

# Smart Inventory Management System for Two Zero Two Food

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**Abstract:** Smart Inventory Management System for Fresh Market is a web-based system, and it is developed especially for Two Zero Two Food in their inventory management. This project is proposed to help fresh markets in tracking their stocks easily and only restock when required as food security threats might happened when there is no proper system to manage stocks in fresh market. This project is developed using waterfall model which the phases move like a waterfall. The development tools that were used to develop this system are Visual Studio Code and XAMPP where phpMyAdmin used as the system database tool for MySQL. This project's output brings an effective inventory management system. According to user acceptance testing, user very satisfied on this system.

**Keywords:** Smart Inventory Management System, Inventory Management, Food Security

## 1. Introduction

Inventory management system is a software program designed to track products, inventory, orders, and achievement both to and from customers and with suppliers. To have an effective inventory system, the system must include real-time updating to make sure the inventory levels when there is an order being processed. It also needs to assist in multichannel sales to stock the correct amount of inventory for each channel so that the business will not experience issues that overselling or understocking. Besides, demand forecasting also needed to help the business know the correct amount of inventory should stock for peak season when demand is soaring and carry out an adjustment when demand is low. It is needed if the retailers have multiple physical store locations so that employees no need to do manual stock count and it also can reduce human error for the records [1].

In this project, a smart inventory management system is going to develop. Rather than focusing on all types of business, this project will only focus on business in fresh markets. It is because issue of food insecurity might happen in Malaysia one day. To maintain food security, smart inventory management system for fresh market is proposed. This proposed system allows user to insert new stock in the system, record number of stock available, record stock price, search for stock available, generate report with one click. Through this system, fresh markets can control and track their orders and stock. At the same time, it will not happen overstocking so that the food security able to maintain. The cost for stock can

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be reduce at the same time. The objectives of this project are to design smart inventory management system for fresh market based on user requirement which the user is Two Zero Two Food using PHP and MySQL, to develop a smart inventory management system for fresh market, Two Zero Two Food, and to test the functionality of the smart inventory management system, whether it meets user specifications and works as expected.

Moreover, it is important to have inventory management in business because inventory management able to control the stock, have inventory reporting to review the previous sales and business, cost saving [2]. At the same time, it also can help to prevent wasting cost or goods in the business. So, it is important to have an inventory management system in helping the process become more efficient. Therefore, each business will need an inventory management system.

## 2. Related Work

### 2.1 Inventory Management

Inventory management is the backbone of any business operations. It is because inventory management is a systematic process for sourcing, storing, and selling both raw materials and finished goods [3]. It means the right stock, at the right levels, in the right place, at the right time, and at the right cost in business terms [3]. In supply chain, inventory management act as controlling and overseeing purchases from suppliers as well as customers, maintaining the stock storage, controlling the number of products, and the fulfillment of order. Some businesses often use Excel, Google sheets as their inventory databases tracker and to see whether ordering is needed or not [3].

### 2.2 A Study on Similar Systems

There are quite a lot of existing applications or system that similar with the proposed system. Three existing systems are chosen for comparison. The systems are Smart Inventory System – Mobile & Web [4], Smart Inventory Manager & SoltiScan [5] and Zoho Inventroy [6]. Table 1 shows the comparison between the features of existing system and the proposed system.

**Table 1: Comparison between similar systems with the proposed system**

Features	Smart Inventory System – Mobile & Web	Smart Inventory Manager & SoltiScan	Zoho Inventroy	Proposed System
Login and Register	/	X	/	/
Add new items into system	/	/	/	/
Generate report in one click	X	/	/	/
Free access	X	X	/	/
Send notification while the demand under minimum	X	/	X	/
Add new items by scanning Bar Code or QR Code	/	/	/	X
Involve Cloud	/	X	/	X
Access in online and offline	X	/	X	X
Unlimited products	/	/	X	/
Summary of the data	X	/	/	/

### 3. Methodology/Framework

In this project, the methodology used to develop the proposed system is by using waterfall. Waterfall model is a standard model used in system development life cycle (SDLC) to develop a system with a linear and sequential method [7]. This model develops systematically like a waterfall as it starts from one phase to another in a downward style. There are different phases divide in this model as the output of one phase will be used as the input of next phases and there will no phases overlapping. The phases are requirement phase, analysis, design, implementation, testing, deployment, and maintenance.

#### 3.1 Waterfall model

Waterfall has requirement phase, analysis, design, implementation, testing, deployment, and maintenance. Requirement phase is where the information to develop the proposed system is collected. The title and type of the system is decided in this phase. After the title and the system is confirmed, the information related to this project like problem statement, objective, problem background, etc. is collected. After all the problem statement, objectives and scope are finalized, the methodology to develop this system is determined. Gantt chart (see Appendix) is built to determine the time duration, progress, and flow for each activity. Lastly, all the information gained in this phase is included in proposal for approval.

Analysis phase is where analysis of data is done. In this phase, three existing systems that related to existing systems is studied and the comparison of the features among three system and the proposed system is done. Interviews are done with the admin and retailer of Two Zero Two Food to get know about the existing inventory management system. Information related to the system is studied to gain more information to help in the development of the proposed system.

In the design phase, data flow diagram (DFD) and wireframe are designed to have a clearer image of the proposed system. Data flow diagram (DFD) is a diagram that illustrates the data flow of a system and wireframe is to have an outline of the interface of the system. These diagrams are designed by using draw.io. In this phase, database is designed to store data and would need to ensure that there is no error

In the implementation phase, coding tasks started after the design phase. All the coding task carried out by using Visual Studio Code to standardize the platform of coding and to ensure the development process is move as planned. The programming language that going to use to implement this system is PHP, Hypertext Markup Language (HTML), JavaScript and Cascading Style Sheets (CSS). While implementing the system, developer will focus on each page and module to ensure that the outcome meet the user requirements. The database linking between the system also carried out in this phase so that user can store their data in database successfully.

