testing and User Acceptance Testing (UAT)[9]. Black Box Testing was used to evaluate system functionality by analyzing the relationship between input and output without inspecting the source code[10]. UAT assessed the system's acceptance level from the user's perspective, focusing on system usability, user experience, and interaction. Evaluation tools included interface layout, use of highlights, visual design, and balance between interface elements. The results of testing conducted by PT SEA staff were then converted into percentage values, which served as indicators of the system's success.

3. Result and Discussion

The current system is illustrated using a flowchart, representing the sequence of processes by connecting each step or instruction within the overall program. The flowchart depicting the ongoing service handling process can be defined in the following figure:

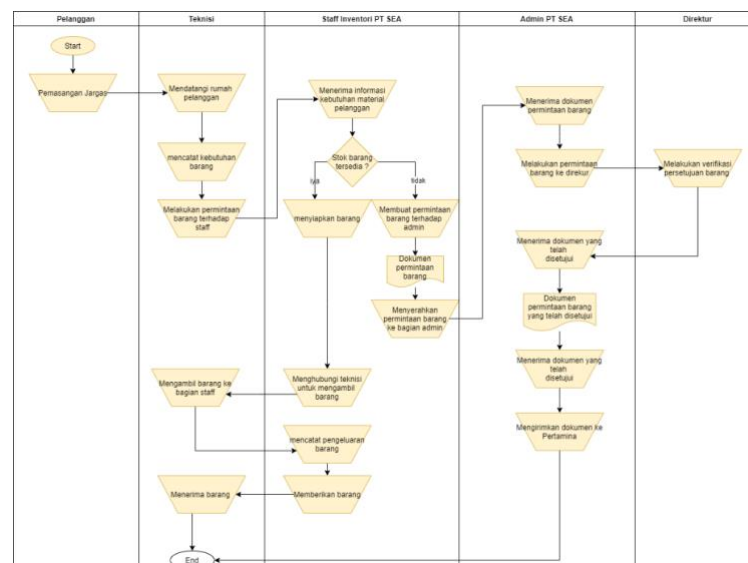


Fig. 2: Flowchart of Item Request

Based on the descriptions provided above regarding the current system, the author proposes the development of a more structured inventory information system by designing the system for each user/division through Unified Modeling Language (UML) modeling, which includes the Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram.

3.1. Usecase Diagram

The inventory management process in the company is still conducted manually, including the management and request of incoming and outgoing goods data, as well as the recording of incoming items by technicians through documentation. This approach allows for potential data loss, damage, and difficulties in retrieving stock card data when needed. The goods request process at PT SEA remains manual. It begins with the administrator preparing a request letter for goods that have been proposed by staff due to stock shortages or depletion. This letter must then be signed by the Director as approval. The request letter is subsequently sent to PT PERTAGAS via a shipping service in Indonesia. Upon receiving the letter, PT PERTAGAS processes the order and delivers the goods to PT SEA. A Use Case Diagram is an abstraction of the interactions between the system and its actors. Use cases are created based on the needs of the actors. The following is the Use Case Diagram of the inventory system at PT SEA:

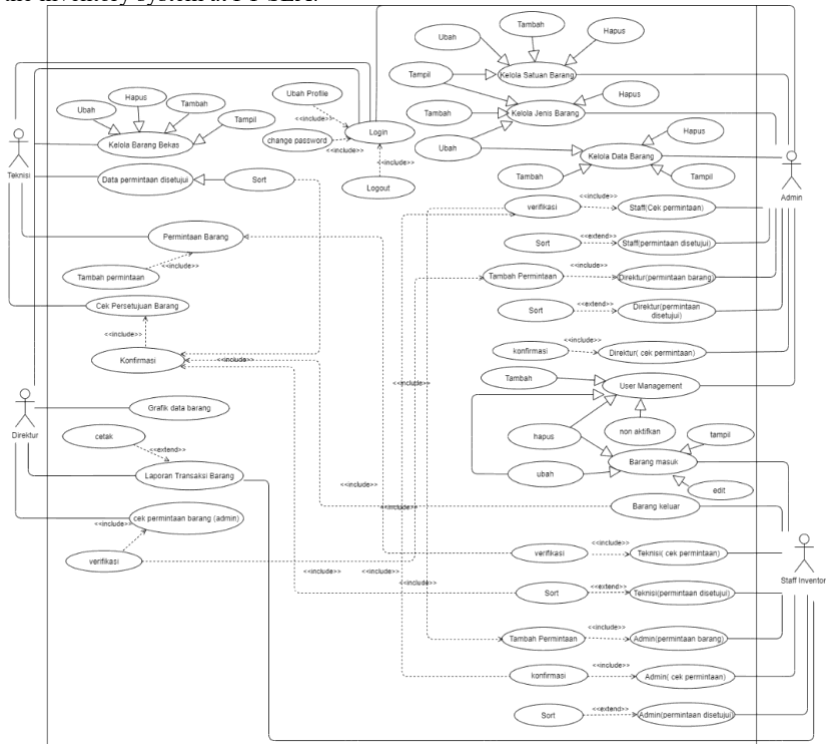


Fig. 2: Use Case Diagram of the Inventory System at PT SEA

3.2. Sequence diagram

Sequence Diagram is a design that illustrates the interaction or relationship between objects from one process to another in accordance with the sequence of those processes. A Sequence Diagram can demonstrate how data flows and the series of steps the system must perform to produce a specific output. The following sequence diagram represents all elements required to build the information within the inventory information system at PT Subang Energi Abadi. The design of the Sequence Diagram for the inventory information system at PT Subang Energi Abadi consists of 31 sequence diagrams. The following illustrates the sequence of the admin making a goods request, as shown in the diagram below, which explains the sequence diagram for adding a goods request:

