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Development of Commercial Equipment Store Management System

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Abstract: Online system is very useful to manage all the business activities in this fast-moving world. The main purpose of this study to identify and improve the manual-based system of GNS commercial equipment store. The problems of using the existing system were collected and analyzed through interview and questionnaire. The existing considered not much convenient as all the business processes done manually by the staffs which consumes time and tedious work. Therefore, the proposed management system allows the store to run their business activities every day through online. It is expected that the system will help the store owner and staffs to manage and monitor their business tasks in their store efficiently.

Keywords: Management System, Commercial Equipment, Web-Based

1. Introduction

Commercial refers to activities involving or relating to the buying and selling of products or services. This is designed for a large market to make a profit. Equipment means a device or machine that is designed for a particular use or function [1]. Commercial equipment are appliances that are used in businesses like in restaurants, grocery stores or even in laundries where huge scale consumption is made. Commercial equipment are heavy duty machines and last longer than home appliances. The appliances are designed to withstand the load and to deliver quickly. The commercial equipment's are delivered upon the customer request. The people who are involved in the processes are customer and the staffs. For the business operation to run smoothly a proper management system is important.

In the current process of the commercial equipment store selling and buying process are handled in the manual way which can be very tedious. Customer walk-in to buy the commercial equipment. They come in person to check the products that are available or to ask regarding it at the store. The current system is standalone as all the business activities can be done only in the computer of the store. The staffs use the computer to update the stock records in the Microsoft Excel form. The reservation records that made by customers also recorded manually in the Microsoft Excel form that are made as quotations. Then, the records are printed and saved in files. Moreover, the customer details are written

in a logbook for the delivery process. This might lead to damage if the logbook is lost or being misplaced. It is also less efficient because there are chances the records can be lost if it is not stored properly.

In order to cope up with the issues, this project proposes a management system for the commercial equipment store. This system can improve the current management system to be efficient. It helps the customer to check the products online and get quotation. The system will show the quotations and orders made by the customers in the system. Database of the system is developed to store all the business activities. For example, the order date and time, customer details and other activities. A proper management system which is efficient, effective and meet all the need of business will certainly contribute to company profits [2]. In order to achieve this, three objectives have been set which are:

i. To design GNS commercial equipment store management system using object-oriented approach.
ii. To develop GNS commercial equipment store management system.
iii. To functional and user test the developed GNS commercial equipment store management system.

This article is organized into five sections. The first part is an introduction describing the context of the project. The second section describes the analysis of the relevant work. In the third section, the methodology is explained. In the last section, a conclusion with some instructions for future development is given.

2. Related Work

The current process of the GNS commercial equipment store selling and buying process are handled in the manual way. All the documents related to the sales are kept in files. This leads to increased printing and storage costs well as forms being exposed to the risk of getting lost and damaged. Customers also have come in person to check the products that are available or to ask regarding it at the store. The current system is standalone as all the business activities can be done only in the computer of the store. The current working process of the commercial equipment store can be very tedious and required much manual work.

2.1 Management System

Management is defined as structured framework for managing an organization's policies, procedures, and processes while encouraging continual improvement within [3]. System can be defined as a collection of components that working together to achieve the goals [4]. Thus, a management system is a collection of components that working together for a structured framework for managing an organization. Management system is considered important for every organization to be managed properly. The organizations with good management system able to boost their performance and efficiency of their business. An excellent management system guarantees the consistent delivery of quality products or services to customers.

2.2 Comparison of Existing System

Three existing systems are investigated to identify the strengths and weaknesses to endure that the current systems were good in term of the efficiency and functionalities. The proposed system modules and features are compared between existing and proposed system.