The testing phase is to test the system implemented and developed after implementation phase. It is to ensure that the quality of the proposed system and there are no errors in the system. So, in this phase the final system will be tested.

For deployment and maintenance phases, since this system will not be implemented for live environment for now, so in this project there is no deployment and maintenance will do.

#### 3.2 System Development Workflow

Table 2 shows the system development workflow. Each activity in each phase has listed following by the output of the activities.

**Table 2: System Development Workflow**

Phase	Task	Output
Planning	<ul style="list-style-type: none"> <li>Proposed the project title</li> <li>Identify problem statement, objectives, and scope of the project</li> <li>Determine the project schedule</li> </ul>	<ul style="list-style-type: none"> <li>Project proposal</li> <li>Develop Gantt chart</li> </ul>
Analysis	<ul style="list-style-type: none"> <li>Study online resources and journals that are related to title</li> <li>Research on the features of existing system</li> <li>Interview with the owner and admin of chosen company</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>Comparison between existing system and proposed system</li> <li>Gather user requirement</li> </ul>
Design	<ul style="list-style-type: none"> <li>Design wireframe</li> <li>Design dataflow diagram</li> </ul>	<ul style="list-style-type: none"> <li>Wireframe</li> <li>Dataflow diagram</li> </ul>
Implementation	<ul style="list-style-type: none"> <li>Develop the system</li> <li>Connect the system with database</li> </ul>	<ul style="list-style-type: none"> <li>Proposed system</li> <li>Prototype of system</li> </ul>
Testing	<ul style="list-style-type: none"> <li>Carry out system testing</li> <li>Identify bugs and errors</li> </ul>	<ul style="list-style-type: none"> <li>Solve and improve the system</li> <li>Ready to launch the proposed system</li> </ul>

### 3.3 System Analysis and Design

System analysis is carried out to determine the requirements of a new product [8]. This section discusses the system requirements analysis implemented to develop the proposed system. Functional and non-functional requirements of the proposed system is analyzed.

#### 3.3.1 Functional and non-functional requirements

Functional requirements refer to the features of the system while non-functional requirements focus on the system's performance. Functional requirements analysis able to make the system develop according to user requirements and follow the functional requirements. If functional requirements do not achieve, it means the system does not operate.

For non-functional requirements, it focuses on security, portability, reliability, availability, and so on. Non-functional requirements refer to the requirements of system performance. Its emphasis on the

user expectation of the system. Table 3 and Table 4 shows the functional requirements and non-functional requirements of the proposed system.

**Table 3: Functional requirements of the proposed system**

No.	Modules (Users)	Functionalities
1.	Login (Admin, Employees)	- System should allow user to input the username registered in the login page. - System should alert users for invalid input.
2.	User management (Admin)	- System should allow user to create, display, update the user account details.
3.	Search (Admin, Employees)	- System should allow user to search for the product information. - System should allow user to search for the price of the product.
4.	Product management (Admin, Employees)	- System should allow user to create, read, update, and delete the product information such as product name, product price, and product quantity.
5.	Brand management (Admin)	- System should allow user to create, read, update, and delete the brand information such as brand name.
6.	Category management (Admin)	- System should allow user to create, read, update, and delete the category information such as category name.
7.	Sales management (Admin, Employees)	- System should allow user to create, read, update, and delete the sales information such as product sold, quantity sold, and price. - System should allow user to generate report. - System should send alert message to user when the product demand is at minimum number.
8.	Logout (Admin, Employees)	- System should allow user to sign out of the system by pressing logout button - System should allow user to keep signed in if user did not click the log out button.

**Table 4: Non- functional requirements of the proposed system**

No.	Non-functional Requirement	Functionalities
1.	Usability	System should provide a user-friendly and easy to use interface.
2.	Security	System should only let the user in if the user has corrected login credentials.
3.	Operationality	System should available when there is internet connection to have real-time database updates.
4.	Availability	System should available 24/7, unless scheduled maintenance.

### 3.3.2 Data Flow Diagram

Data flow diagram (DFD) illustrates the data flow of the system. In this section, data flow diagram is designed to show the data flow of proposed system. A context diagram is shown in Figure 1 which illustrate the input and output of the system between the entities. The entities involved are admin and

employee. The DFD Level 0 diagram is shown in Figure 2 to show that the process and the data flow of the system.

