UNIVERSITY OF ECONOMICS AND LAW

FACULTY OF INFORMATION SYSTEM

PROJECT REPORT

Topic 02:

SUPERMARKET WAREHOUSE MANAGEMENT SYSTEM

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Subject: System Analysis and Design

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REPORT'S IMAGES SOURCE

1. Mockup in Figma:

   Link: https://bom.so/Mockup_BA
2. Folder of project including: BPMN, DFD, Mockup, Report (PDF and .docx)

   Link: https://bom.so/Folder_BA

APPRECIATION

First of all, we would like to sincerely thank Ms. Vu Thuy Hang for creating the opportunity for us to carry out the topic to consolidate the subject knowledge in general, and Ms. Tran Thi Anh - co-lecturer helped, answered, and supported the group's exercises. However, in the process of implementation is inevitable gaps in the knowledge that the team is to practice and study to get better. We would like to try to learn, try effort to improve ourselves, cultivate more professional knowledge to become a better version of ourselves.

TABLE OF CONTENTS

GROUP MEMBER'S CONTRIBUTION ii
APPRECIATION iii
LIST OF TABLES AND FIGURES vi
INTRODUCTION 1
CHAPTER 1: PROJECT OVERVIEW 2
1. The reason for choosing the topic: 2
2. Target 3
3. Technology Application: 3
a. Camera: 3
b. Automatic Barcode Scanning Stations 6
c. Point of Sale (POS) 7
d. Inventory Robot 8
CHAPTER 2: PROJECT ANALYSTS 11
1. Requirements 11
2. Overall flow (BPMN and description) 12
2.1 Shelf management process 12
2.1.1. Diagram 12
2.1.2. Description 13
2.2 Warehouse management process 15
2.2.1. Diagram 15
2.2.2. Description 16
3. Data Flow Diagram (DFD) 18
3.1. Context Diagram 18
3.2. Shelf management 20
3.3. Warehouse Manager 22
3.4. Inventory Management 23
3.5. Procurement Management 25

CHAPTER 3: APPLICATION BUILDING 27
1. Use case diagram 27
2. Mockup design 28
2.1. Log-in 29
2.2. Home Page 29
2.3. Procurement 32
2.3.1 Procurement Management page 32
2.3.2 Procurement Detail page 33
2.4. Inventory management 34
2.4.1 Product detail 35
2.5. Camera 36
2.5.1. Warehouse map 37
2.5.2. Setting 38
2.5.3. Shelf 39
2.5.4. Robot 40

LIST OF TABLES AND FIGURES

Table 1. Use case description 28

Figure 1. 3D image of product 4
Figure 2. Simulation of shelf 5
Figure 3. Real-time shelf monitoring 5
Figure 4. Real-time shelf monitoring analyst 6
Figure 5. Scanning station 6
Figure 6. Activity of POS system 7
Figure 7. POS operation 8
Figure 8. Inventory robot 8
Figure 9. Robot's function 9
Figure 10. Robot's function description 10
Figure 11. Shelf management diagram 13
Figure 12. Warehouse management diagram 16
Figure 13. DFD for the system 18
Figure 14. DFD for Shelf management 20
Figure 15. DFD for Warehouse Manager 22
Figure 16. DFD for Warehouse management 23
Figure 17. DFD for Procurement 25
Figure 18. Use case diagram 27
Figure 19. Mockup for Log in 29
Figure 20. Mockup for Home Page 30
Figure 21. Mockup for Drop-down Notification 31
Figure 22. Mockup for Detail Notification 32
Figure 23. Mockup for Procurement function 32
Figure 24. Mockup for Procurement Detail 34
Figure 25. Mockup for Inventory management 35
Figure 26. Mockup for Product Detail 36
Figure 27. Mockup for Camera 37
Figure 28. Mockup for Warehouse map 38
Figure 29. Mockup for Setting 39
Figure 30. Mockup for Shelf 40
Figure 31. Mockup for Robot Setting 41

INTRODUCTION

Technology affects almost every aspect of 21st-century life, from communication, security and retail, to food access and productivity. With the invention of the Internet of Things, Artificial Intelligence, Cloud computing, Big Data has made breakthroughs in the field of technology and people have been able to automate some business processes more efficiently. Especially in the retail sector, the appearance of machinery and technology has helped businesses create their competitiveness in the market. For example, with the support of a robotic warehouse, the enterprise could optimize the labor resources, increase order fulfillment rate or even maximize the warehouse space. Or with the camera technology integrated with computer vision about deep learning algorithms and sensor fusion could help the supermarket increase the on-shelf availability and also help the shelf-stalker to reduce the shelf-checking times. As a result, the application of appropriate technology solutions will help businesses gain a position in the market and also help businesses increase productivity.

CHAPTER 1: PROJECT OVERVIEW

1. The reason for choosing the topic:

– The application of technology to the retail field is becoming developed than traditional retail as before. Also, retail supermarkets have required changing operating procedures and applying science and technology to ensure efficient business operations catch up with modern consumption trends. For that reason, our team chose the topic "Supermarket warehouse management system" to analyze and design a system to automate some processes to operate and manage supermarkets effectively. This topic will revolve around the following issues:

– ***On-shelf availability:***

- Studies show that, on average, 5% to 10% of the products offered today in grocery stores are unavailable at any given time, a situation which has not improved in two decades. Products that are not available to the consumer on dedicated shelf space are referred to as being out-of-shelf (OOS). For that reason, retailers are paying more attention to the use of technology solutions to solve this problem and also limit the situation that shelf-stalkers have to check goods at each shelf. This improves on-shelf availability and solves many problems such as the decrease in forecasting & inaccurate ordering; the increase in operational costs or the decrease in-store loyalty.

– ***Inventory management:***

- This field requires a large amount of labor and storage space. To overcome this situation, some of the leading retail companies are using robots that combine AI and advanced algorithms to improve operational efficiency. Robotic warehouse systems drastically reduce unnecessary walking by delivering work to the operators in the active area. Collaborative robots lead the picker, displaying the item and the quantity of the pick at each location. These directed workflows speed up the task and optimize the time needed to train associates on the new technology

2. Target

– Through research and analysis of existing technologies, our system aims to help supermarkets optimize warehouse and shelf management issues. Finally, when applying the supermarket system, it is possible to save money, time, and effort, as detailed below:

- Improving on-shelf availability management: this will help the shelf-stalker reduce the time off checking the shelf and rearranging the product on the wrong shelf. In addition, the system will bring the customers great experience on shopping due to avoiding out-of-stock and increase sales and profitability
- Improving inventory management: Based on automatic conveyor belts to help identify products and arrange products to designated locations, the company was able to save labor resources and limit errors in arranging goods. Also thanks to the robot, employees will save walking time in the process of fulfilling goods and maximize the storage space. Furthermore, with the support of POS application and automatic warning system in low inventory, the company will be able to control the replenishment goods and have a better production management schedule.

3. Technology Application:

a. Camera:

– Cameras are installed to oversee shelves in store for real-time shelf monitoring. Those include the following:

- ***3D Modeling (Digitizing SKUs):***

– Using a 3D digital copy of the archive unit is placed in a virtual environment to simulate the retail scene in the real world goods.

– These 3d versions are created using 2-D digital of the product packaging or by combining a series of images of the product through photogrammetry.

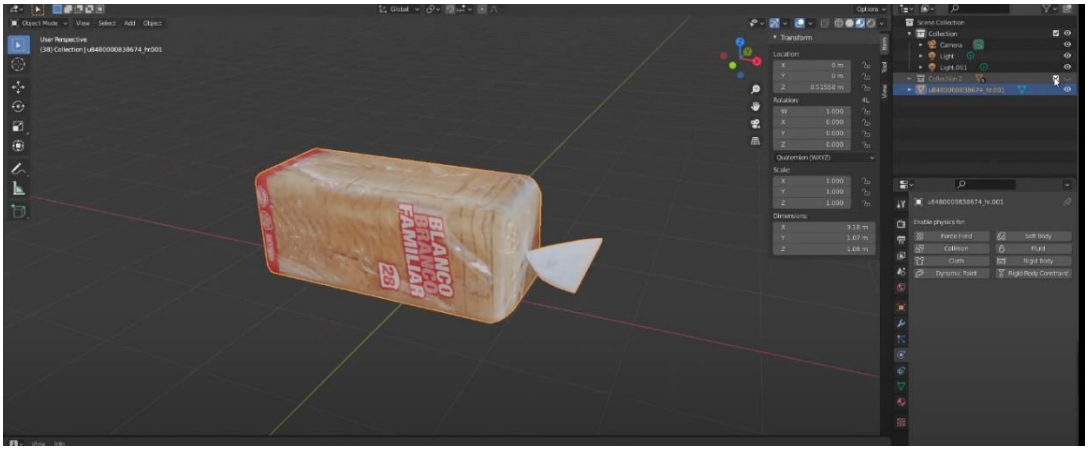

Figure 1. 3D image of product

* ***Photogrammetry:*** A method of checking the geometric deformation of the product by taking pictures. This method is used to accurately determine the 3-dimensional coordinates of the product and can be exported for reporting and inspection.

- By using this technique to train your shelf monitoring software for a specific environment, you gain access to a system for inventory testing and can be customized on a large scale.

- Combined with Synthetic Data Generation (data aggregation) enables rapid development of new Digitizing SKUs by training models to recognize new interfaces before they hit the shelves.

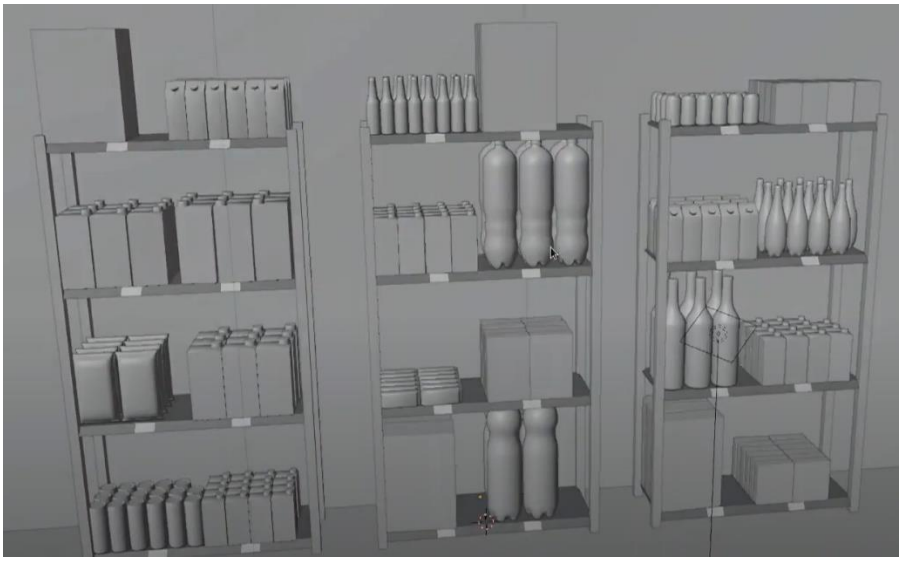

Figure 2. Simulation of shelf

- ***Computer Vision:***

– Once the apps are deployed in the store. Our computer vision software can detect the stock of each product on the shelf through the camera.

