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Optimizing Asset Management: A Risk-Based Approach with Inventory Outsourcing and Asset Management Information System

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Abstract— Effective management of regional assets is crucial for efficient government administration and community service delivery. Proper asset management ensures transparency, efficiency, and accountability in regional property management, supporting key tasks and functions of the government. Efficient asset management empowers local governments to fund regional development and enhances public confidence in state finance management. The rapid development of information technology presents unique challenges, especially in asset management within educational institutions. This study focuses on implementing the Risk-Based Asset Management (RBAM) method in a Web-Based Asset Management Information System. RBAM categorizes requests by risk levels, generates monthly data analysis, and aids in anticipating item stock quantities. The integrated RBAM is expected to enhance inventory management efficiency, improving responsiveness to demand fluctuations. This journal presents research findings related to RBAM implementation, aiming to enhance asset management performance in the government context. The study employs the Research and Development method, fitting for software engineering research. The development utilizes the waterfall model, ensuring a structured software development process. The system streamlines item data management, reporting requests, enhancing facility inventory management.

Keywords: Asset Management, Risk-Based Asset Management, Inventory Control.

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1. Introduction

Asset management is necessary regarding the inventory of assets. The aspects relating to asset management and risk management shall be considered when drawing up the Asset Inventory [1]. Regional assets are one of the important elements in administering government and providing services to the community. Government assets must be managed properly and correctly, so that a transparent, efficient, accountable management of regional property can be realized, and there is certainty of value that can support the main tasks and functions of the regional government. Proper and effective asset management based on the principles of effective and efficient management will be able to empower local governments to finance regional development. On the one hand, professional and modern management of public/sectoral assets by prioritizing good governance will be able to increase public confidence in the management of state finances. [2].

The use of information technology undergoes rapid development every year, posing unique challenges for technology users. In Indonesia, Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 44 of 2019 has regulated the requirements and standards related to facilities and infrastructure in primary and secondary schools [3]. One aspect that needs to be considered is the asset management or organizational resource management, which includes activities such as requesting items, approving requests, and managing item data [4].

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In general, there are a range of types of assets used to conduct various skill-based learning activities around technical and vocational education and training. Inefficiencies in operation and administration, such as difficulty to monitor the history of assets, location or use could result from a lack of proper management of school assets [5].

The inventory process runs smoothly when there is sufficient stock of items and requests are approved. However, obstacles arise when there is a drastic increase in requests, and the available stock cannot fulfil all demands, especially in urgent situations where requests cannot be met in a timely manner. Some school inventory systems have provided data on item stock as a reference during requests. However, to make the inventory process more comprehensive, the Risk-Based Asset Management (RBAM) method can be implemented. RBAM helps anticipate spikes in demand and prioritize the fulfilment of urgent requests.

In this study, we implement the RBAM method in a Web-Based Asset Management Information System. The use of RBAM in this system is expected to categorize requests based on risk levels and generate data analysis and information on requests each month. This analysis aids in anticipating the quantity of item stock based on the rising and falling trends of requests.

Improvements in asset management can be supported using information technology [6]. With the integrated RBAM method in the Asset Management Information System, it is expected that inventory management can become more efficient and responsive to changes in demand. Through this journal, we aim to present the research findings and analysis related to the implementation of RBAM in the context of asset management based on the web. Hopefully, our findings can contribute positively to improving asset management performance in the government environment.

2. Method

The stages in this study used the Research and Development (R&D) method. The R&D method in software engineering research is very suitable because it supports communication. Communication between software developers and prospective software engineering users with prototype systems is very important in software engineering development [7]. The research was conducted using management of outsourcing inventory as a matter of VaR (Value at Risk) provides a mechanism for managing outsourcing inventory business when the warehouse is a leader who is knowledgeable about demand allocation and company cost parameters in outsourcing inventory management [8]. Meanwhile, for developing the information system, the software development model used was the waterfall model.