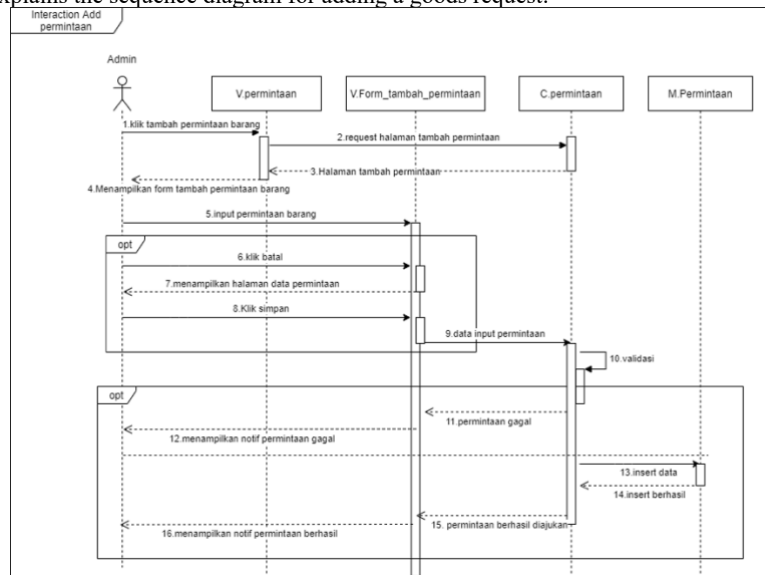


Fig. 4: Sequence Diagram for Adding a Goods Request

Based on the diagram above, to make a goods request, the actor must first access the goods request menu page, after which the system will display the form to add a goods request. The actor then inputs the requested item data to be submitted. After inputting the data, the actor can choose to save or cancel the submission. If the actor selects save, the system will perform validation. If the request fails, the system will display a failure notification, allowing the actor to re-enter the data. However, if the request is successful, the system will display a notification stating "request successfully saved."

3.3. Class Diagram

The Class Diagram in the design of this Inventory Information System illustrates the functions used to build the program, such as the controller, model, and view[11]. The controller manages and processes data from the user. The model relates to data within the database. The view is responsible for displaying data associated with the user interface of the system. Below is the class diagram of the Inventory Information System used in the PT SEA warehouse, as shown in the following figure, which explains the class diagram of the inventory information system:

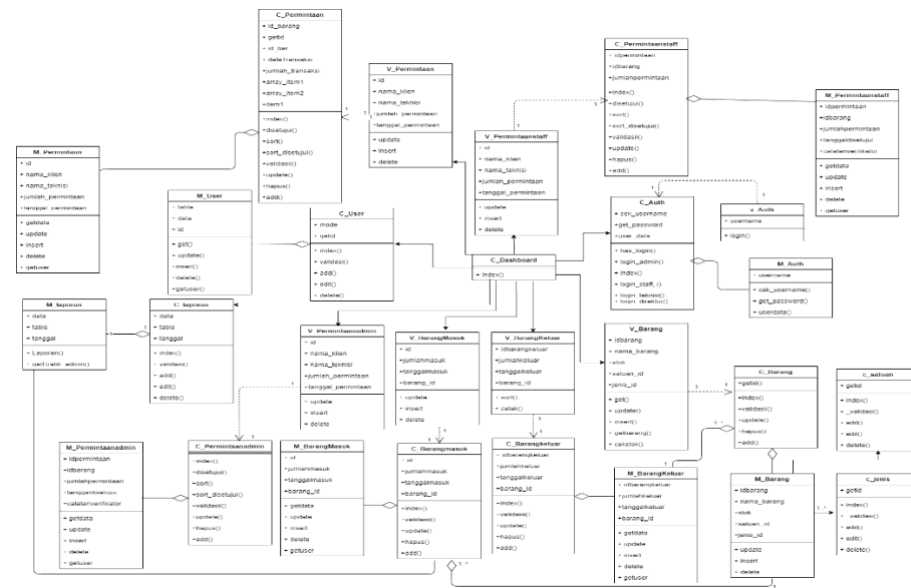


Fig. 3: SEA Class Diagram

3.4. Implementasi Metode FIFO

The flow of the FIFO method in the Inventory Information System of PT Subang Energi Abadi is illustrated in the figure below:

