



{ MUDIMA }



Design and Development of Raw Material Management Information Systems for Pelangi Cake Bakery

Vincent Dennis Christian^{1*}, Prya Artha Widjaja²

Universitas Matana

Corresponding Author: Vincent Dennis Christian vincentdennischristian@gmail.com

ARTICLE INFO

Keywords: Raw Material, Information System, Reorder

Received : 5 May

Revised : 20 June

Accepted : 23 July

©2024 Christian, Widjadja: This is an open-access article distributed under the terms of the [Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/).



ABSTRACT

Effective management of raw materials is an important factor in maintaining business operations, especially for manufacturers. Pelangi Cake Bakery face some challenges in managing its raw materials. The challenges it faces are in terms of documentation and maintaining the supply of its raw materials. This research aims to build a raw material management information system that could help Pelangi Cake Bakery to effectively and efficiently manage its raw materials inventory. The system would be able to provide accurate and real-time information, as well as a centralized documentation that could help its users to make decisions. The findings of this research are that the main problem Pelangi Cake Bakery had was there were no documentation done in its inventory management. Therefore, the system is designed to be focused on the documentation of the usage of raw materials, stock reports, and to encourage collaboration between people in the raw material management activity

INTRODUCTION

In this era of globalization where business competition is getting fiercer than ever, the usage of information technology has become widespread among businesses for its operations and innovation (Xia et al., 2024). One important business activity, especially in manufacturing businesses is management of its raw materials. Effective management of its raw materials is detrimental to ensure business process flow as intended and it could lead to consumer satisfaction. A good inventory management system can also lead to reduced stockout, better tracking and availability of items (Savitha, 2023).

Pelangi Cake Bakery, a business based in Indonesia that produces goods such as birthday cakes, desserts, and snacks acknowledge the need of an effective management system of its raw materials. Pelangi Cake Bakery routinely orders raw materials such as flour, jams, chocolate, butter and many more. However, it does not have a proper inventory system to manage its raw materials. Pelangi Cake Bakery only does visual inspection to check its stock of raw materials, which leads to stockouts. Another problem that was identified was the lack of documentation of items going in and out. These are several reasons why Pelangi Cake Bakery needs a raw material management information system to be implemented (Christian, 2024).

METHODS

The methods used in this research is a qualitative approach, in which the researcher will be conducting an interview with the staff and owner of the business to find out necessary information such as user story, problems in the business process and hopes for the system that is to be developed. UML diagrams such as use case, activity, class, sequence diagram are to be used to visually model the system, to show its structure, data, and processes. The system's interface is also going to be designed using a prototyping software to let the client and reader visualize how the system will turn out. The SDLC method chosen is the waterfall method, in which the previous steps needed to be completed

before moving forward to the next one (Nugraha, 2020). The development of the system website will be using PHP as the programming language. Lastly, blackbox testing method will be used as the testing method of this research. This method of testing aims to see whether the system developed can operate as intended.

RESULTS AND DISCUSSION

Interview Results

After conducting the interviews with staff and owner, information regarding the roles, business processes and its weaknesses were identified. In the inventory or raw material management process, there were three entities involved, they are: production staff, decoration staff and the business owner.

Each of them has their own responsibilities.

1. Business owner: Manage finances, manage operations, manages purchases of raw materials, manages marketing.
2. Production staff: Manufactures goods (turning raw materials into unfinished products, such as basic cakes and snacks). Pack products and manages items in the warehouse.
3. Decoration staff: Decorates cakes that has been made by the production staff and packs them.

The process of raw material management in the bakery have also been identified through the rich picture diagram shown in figure 2. Production staff who manages most of the warehouse activity, inspects the stock of raw materials visually daily. If there were any need to restock the raw materials, then they would report to the business owner, in which the owner will order the needed items to the supplier. After the items ordered are shipped and received, production staff will put them into the shelves. Any delivery notes received by the production staff would then be given to the store clerk, in which it will be collected and given to the owner by the end of the day.

Weaknesses Found in Current Process

Based on the results of the interview, the current process to manage raw materials has its weaknesses, such as:

- Production staff inspects stock of raw materials visually, which is prone to human error.
- No documentation for raw material usage and receiving raw materials.
- Items received are not inspected whether they match the orders or not.

Solutions to The Problems Found

Based on the weaknesses stated before, Pelangi Cake needs a web based raw materials management system, that could help to record inventory levels. With this proposed system, the problems stated above could be solved through:

- Items going in and out are updated immediately after the user had saved the changes & information are stored in a centralized database.
- The business owner could upload purchase order forms into the system to make matching process during receiving items easier.
- The system could generate a detailed report showing the quantity of each item that is available and stored in the warehouse.
- The system would notify the users when items need to be reordered.

System Design

The rich picture diagram in figure 3 shows how the designed system would work. The warehouse staff (production staff & Decoration

staff) would be able to input usage of items to the system, in which it would immediately be updated. If there are any items that needed to be reordered, then the system would notify the user. The warehouse staff then could create a purchase requisition form to be sent to the owner for approval. The owner then could approve or reject the request. If the request is approved then it would be saved in the system. In the receiving process, warehouse staff could use the feature in the system to input the items received and match it with the order that was made. The users of the system could also generate reports from the system to have an overview of the current inventory levels, which could provide them the necessary information to plan ahead.

To further conduct the design of the system, various other UML diagrams are going to be used. A use case diagram needs to be made to state what actions are available for the user to do (Andriyani et al., 2022). The use case diagram below shows that there are two actors, the warehouse staff and the business owner. The warehouse staff can crosscheck and match items received, create purchase requisitions, update item usage, and generate stock reports. The business owner could create new staff accounts, register new suppliers and items. Approving purchase requests, uploading purchase order data are also a few more unique actions that can only be done by the owner.

