

VIETNAM NATIONAL UNIVERSITY HCMC
UNIVERSITY OF ECONOMICS AND LAW
FACULTY OF INFORMATION SYSTEM



PROJECT REPORT

ANALYSIS AND DESIGN INFORMATION SMART MANAGEMENT SYSTEM FOR SUPERMARKET

Instructor: Ms. Vu Thuy Hang

Class: K18406C – Group 6

Student's name:

- | | |
|--------------------------|------------|
| 1. Trần Khánh Duy | K184060780 |
| 2. Ngô Hữu Tài | K184060801 |
| 3. Lâm Thị Hoài Thanh | K184060802 |
| 4. Nguyễn Phạm Thủy Tiên | K184060809 |

Ho Chi Minh City, December 26th 2020

TABLE OF CONTENTS

I. OVERVIEW	4
1. Introduction	4
2. System Description.....	4
II. GENERAL ANALYST.....	6
1. Business Process Model and Notation	6
2. Explanation.....	6
III. FEATURE DESCRIPTION	7
1. Login.....	7
1.1. Business Process Model and Notation.....	7
1.2. Data Flow Diagram.....	7
2. Product Management.....	8
2.1. Business Process Model and Notation.....	8
2.1.1. Register information for new products.....	10
2.1.2. Editing product information	10
2.1.3. Delete products.....	10
2.1.4. Exit	11
2.2. Data Flow Diagram.....	11
3. Purchase Order Management	12
3.1. Business Process Model and Notation.....	12
3.1.1. Display and edit purchase order	12
3.1.2. Approve created order	14
3.2. Data Flow Diagram.....	15
4. Inventory Management.....	15
4.1. Business Process Model and Notation.....	16
4.1.1. Sensor on the shelves	17
4.1.2 Robot	17
4.2. Data Flow Diagram.....	18

IV. APPLICATION INTERFACE.....	19
1. Validation Table	19
1.1. Employee Accounts	19
1.2. Product	19
1.3. Shelf	20
2. User Interface	20
2.1. Login	20
2.2. Main Menu.....	21
2.3. Search Product	23
2.4. Create Requisition.....	24
2.5. Map	25
2.6. Product Management.	26
V. CONCLUSION.....	33

I. OVERVIEW

1. Introduction

With the rapid development of modern science and technology, computer technology has penetrated all fields and become the necessary tools for various industries, especially Internet technology promotion and the establishment of the information highway. It makes the IT industry increasingly shows its unique advantages in the market competition. In the digital age, there is huge data information waiting for processing and transmission, which makes the further development and use of the database is particularly urgent.

As some small and medium-sized supermarkets in the domestic market, they are falling behind the large and medium-sized supermarkets during the informatization, but for these enterprises' resource management, information storage and processing also shows the urgent need. To adapt to market competition requires efficient handling and management methods, so it is indispensable that accelerate the process of the computerization of the supermarket.

For many reasons above, my team chooses project “**ANALYSIS AND DESIGN INFORMATION SMART MANAGEMENT SYSTEM FOR SUPERMARKET**” to help managers at the supermarket can save much time. We design a smart system by use Robots, sensors, and beacons.

My system has the application for a manager who can manage all shelves at the supermarket. Besides, we integrated management stock at the warehouse, product and the system can automatic to create a purchase order for purchase product when warehouse out of stock. We hope our application will be effective in shelve management.

2. System Description

What: This is a system for smart supermarkets, it helps managers save time and power when using the system.

How: This system using Robots and sensors to perform and manage tasks that the administrator instead has to do. To use this system, the manager must log in with the account that was provided to use the system.

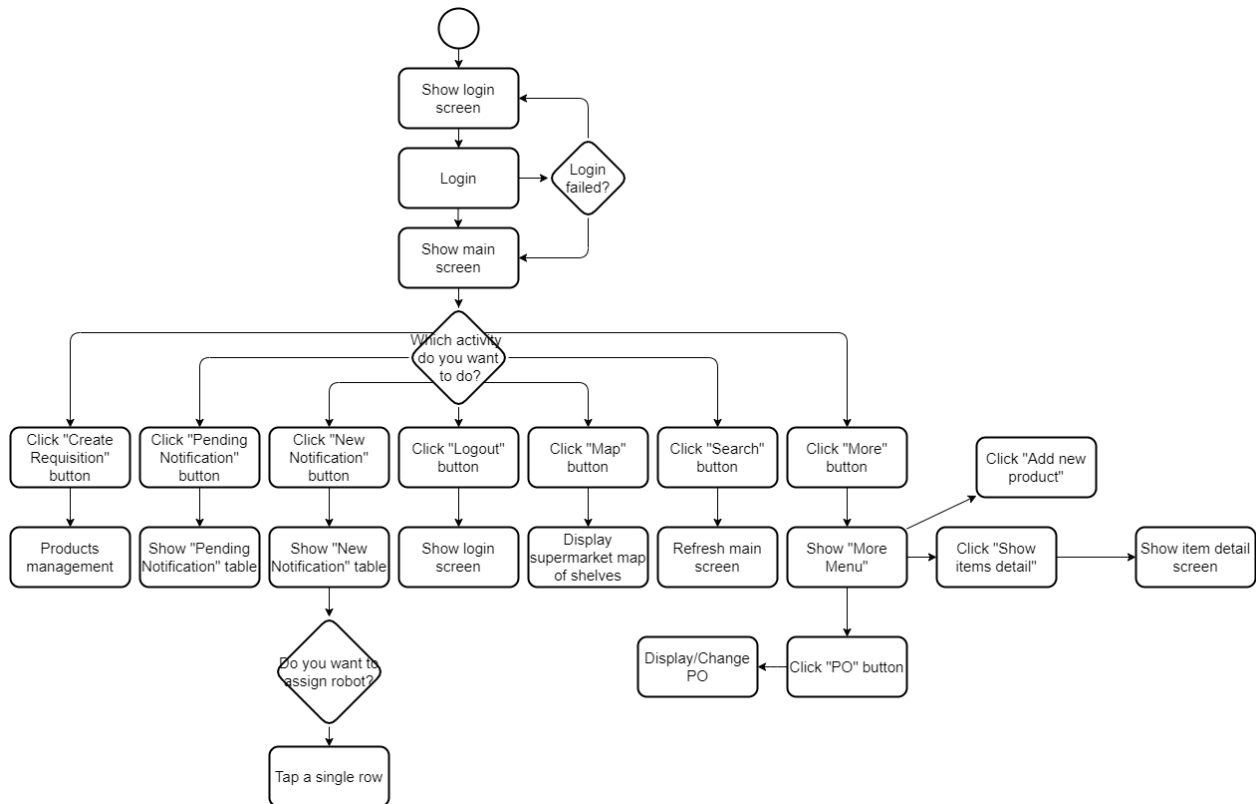
Where: This system is used in the supermarket by a manager or at a big store.

Who: The user of this system is the manager of the supermarket.

When: The system is used continuously from time to time throughout the time supermarket works.