The waterfall method is a plan-based procedural project management that follows the process and flow of software development [9]. The waterfall model involves several steps, including defining the problem, analysing requirements, designing prototypes, implementation, integration/testing, and release/maintenance [10]. The waterfall model for software development follows a sequential linear or classic life cycle approach, encompassing steps such as problem definition, requirements analysis, prototype design, implementation, integration or testing, and release and maintenance [11].



Figure 1. Waterfall Software Development Method

2.1 Data Collection

Data collection was carried out in three stages:

A. Observation, conducted to obtain a concept of an information system for managing inventory of goods. This was based on the manual inventory processes in the era of developing web-based inventory information systems, aimed at facilitating users in managing inventory data based on

standard operational procedure (SOP).

B. Interviews were conducted by engaging in question-and-answer sessions with the facilities and infrastructure department of a vocational school in Central Java, Semarang, to gather information about the inventory data that would be managed using the system. The interviews were performed to ensure that the developed inventory information system aligned with the objective of managing inventory data in the facilities and infrastructure department of the school, while also presenting data on the process of requesting or repairing items with the added convenience of tracking items.

C. Guidance Study, involved seeking guidance from a competent advisor, selected based on their expertise in the relevant field related to the subject matter of the final project being undertaken.

2.2 Design

A. Flowchart

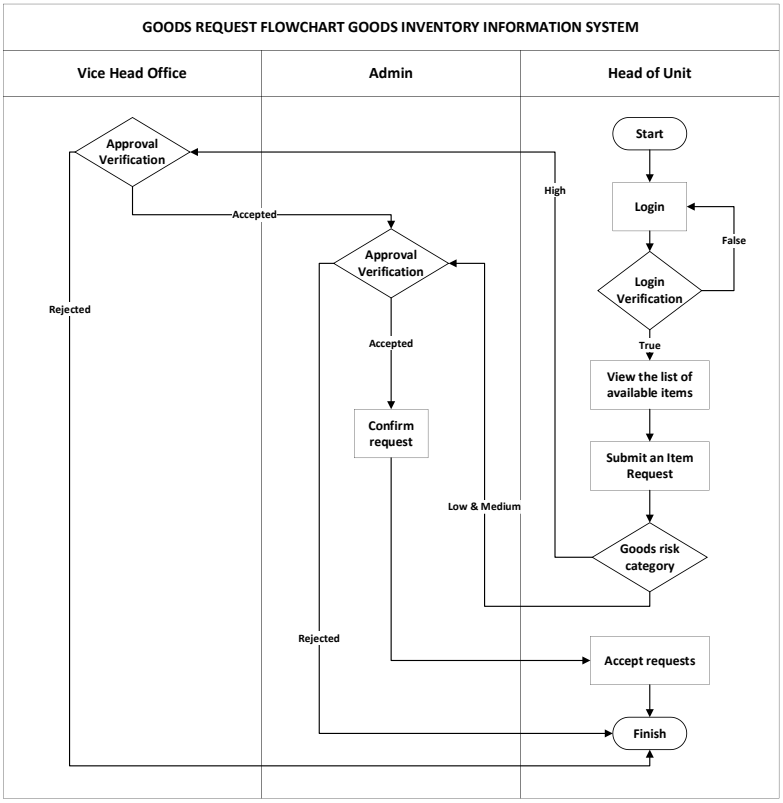


Figure 2. Flowchart Request Item

Explanation of the stages in the item request flowchart:

a) The initial stage in the item request process is to log in to the system so that users can access the menu available in the system. During login, the system verifies the login information, and if it is incorrect, the process will be redirected to the login page. If the login is successful, the process can proceed to access the system.

b) After accessing the system, the Head of Unit can create item requests as needed. The system then checks the risk category of the item.

c) If the item falls into the high-risk category, it requires verification and approval by Vice Head Office first. If approved, then it goes to Admin for further approval. If rejected, the request process ends and cannot be fulfilled.

d) If the item falls into the low or medium-risk category, it requires verification and approval directly from Admin. If approved, the Head of Unit can receive the item. However, if rejected, the request process ends and cannot be fulfilled.