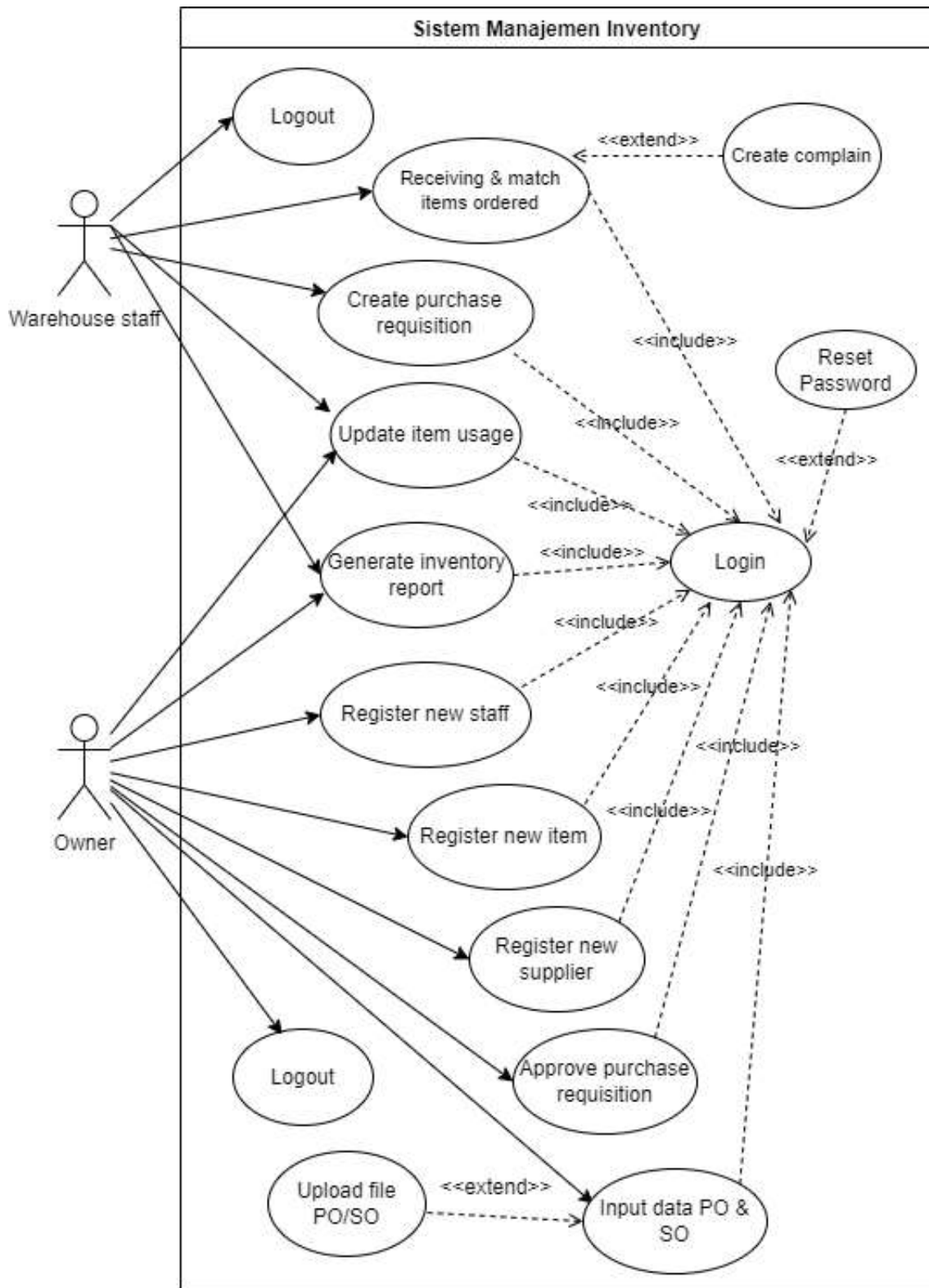


Figure 1. Use Case Diagram of Raw Material Management System

An activity diagram is also constructed based on the use case of the use case diagram above. The activity diagram is used to further visualize the flow of activity in the system (University of Waterloo, 2024).

Eight activity diagrams were created to visualize the flow of the designed system.

1. Login & Logout (Figure 6): This activity diagram shows how a user logs in and out of the system. Starting from when they enter their credentials, verification and until they decided to end their session and logs out of the system.
2. Receiving and matching (Figure 7): This activity diagram shows what the steps the warehouse staff must take when receiving order shipment and to make sure items received are the same as items ordered.
3. Item usage (Figure 8): This activity diagram shows the flow of process when the warehouse staff needs to take items out of the warehouse for production purposes. From selecting the item needed and state how much quantity they need, until the system receives the confirmation to update the stock levels.
4. Create Purchase Requisition (Figure 9): This activity diagram shows the flow of process when the warehouse staff creates a new purchase requisition form, in which he/she states the items needed and the quantity that needs to be ordered, to be sent to the business owner for replenishment.
5. Purchase Requisition Approval (Figure 10): This activity diagram shows the process when the business owner receives the request from the warehouse staff, containing items that needs to be reordered. The business owner needs to approve or reject this request form. If approved, then it will be saved in the system, to be used to make orders to the supplier. If rejected, it is to be sent back to the warehouse staff for revision.
6. Registration of new staff/items/suppliers (Figure 11): This activity diagram shows the process of adding new staff account, new items and suppliers. It starts from the need to create a

new data entry, filling out necessary data and storing the new entry.

7. Generate Report (Figure 12): This activity diagram shows the process flow when users need to generate report of the raw materials available. Users will need to pick the type of report that is going to be created, all items or a specific item. If the user chose all items, then the report will show details of each item that is registered. If the user chose a specific item report, then the system will display information regarding that specific item.
8. Reset Password (Figure 13): This activity diagram shows the process flow of when a user decided to change or forgot his or her password.

User Interface Mockup Design

The user interface designed for this website (Shown in Figure 4) has several elements inside it. A side navigation bar that includes a variety of menus that the users can navigate through, each with their own purpose. A dashboard in the center of the homepage, providing the user with easy-to-read information and also a section that provides information on which item needs to be replenished.

On the side navigation bar, it includes features such as:

- Item data
- Item type & unit of measurement
- Items going in (receiving)
- Items going out (usage)
- Create & approve purchase Requisition
- Inventory report
- Complain list
- User management
- Supplier list
- Change Password

Raw Material Management System Website

The website was mainly developed using PHP language and developed locally. PHP is a programming language that is designed to be used on dynamic web development. PHP serves as an intermediary between database and web server, that

allows process of data and interaction with users (Primakara University, 2023).

The picture shown on figure 5 shows the homepage of the developed website of the raw material management system. It features more or less the same appearance as the mockup design page. Primary elements of the homepage are the side navigation bar and the dashboard that users can interact with.

Blackbox Testing

After the development stage of the website was done, testing should be done to ensure the system developed is running properly. To do the testing needed, the blackbox testing method was used. Blackbox testing is a form of testing that aims to test whether the system is running as it was designed, to make sure each and every feature is tested (Sutiah & Supriyono, 2021). Table 1 shows the results of the testing done.

CONCLUSION

From the results of this research, it can be concluded that the main problem Pelangi Cake Bakery faced was that there were no documentations that can oversee the movement of raw materials in the business process. That is precisely why Pelangi Cake needed a system that can manage its raw materials through proper documentation, information through reports and notification, while encouraging collaboration between staffs and business owner in managing inventory levels.