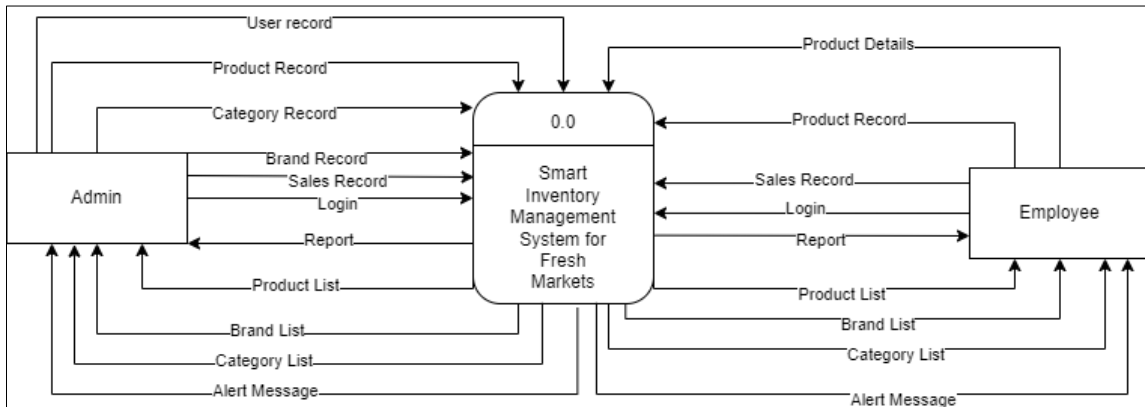


Figure 1: Context Diagram of Proposed System

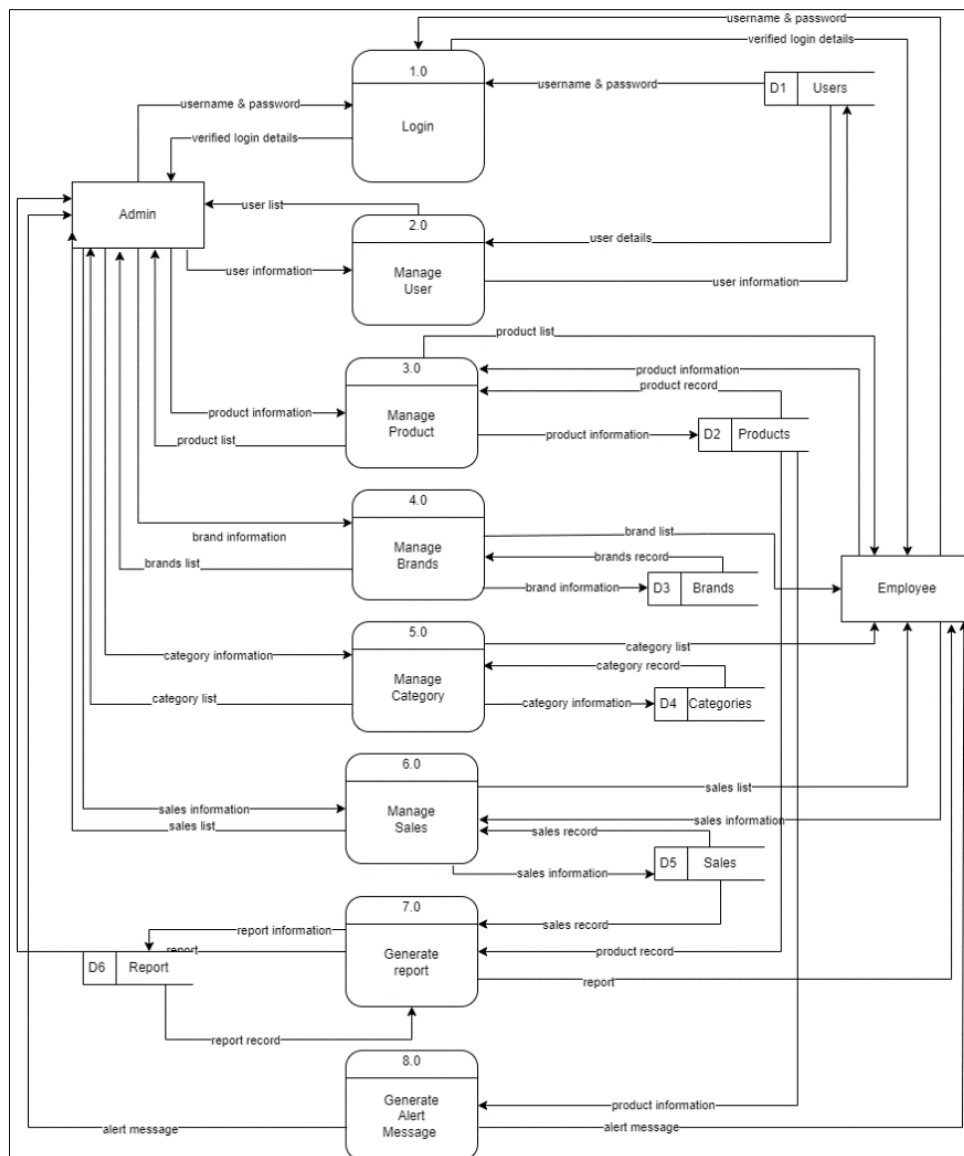


Figure 2: DFD Level 0 of Proposed System

### 3.3.3 Activity Diagram

Activity diagram is used to explain the features of the system. Activity diagram is important as it shows the structure of the system by showing the flow of the activity. The flow of the activity can be single, branched, and parallel. In this project, there are two entities involve who are admin and employee. Figure 3 and Figure 4 shows the activity diagram of admin and employee respectively.