– The vision software is integrated with Synthetic Data Generation and uses algorithms to recognize goods samples updated from 3d modeling.

Figure 3. Real-time shelf monitoring

– Based on the real-time shelf monitoring data collected by the system, the system will automatically activate and notify the store staff about the current availability of current products to ensure stock. The goods of each shelf product are always available.

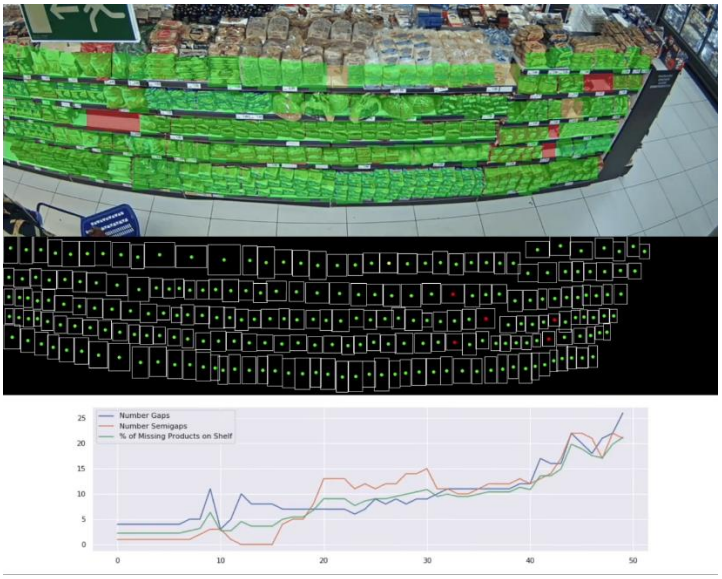

Figure 4. Real-time shelf monitoring analyst

– Synthetic Data Generation: data is created artificially, with the help of algorithms, not by actual events. Aggregated Data can be applied to a variety of activities, including testing data for new products and tools, and developing and evaluating the performance of AI models.

b. Automatic Barcode Scanning Stations

Figure 5. Scanning station

– Our automatic barcode scanning stations are a quick and easy solution to upgrade your operation from manual barcode scanning to automated barcode data capture.

– The modular design allows for rapid deployment over existing conveyors and is configurable to allow from 1 sided up-to 6 sided barcode reading.

– The system contains filtering of allowed barcodes, so production codes or other barcodes on the parcel will be rejected. The system can also import EDI for a match of known barcodes.

c. Point of Sale (POS)

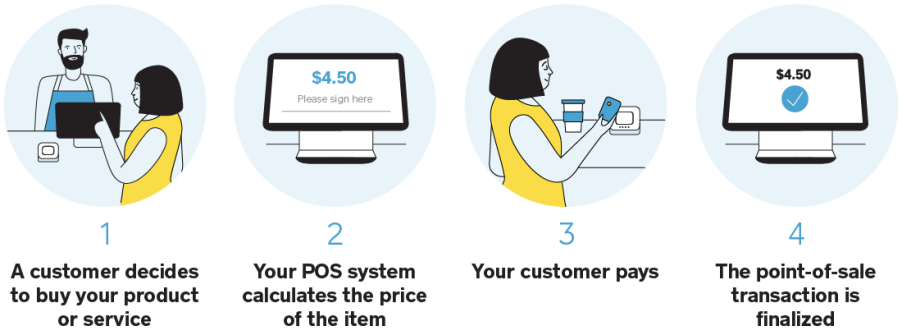

Figure 6. Activity of POS system

– A POS system is made up of hardware and software that works together to process sales and payment transactions at the point of purchase.

– POS systems can let you replace manual counts with time-saving and accurate automated processes. Some POS solutions can even alert you when stock is running low and provide you with the information you need to issue a purchase order in time.

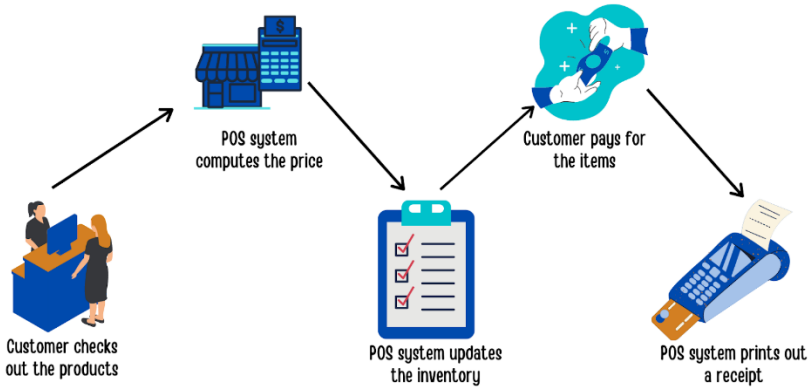

Figure 7. POS operation

d. Inventory Robot

Figure 8. Inventory robot

- Inventory Robot integrated with Visual AI supports loading/unloading, sorting, moving, stacking, and other manufacturing tasks.
- On the production line, RoboView Server can connect to a variety of cameras (laser cameras, etc.) to capture goods at any position in view. After obtaining the 3D cloud, recognition and positioning are performed to accurately calculate the item's posture and shape (up to 0.1mm accuracy). This information is then sent to the robotic arm or AGV for precise picking, packing, forklift, shipping, or specialized tasks like smart glue application.

– The RoboView server can also connect to 2D industrial cameras to take pictures of items on the conveyor belt and use conventional machine vision and deep learning algorithms to complete visual tasks such as sorting, counting, Separation, and filtering of defective goods.

Figure 9. Robot's function

– The RoboView server captures images from surveillance video in real-time, performs target identification and tracking of personnel, goods, and AGVs, and then links them to specific planning areas for implementation. implement decision-making with operational logic. The RoboView server performs real-time analysis of employee travel routes in mission scenarios, trajectories of AGV routes, and all location states in the area, and then sends the data. this to upper layer systems, such as the control system or main control via the standard APISEER to complete the higher-level task.

– The RoboView server receives real-time video collected through a live camera feed, evaluates the site scenario through various vision algorithms, and then sends the data to the coordinator or general manager. can corresponding control systems through API standard SEER to ensure safety in real-time of work and production.

Figure 10. Robot's function description

CHAPTER 2: PROJECT ANALYSTS

1. Requirements

– For the system to work efficiently, to do what it is supposed to do and to minimize errors, the system will need to fulfill the following requirements:

– ***With supermarket:***

- Firstly: The supermarket's space is equipped with modern camera technology to be able to scan all the shelves and perform continuous scanning during the operation of the supermarket to send the right alerts to the staff. at the time
- Secondly: The products are logically arranged, following the principles, and are scheduled to continuously update product information on the database if there are changes.
- Thirdly: Product storage areas and shelves are marked in a logical sequence for easy tracking and organization of products.
- Fourthly: Supermarket employees are trained in the operation process of the supermarket with relevant technology equipment during the performance of their duties.
- Finally: The POS payment system can link and update information about the number of goods on the database when the customer makes a successful payment.

– ***With inventory:***

- Firstly: The warehouse uses a scanner for recognizing the products and a conveyor belt for moving products to the specified place
- Secondly: The shelves in the warehouse are sorted and specified by ID, the boxes are moved to the specified warehouse, the shelves are planned previously.

- Thirdly: The warehouse is equipped with modern robots to support the process of picking up goods from the shelf and delivering them to the restocking place so that the shelf-stalker fulfills products faster.

– ***With products:***

- Products are placed according to the standard SKU code with relevant information and represented by shortened characters, easy to understand. The product has a built-in barcode so that it can be retrieved when required

– ***With system:***

- Firstly: The product database is divided into two parts, the inventory database and the shelf database, for easy tracking and always needs to be updated regularly and quickly.
- Secondly: The system needs to be checked and maintained to avoid errors during operation

2. Overall flow (BPMN and description)

2.1 Shelf management process

2.1.1. Diagram

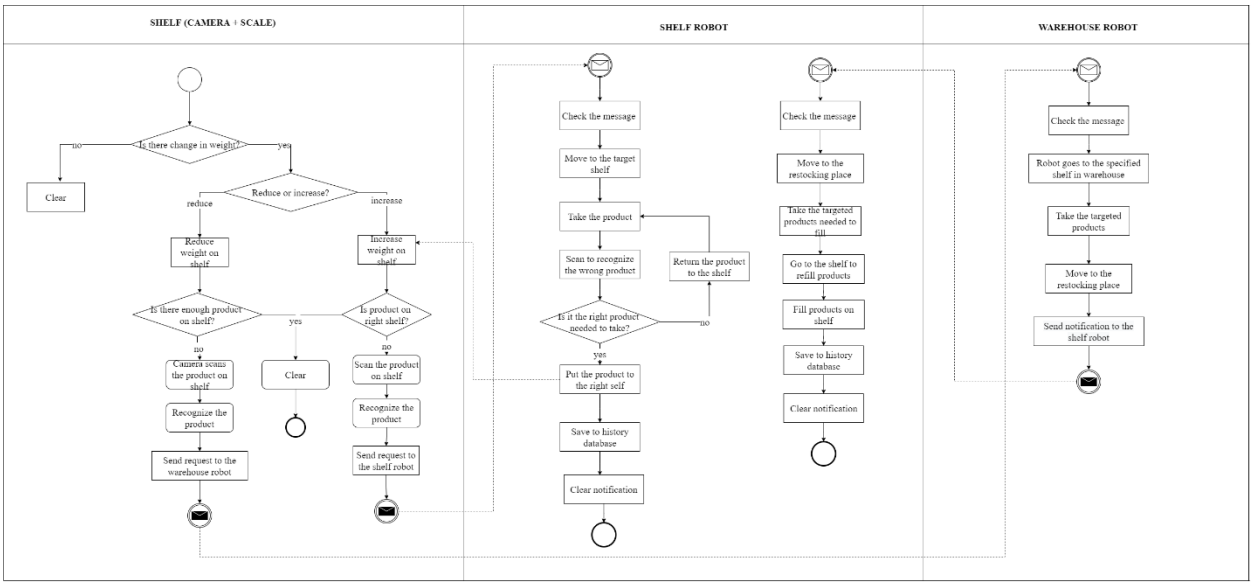

Figure 11. Shelf management diagram

2.1.2. Description

– Supermarkets will be set up with technology cameras that can sensor all of the stalls and the shelves will be equipped with electronic scales to measure the volume of goods taken out or added to the shelves.