It should be noted that the system designed has its flaws and not all of its designed functions have been completely implemented. Therefore, for further research this system could be improved by broadening its scope and implementing all of the necessary functions.

IMAGES

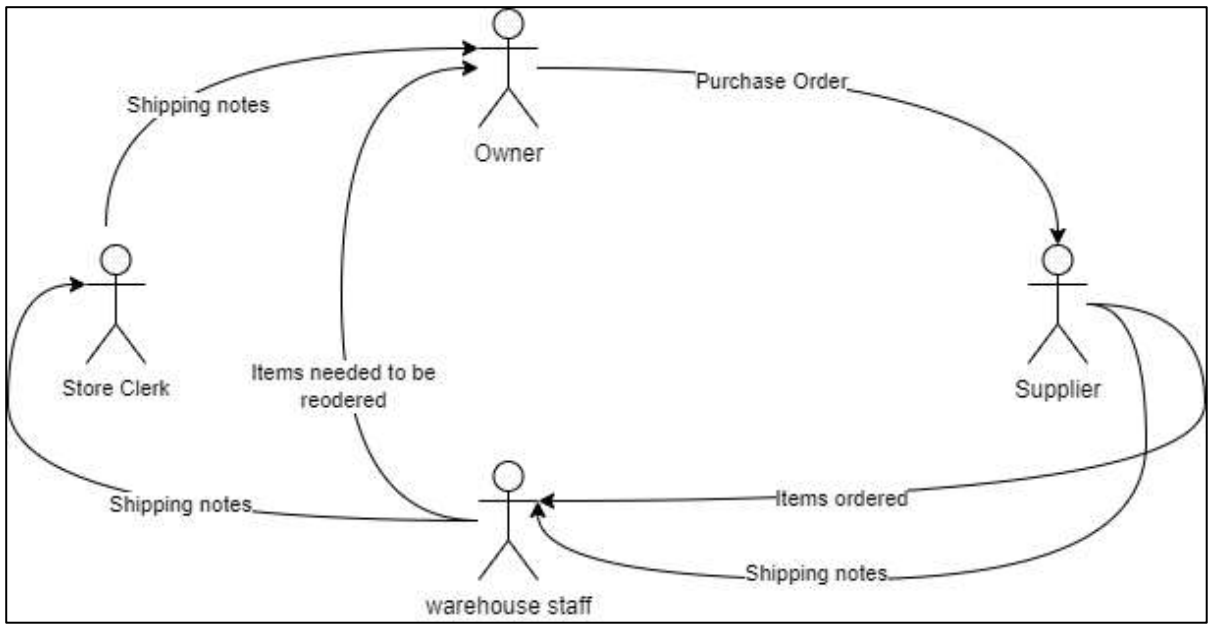


Figure 2. Rich Picture Diagram of Current System

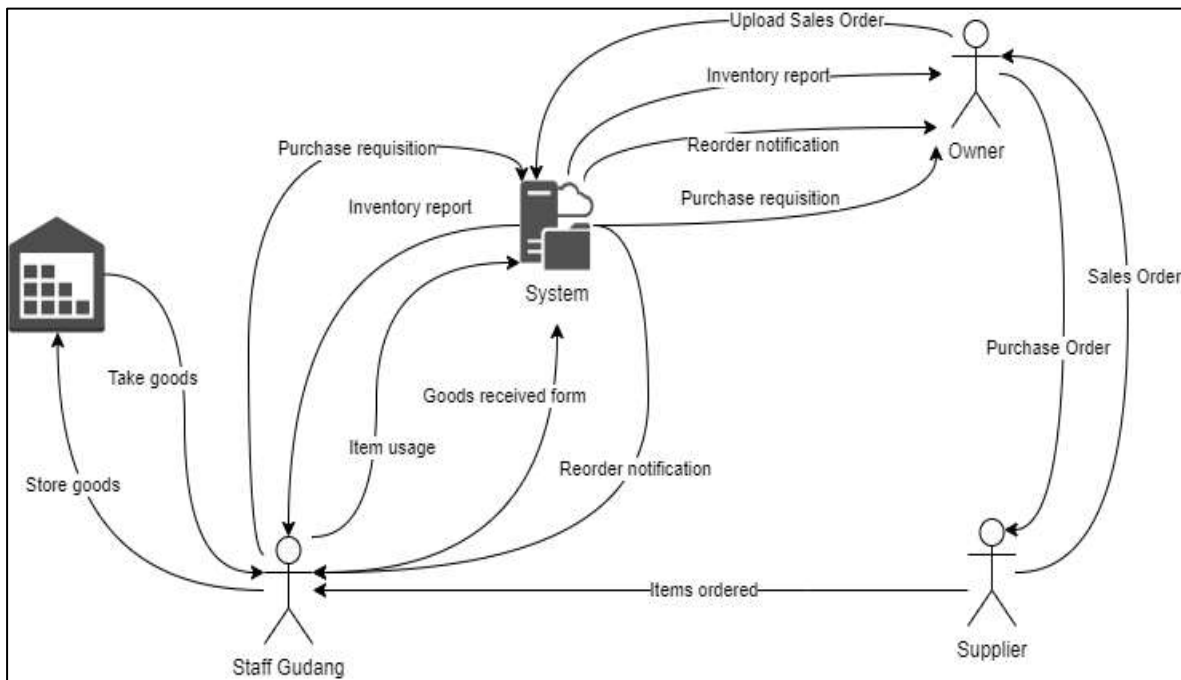


Figure 3. Rich Picture Diagram of Raw Material Management System



Figure 4. Mockup Design Homepage

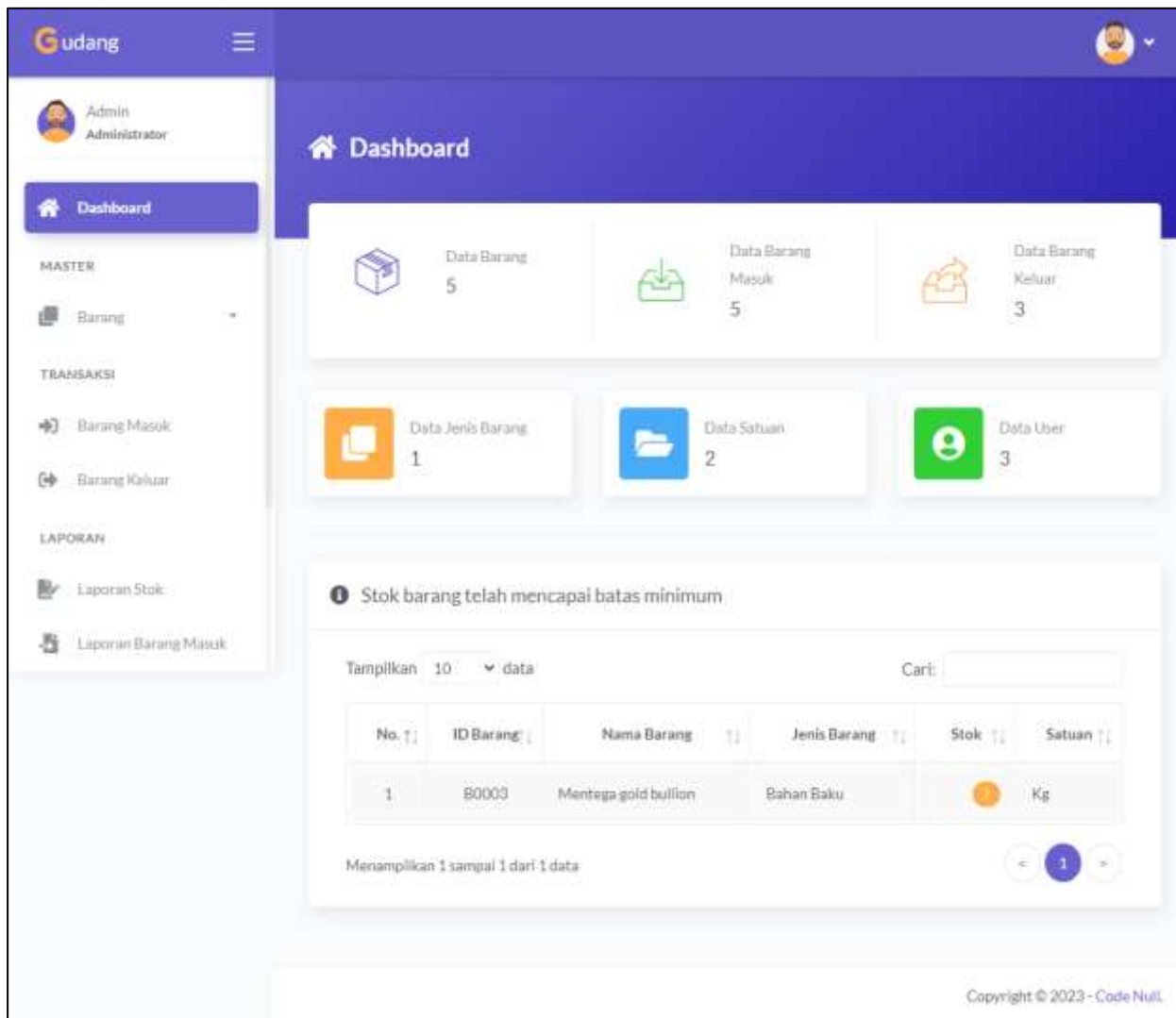


Figure 5. Raw Material Management System Website

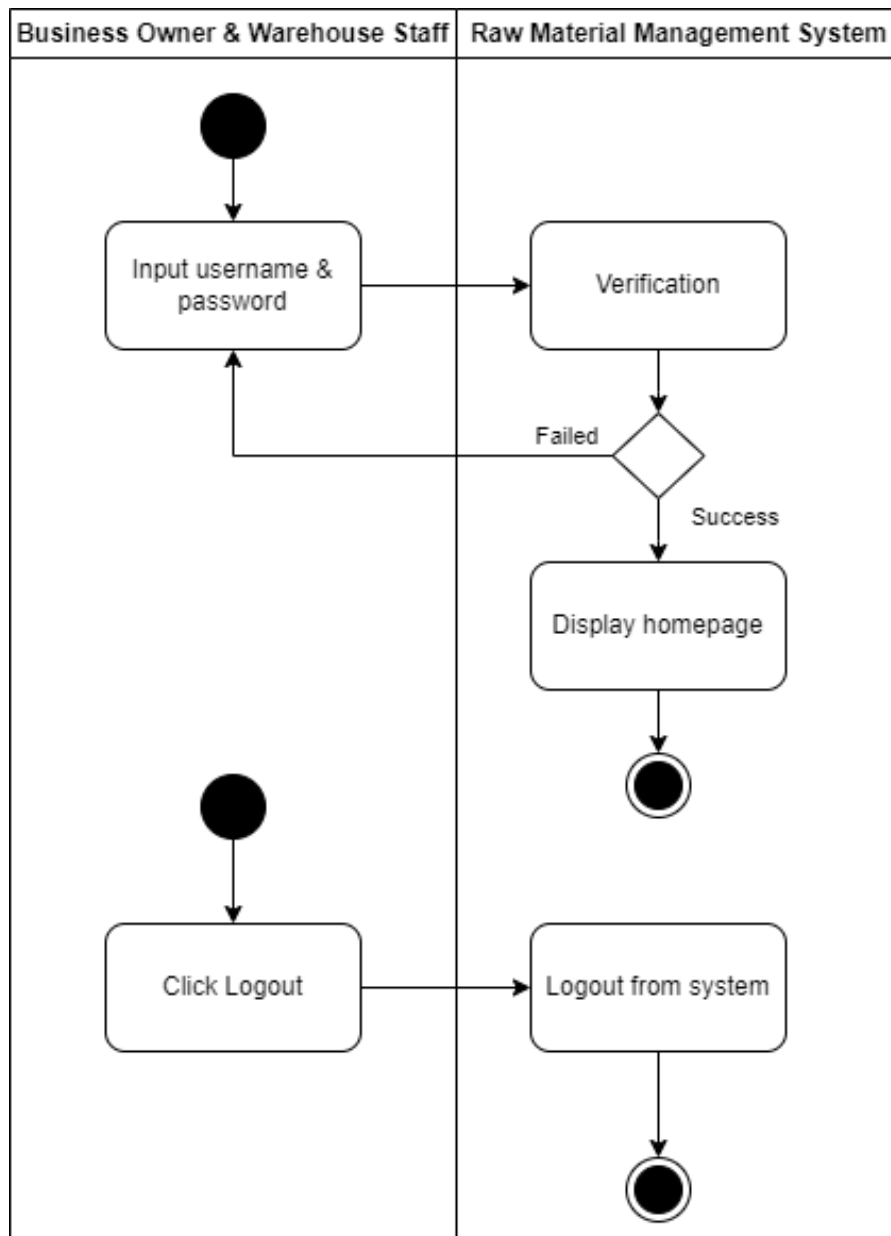


Figure 6. Activity Diagram – Login & Logout

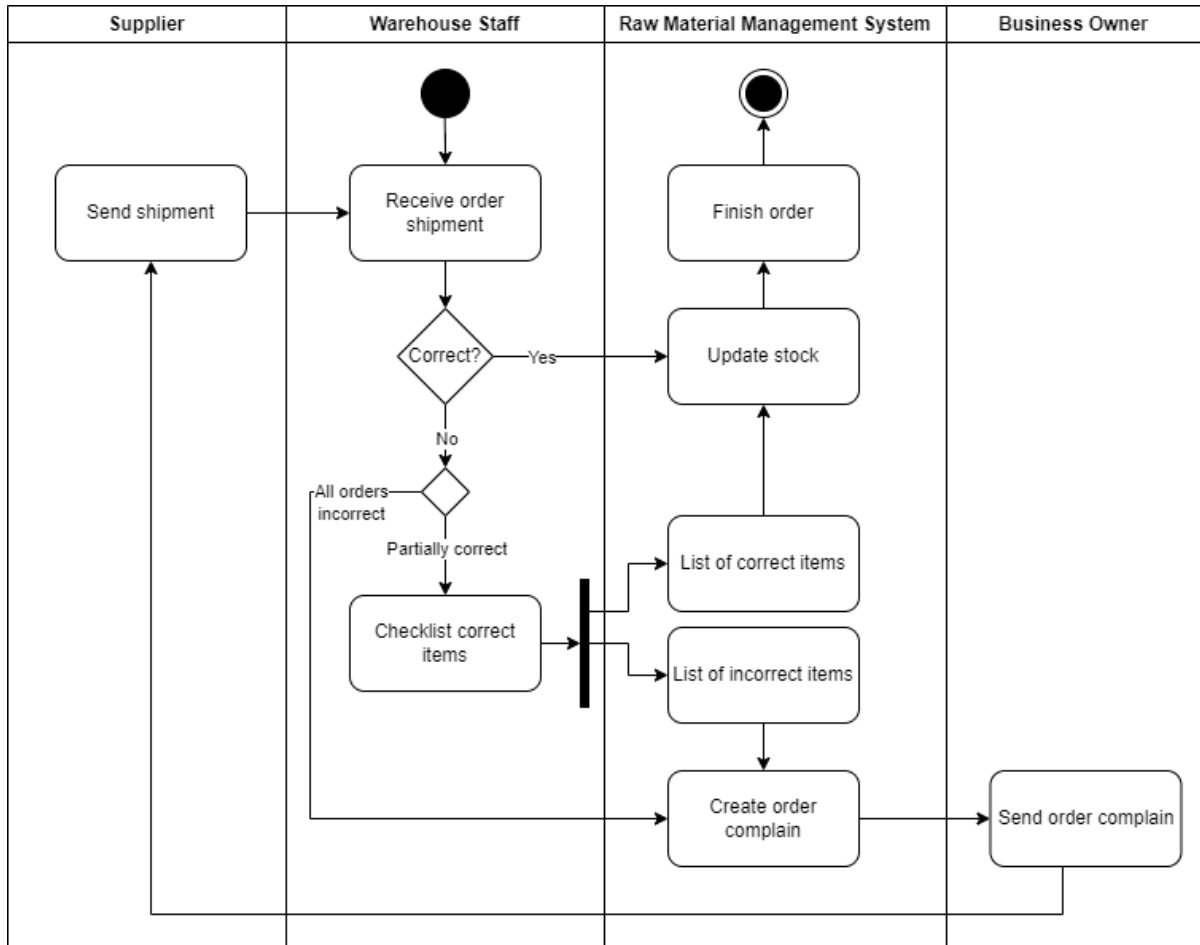


Figure 7. Activity Diagram – Receiving and Matching Order Items

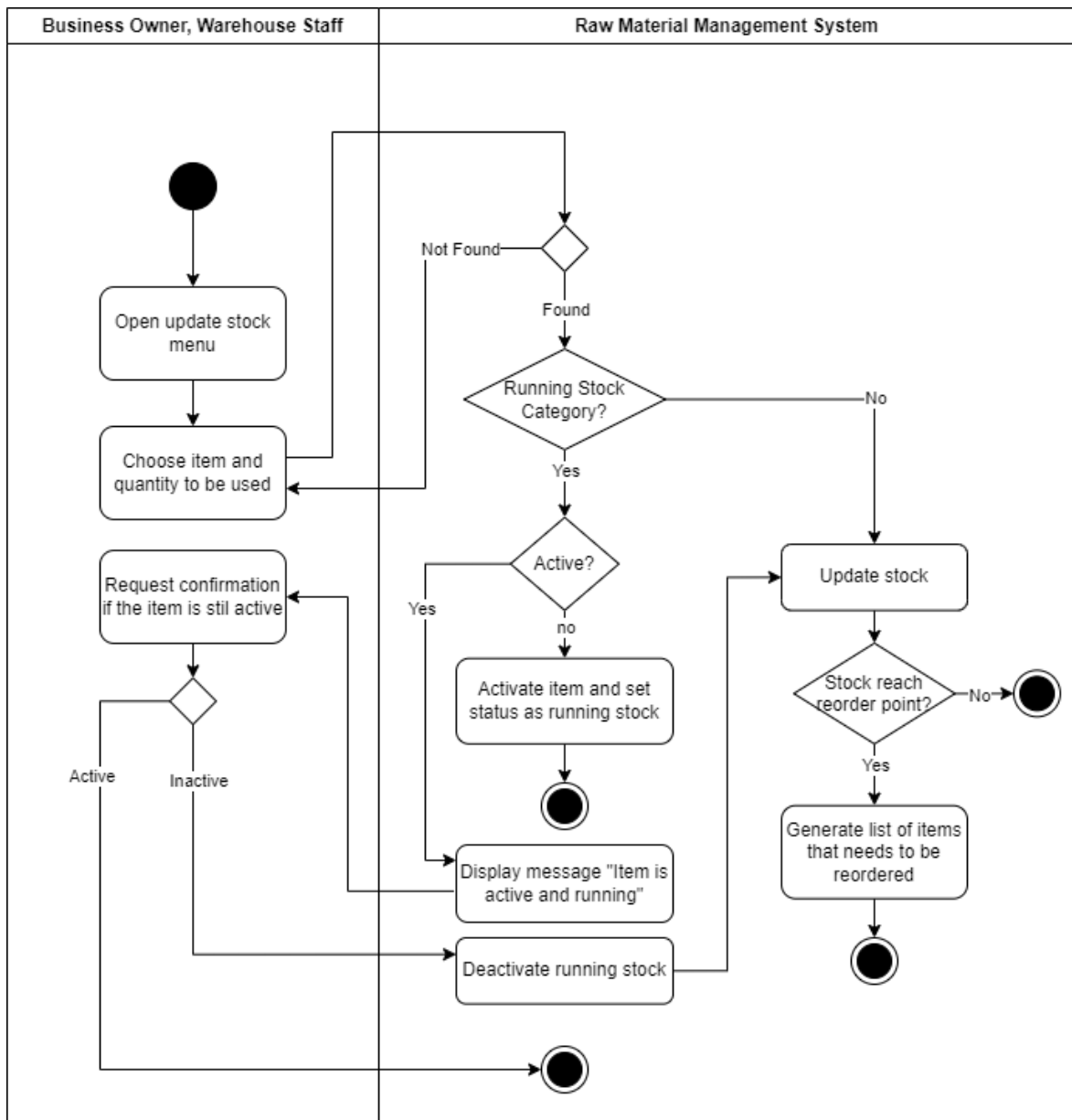


Figure 8. Activity Diagram – Item Usage

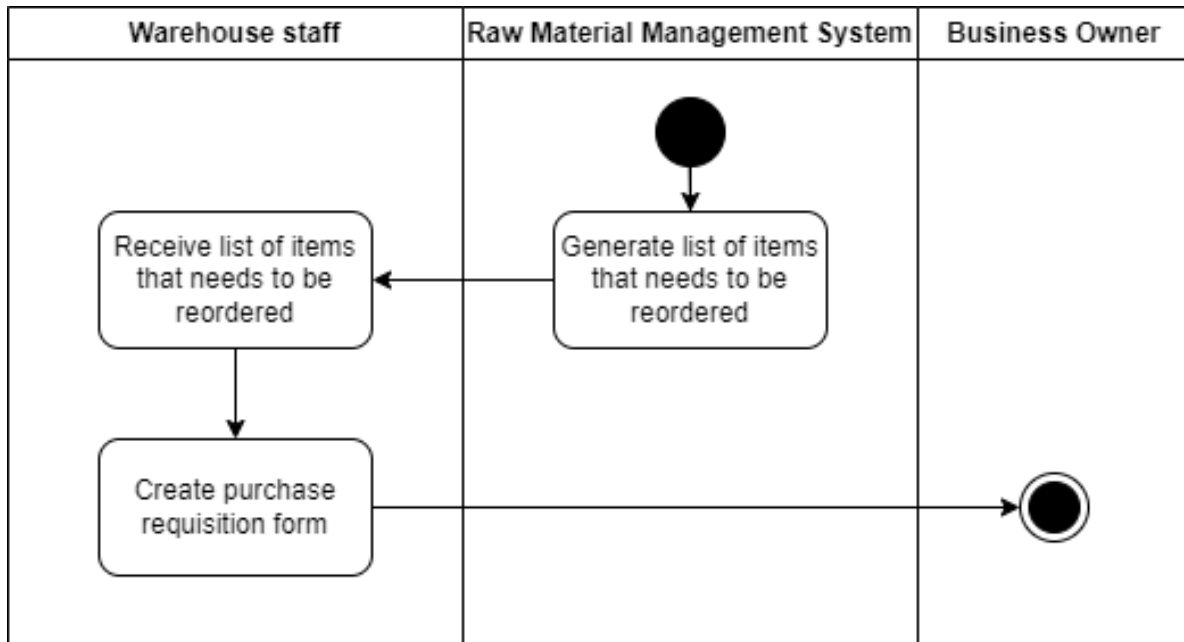


Figure 9. Activity Diagram – Create Purchase Requisition