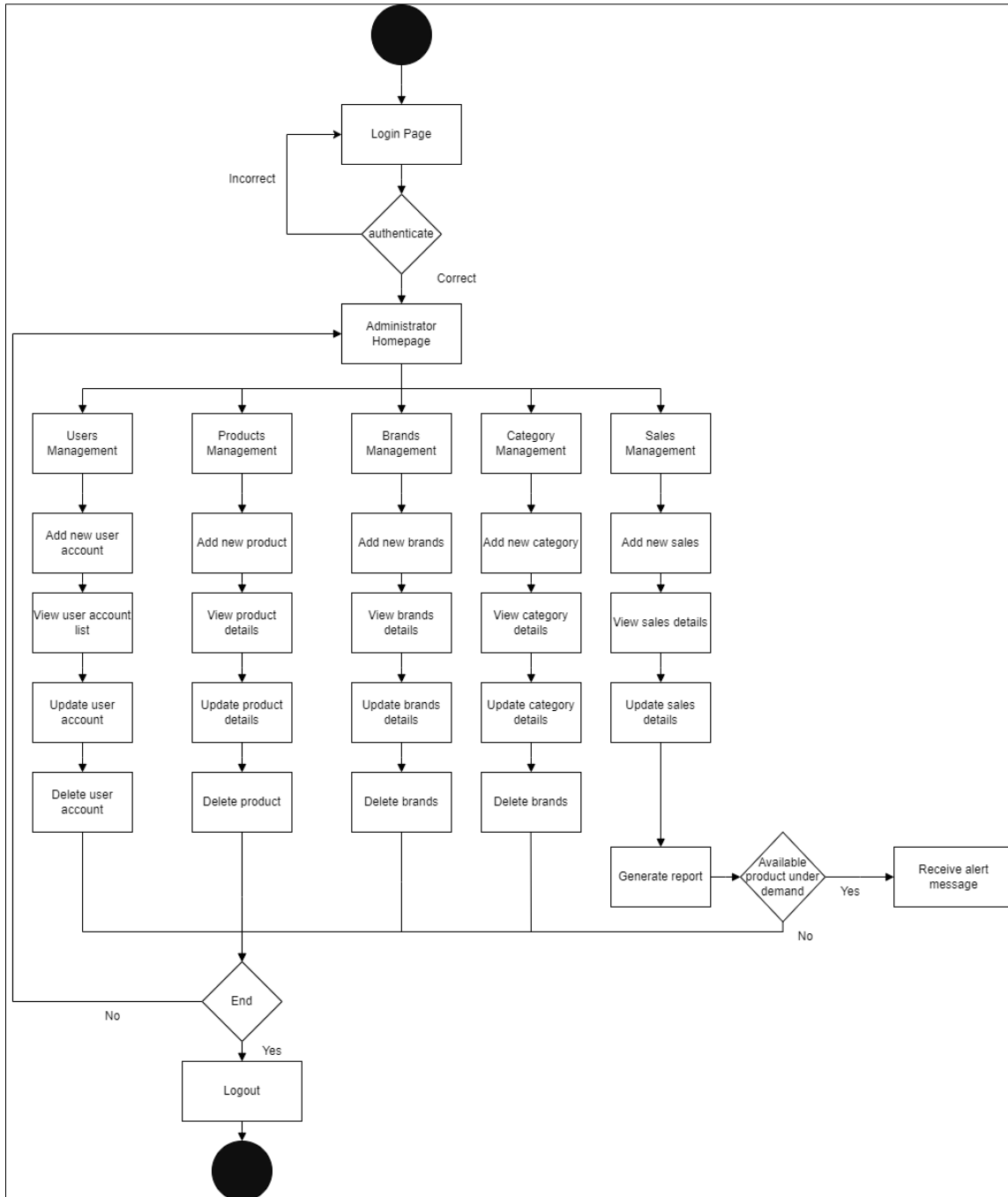
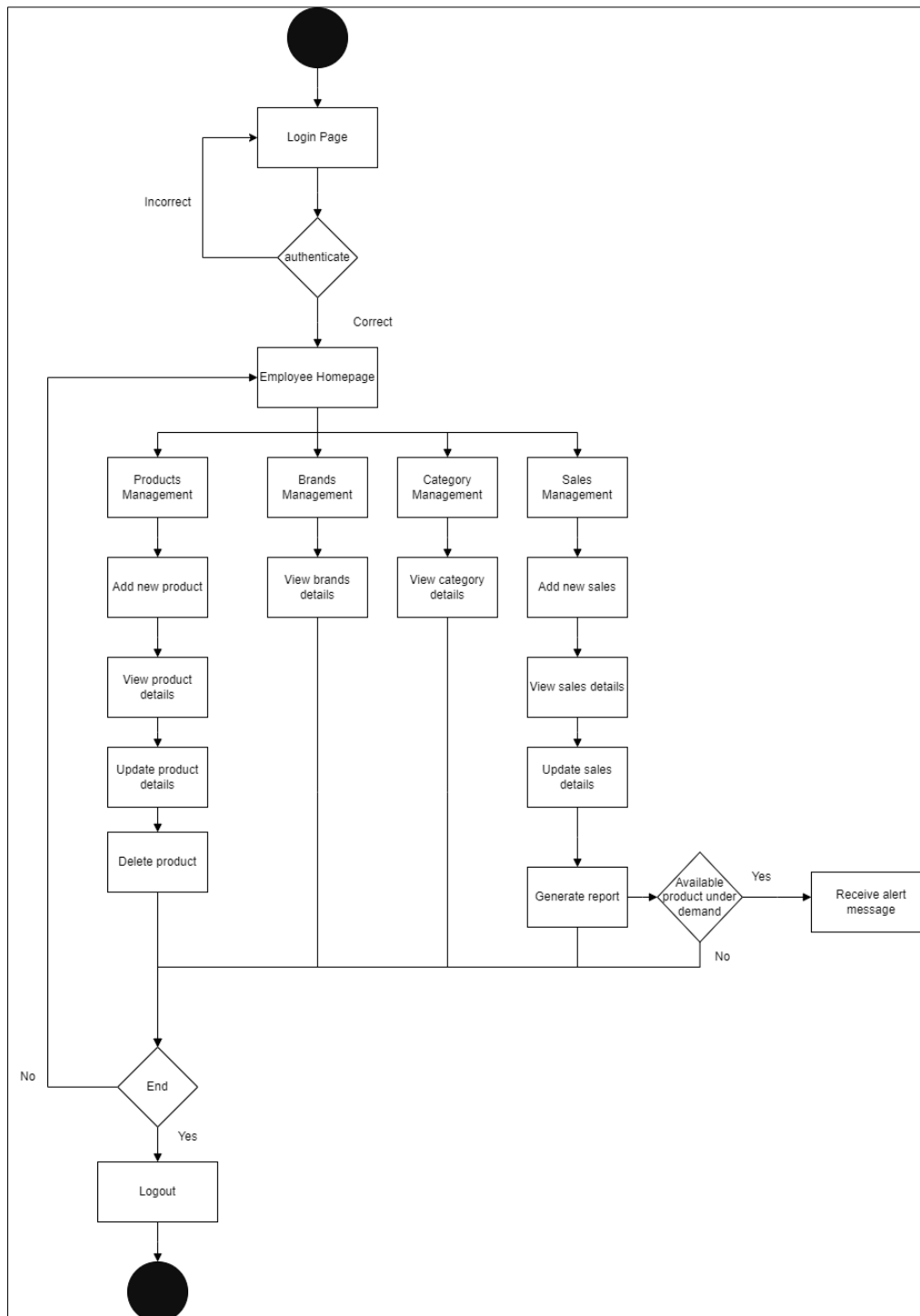