B. Architectural Diagrams

Each user, starting from the Administrator, Admin, Vice Head Office, and Head of Unit, utilizes a desktop device connected to the internet. This website serves as the domain address of the school's hosting server, which stores data related to the school's facilities and infrastructure, displayed through the website.

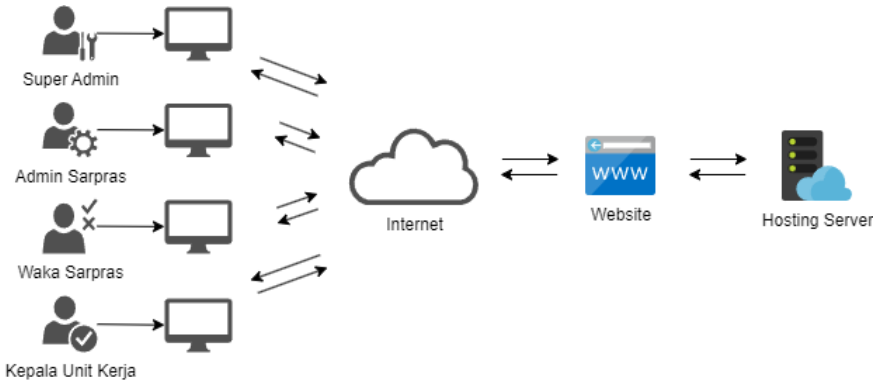


Figure 3. Architectural Diagrams

C. System Design

1) Use Case

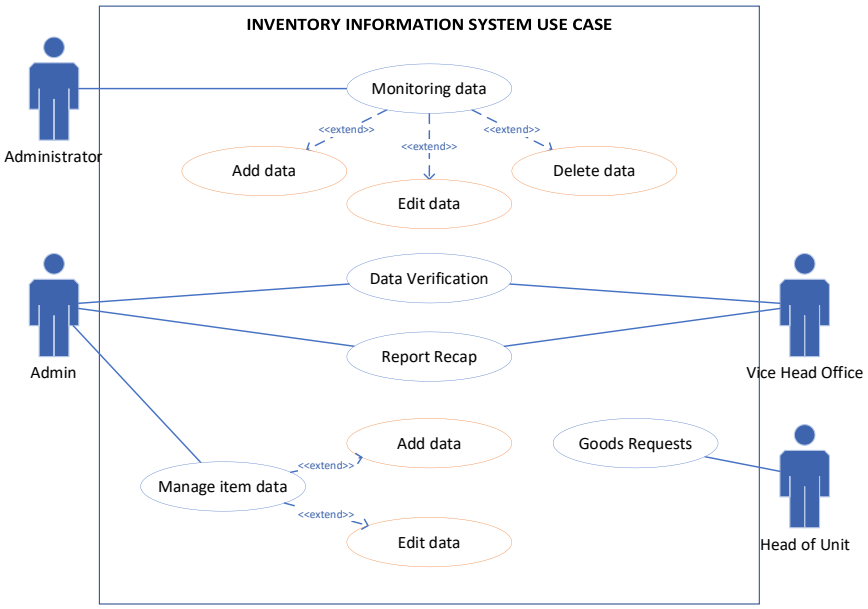


Figure 4. Use Case

Here is an explanation of the use cases in the above diagram:

a) Administrator is a user who has management access (add, edit, delete) to data and can generate inventory reports.
b) Vice Head Office is a user who has access to conduct the first verification during the approval of requests for item requests or repairs if the risk category of the item is high.
c) Admin is a user who has access to verify and approve item requests or repairs.
d) Head Of Unit is a user who has access to make item requests or repairs based on the needs and the available stock in the facilities warehouse.
e) Data Verification is the process of approving item requests and repairs.
f) Report Recap is an activity to print reports on item stock, incoming and outgoing items, and data on item requests or repair requests within a specified date range.
g) Monitoring Item Data is the process of monitoring data to add, edit, or delete items.
h) Managing Item Data is the process of adding and editing item data.
i) Item Request is an activity that can be done by Head of Unit to submit item requests.