– The process starts when the supermarket is in operation, starting with the shelves checking the volume of products on the shelves and will happen in two cases. If the shelf volume does not change, nothing will happen. If the quantity number of products on the shelf changes, the system checks to see if the volume is increasing or decreasing.

- In the case of reduced shelf volume, the product is removed off the shelf. The sensor camera will check to see if there are enough products on the shelf. If the allowed number of rows is above the minimum, then stop. If not, the camera will scan and identify the product. After that, the system will send a stock-out notification to the warehouse robot.

- In the case of increased shelf volume, it means that products are being added to the shelves. The sensor camera will check if the added product is the right product on the shelf, it will increase the data stored on the shelf. If the added goods are not on that shelf, the camera will scan and identify the product on the wrong shelf. The system will then send a notification to the shelf robot.

2.2 Warehouse management process

a. The process of inventory robot

– The process begins when the robot receives a request for shelf availability to be refilled. The notice will include all information about the product to be obtained. The robot checks the message then goes to the target shelf storage area and picks up the required product. Next, the warehouse robot will bring the product to the restocking area and send a request to the shelf management robot about the product that needs to be filled on the shelf of the supermarket.

b. The process of management robot

– The shelf robot has two process flows: handling products on the wrong shelf and adding goods as needed.

- **For handling the product on wrong shelf**

– This process begins when the shelf robot receives a notification from the system that a product is being placed on the wrong shelf. The robot will go to the target shelf and proceed to pick up the specified product. After taking the product, the robot will scan to check whether the product is a product of the notification system. If not, the robot will return the product to its original location and take another product. If the robot has picked up the correct product, the robot will move to the shelf containing the misplaced product and return the product to the correct location. The process ends when the actions are saved to the history database and the notifications are cleared.

- **For refill the products on the shelf when stocking-out**

– This process starts when the shelf robot receives a notification from the warehouse robot. The shelf robot checks the message and moves to the replenishment area. The robot picks up the product according to the notification, moves to the shelf to add, and proceeds to add the product to the shelf. The process ends when the messages are saved to the history database and the notifications are cleared.

2.2 Warehouse management process

2.2.1. Diagram

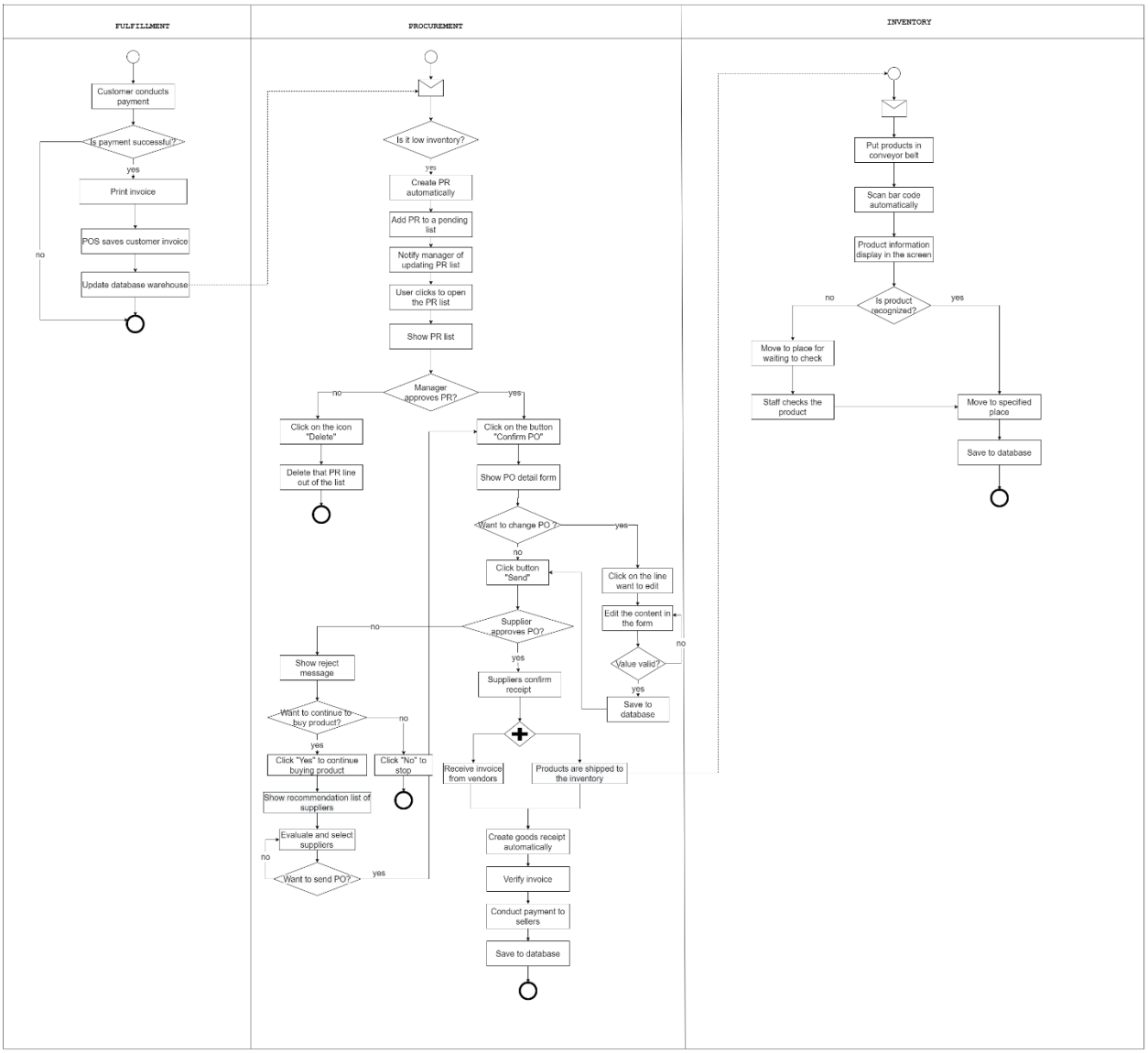

Figure 12. Warehouse management diagram

2.2.2. Description

- The process of procurement may alert the company that it needs to increase its inventory of certain materials when there is a change in the number of goods in the storage stock.
- When a customer makes a successful payment, POS will print an invoice, save its information to the database, and then update the number of products in the warehouse database. After that, the system will check whether the inventory is

less than the minimum quantity or not. If so, the system will create PR automatically and add it to a pending list on the app, then notify the manager about the updating PR list. When the manager logs in to the app and clicks on the procurement button, the PR list will be shown. If the manager doesn't approve this PR, they will click on the icon "Delete" to reject that PR. If the manager approves this PR, then click on the button "Confirm PO" to see PO's details information. When seeing its information, if he wants to change anything such as the purchasing quantity or the date received,… he clicks on that line to edit its value. If this value is valid, the system will save these changes. If not, he has to edit until it is valid. The next step is sending PO to suppliers, by clicking on the button "Send". Upon receiving the order, in the case that supplier rejects this order, the app will show notification and ask the manager whether he wants to continue the purchasing process, click on "yes" to continue and "no" to stop. If it is yes, it will show a list of other suppliers for the manager to choose another vendor. On the other hand, if the supplier approves the PO, they will confirm and then ships the products to the supermarket. Once the supermarket gets products, they also receive an invoice. After verifying the invoice, it sends a payment to the vendor.

– When receiving goods from suppliers: Products will be transferred to the automatic conveyor belt. The system line will scan the product and display information about the product on the line's interface screen. If the item is not recognized, the box will be moved to a waiting area to be checked by staff. If the item is recognized, the goods will be delivered to pre-specified shelves only. The process is over when the information of the items is all saved in the database.

3. Data Flow Diagram (DFD)

3.1. Context Diagram

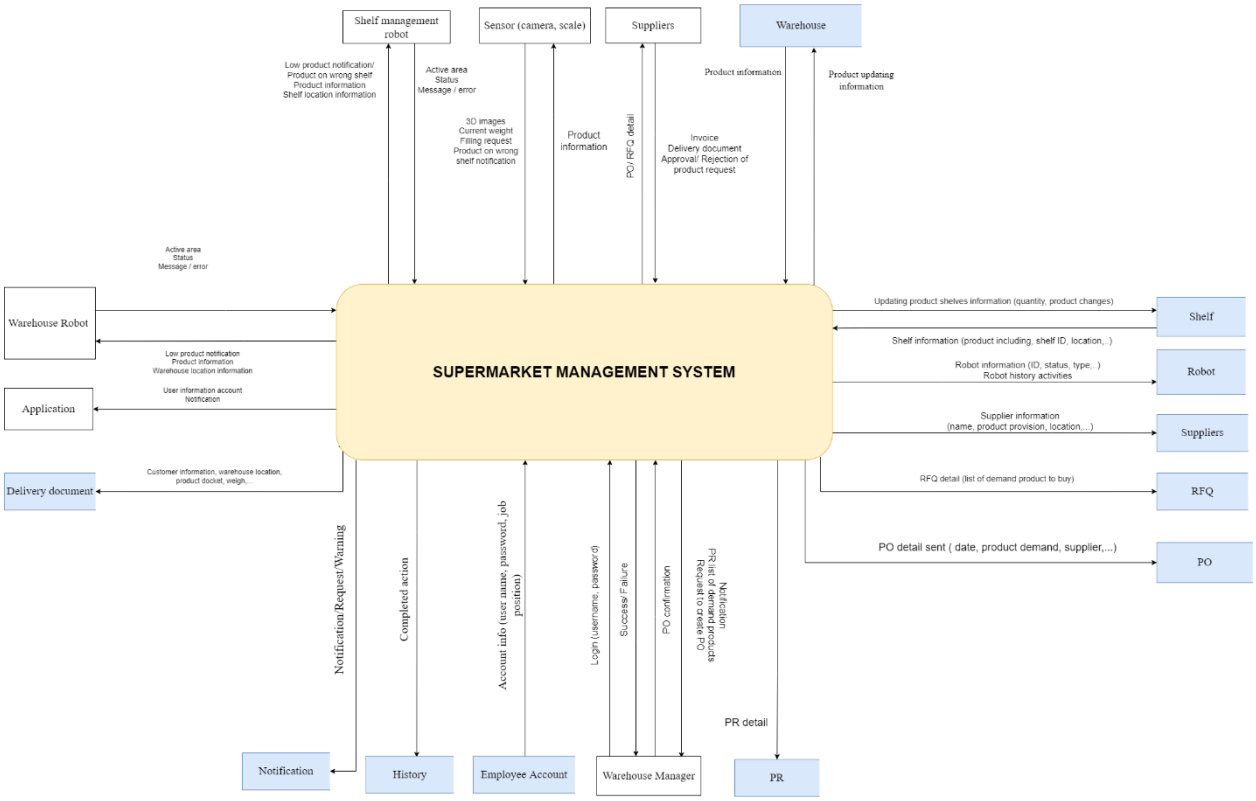

Figure 13. DFD for the system

- ***Main process:*** *Supermarket Management System*
- ***Datastore:***
  - Warehouse: this datastore will transmit data about product information to the system and receive the updated product information in return
  - Shelf: this datastore will transmit data about the shelves' product information to the system and receive the updated shelf product information in return
  - Robot: the system will provide this datastore with information about robots such as name, ID, active area, location,…
  - Supplier: this datastore will save data of supplier information from the system such as Suppliers' name, product provision, location, contact information