II. GENERAL ANALYST

1. Business Process Model and Notation



2. Explanation

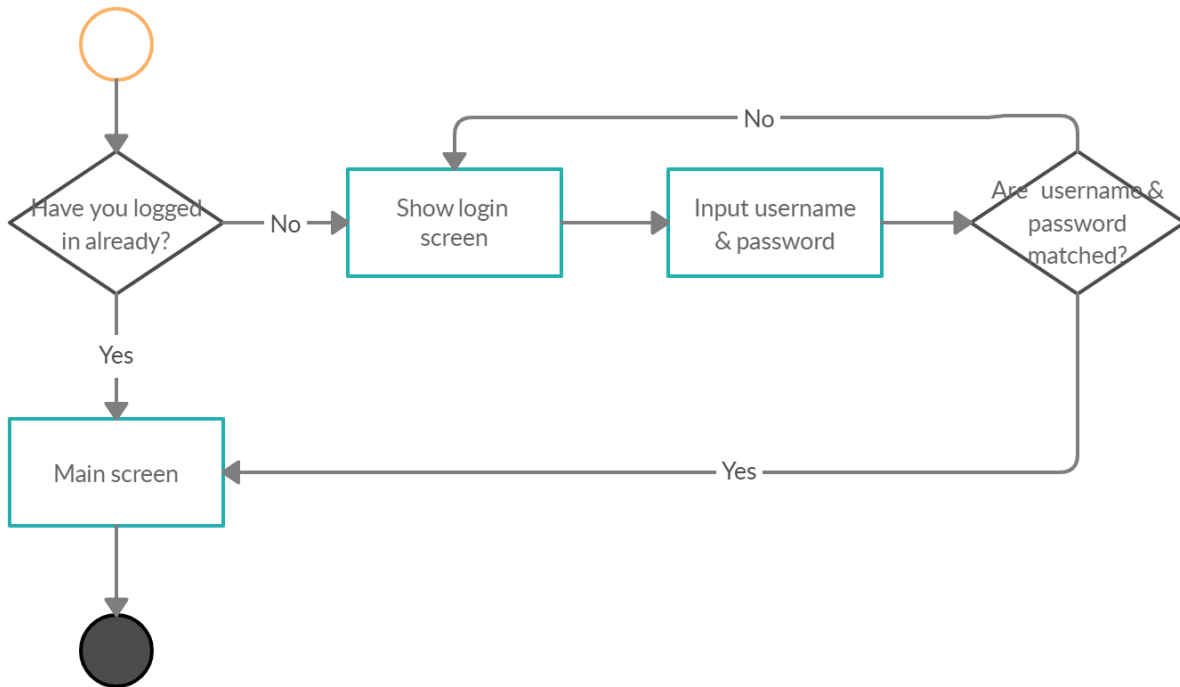
The app allows staff at supermarkets to monitor and manage the shelves and quantity of products on each shelf through the help of robots. To connect with the application, users need to log in with the provided username and password. The system gets account information from the employee account to compare and return a result. If it's right, return successfully. If not, return fail.

On the main screen, the app will display notifications showing the status of the shelves and need to be handled by the robot. Besides, employees can also carry out necessary tasks with products and shelves such as viewing, searching, modifying, deleting, adding. Also, providing immediate alerts to managers and employees when the product is empty and the product is on the wrong shelf.

III. FEATURE DESCRIPTION

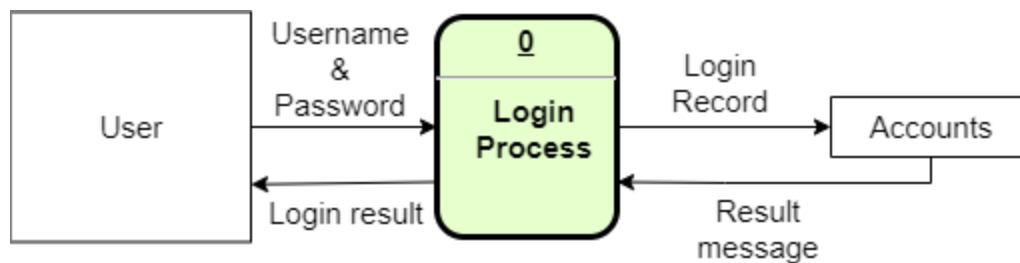
1. Login

1.1. Business Process Model and Notation



The login screen allows registered users to log in to the site to access all of the features that their account gives them access to. If they type in their username and password and click submit the users' credentials are validated and if correct they are logged in.

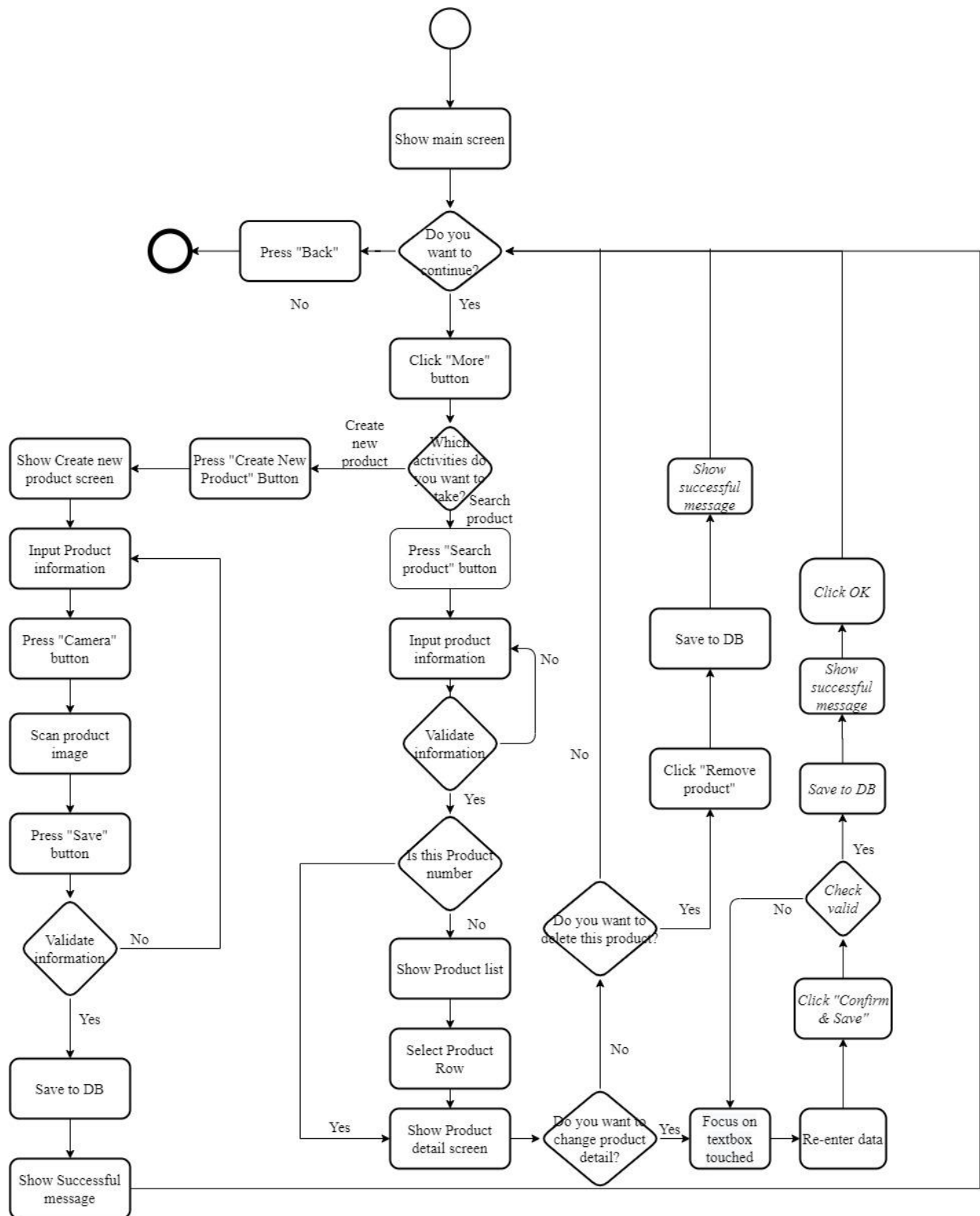
1.2. Data Flow Diagram



When employees choose the app, the app will show a login screen. Employee inputs username and password which has been provided. After logging in, the app will send a request for BE and Backend will send a request for Database to request information of employee to compare. When the app has compared all information of employees, they can interact with an app. At the same time with a check log, if employees logged in successfully, the app would have shown a shelf map of the supermarket has available in the database. If they logged in unsuccessful, the user interface would have shown notification and request retry to log in.