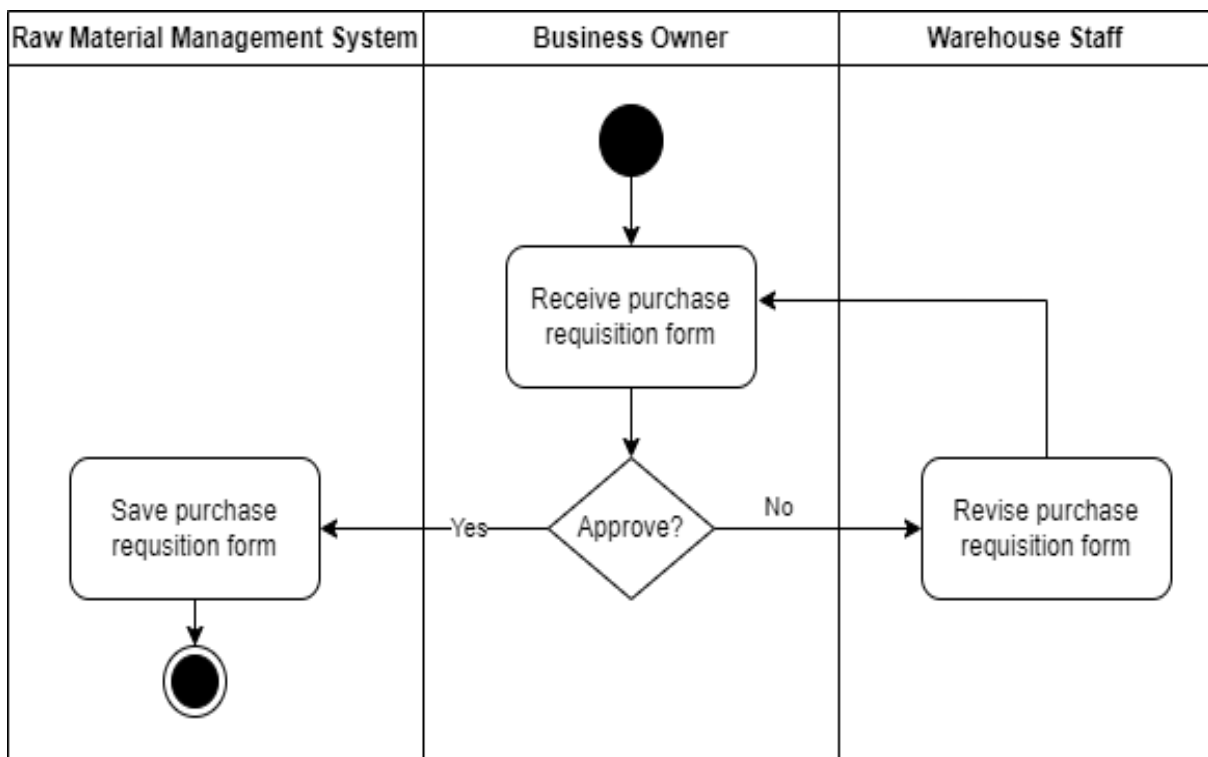


Figure 10. Activity Diagram – Approve Purchase Requisition

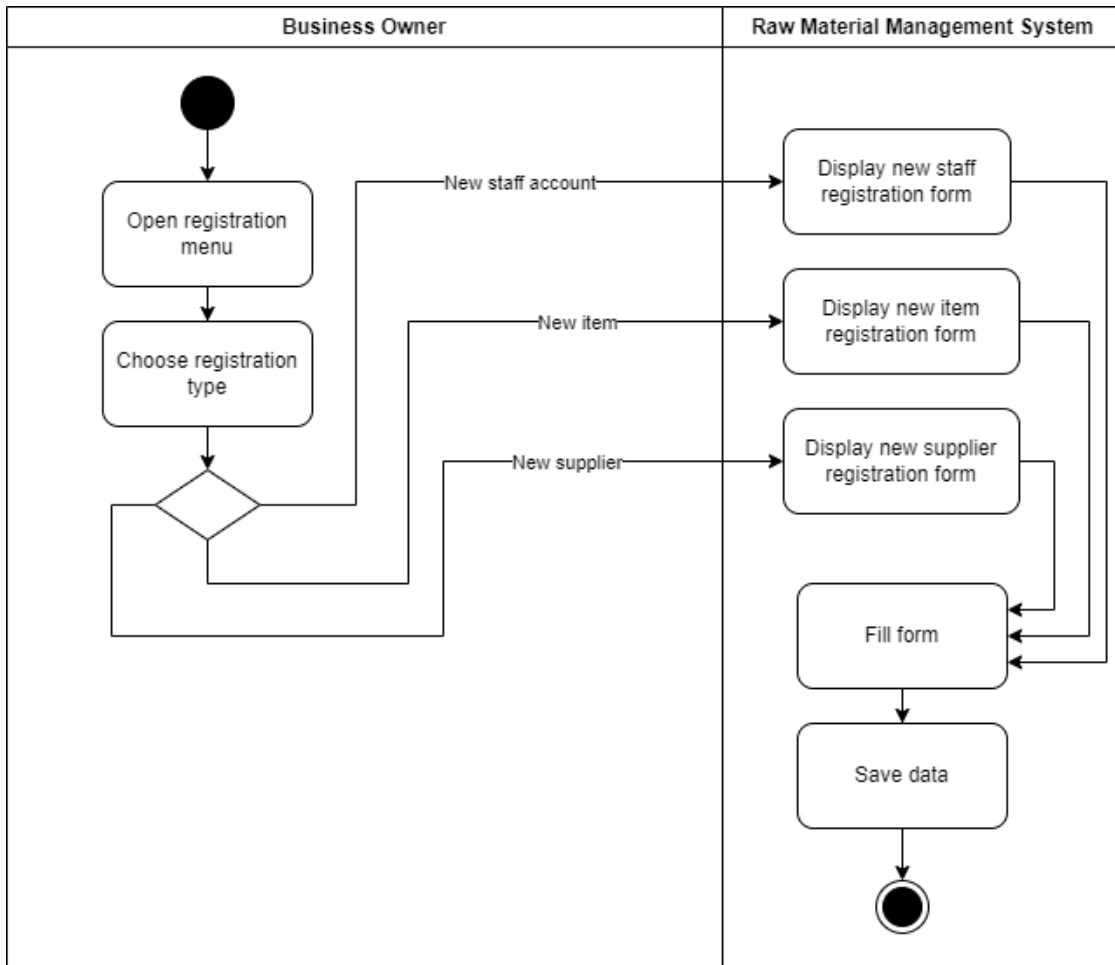


Figure 11. Activity Diagram – Registration of New Item/Staff/Supplier

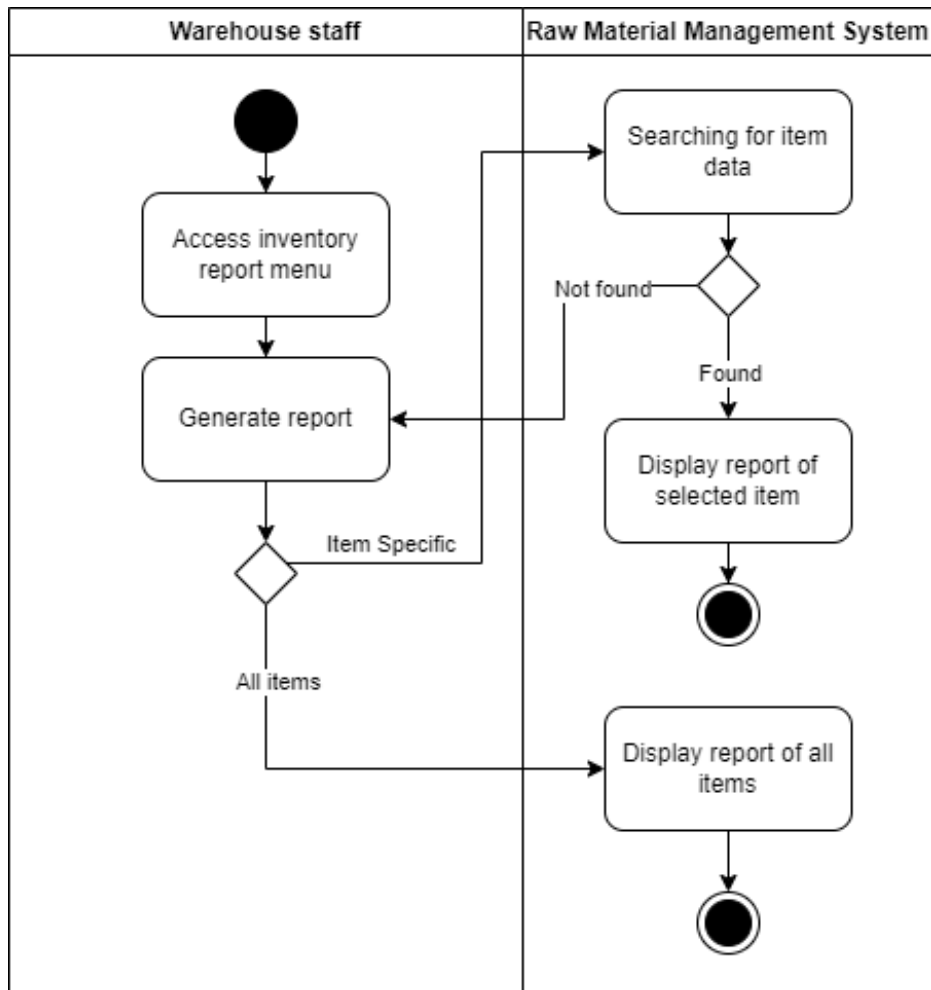


Figure 12. Activity Diagram - Generate Report

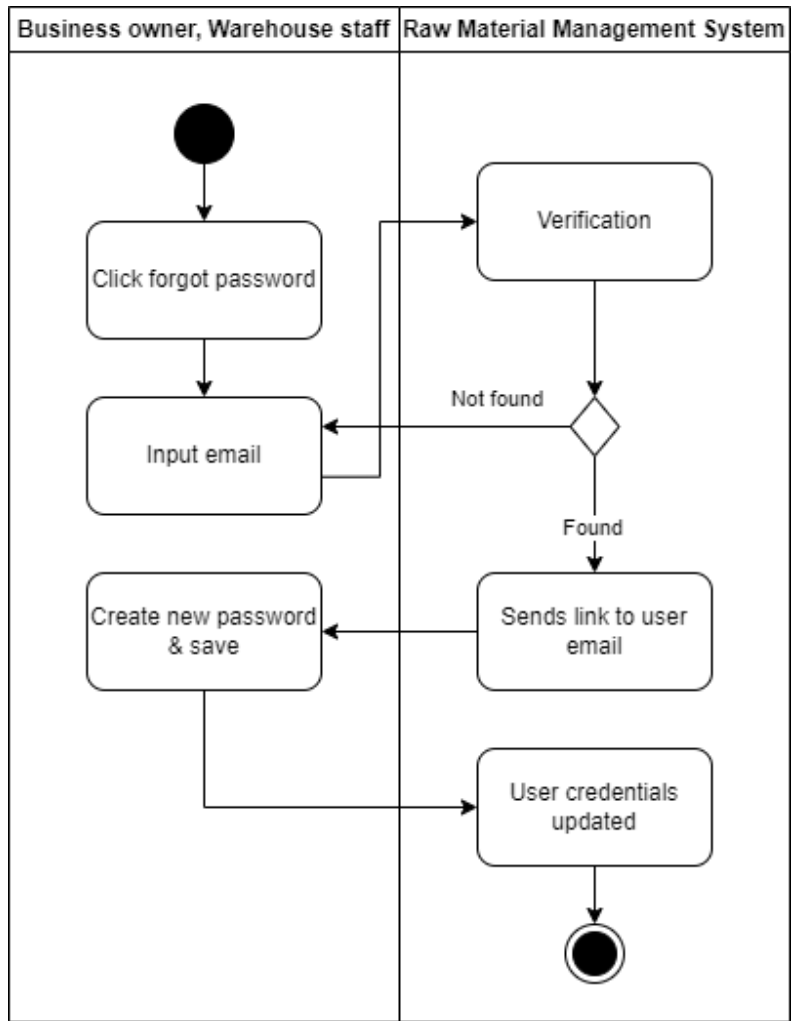


Figure 13. Activity Diagram – Reset Password

Activity	Procedure	Expected Results	Result
Login	User fill out username and password	User will be logged into the system & asked to redo login process if failed.	Success
Logout	User clicks logout button	User session is terminated and directed to login page	Success
Change Password	User inputs old password and enters new password	After saving new password, credentials are updated.	Success
Access items page	User presses items menu.	Shows items page.	Success
Enter new item data	User presses enter new data, fills out form and saves the changes made.	New items are registered and saved after the user saved the changes.	Success