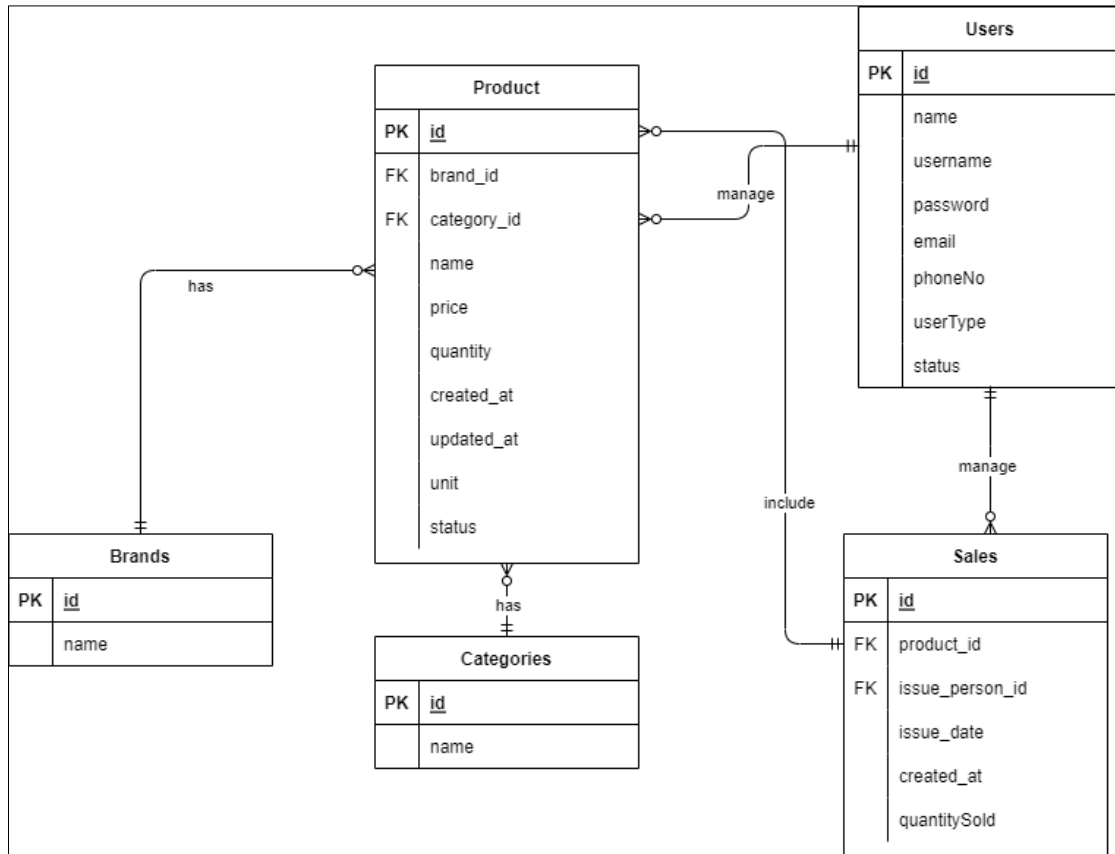
Figure 3: Activity Diagram of admin



**Figure 4: Activity Diagram of admin**

### 3.3.4 Entity Relationship Diagram (ERD)

An ERD is designed to describe the relationship between entity sets stored in database. Figure 5 shows the ERD of the proposed system.



**Figure 5: ERD for Proposed System**

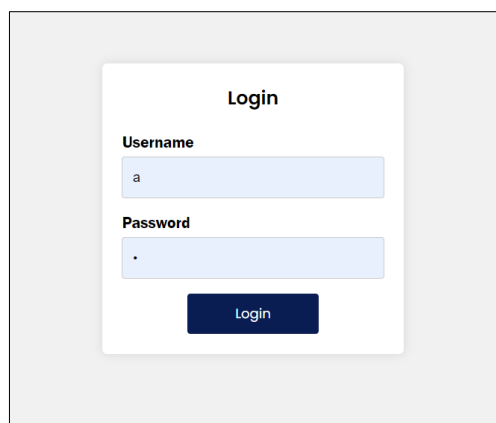
#### 4. Results and Discussion

This section discusses the result of the development of Smart Inventory Management System for Two Zero Two Food. The design of the proposed system is shown by displaying user interface. The test plan is also shown in the sub section.

##### 4.1 User Interface

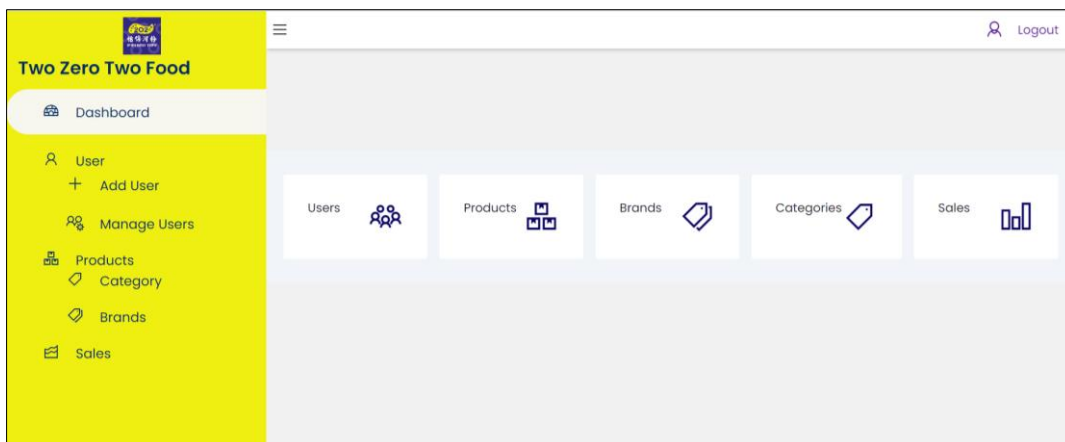
The proposed system has successfully developed. A simple user interface design is provided to the users so that it is user friendly. The user interface design is shown from Figure 6 to Figure 13.