- RFQ (Request for Quotation): the system will provide this datastore with information about RFQ detail including product name, demand quantity, price,..
- PO (Purchase Order): the system will provide this datastore with information about PO detail including product name, quantity, supplier name, price, total, company information,…
- PR (Purchase Requisition): the system will provide this datastore with information about RFQ detail including product name, demand quantity
- Employee Account: this datastore will transmit data about user information such as: account name, password, position
- History: the system will provide this datastore with information about the completed actions.
- Notification: the system will provide this datastore with information about the notifications, warnings, requests.
- Delivery Document: the system will provide this datastore with information about customer information, warehouse location, product docket, total weight...

– ***External Entities:***

- Shelf management robot: the system will transmit data about Low product information; Product on the wrong shelf, Product and Shelf information to this entity and receive the Active area; Robot's status; Message/Error in return.
- Sensor (camera, scale): the system will provide this entity with product information and the sensor will provide the system with 3D images; Current weight; Filling products, and Product on the wrong shelf notification.
- Suppliers: this entity will send the system Invoice, Delivery document, Approval/ Rejection of response, and receive PO/ RFQ detail from the system in return

- Warehouse manager: the manager will input login information such as username and password and receive the success or failure response in return. In addition, the system will send the notification; PR list of demand products, and Request to create PO and receive PO confirmation in return.
- Application: the system will provide this entity with user account information and send notifications
- Warehouse Robot: the system will transmit data about Low product information; Product and Warehouse information to this entity and receive the Active area; Robot's status; Message/Error in return.

3.2. Shelf management

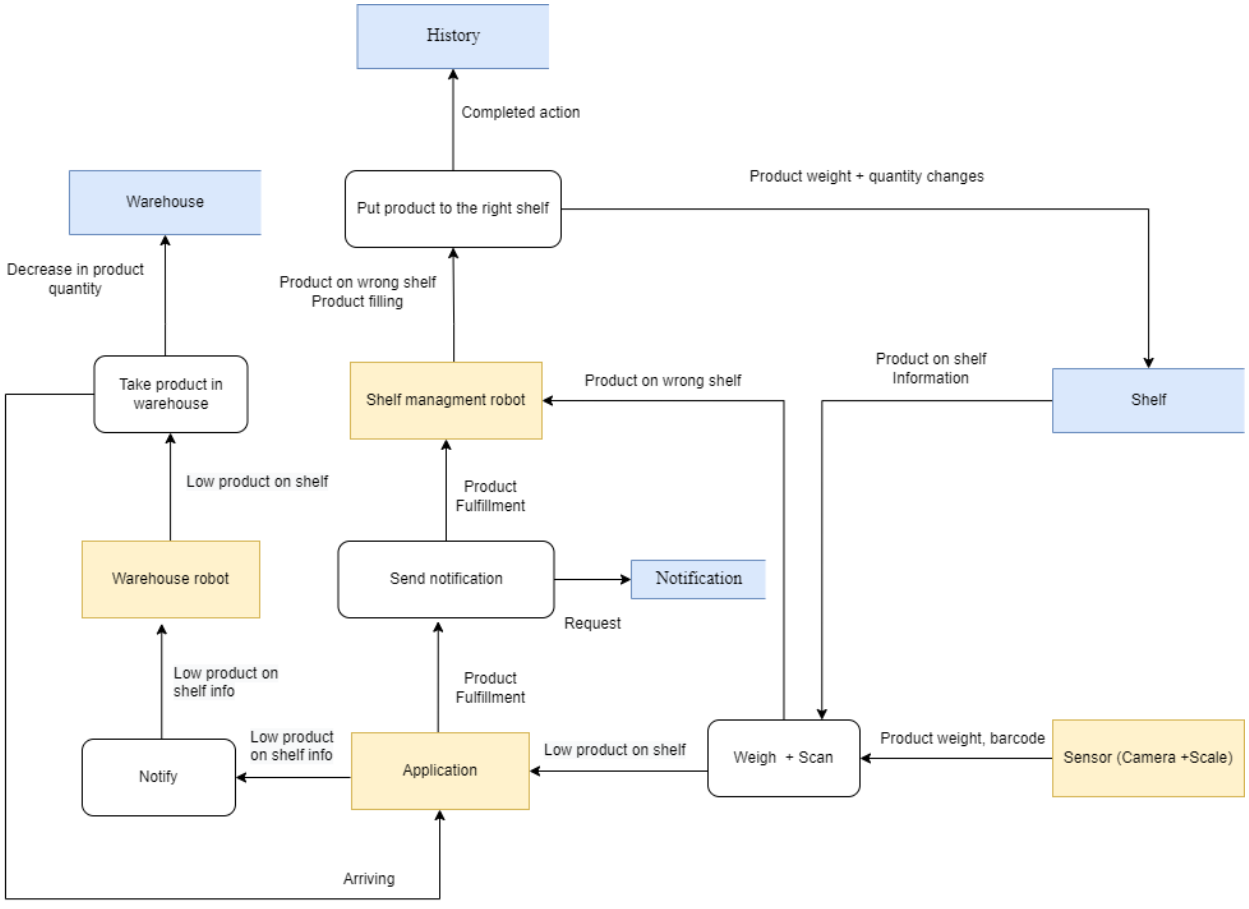

Figure 14. DFD for Shelf management

- In this diagram, there are 4 datastores, 4 entities and 5 processes.
- In the “Weigh and Scan” process, it receives the information of the product on the shelf from the datastore “Shelf ”. The Sensor (Camera and Scale) provides this process with the weight, the barcode of the products, and this process transmit the data “Low product on shelf” to the entity “Application” also the data of product on the wrong shelf to the “Shelf management robot”
- In the “Send notification” process, it will send data of request saved in the datastore “Notification”. The entity “Application” will provide this process with data of “Product Fulfillment” and the entity “Shelf management robot” receives data of “Product Fulfillment” from this process.
- In the “Put product on the wrong shelf” process, the “Shelf management robot” will transmit the data of “Product filling” and “Product on the wrong shelf” to the process. The data of “Completed action” will be saved in the datastore “History” initialized from this process. The datastore “Shelf” will receive the data of “Product weight and quantity changes” from the process.
- In the “Notify” process, it will receive data of “Low product on shelf information” from the entity “Application” and transmit the data of Low product on shelf information” to the entity “Warehouse robot”
- In the “Take product in warehouse” process, the entity “Warehouse robot” will transmit the data of “Low product on shelf information” to the process and the process will give the “Application” data of “Arriving”. The datastore “Warehouse” will be transmitted the data of “Decrease in product quantity” from the process

3.3. Warehouse Manager

– In this diagram, there are 4 datastores, 3 entities and 6 processes.

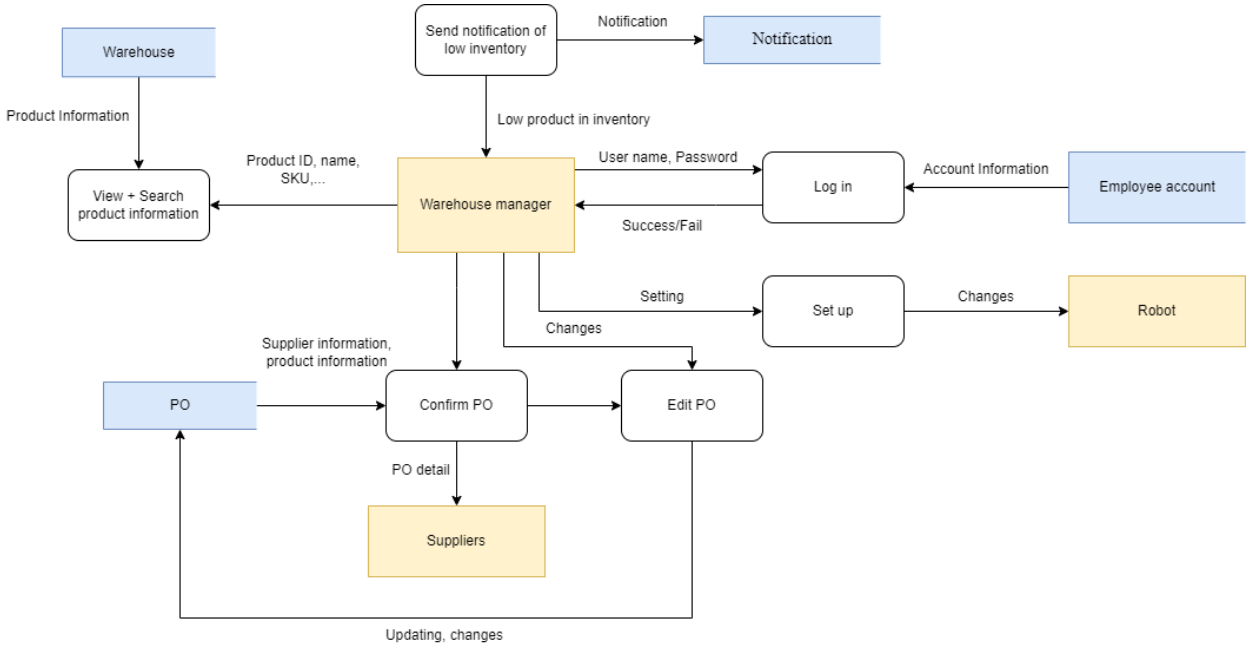

Figure 15. DFD for Warehouse Manager

– In the “Login” process, the “Warehouse manager” will input data of “Username, password”. Data will be compared with the datastore “Employee Account” about the data of “Account information”; if it’s true, log in will message success, else, it will message fail

– In the “Set up” process, the “Warehouse manager” will input data of “Setting” and the process will return the data “Changes” to the entity “Robot”

– In the “Send notification of low inventory” process, the entity “Warehouse manager” will receive the data of “Low product inventory” from the process and the datastore “Notification” will save data of the notification initialized by the process

– In the “View and Search product information” process, the manger will transmit the data such as product ID, SKU, barcode... to this process. Data will be

compared with the datastore “Warehouse” and return a value of product information.