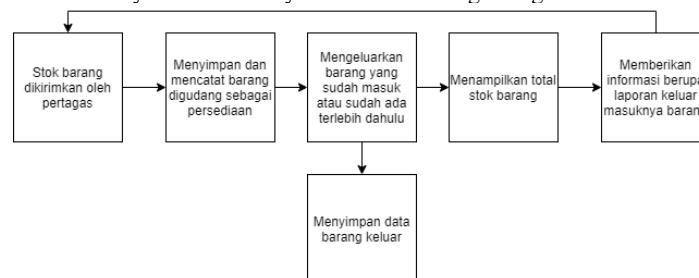


Fig. 4: FIFO Method

The following are the steps illustrated in the figure above:

1. Preparing the basic documents in the form of item records or stock forms for goods that enter the inventory (warehouse) based on their time of arrival.
2. Entering the previously prepared item records into the system.
3. The inputted data is then processed by sorting it according to the FIFO (First In First Out) method, which ensures that items that entered the warehouse first are the ones to be dispatched or sold first.
4. The processed data is then stored in the system.
5. The stored data can be reopened for further processing. After that, the data is outputted, meaning that the processed data can be printed or exported.
6. The outputted data, which has now become information, can be read and understood by the recipient. The items can then be distributed to consumers based on the FIFO method.

The technician submits a goods request to the staff by inputting the request date, client name, item name, and quantity requested. The staff then verifies the goods request based on the FIFO (First In First Out) method, meaning the items with the earliest entry date will be issued first. This information is available in the Lot table[12]. The request table includes the technician's name, client name, item name, lot,

quantity, and date. Once verified, the stock quantity will automatically decrease in the stock menu under the administrator interface, based on the corresponding stock date[13]. The image below illustrates the FIFO feature in the system:

No.	ID Barang	Tanggal Masuk	Nama Barang	Jenis Barang	Satuan
1	B000014	2021-07-05	ENDCAPE	Material	0 Unit
2	B000002	2021-07-06	Regulator	Material	100 Unit
3	B000013	2021-07-06	REDUCER	Material	100 Unit
4	B000012	2021-07-06	TEE-90	Material	100 Unit
5	B000010	2021-07-06	TAPPING SADLE 90-32	Material	100 Unit

Fig. 5: FIFO Feature

The stock page displays the quantity of items in stock by date, which is adjusted based on the quantity requested by the technician. Several fields are included on this page, namely: No, Item ID, Entry Date, Item Name, Item Type, and Unit.

3.5. System Testing

Based on the black box testing conducted with 22 test cases, it can be concluded that the functional system requirements of the inventory information system at PT SEA have been fully met, achieving 100% performance in accordance with the system's objectives and intended functions[10].

Table 1: Average Score of User Acceptance Testing (UAT)

PERTANYAAN	NILAI			
	Nilai jumlah	Jumlah/ responden	%	Rata-rata
ASPEK SISTEM				
1	19	4,75	95%	95%
2	20	5	100%	
3	18	4,5	90%	
ASPEK PENGGUNA				
4	20	5	100%	99%
5	20	5	100%	
6	20	5	100%	
7	19	4,75	95%	
ASPEK INTERAKSI				
8	20	5	100%	100%
9	20	5	100%	
10	20	5	100%	
RATA-RATA TOTAL		98%		

Based on the table, the average score for the system aspect is 95%, indicating agreement that the inventory system at PT SEA has a good appearance, a user interface that is easily accepted, and is easy to operate. For the user aspect, the average score is 99%, which suggests that the inventory system at PT Subang Energi Abadi sufficiently supports user needs. Finally, the interactive aspect received a 100% agreement, indicating that the inventory system at PT Subang Energi Abadi is easy to use and that the menus function as intended. Thus, the testing results conducted by four users demonstrate an excellent rating, with an overall average score of 98%.

4. Conclusion

Based on the results of the analysis, design, implementation, and testing of the Inventory Information System at PT SEA, the system was successfully developed using the Waterfall method combined with the First In First Out (FIFO) approach. The design process was carried out using UML modeling, with the database implemented using MySQL, the PHP programming language, and the CodeIgniter framework.

Testing results using the Black Box Testing method showed a 100% success rate, while User Acceptance Testing (UAT) yielded an average score of 98%, indicating that the system functions properly and is well-received by users within PT SEA.

The system has proven effective in addressing several key issues in inventory management. It significantly reduces the risk of data loss and damage for incoming and outgoing goods by integrating data entry into a centralized database. Furthermore, the item request feature facilitates technicians in submitting item requests, as evidenced by testing results that demonstrate error-free operation and a high feasibility score in the UAT evaluation. The real-time reporting feature has also been successful in assisting management with the preparation of item flow reports, eliminating the risk of input errors that commonly occurred in the previous manual process.

In addition, the system provides convenience for inventory staff in managing stock levels by automatically displaying low-stock alerts on the dashboard. This feature enables swift decision-making to avoid stock shortages. All system functionalities tested through black box testing indicated zero operational errors with a 100% success rate, while the user aspect in UAT demonstrated an average feasibility rating of 99%. Therefore, it can be concluded that the system is effective, efficient, and feasible to be implemented as a reliable inventory management solution at PT SEA.

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