Figure 6 shows the interface of login page which user need to login into the system to access the data by entering username and password.

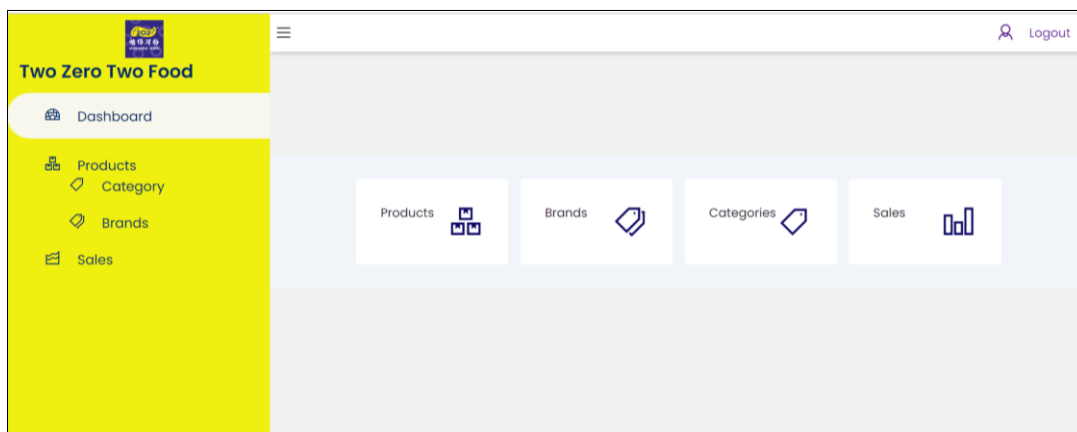


**Figure 6: Login Page**

Figure 7 shows the interface of the dashboard of the system when admin is logged in and Figure 8 shows the dashboard when employee is logged in. There is a side menu in the page and user can click to the site they wish to. Admin can see user list and have the privilege to carry out CRUD towards the user's information while normal employee did not have this privilege.

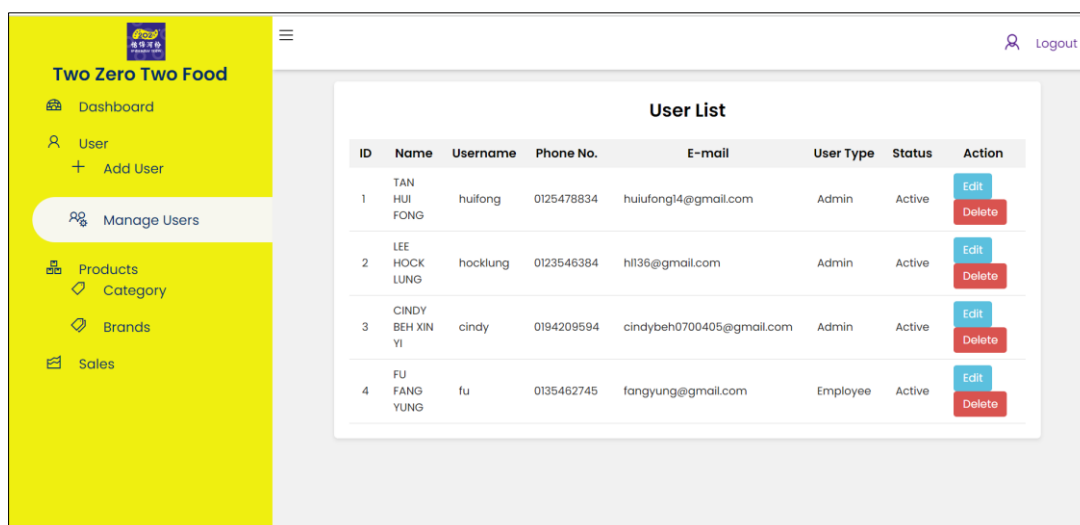


**Figure 7: Dashboard for Admin**



**Figure 8: Dashboard for Employee**

Figure 9 shows the user record and admin able to edit or delete their details in this page.



**Figure 9: User List in The System**

Figure 10 shows the interface of adding user which admin can add the user into the system by visiting this page.

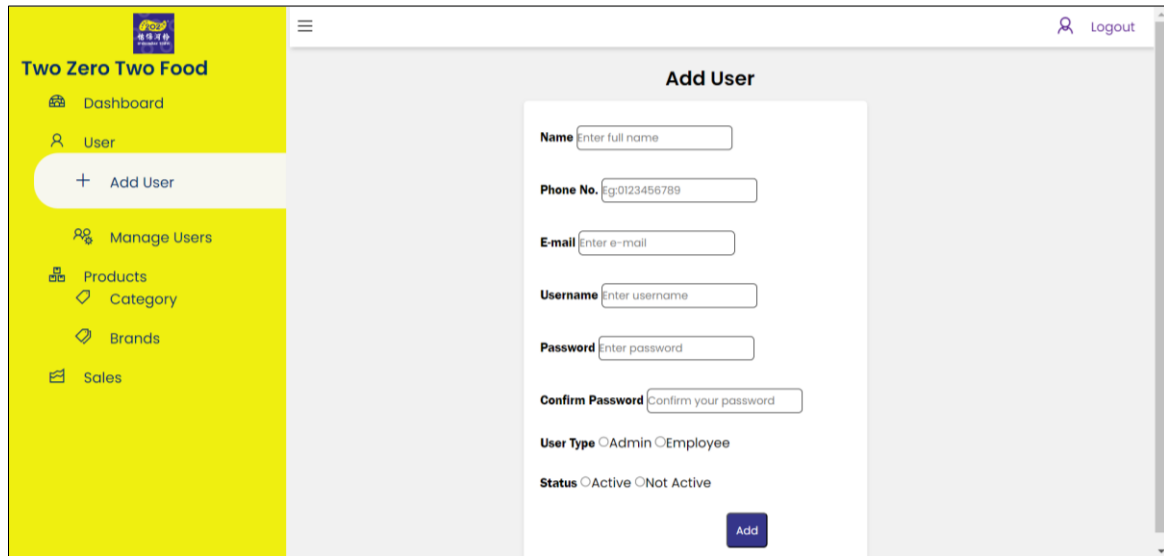


Figure 10: Add User Page

Figure 11 shows the product available list in the shop and users can edit or delete the product. If they wish to update or delete the product, a confirmation will display as shown in Figure 12.