– In the “Confirm PO” process, when the manager perform this process, data will be provided by the datastore “PO” and push the detail to the entity “Supplier”.
– In the “Edit PO” process, the manager will transmit the data changes to this process and those updating will be saved in datastore “PO”

3.4. Inventory Management

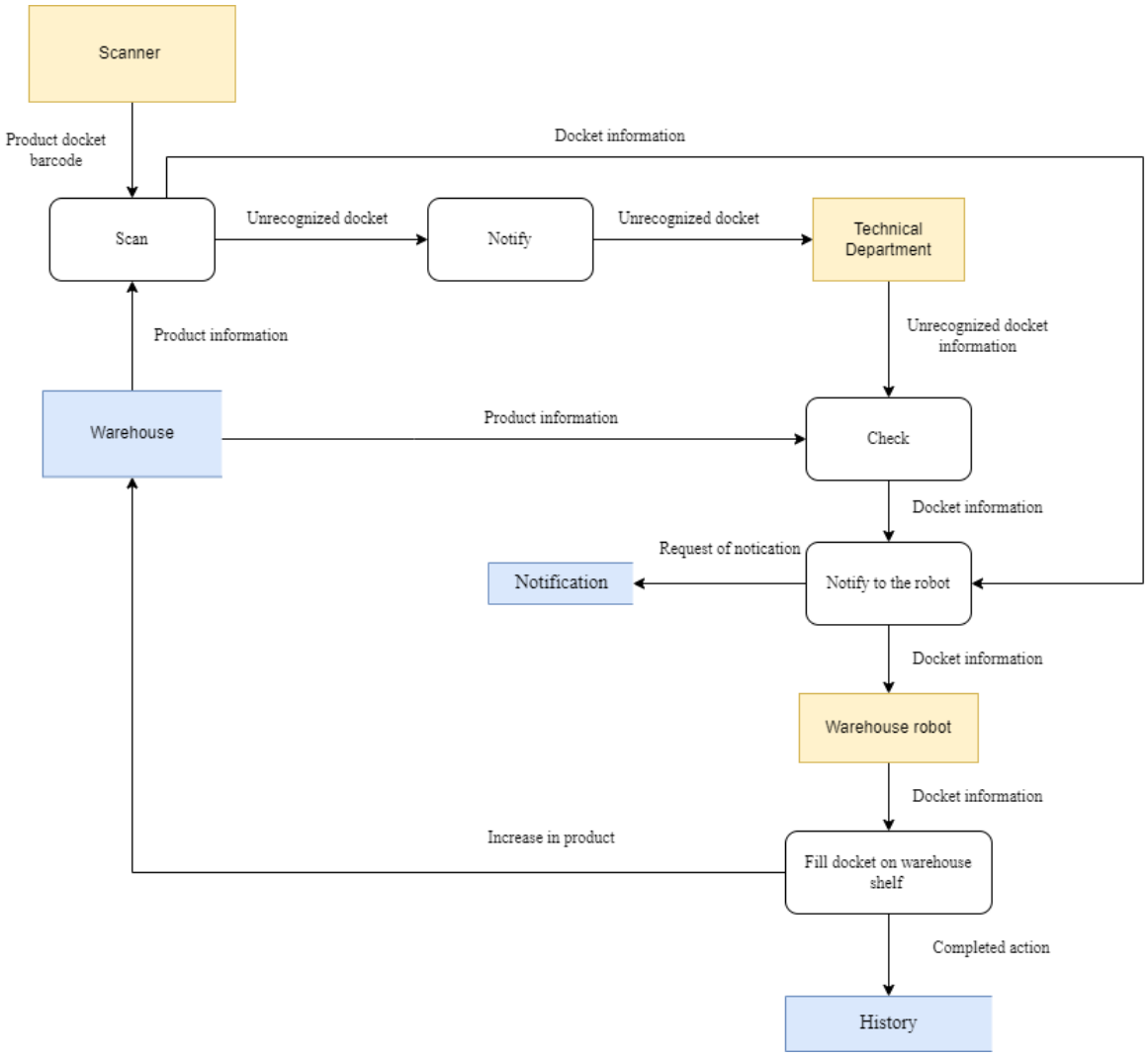

Figure 16. DFD for Warehouse management

– In this diagram, there are 3 datastores, 3 entities and 5 processes.

- In the “Scan” process, the entity “Scanner” will transmit the data of “Product docket barcode” to this action. Data of “Product information” will be given to the process. When the product docket is recognized, the next step is the “Notify to the robot” process with the data of “Docket information”. In opposite, when the product docket is unrecognized, the next step is to transmit the data of “Unrecognized docket information” to the entity “Technical department”

- In the “Check” process, the entity “Technical department” will give this process the data of “Unrecognized docket” and those data will be provided by the datastore “Warehouse”. This process will transmit the data of “Docket information” to the process “Notify to the robot”. After that, a request for this process will be saved in the datastore “Notification”. The entity “Warehouse robot” will receive the data of “Docket information” and then, it will perform the “Fill docket on warehouse shelf” process. In the end, when the process is completed, the datastore will save data of “Completed actions”

3.5. Procurement Management

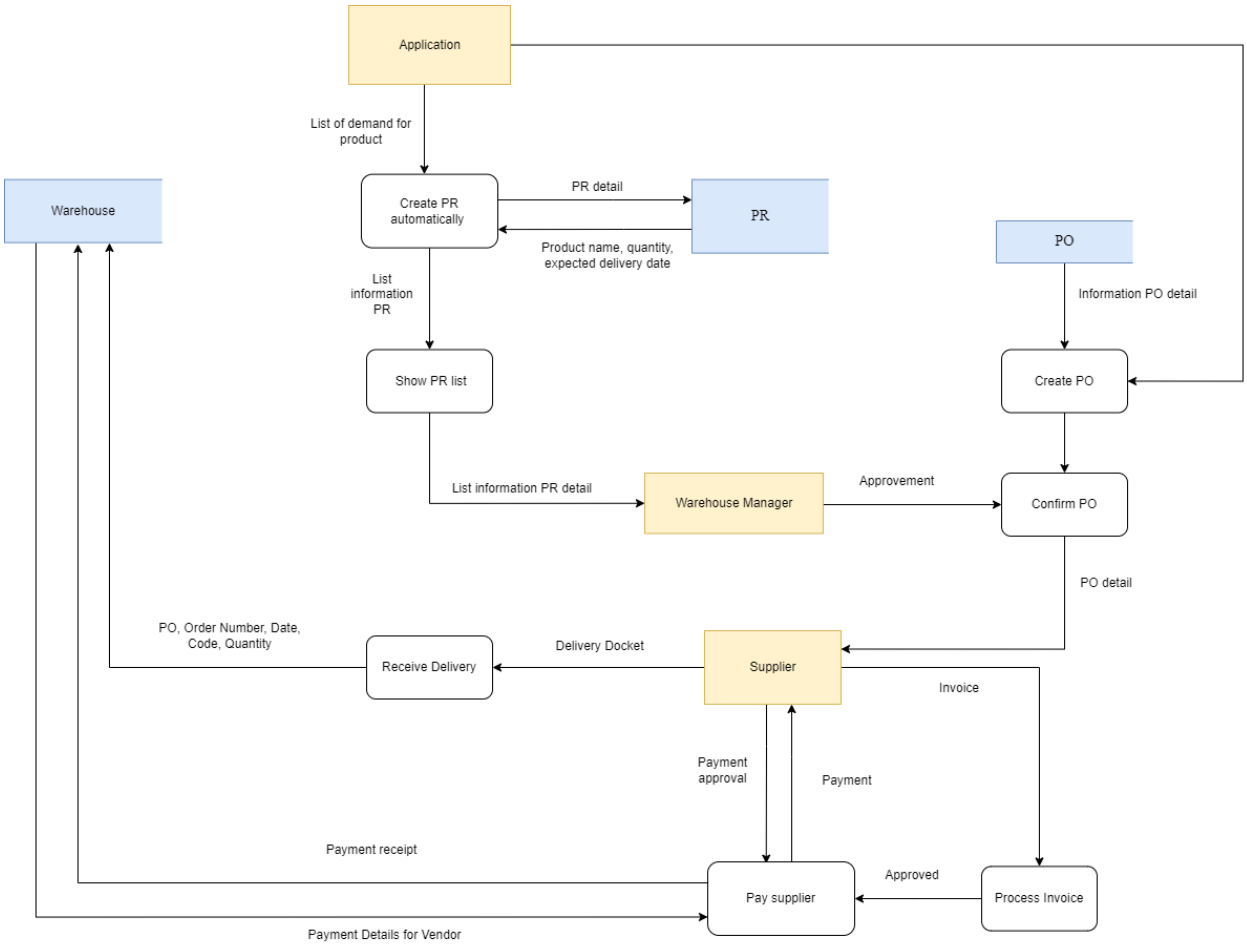

Figure 17. DFD for Procurement

- In this diagram, there are 3 datastores, 3 entities and 7 processes.
- In the “Create PR automatically” process, the entity “Application” will push the data about “List demand for product” for this process. The datastore “PR” provides this process with data such as product name, quantity…. and update data PR detail in return. When this process ends, the next process is “Show PR list” with data about “List information PR” and push those data detail to the “Warehouse manager”.