2. Product Management

2.1. Business Process Model and Notation



The product management function is one of the most important functions of this application. Thank to this application, the store manager can follow and manage all information of the product such as adding, deleting, and editing product information.

2.1.1. Register information for new products

To register new products, the manager has to click on the “More” button on the Tab Bar and click on the “Create new product” button. Then, the “Production registration” screen will appear and the manager can input all the information required. After that, the manager also needs to click the “Camera” button to scan the product's appearance.

In the end, click the “Save” button. If all the required fill is filled and the new product does not exist in the Database, then all the information will save into the Database, and the “Successful message” will appear. Click “Ok” to back to the main screen. The process is over. If not, the registration process will start again.

2.1.2. Editing product information

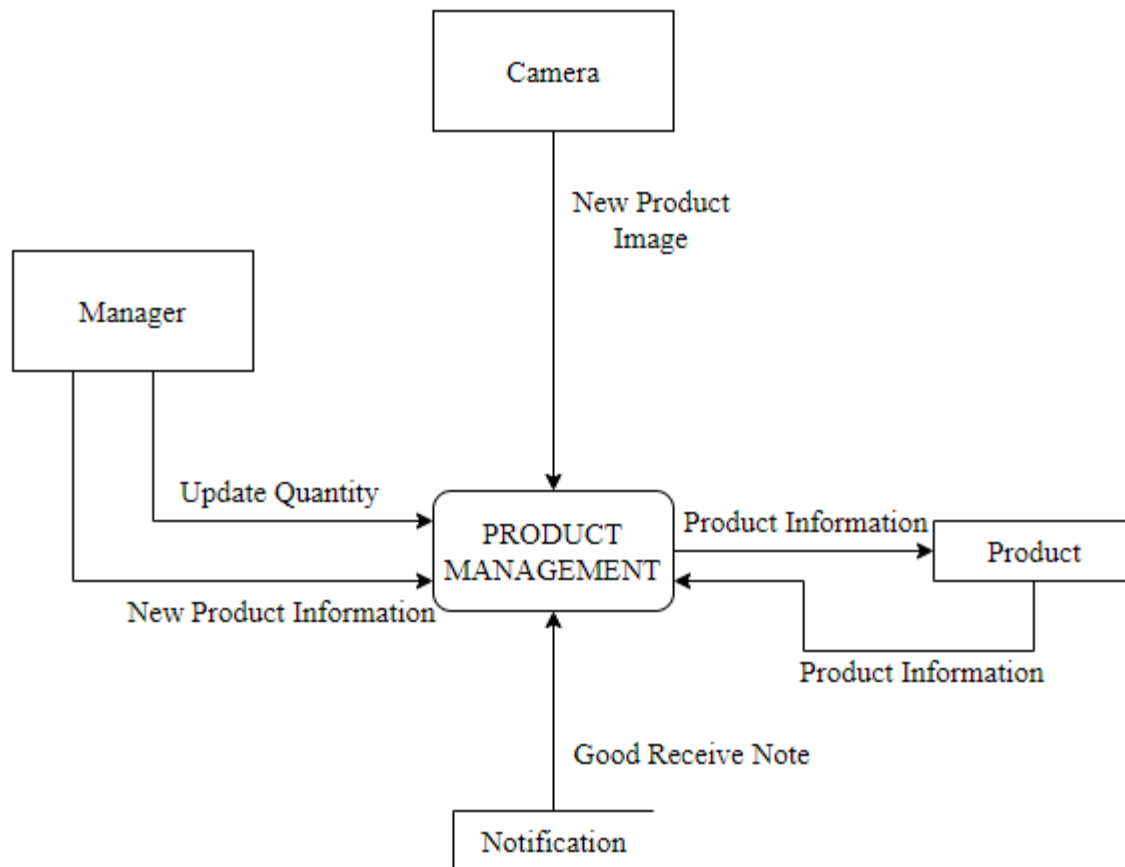
Same as the registration process, the manager needs to click on the “More” button and then choose the “Search product” button. Now the manager can input the information to find the product, and at the “Product detail” screen choose the “Edit” button. At the “Edit product” screen, the manager can change existed product information. After that, click the “Confirm & Save” button, now the system will validate the input data, if valid the data will be updated in the Database and show “Successful message”. If not valid, the system will ask the manager to input the data again. The process is over.

2.1.3. Delete products

In some case, the store stop selling some products, the manager needs to click on that product to go to the “Product detail” screen. And then, click on the “Delete” button. The system will display a warning to the manager to confirm the deletion. If clicking the “Ok” button, then the system will process to delete the product information in the Database and ending the process.

2.1.4. Exit

If the manager wants to go back to the “Main” screen, just simply click the “Back” button.



2.2. Data Flow Diagram

In this DFD, we can see that product management has two external entities. The manager input the product information such as product identification, product name, quantity, ... and the camera input the product picture for the process. After that, the Product datastore will push the product information to the process to make sure that the product does not exist in the Database. Finally, save all the updates into the Product datastore. As for the Notification datastore, it input the “GRN” to push the notification to the process.