D. **Sequence Diagram**

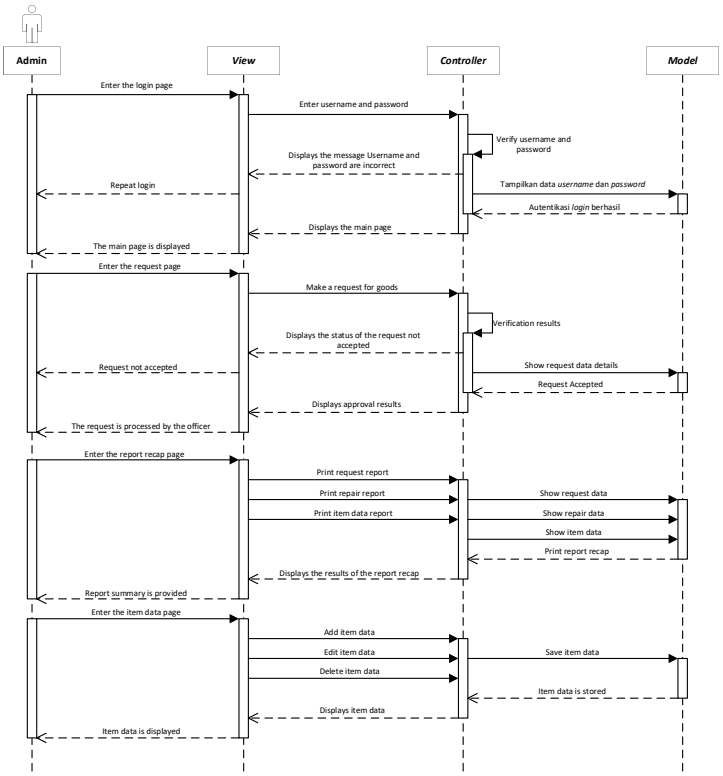


Figure 5. Sequence Diagram for Admin

For Administrator:

a) Administrator logs in by entering the username and password. If the validation process is successful, Administrator can access the system. If the validation fails, it will be redirected to the login page.
b) After successful login, Administrator can manage user data and facility inventory data.

E. **Activity Diagram**

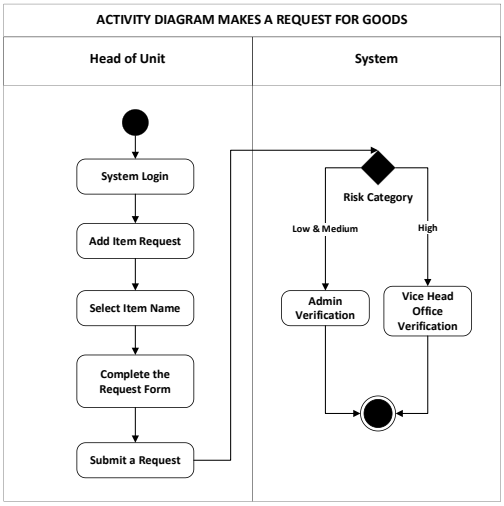


Figure 6. Activity Diagram Item Request

Activity Diagram - Item Request:

a) Head Of Unit logs in to the system by entering the username and password.
b) Access the item request menu, then add a new item request by filling out the request form.

c) Select the item name and quantity to be requested.
d) Save the request data to submit it for verification.
e) The system categorizes the request, if the risk category is low or medium, it is verified by Admin, but if the risk category is high, it is verified by Vice Head Office first.