Access item type page	User presses item type menu	Shows item type page	Success
Enter new item type	User presses enter new item type, fills out form and saves the changes made.	New item types are registered and saved after the user saved the changes.	Success
Access item units of measurement page	User presses item unit menu	Shows item unit page	success
Enter new item unit	User presses enter new item unit, fills out form and saves the changes made.	New item units are registered and saved after the user saved the changes.	success

Access receiving menu (items going in)	User presses receive items menu.	Displays receiving items menu.	Success
Input items received	Users press receive items in the receiving page and fills out form.	Items received will be saved and updated to the system after the user has finished filling out the form.	Success
Access item usage menu (items going out)	User presses use items menu.	Displays item usage menu	Success
Input items used	Users press receive items in the item usage page and fills out form.	Items used will be saved and updated to the system after the user has finished filling out the form.	Success
Access inventory report menu	User presses on the inventory report menu	Displays inventory report page	Success
Display inventory stock report	User presses generate report	Displays inventory report	Success
Access Receiving report menu (items going in)	User presses on the receiving report menu.	Displays receiving report page.	Success
Display receiving stock report	User chooses starting and end date of report, then clicks on generate report.	Displays receiving report based on the range of date chosen.	Success

Access item usage report menu (items going out)	User presses on the item usage report menu.	Displays item usage report page	Success
Display item usage report	User chooses starting and end date of report, then clicks on generate report.	Displays item usage report based on the range of date chosen.	Success