- In the “Create PO” process, the datastore “PO” will provide this process with data of PO detail. The next process is “Confirm PO”, the manager will approve this action and the data of PO detail will be pushed to the entity “Supplier”
- In the “Process invoice” process, the supplier will transmit the data of invoice and move to the next process “Pay supplier”. The entity “Supplier” gives this process data of “Payment approval” and receive “Payment” in return. This process also push data of “Payment receipt” to the datastore “Warehouse” and receive data of “Payment detail for suppliers” in return.
- In the process “Receive Delivery”, the supplier will send delivery docket to this process and the datastore “Delivery Document” will save the information of this docket information

CHAPTER 3: APPLICATION BUILDING

1. Use case diagram

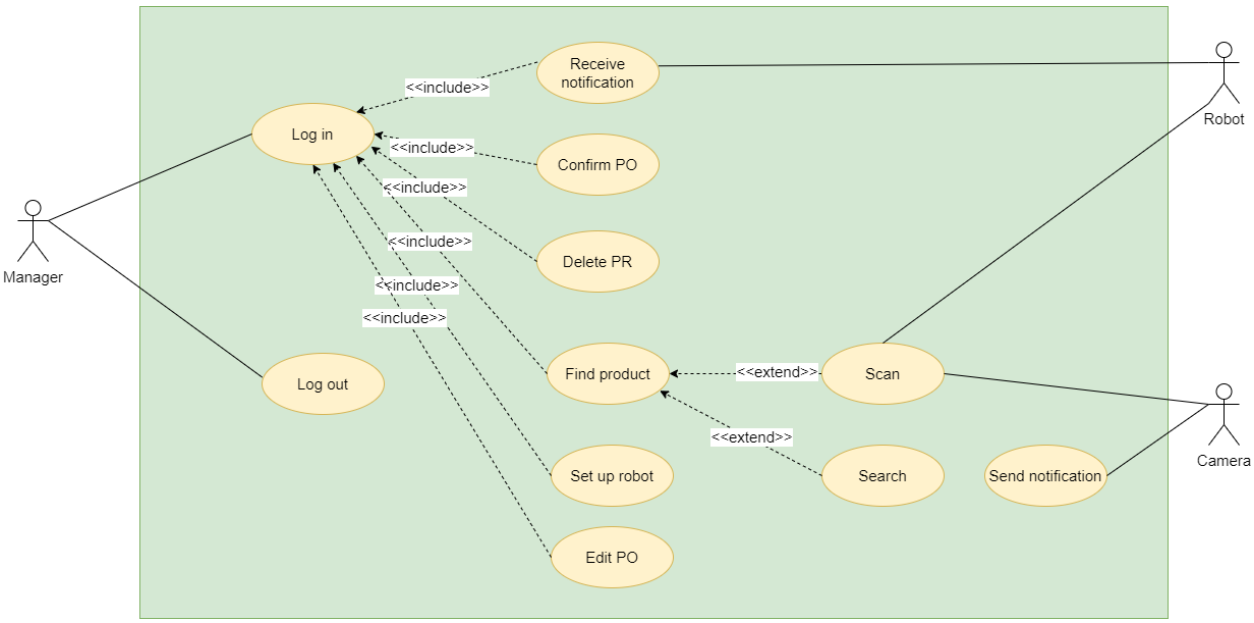

Figure 18. Use case diagram

No	Function	User	Description
1	Log in	Manager	The manager has to log in to use the functions of the system application
2	Log out	Manager	The manager can log out of the application
3	Receive notification	Manager, Robot	Those users will receive a notification of request, warning.…
4	Confirm PO	Manager	The manager will have to conduct confirming PO request to send PO to suppliers
5	Delete PR line	Manager	Although the low of products will be automatically included in the demand to buy product, the manger can delete the products in PR list when needed
6	Find product	Manager	The manager can find product through 2 actions search and scan base on the product barcode, name, suppliers name…

7	Search	Manager	The manager can search to find product base on the product information
8	Scan	Manager, robot	Those users conduct scanning product barcode to recognize the products
9	Set up robot	Manager	The manager can set up the robot status (active -inactive, change location...) in demand
10	Send notification	Camera	During the operation, the camera scans the product shelves to find the problems such as low product on shelf, products on wrong shelf… and send a notification to others immediately.
11	Edit PR	Manager	The manager can choose to edit some components in PR form

Table 1. Use case description

2. Mockup design

- The application provides users with the necessary functions to manage warehouses and shelves at supermarkets.
- In the app interface, there will be:
  - General functions:
    - The left corner of the screen allows the user to change the language of the application, on the right is the notification icon, the notifications sent to the application will be stored here as a summary. Below the right-hand corner allows users to review the history of activities that they have manipulated on the application.
    - All pages (except log in and Homepage pages) will have a footer bar including 5 Icon links to interfaces such as Homepage, Procurement Management, Inventory Management, Camera, and Notification. This footer bar helps users without having to return to the homepage to easily access other functions of the application.

2.1. Log-in

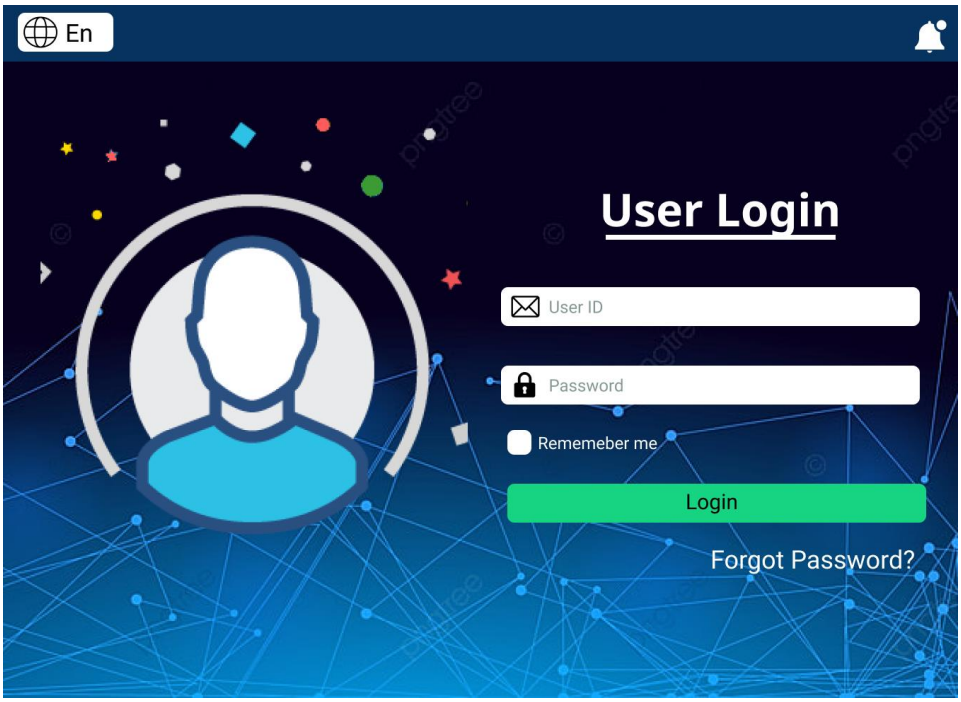

Figure 19. Mockup for Log in

– In the Log-in mockup, the user will log in by the account the company providing to use the functions of the application. The user can tick on the checkbox “Remember me” for a faster log-in the next time. If the user forgot the password, he/she can click on the link “Forgot Password” to take back the account and the system will request the user to change a new password

2.2. Home Page

Figure 20. Mockup for Home Page

- When the user logs in to the application, the home page will appear. In this mockup, there are three main functions for the user containing: Procurement management, Inventory management, and Camera.
- The right corner of the application will be the login username and notification function. About the Notification function:
  - When a notification arrives, the bell icon will show the notification number appear. When the user clicks on the icon, the interface will drop down the notifications that have been sent. Users who select view detail in the lower right corner of the application drop-down will be redirected to the independent Notification interface.

Figure 21. Mockup for Drop-down Notification

- In the independent Notification interface, notifications are classified into 3 categories, including notifications about inventory, notifications about goods on shelves, and notifications about issues related to robot management. This interface makes it easier for users to manage and control related issues.