F. Class Diagram

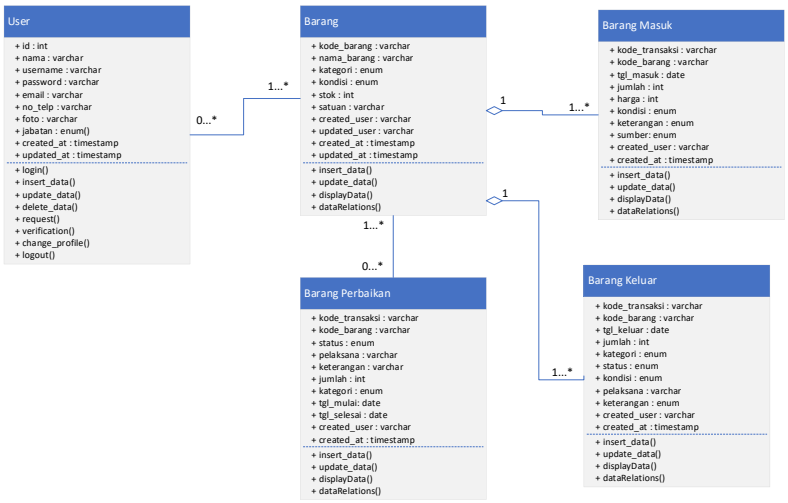


Figure 7. Class Diagram

The explanation of the above diagram is as follows:
a) The class "User" has attributes and data types as shown in the diagram, with operations such as login, insert_data, update_data, delete_data, request, verification, change_profile, and logout. Zero or multiple users can have one or many items.
b) The class "Item" has attributes and data types as shown in the diagram, with operations like insert_data, update_data, displayData, and dataRelations. One or multiple items can be owned by many users or no user at all. Additionally, one item can belong to one or multiple item categories.
c) The class "Incoming Item" has attributes and data types as shown in the diagram, with operations like insert_data, update_data, displayData, and dataRelations. One or multiple incoming items are subclasses of a single item's data.
d) The class "Outgoing Item" has attributes and data types as shown in the diagram, with operations like insert_data, update_data, displayData, and dataRelations. One or multiple outgoing items are subclasses of a single item's data.

3. Result and Discussion

Here is the result of the database schema that has been designed to facilitate data and information management within this system. In the database schema, there are nine tables, whereas previously in the class diagram, there were only five; these additions were made to cater to the storage requirements for notifications, time to respond, repair logs, and incoming item details.