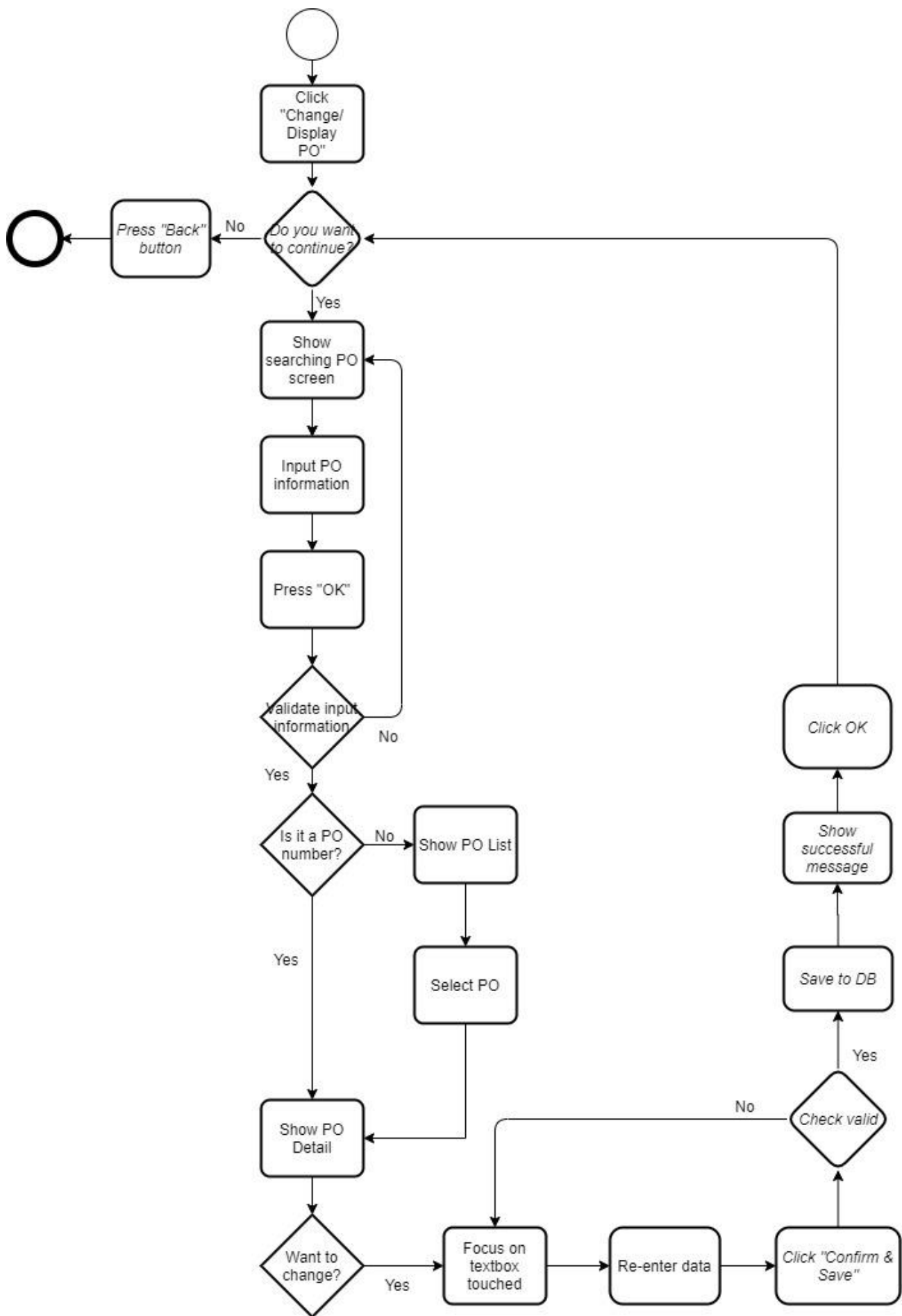
3. Purchase Order Management

3.1. Business Process Model and Notation

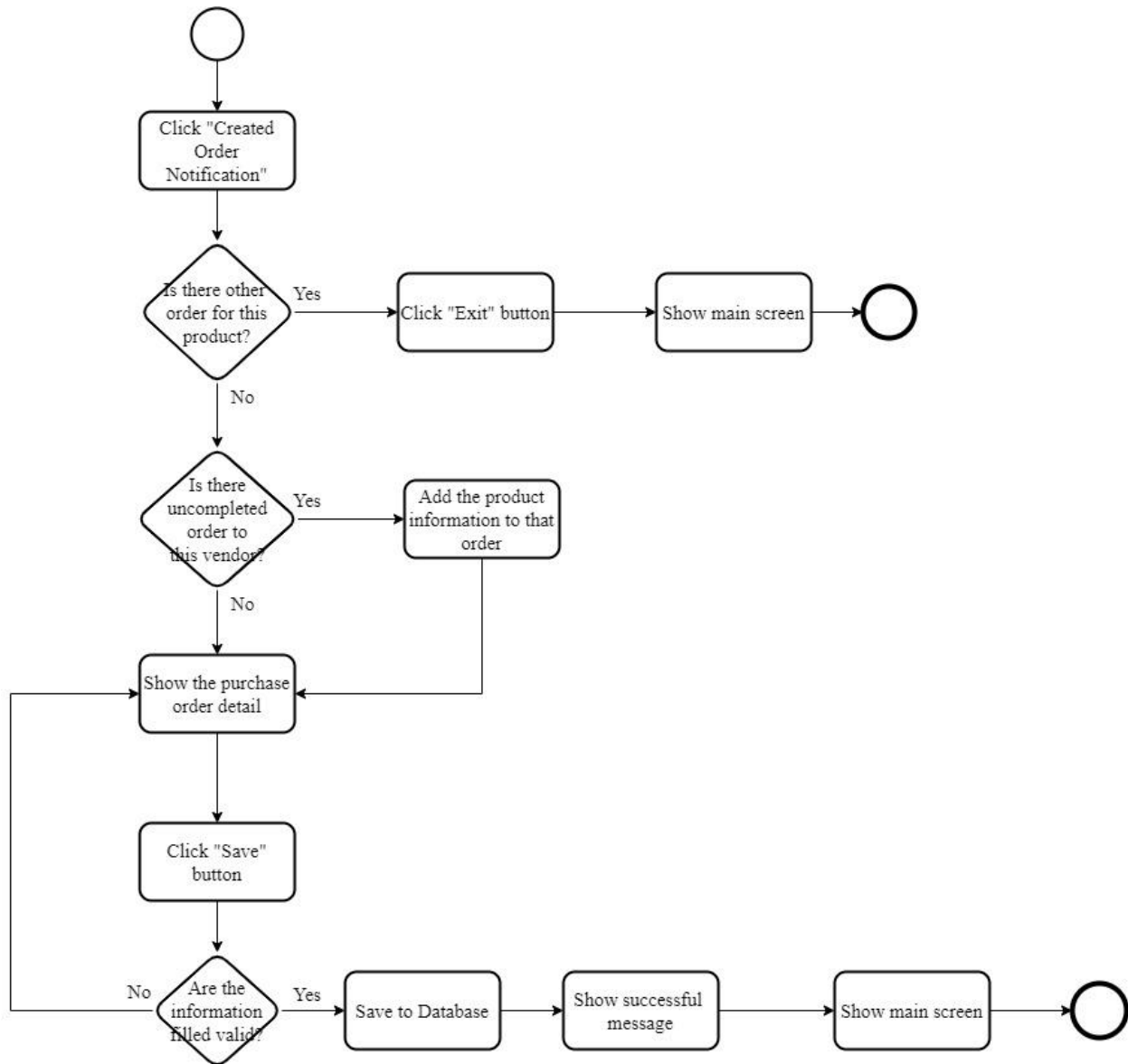
3.1.1. Display and edit purchase order

When clicking on the “Display purchase order” button, the “Searching purchase order” screen will appear. After, the manager input the purchase order information, the system will validate the input data, if valid the Purchase order detail will appear, if not the system will show a warning message and the manager have to re-enter the information.

If the manager wants to change the purchase order detail, then by clicking the “Edit” button on the purchase order detail screen. Then the manager can input new information and save it by clicking the “Save” button. The system will validate the data if succeed the new information will be updated in the database, if not the manager will have to re-enter the information.