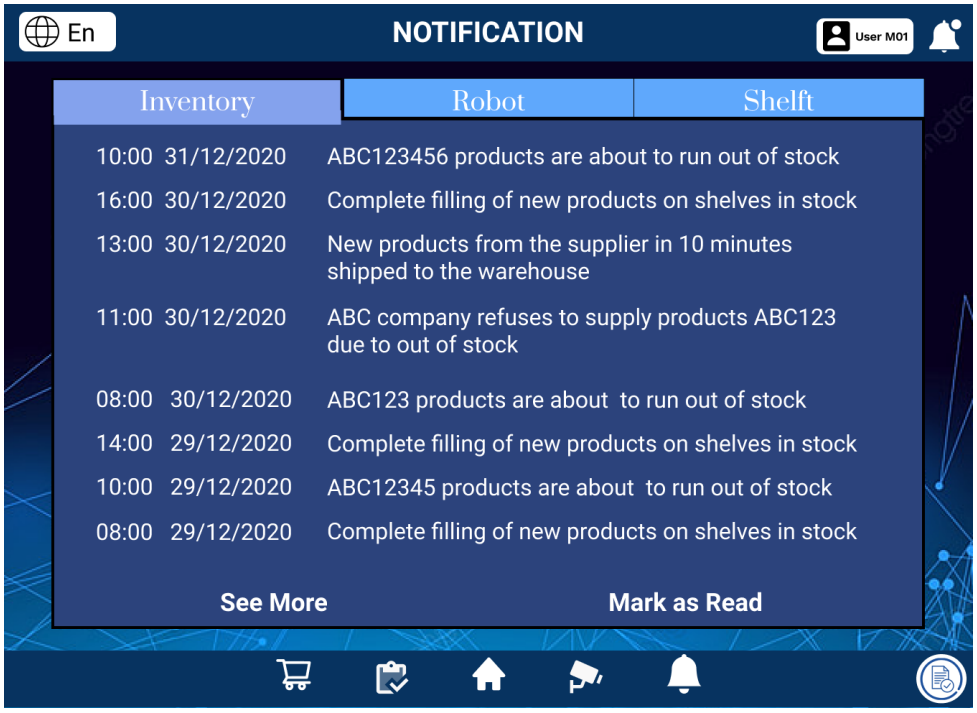

Figure 22. Mockup for Detail Notification

2.3. Procurement

2.3.1 Procurement Management page

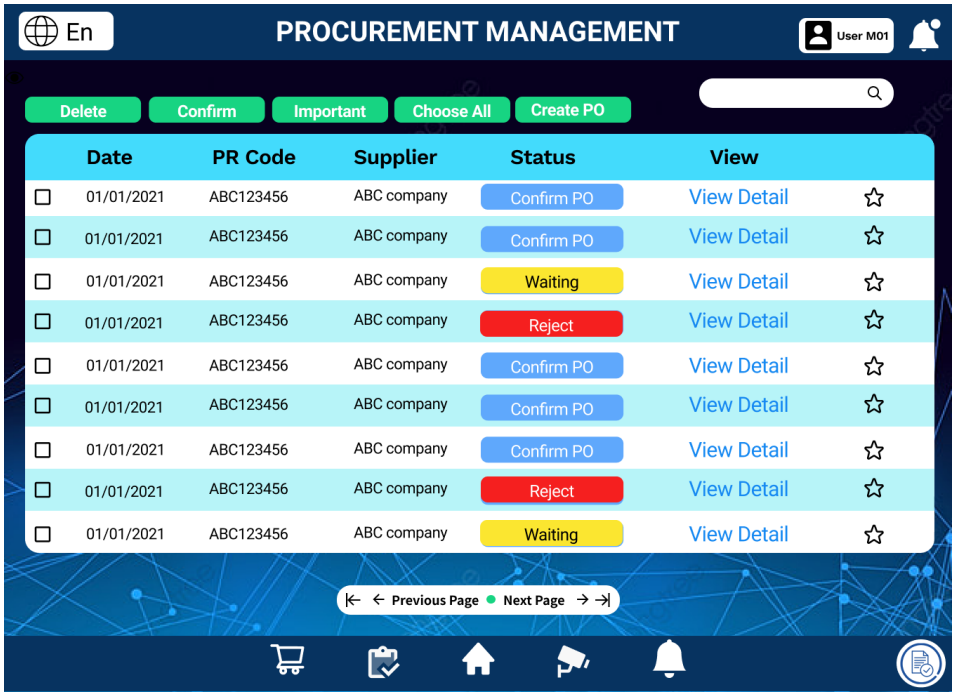

Figure 23. Mockup for Procurement function

- This interface allows users to check and manage POs for products that need to be restocked. The interface will display information such as Date, PR code, supplier, PO status. The checkbox at the beginning of each line makes it more convenient for users to perform the same operation with different lines. The star icon at the end of the line makes it easier for users to manage important orders or special points that need attention. The status for each PO is divided into 3 categories: confirm (waiting for the user to confirm to send the PO to the provider), waiting (waiting for the supplier to respond), and reject (rejected by the provider). Those orders confirmed by the supplier will be deleted automatically in this interface and saved in history. When the user tabs to View Detail, it will be linked to the Procurement Detail interface so that the user can view and edit more detailed information.
- The application also supports functions such as the delete PO button when the user feels unnecessary information, the Confirm button that allows users to confirm multiple POs at once, the Important button that helps users review the starred PO lines. The Choose All button and the Create PO button (when the user needs to create a new PO actively). And the application also provides a search bar to make searching easy.

2.3.2 Procurement Detail page

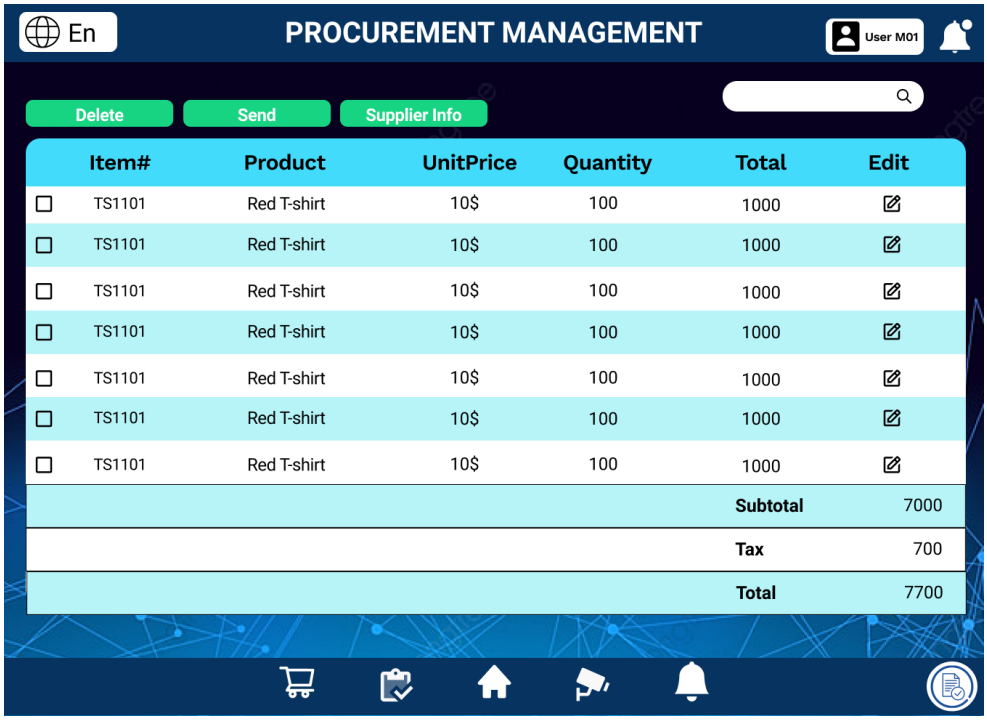

Figure 24. Mockup for Procurement Detail

– This interface includes information such as Item#, product name, Unit price, Quantity, Total, Subtotal, Tax when user click on “View detail” in the previous page. This interface also allows users to change information in lines, delete products, send to suppliers and view supplier information.

2.4. Inventory management

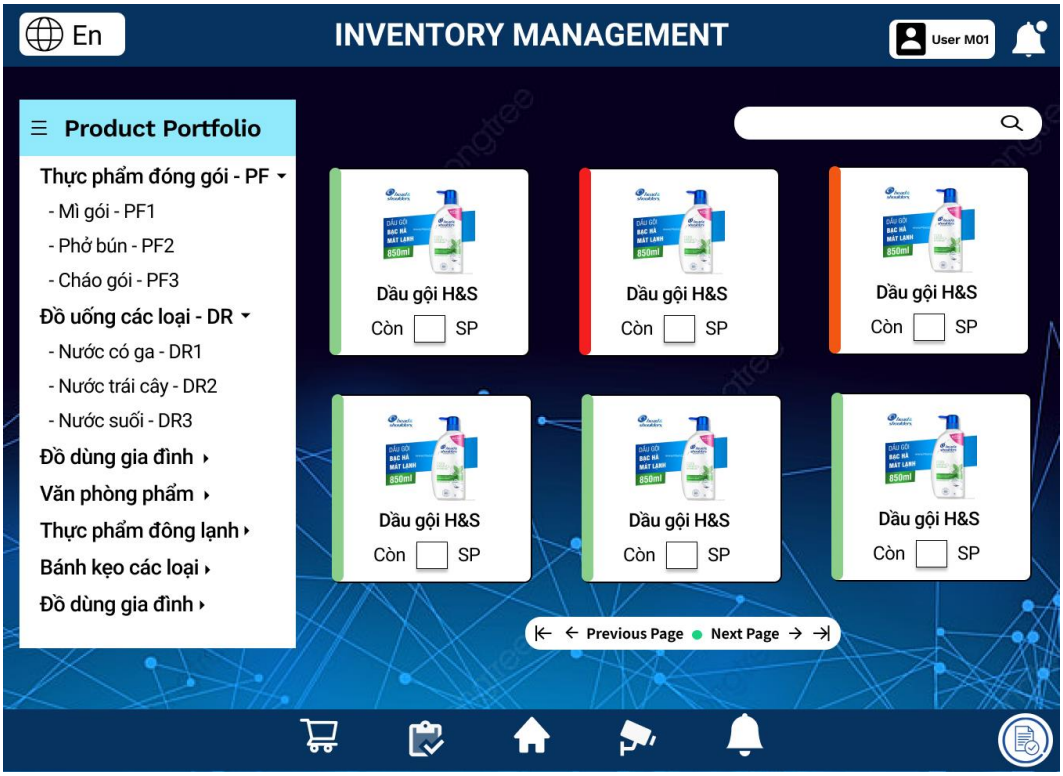

Figure 25. Mockup for Inventory management

- On the left side of the interface is a menu consisting of product categories that have been classified and displayed according to the structure: "Product Name - Product Code" to make it easier for users to remember and search for the products they want to see. To the right of the interface is the Search bar to help you search for the desired product.
- The product screen in the interface will appear according to the product list on the left-hand side. Each product box will provide the inventory number for that product type. The colored bar to the left of each product page indicates the status of that product: Red indicates less than minimum product remaining, orange indicates average product remaining, and blue indicates stock. does not need to be added. When clicking on the product box displayed in this interface, the application will link through the Product Detail interface.

2.4.1 Product detail

Figure 26. Mockup for Product Detail

– When the user clicks on the product box in the “Inventory management” page, It will lead to the product detail page of each product. This interface will provide users with detailed information such as product image, Barcode, product name, product ID, date of import, supplier, invoice number, warehouse date, location Product placement in warehouses and supermarkets with the same quantity of inventory.