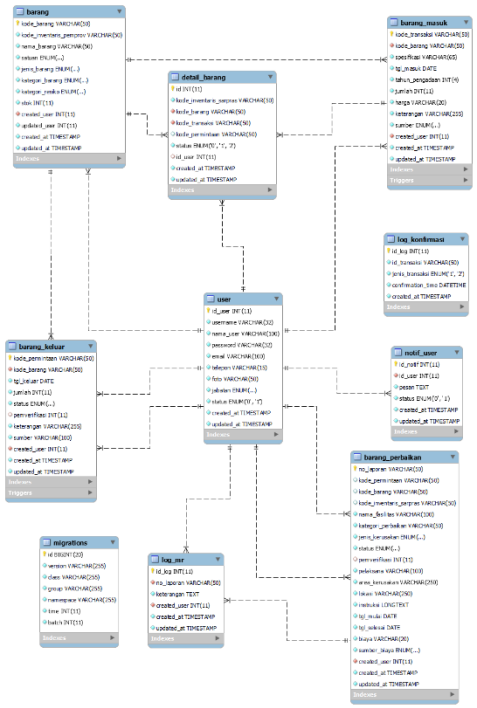
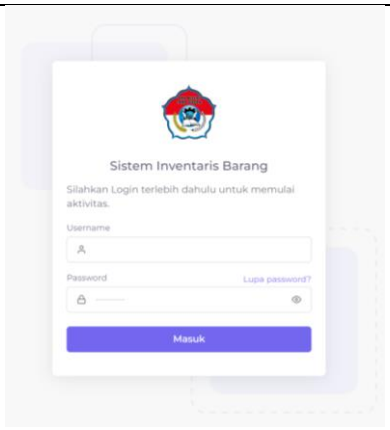
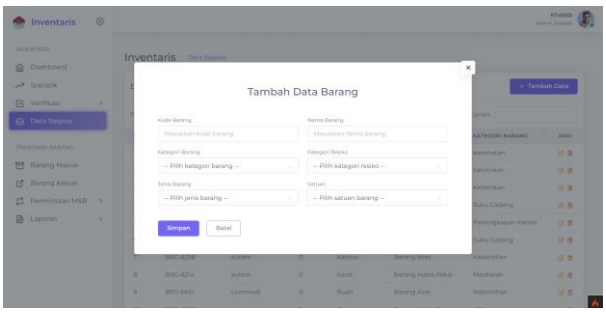
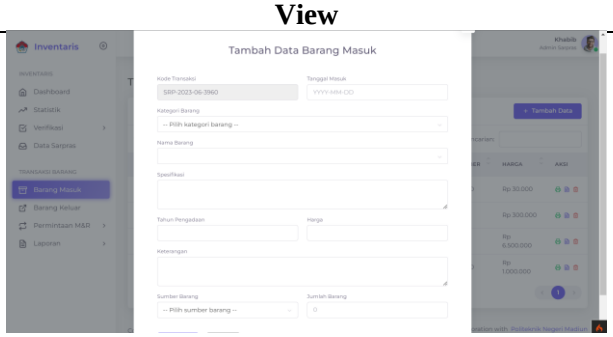
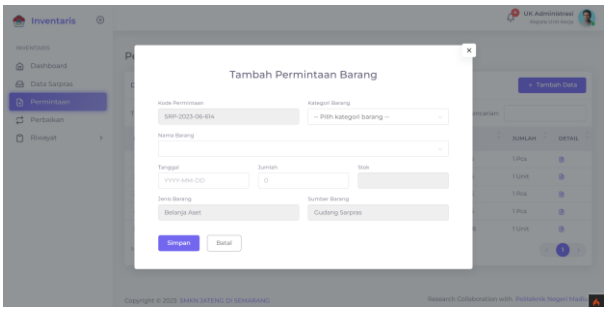
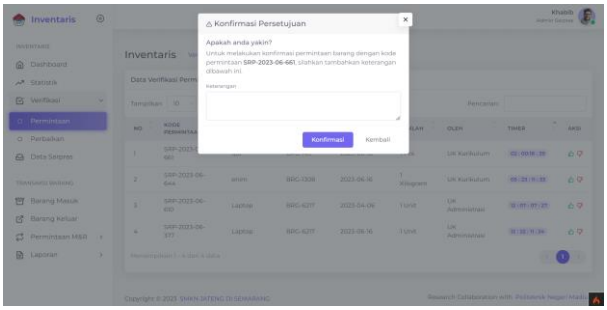


Figure 8. Database Schema

Inventory Outsourcing and Asset Management Information System have been designed and tested directly by users. Below are the results of the information system test table by actors.

No	View	Sub Test	Test Result
1		Enter the system with username and password	If username and password true, system displays a different main page for each user's position, if it is false, it will remain on the system login page
2		Add data for sarpras items	Data is stored in the database and there is no the same item code
3		Add incoming goods data	Incoming goods data is stored in the database and the stock of input data

No	View	Sub Test	Test Result
			increases with the number of each incoming item
4		Add request goods	Can make requests for goods with stock above 0 and are not allowed to enter more than the available stock
5		Request confirmation	Can verify the request for goods to be approved or rejected. If no response is approved or rejected, the system will respond automatically rejecting the request for goods when the time to respond is up.

4. Conclusion

The Final Project research conducted at Central Java Vocational High School in Semarang aims to create a website to facilitate the process of managing school facility inventory. This convenience is manifested in several processes that occur, as follows:

A. Admin can manage item data through the system, including activities such as inputting, modifying, and deleting facility inventory data. They can also add stock by entering incoming item data. A statistical menu is available to assist in determining the items that need to have surplus stock due to an increase in demand. Statistics aid in decision-making based on summarized inventory data.
B. Both Admin and Vice Head Office can print reports on item stock, incoming items, outgoing items or requests, and repair records.
C. Head of Unit can add item request data for items available in the facility and can also add general repair requests or request specific item repairs. For each ongoing repair, there is a repair timeline that can be viewed, and a feature to print repair instructions is available. Head Of Unit can print repair reports when the repairs have been confirmed as completed by Admin and accepted by Head of Unit.

Acknowledgment

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