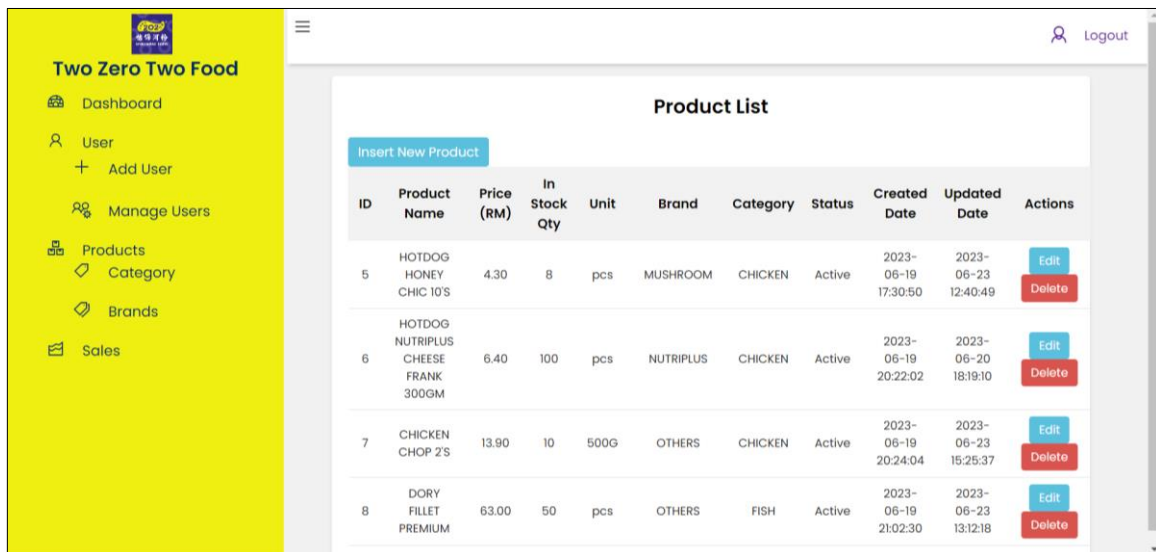


Figure 11: Product Available List

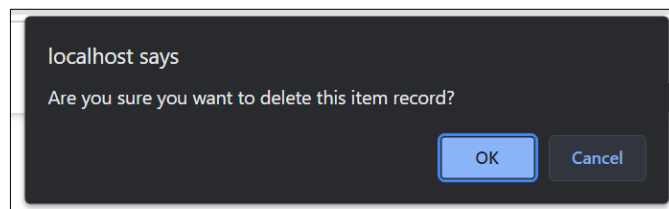
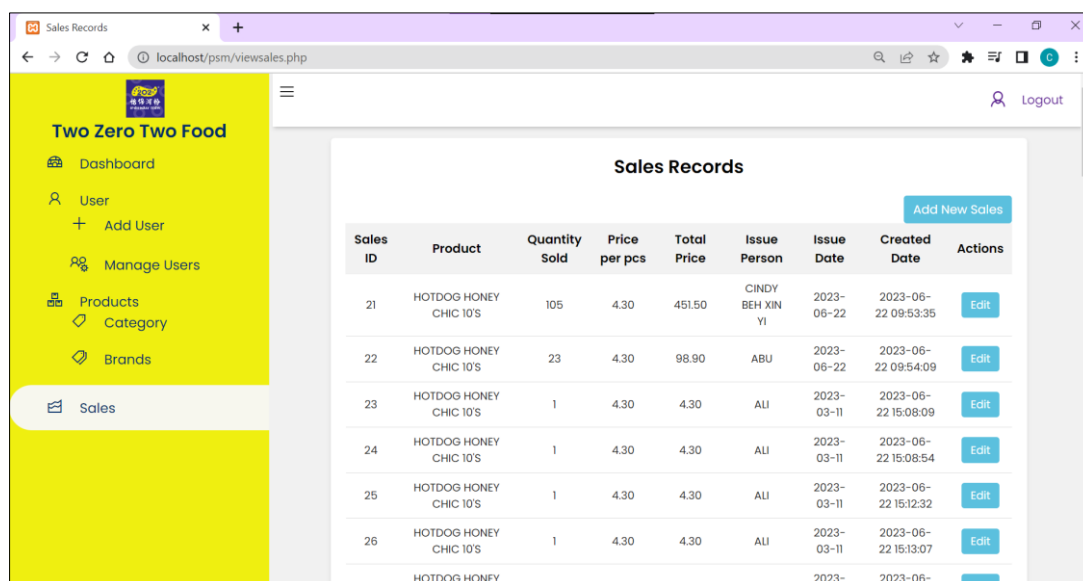


Figure 12: Confirmation message

Figure 13 shows sales record interface and user can edit the sales details if they wish to. Users can also add new sales by clicking the button “Add New Sales”.



**Figure 13: Sales Records Page**

#### 4.2 Test Plan

Test Plan is an instrument that is used to evaluate the system whether it meets user and system requirements or not. Table 5 to Table 9 shows the test plan used to carry out for the features provided in proposed system.