2.5. Camera

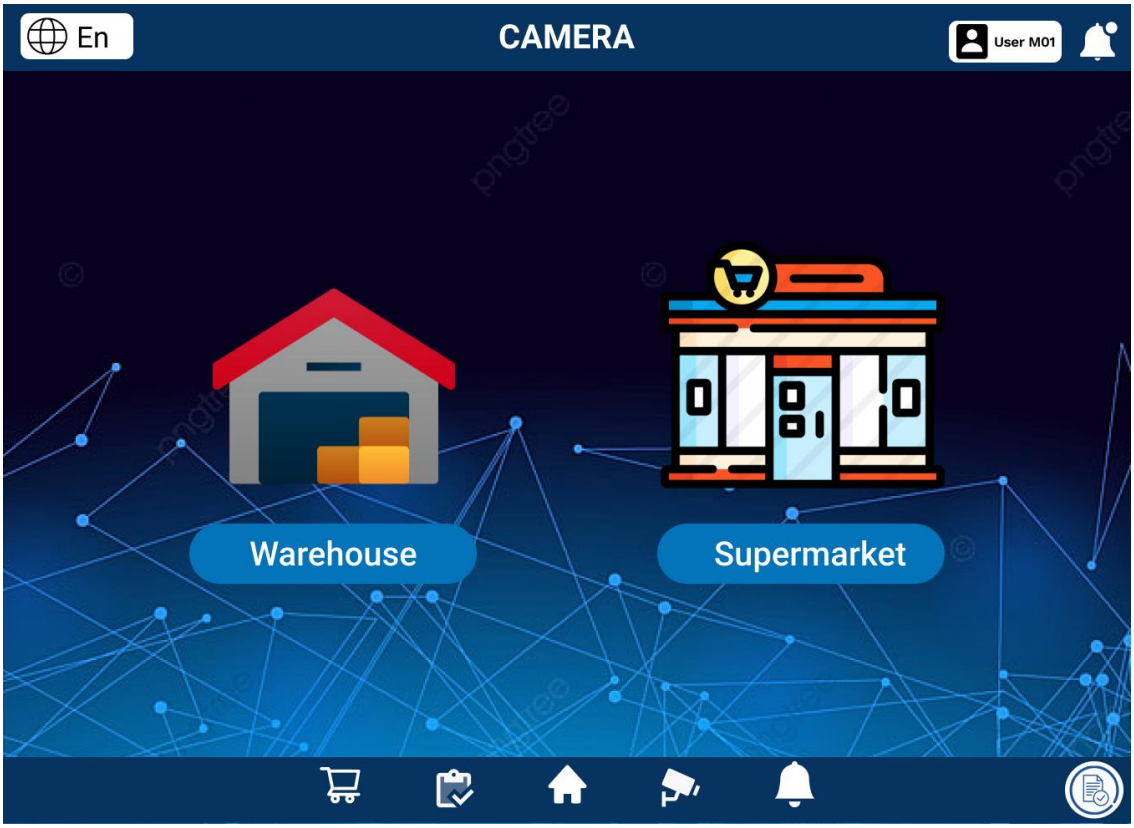

Figure 27. Mockup for Camera

– The camera function is divided into two subfunctions as Warehouse and Supermarket so that users can choose a reasonable viewing area. However, the interface when clicking on these two areas is the same.

2.5.1. Warehouse map

Figure 28. Mockup for Warehouse map

– In this interface, the application will display a map of the area selected by the user, the user can zoom in/zoom out to observe the general or detailed view of each area. The map will display as a real image or graphic. In graphic mode, the number of goods on the shelf will use colors to describe 3 levels: low, medium, and high through red, orange and blue, respectively. When clicking on the robot that appears on the map, the detailed information of the robot such as ID, Status, Battery, Active time and Active Location will be displayed. When the user selects the Setting button, the application will move to the Setting interface

2.5.2. Setting

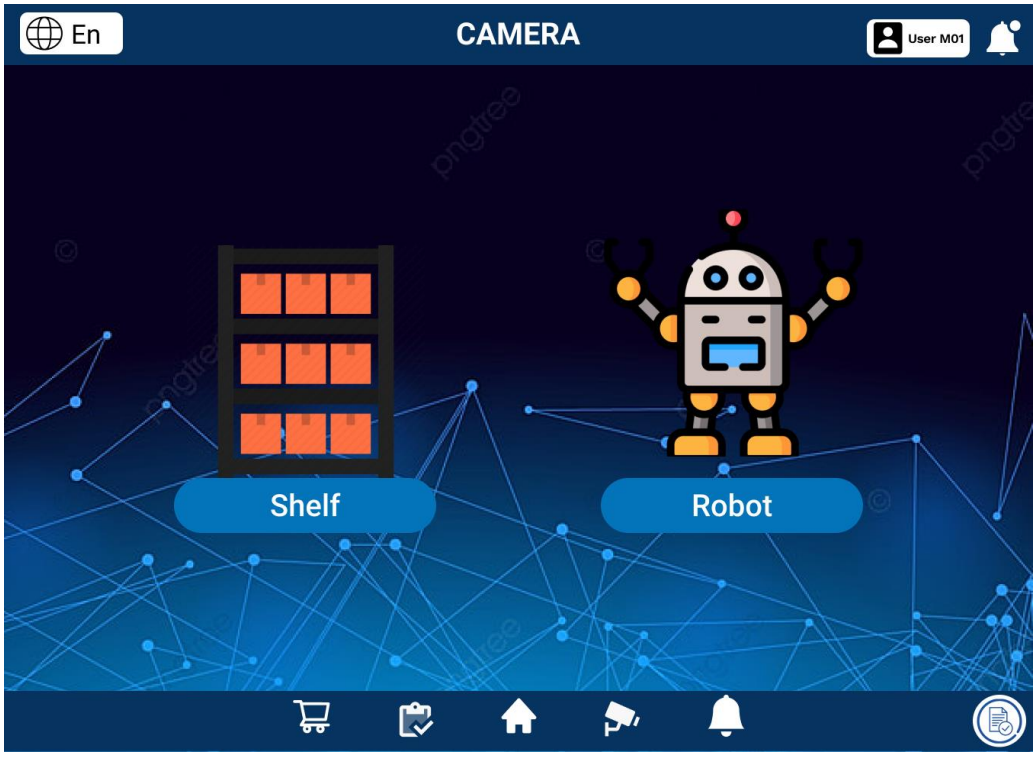

Figure 29. Mockup for Setting

– The Setting interface displays two entities, a shelf, and a robot. Allows the user to change some states of these functions

2.5.3. Shelf

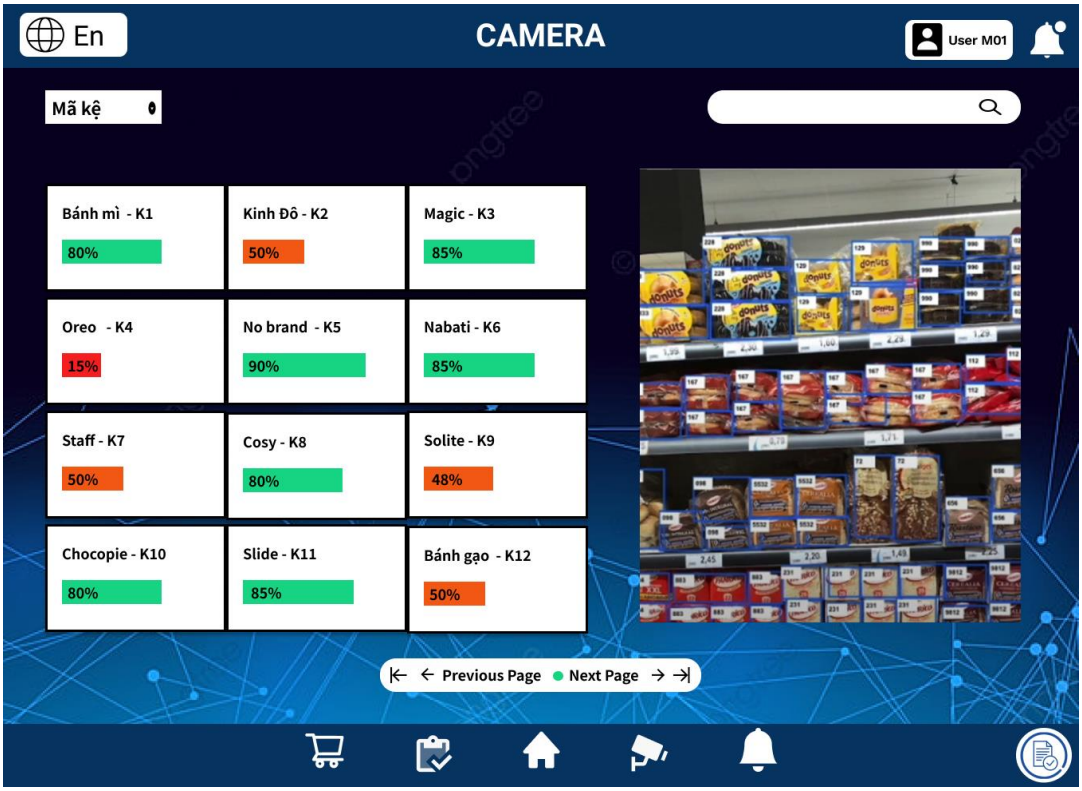

Figure 30. Mockup for Shelf

– At the same time, this interface also allows users to observe and check the shelves with live images from the camera in real-time. Products are noted by the camera with color frames. If there is a product that is not on the shelf, the frame of the product is red. From there, users can more conveniently observe, check and detect system errors in a timely and proactive manner.

2.5.4. Robot

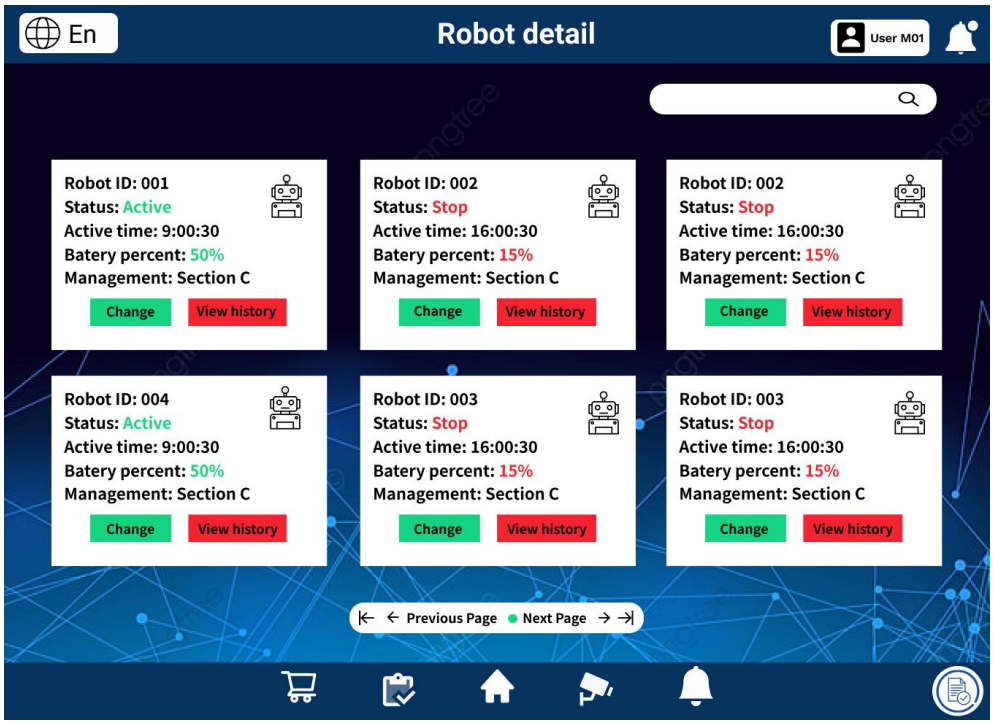

Figure 31. Mockup for Robot Setting

– This interface allows users to see an overview of all robots operating in the supermarket/warehouse. The Change button allows the user to change and customize the desired robots and the View History button allows the user to review the activity log of the Robot of their choice.

-THE END-