Access user management menu	User presses on user management menu.	Displays user management page	Success
Edit user	Business owner presses on edit user menu	Displays user data that can be edited	Success

Blackbox Testing

REFERENCES

- Andriyani, Y., Id, I. D., Mahdiyah, E., & Aminuddin, A. (2022). Use Case Realization in Software Reverse Engineering. *Ingenierie Des Systemes d'Information*, 27(2). <https://doi.org/10.18280/isi.270218>
- Christian, V. D. (2024). Rancang Bangun Sistem Informasi Manajemen Persediaan Bahan Baku di Pelangi Cake Bakery [Universitas Matana]. <http://repository.matanauniversity.ac.id:8080/xmlui/123456789/1271>
- Nugraha, Y. (2020). Information System Development With Comparison of Waterfall and Prototyping Models. *RISTEC : Research in Information Systems and Technology*, 1(2). <https://doi.org/10.31980/ristec.v1i2.1202>
- Primakara University. (2023, June 23). Apa Itu PHP? Kenali Bahasa Pemrograman & Fungsinya. Primakara University. <https://primakara.ac.id/blog/info-teknologi/php-adalah#:~:text=PHP%20adalah%20singkatan%20dari%20%22Hypertext,konten%20dinamis%20dalam%20halaman%20web.>
- Savitha, P. (2023). INVENTORY MANAGEMENT SYSTEM. *International Scientific Journal of Engineering and Management* (2023),. <https://isjem.com/download/inventory-management-system/>
- Sutiah, S., & Supriyono, S. (2021). Software testing on e-learning Madrasahs using Blackbox testing. *IOP Conference Series: Materials Science and Engineering*, 1073(1). <https://doi.org/10.1088/1757-899x/1073/1/012065>
- University of Waterloo. (2024). Activity Diagram. University of Waterloo. <https://uwaterloo.ca/ist-project-management-office/tools-and-templates/tools/activity-diagram>
- Xia, L., Baghaie, S., & Mohammad Sajadi, S. (2024). The digital economy: Challenges and opportunities in the new era of technology and electronic communications. *Ain Shams Engineering Journal*, 15(2). <https://doi.org/10.1016/j.asej.2023.102411>