3.1.2. Approve created order

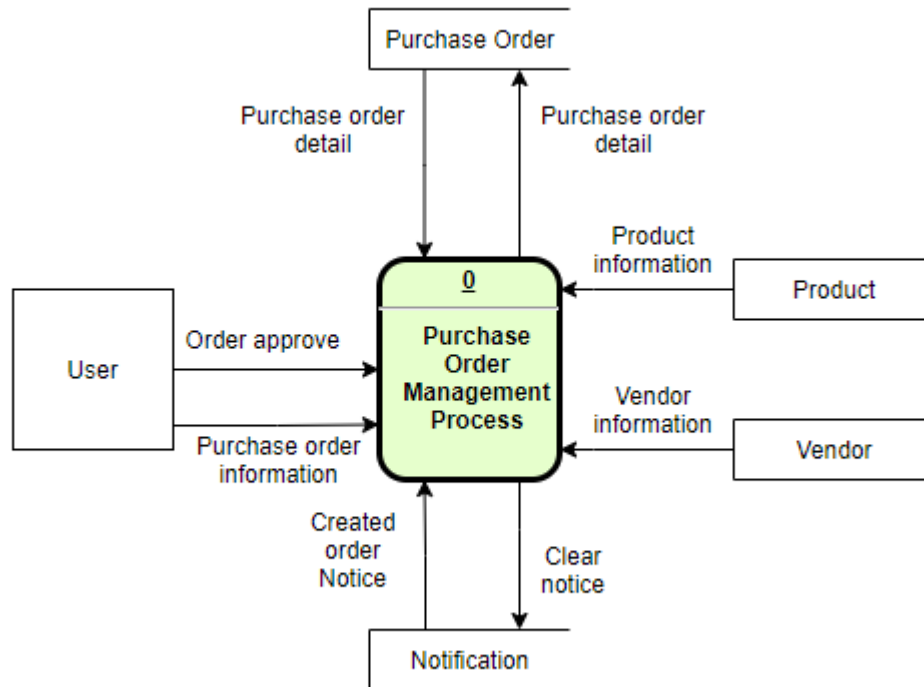


After the Robot sending the “Created purchase order” notification, the manager can approve it by clicking the notification. If there already have a purchase order for that product, then the process will end. If no other purchase order is created for that product then the system will start to look for the opened purchase order for that vendor, if have one the product will automatically add-in that order.

If no purchase order is created for that vendor the system will create a new purchase order for the product’s vendor. Finally, the manager can click the “Save” button to save

the order. If all the data is valid, then the order will be saved in the Database. If not the manager will have to re-enter the information.

3.2. Data Flow Diagram

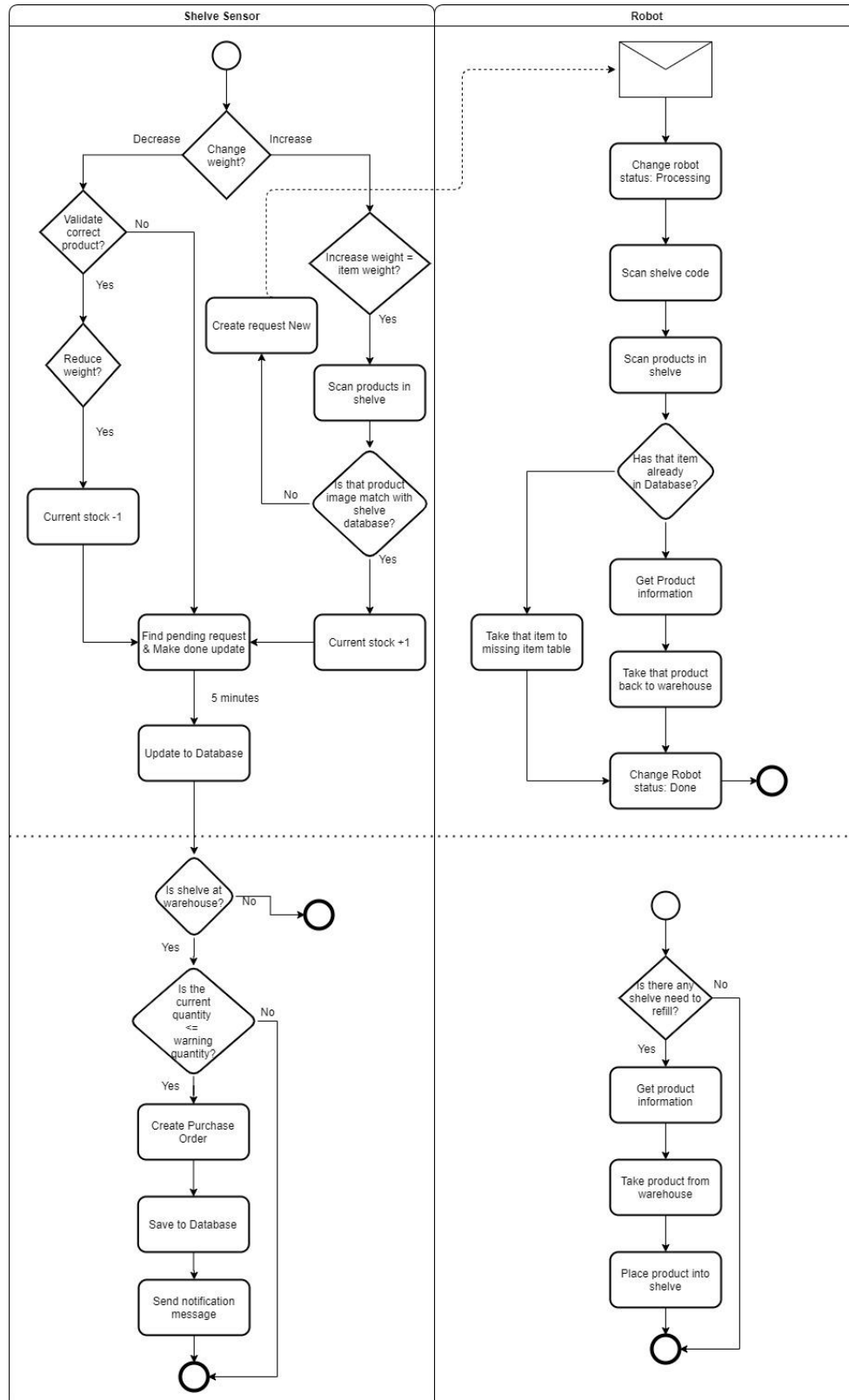


When creating the purchase order, the process will get the information from the product and vendor data store to add all the information to the purchase order, and then after the robot send the notification, the process will get that purchase order so that the manager can approve for it and save it back in the purchase order data store and create a clear notification into the Notification datastore.

When display and changing the purchase order detail, the manager will input purchase order information to get the data from the Purchase order data store. After that, the data will be saved back to the database.

4. Inventory Management

4.1. Business Process Model and Notation



4.1.1. Sensor on the shelf

The system uses a weight sensor installed on the shelf and robots to perform this function.

Firstly, the sensor will check if the shelf has any weight change.

- + If the weight reduces the robot will check the validation of that product in the Database. If that item is not the product stored on that shelf, the robot will find that Pending notification and make a Done update. If that is the same product in the Database, the current stock will minus 1 after that the robot will find that Pending notification and make a Done update.
- + If the weight increase, the sensor will inform the robot to come and identify that item. If the item matches the product, the current stock will plus 1. If not, the robot will create New notification then go through the process (*).