**Table 5: Test plan for Login**

No.	Test Cases	Expected Result	Actual Result
1.	Complete with valid username and password	Login successfully and show homepage based on user authentication	Pass / <del>Fail</del>
2.	Complete but invalid username or password	Failure message is shown, and login request is rejected	Pass / <del>Fail</del>
3.	Incomplete data input	Alert message is shown for user to fill in the full data	Pass / <del>Fail</del>

**Table 6: Test plan for User Management**

No.	Test Cases	Expected Result	Actual Result
1.	Add inputs	User added successfully and record in user list	Pass / <del>Fail</del>
2.	Add with invalid username or password	Failure message is shown, and admin need to fill in again	Pass / <del>Fail</del>
3.	Incomplete data input	Alert message is shown for admin to fill in the full data	Pass / <del>Fail</del>
4.	Update user	User details updated	Pass / <del>Fail</del>
5.	Delete input	User details deleted	Pass / <del>Fail</del>

**Table 7: Test plan for Product Management**

No.	Test Cases	Expected Result	Actual Result
1.	Complete data input	Product added or updated successfully and record in product list	Pass / <del>Fail</del>
2.	CRUD of product details	Product details can be created, read, updated and deleted from the list	Pass / <del>Fail</del>
3.	Incomplete data input	Alert message is shown for user to fill in the full data	Pass / <del>Fail</del>

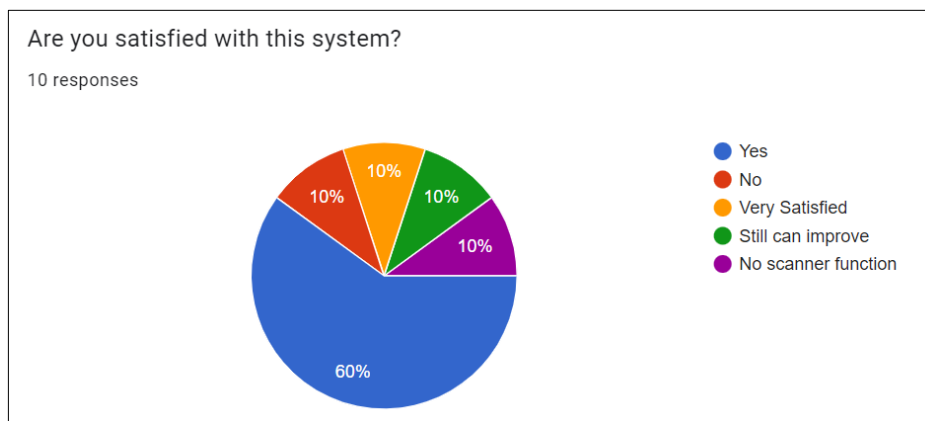
**Table 8: Test plan for Sales Management**

No.	Test Cases	Expected Result	Actual Result
1.	Complete data input	Sales added or updated successfully and record in product list	Pass / <del>Fail</del>
2.	CRUD of sales details	Sales details can create, read, update and delete from the list	Pass / <del>Fail</del>
3.	Incomplete data input	Alert message is shown for user to fill in the full data	Pass / <del>Fail</del>
4.	Generate report	Report can be generated with complete details	Pass / <del>Fail</del>

**Table 9: Test plan for Alert Message**

No.	Test Cases	Expected Result	Actual Result
1.	Product demand is at minimum demand	Send message to user when product under demand	Pass / <del>Fail</del>

Besides, the user acceptance form is distributed to Two Zero Two Food Sdn. Bhd.’s admins and employees for feedback using Google form. The collected feedback shows that the users are very satisfied with the system developed. The data is represented in Figure 14.



**Figure 14: User Acceptance Result in Pie Chart**

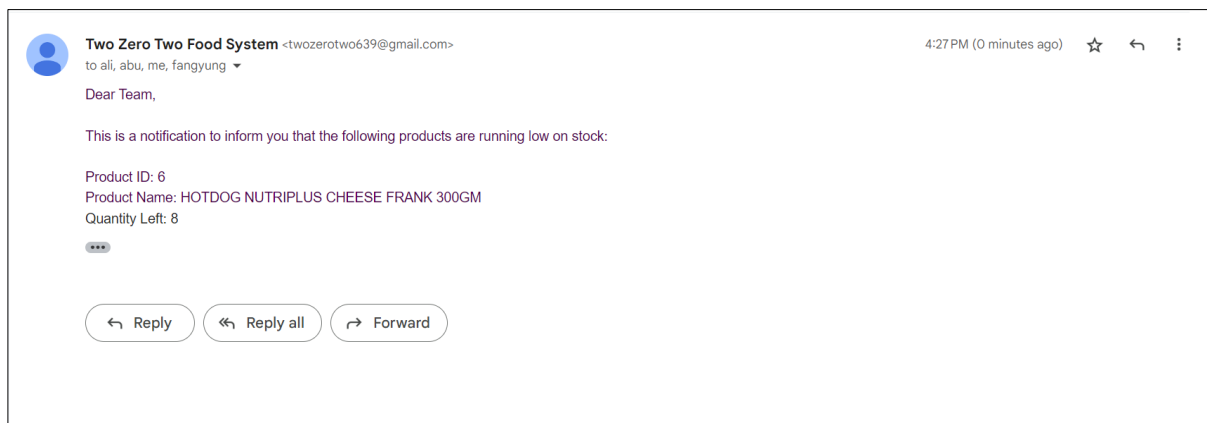
## 5. Conclusion

In conclusion, Smart Inventory Management System for Two Zero Two Food is developed successfully as a web-based system that allows users to track and record their stock. It has met the objectives that are defined at the planning stage. As a result, this system was tested by using test plan and all are fully functionality. But there are still some limitations in this system because this system is unable to add products by using scanner and unable to add sales directly when there is product sold. Therefore, to enhance the system, involvement of internet of things (IoT) like scanners is needed so that users can add their products in a shorted time and their sales immediately when there is product being sold.

## Acknowledgment

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## Appendix A



**Figure 15: Alert Message Sent to Users' Email When the Stock Under Demand**

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