Secondly, every 5 minutes the application will automatically refresh to make sure all the notification is up-to-dated. After that, if the robot is checking in the store, this process will end.

If not, the robot will check the current stock of that product to find out whether the current stock is smaller than the warning stock. If the result is yes, the robot will automatically create a purchase order for that product and send the notification to the system.

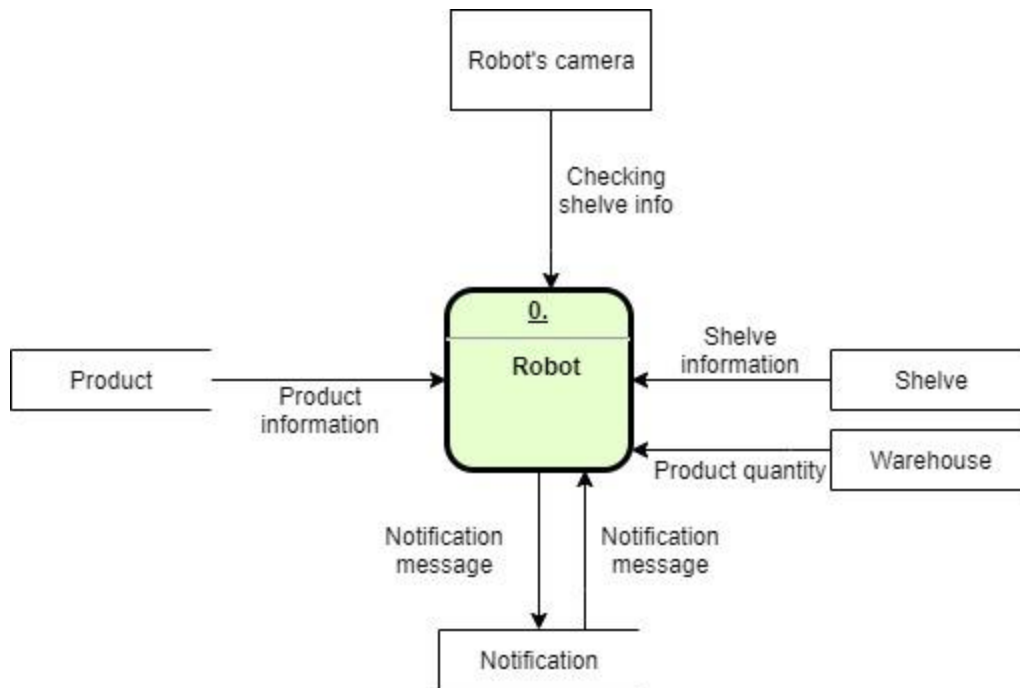
4.1.2 Robot

In the process (*), the robot will change its status into processing and scan the product to know if the product exists in the Database or not. If yes, the robot will get the location of that product and process to put it back to its correct shelf. Otherwise, the robot will take that item to the missing item table. After complete the task, the robot will update its status to Done and go back to the robot station.

Besides process (*), the robot also has the routine to go and check its assigned area to identify any shelf that needs to refill every 10 minutes. If the result is yes, then the

robot will scan and get information about that product. After that, based on the location of the product in the warehouse, the robot will go, pick them up, and place them on the display shelf.

4.2. Data Flow Diagram



For the DFD, this process will get information from the product, shelf, warehouse, robot's camera, and notification data store. When the robot checks its assigned area, the robot will get the product data by using its camera to determine if there has any wrong placed product or not.

And based on the current stock in the warehouse data store, and the weight sensor in the shelf, a robot can know that if there any shelf that needs to refill.

As for the notification data store, the robot will receive about changing weight notification from the sensor and send the created purchase order back to the system.

IV. APPLICATION INTERFACE

1. Validation Table

1.1. Employee Accounts

Field	Description	Data type
Username	A unique sequence of characters used to identify an employee.	nvarchar
Password	A secret word or expression used by authorized an employee.	nvarchar

1.2. Product

Field	Description	Data type
Product Barcode	Barcode of chosen product	nvarchar
Product Name	Name of chosen product	nvarchar
Price	Price of chosen product	numeric
Quantity	The currently available quantity of a product in the shelf or warehouse	numeric
Weight	The weight of a product without its container or package	numeric
Vendor	Supplier of chosen product	nvarchar
Slv.Display	ID of shelves display	nvarchar
Slv.Warehouse	ID of shelves in warehouse	nvarchar

1.3. Shelf

Field	Description	Data type
Shelf code	Bar code of chosen shelf	nvarchar
Area	Area of the chosen shelf	nvarchar
Store location	Location of the chosen shelf	nvarchar

2. User Interface

2.1. Login

17:00 Sat 19 Dec

75%

LOGIN

Username:

Password:

Sign-in

Picture 1. Log-in screen



Employee must fill in username and password exactly to continue using functions of this app. If they forget password, they have to contact managers as managers will regenerate a new password in the database. The system determines and grants password.

2.2. Main Menu.

17:00 Sat 19 Dec		MAIN MENU		75%
New		Pending		
Time	Notification	Product	Shelf	
Sat 19 Dec 20 16:59	Out of stock	SC0502 L'Oreal Makeup Remover 500ml	NORTH-008	
Sat 19 Dec 20 16:50	Out of stock	FF0702 MeatDeli Beef 500gr Pack	SOUTH-004	
Sat 19 Dec 20 16:45	Out of stock	FF0708 Neptune Cooking Oil 500ml	SOUTH-013	
Sat 19 Dec 20 16:44	Out of stock	SC0804 Nivea Face Washing Cream 350ml	NORTH-008	
Sat 19 Dec 20 16:44	Wrong shelf	Unknown product	NORTH-008	
RE		📍		☰

Picture 2. Main menu – New notifications

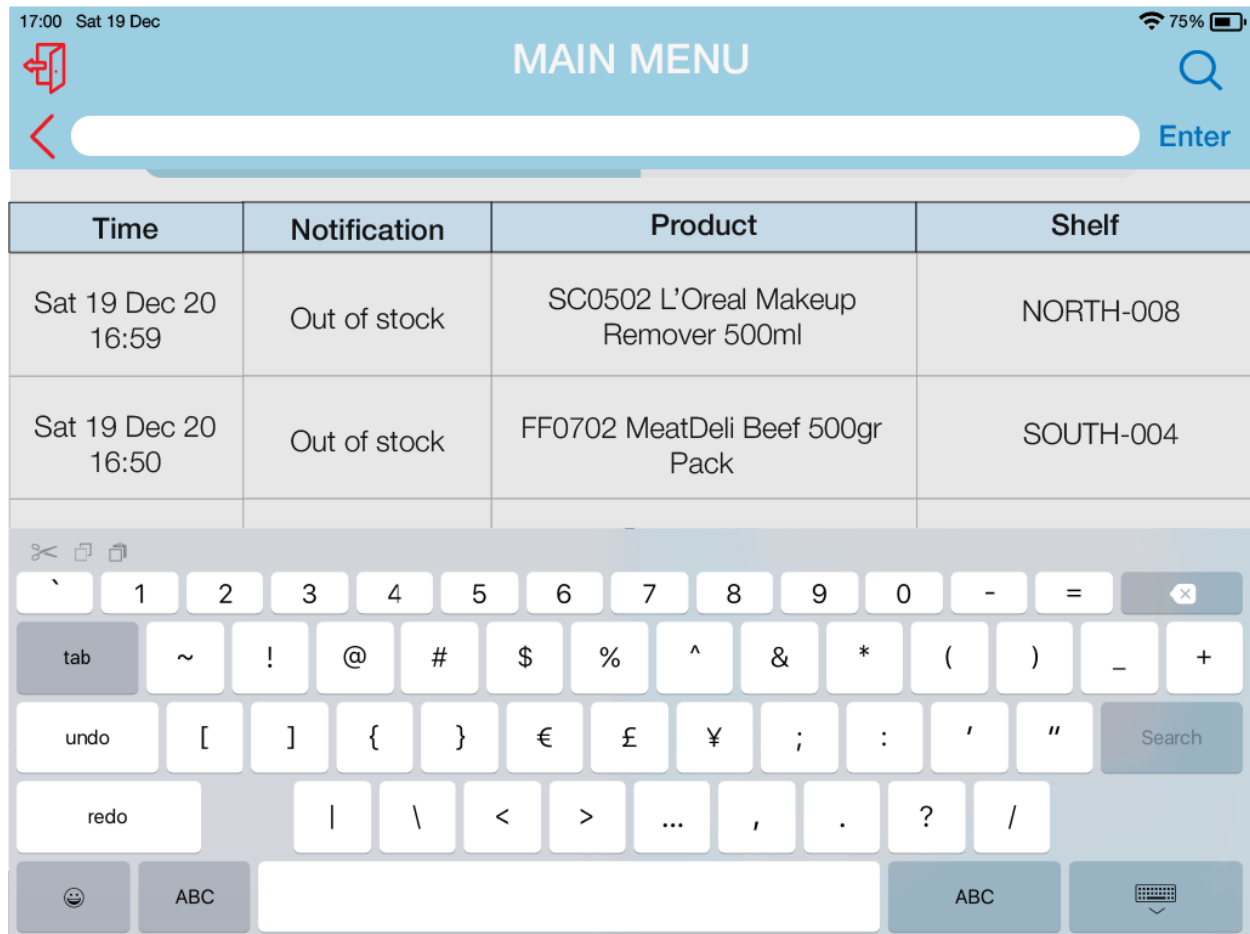
As our team finds out that notification is the most important function when it comes to warehouse management, we design the main screen with 2 tables of notifications. “New notification” visualizes dates, kind of notification like “out of stock”, “wrong shelf”, etc., name of the product and its location.

17:00 Sat 19 Dec		MAIN MENU			75%
New		Pending			
Duration	Task	Product	Shelf	Robot	
5 mins	Refill shelf	SC0502 L'Oreal Makeup Remover 500ml	NORTH-008	ANNA001	
10 mins	Refill shelf	FF0702 MeatDeli Beef 500gr Pack	SOUTH-004	DINAH001	
7 mins	Refill shelf	FF0708 Neptune Cooking Oil 500ml	SOUTH-013	MAX002	
10 mins	Remove wrong item(s)	Unknown item(s)	NORTH-008	ANNA002	
5 mins	Refill shelf	SC0804 Nivea Face Washing Cream 350ml	NORTH-008	LUMI003	
					

Picture 3. Main menu – Pending notifications

On the other side, the pending notification table allows staff to acknowledge what is happened in the supermarket or what are the robots are doing exactly, in other words. There are kinds of tasks, product name, location, duration of the processes, and robot names along with their status of battery are visualized. Therefore, staff will get easily manage every activity of all robots working at a time.

2.3. Search Product



Picture 4. General searching screen

As for the searching function in general, users only have to tap on the magnifier in the top right of the interface, the screen for searching will appear immediately. And the following job is just to type anything of information related to what they are looking for. For example, if you type “L’Oreal”, the result will show every product, PO and requisition engaged “L’Oreal” in it. This function is very quick but as if the result display is too long like an “endless” list, then we have to switch to the “Plan B” with other specific searching functions.

2.4. Create Requisition

17:00 Sat 19 Dec

75%



CREATE REQUISITION

Save

Req. No: 10000450

Created by: Ngo Huu Tai

Delv. date: 22/12/2020

Vendor:

No.	ID code	Product's name	Quantity	Unit	Plant	Barcode	Catalog
1	SC000122	L'Oreal Paris Make Up Remover Micellar Sensitive Skin 400ml	100	bottle(s)	Arlington TX	1234567890128	Skincare & Beauty
2	SC000135	L'oreal Revitalift Hyaluronic Acid Serum 30ml	100	bottle(s)	Arlington TX	1234567890126	Skincare & Beauty
3	SC000128	L'Oreal Paris True Match Super-Blendable Powder 0.33 oz.	100	bottle(s)	Arlington TX	1234567890124	Skincare & Beauty



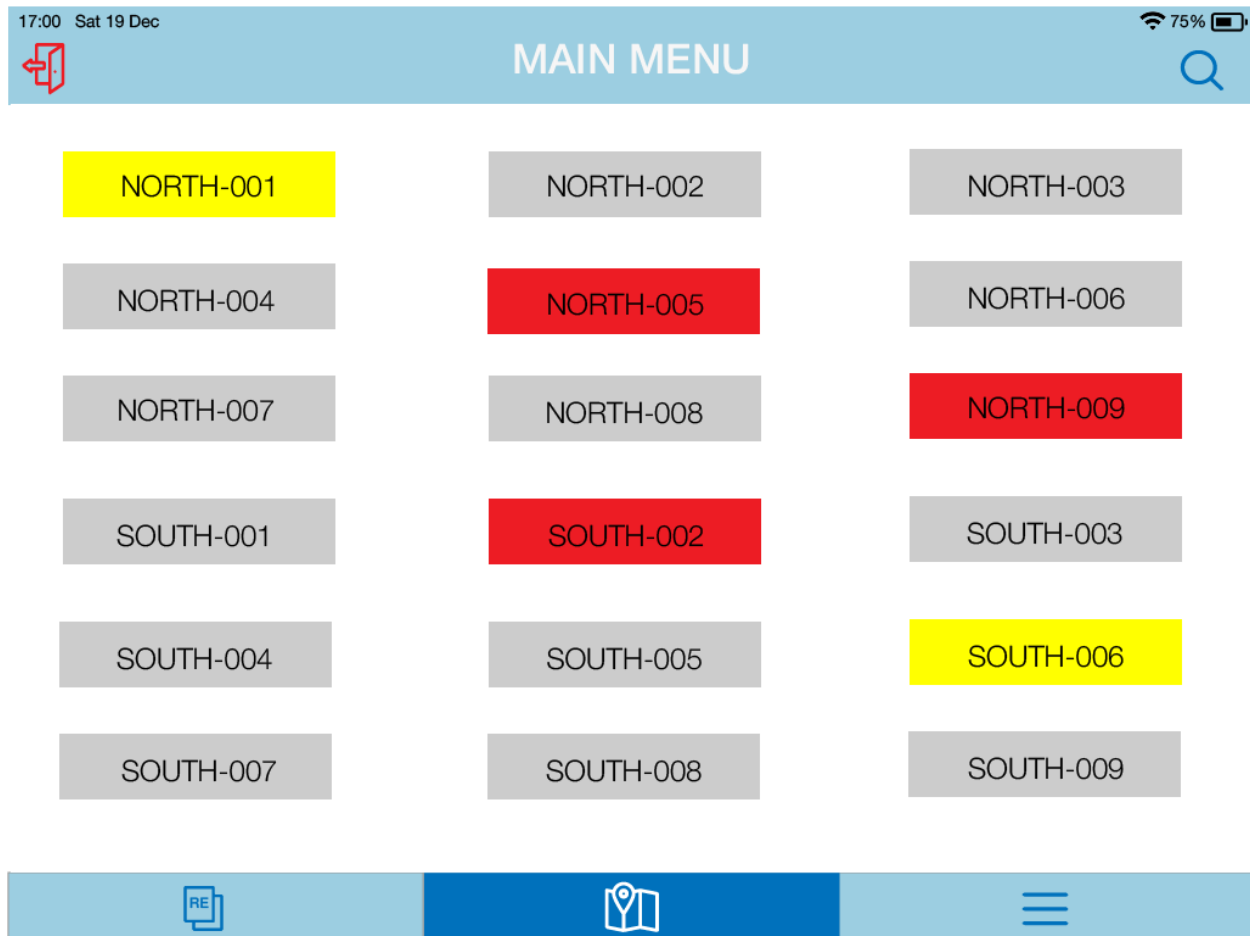




Picture 5. Requisition creating screen

The bottom left of the screen is the requisition create function. Usually, when a robot found an item is out of stock, it will create automatically a PO for it. But users can also create a manual requisition for items when they are in the need of them without the robot's interference.

2.5. Map



Picture 6. Supermarket map of shelves screen

The middle bottom is the map button which will display a supermarket map of shelves. In picture 6, all the shelves and their names display with 3 main colors stand for 3 status:

- + Grey means that the shelf is ready to serve customers' shopping as it is full of items and products.
- + Red means that shelf is lack certain product(s) on it and need to be refilled or is being refilled, as the scale of that shelf checks that everything is supplied and ready to be served, it will immediately turn into grey.
- + Yellow means that shelf has some "stray boys" on it and need be put right back to the shelf where they are supposed to be as if there are supermarket's

items or to the lost-and-found box in the customer service department if there are losing stuff from customers. By the time all the wrong objects/items are removed from the shelf, it will immediately turn grey.

2.6. Product Management.



MAIN MENU			
New		Pending	
Time	Notification	Product	Shelf
Sat 19 Dec 20 16:59	Out of stock	SC0502 L'Oreal Makeup Remover 500ml	NORTH-008
Sat 19 Dec 20 16:50	Out of stock	FF0702 MeatDeli Beef 500gr Pack	SOUTH-004
Sat 19 Dec 20 16:45	Out of stock	FF0708 Neptune Cooking Oil 500ml	SOUTH-013
Sat 19 Dec 20 16:44	Out of stock	SC0804 Nivea Face Washing Cream 350ml	NORTH-002
Sat 19 Dec 20 16:44	Wrong shelf	Unknown product	NORTH-001


Picture 7. “More” menu

The right bottom is the “Trinity More” function which helps staff to manage products and purchase orders.

17:00 Sat 19 Dec

CREATE NEW PRODUCT

Save



Add product's photo

Product ID:

Name:


Category:


Vendor:


Barcode:

Warehouse location:

Supermarket location:







Picture 8. New product creating screen

By tapping the top button in the “More” menu, the user will see a screen for creating a new item appear. They have to input basic information, take its picture, and scan the barcode. By pressing “Save”, this information will be saved to the database of items.

By pressing the second button in the “More” menu, the screen for products searching with their basic information will appear. Users can input as many species as possible from the Product ID, name, barcode, location. If the system validates the right input, the product detail screen will appear.

17:00 Sat 19 Dec 75%

SEARCH PRODUCT

Search

Product ID:

Name:

Category:

Vendor:

Barcode:

Warehouse location:

Supermarket location:

RE 📍 ☰

Picture 9. Product searching screen

As they input the right information, the product detail screen will appear with all the information related to that product displayed. To make a change, users have to tap on the “Change” button in the top right of the screen.

EDIT PRODUCT DETAIL Save

Product ID: SC0205

Name: L'Oreal Make-up Remover 500ml

Category: Skin care and beauty

Vendor: L'Oreal

Barcode: 0 123456 789012

Warehouse location: NO-789

Supermarket location: NO-741

DELETE

RE

Location

Menu

Picture 10. Product detail screen

When the “Change” button is pressed, the product detail edit screen appears. Users have to tap the camera on the picture to change its appearance or tap barcode to change with the camera or focus on the textbox to change other information. Then press “Save” to get the database to memorize the new changes. In case that product is no longer be sold, press the “Delete” button to remove it from the database.

EDIT PRODUCT DETAIL Save

Add product's photo

Product ID: SC0205

Name: L'Oreal Make-up Remover 500ml DELETE

Category: Skin care and beauty

Vendor: L'Oreal

Barcode: 0 123456 789012

Warehouse location: NO-789

Supermarket location: NO-741

Picture 11. Product editing screen

2.7. Purchase Order

17:00 Sat 19 Dec 75%

PURCHASE ORDERS Search

PO Number:

Created date:

Approved by:

Arrived date:

Vendor:

RE

Location Pin

Hamburger Menu

Picture 12. PO searching screen

The third “brother” in the “More” family is PO which will display the searching PO screen. Since all the PO is automatically created by robot. Users only have to input some of the right related information to the textbox.

17:00 Sat 19 Dec

PURCHASE ORDERS

Save

PO Number	Vendor	Created date	Approved by	Status
4500000100	Orion	15/12/2020	Tran Khanh Duy	Pending
4500000101	L'Oreal	15/12/2020	Tran Khanh Duy	Completed
4500000102	Vinamilk	15/12/2020	Ngo Huu Tai	Completed

PO Number:

4500000102

Created date:

15/12/2020

Approved by:

Tran Khanh Duy

Arrived date:

15/12/2020

Vendor's contacts

L'Oreal Vietnam CO.,LTD
121 Alexander de Rhodes,
ward Ben Nghe, district 1, HCM city.

Phone: 25252536
Email: supply.department@lorealvn.net

Products contained:

No.	ID code	Product's name	Quantity	Unit	Price	Barcode	Total
1	SC000122	L'Oreal Paris Make Up Remover Micellar Sensitive Skin 400ml	100	bottle(s)	300.000	1234567890128	30.000.000
2	SC000135	L'oreal Revitalift Hyaluronic Acid Serum 30ml	100	bottle(s)	250.000	1234567890126	25.000.000
3	SC000128	L'Oreal Paris True Match Super-Blendable Powder 0.33 oz.	100	bottle(s)	750.000	1234567890124	75.000.000

Order's total: 130.000.000

Picture 13. PO displaying screen

On the top, a table of the PO list which most related to the input will appear. In picture 13, the result shows POs created on 15th Dec 2020. As if there are necessary changes, users have to focus on the textbox and re-input the right information.

V. CONCLUSION

Through the course and this project, our team has learned a lot about how to analyze a business situation, visualize its processes in general as well as supermarket supply chain processes in specific. We hope our little project will prove probably that every knowledge and lesson learned can be applied to real-life business if we are willing to do it. As beginners in the Business Analysis field, we always know there are flaws in this application but as long as it's our hardworking result and with your further suggestions, we hope every flaw will be a chance for us to explore more in the BA field. Many thanks for your precious help that brought us here.