Table 1 Comparison of existing systems

Features	ATEVT Store Management System	Inventory Management System	MOST Stationery Inventory Management System	GNS Commercial Equipment Store Management System

Web-Based System	X	X	X	/
Products module	X	X	X	/
Login and Register module	/	/	/	/
Customer module	/	X	X	/
Staff module	/	X	/	/
Category module	X	X	X	/
Sales module	/	/	/	/
Report module	/	/	/	/
Generate Quotation	X	X	X	/

Based on the analysis and comparison in Table 1, the online management system seems more efficient than other systems. There can be seen some similarities between the systems. However, there are also unique functions in the proposed system which makes it different from the other systems. The GNS commercial equipment store management system is web-based while others are standalone system. Unique modules such as products module, category module and generate quotation only can be found in the proposed system. All the features are designed in the proposed system which makes it more efficient than the other systems. On the other hand, prototyping methodology was the most suitable in completing the system.

3. Methodology

System development methodology is defined as a set of detailed rules for the system development life cycle [5]. Methodology that has been chosen for the proposed system development is prototype model. The prototyping model is a software development method in which a prototype is created, tested and changed until it is acceptable and also acts as a base to develop the final system [6]. There are several phases in the prototyping model which are planning phase, analysis phase, design phase, system prototype development phase and implementation phase. The prototyping phase will be repeated until it achieved the proposed requirements. Table 2 shows the software development phases and its activities.

Table 2: Software development activities and their task

Phase	Activity	Deliverable
Planning	Propose the project, identifying the existing system problems, determine the objectives, project scope and scheduling the activities	1. Gantt chart 2. Project Proposal
Analysis	Collect the requirements from the stakeholders and analyze it.	1. User, functional and non-functional requirements. 2. Hardware and software specification 3. UML diagrams 4. Class diagrams 5. To-be model
Design	Design the user interface and database design using the requirements collected.	1. The user interface of the system 2. The database design 3. System architecture
Implementation	Conduct testing for user to be satisfied on the prototype designed.	1. Program code and user interfaces

Phase	Activity	Deliverable
Prototype 1	Detect errors on the first prototype which upgrades the functionalities and usability of the system. Repeat starting from planning phase if any error is detected.	1. System Prototype
Prototype 2	Detect errors again on the system prototype and refine it. Repeat starting from planning phase if any error is detected.	1. System Prototype
Implementation Testing	Implement all the function and features designed by developing the system	1. Final report 2. Complete system 3. Test case

4. **Results and Discussion**

The results and discussion present the data and analysis of the study and presents the system analysis.

4.1 System Requirement Analysis

Requirement analysis is the process of determine requirements that developed system needs to fulfill, or user expectation outcome from the proposed system [7]. System requirements include functional and non-functional requirements, user requirements and system requirements. Table 3 summarizes the seven functional modules provided in the system.

Table 3: System functional module

No.	Module	Function	User
1.	Registration and Login module	• Allow users to register and login to the system • Helps with the authentication of the user who enters the system	Administrator, Staff and Customer
2.	Products module	• Contains the all the commercial equipment details. • Administrator and staff can add, edit or delete the commercial equipment information. • Customer can view the commercial equipment with the details and request for quotation.	Administrator, Staff and Customer
3.	Customer module	• It contains all the details of the customers • Admin also can delete customer from the system.	Administrator
4.	Staff module	• Administrator able to add, edit or delete staff information	Administrator
5.	Category module	• Staff and administrator will be able to add new category to the system. • Allows for CRUD operations on updating the category.	Administrator and Staff
6.	Sales module	• All order details of customers will be recorded. • The staff will be able to track the order and delivery details. • Generate quotations to be sent to customers.	Administrator and Staff

7.	Reporting module	• Generates the report of sales.	Administrator

Functional requirements for this system are presented in Table 4 and non-functional requirement in Table 5. Functional requirements are said to be functions for the developed system, while function is described as specific behavior that convert input to output [8]. Non-functional requirements establish the criteria that are used to judge the operation of a system [9].

Table 4: Functional requirements

No	Module	Description
1.	Registration and Login module	• The system should allow user to login into the system using registered email and password. • The system should only allow a user to log in as a user with a valid email and password. • The system should alert the user for any invalid input. • The system should redirect user to that respective main menu upon successful login.
2.	Products module	• The system should allow customers to view the commercial products that are available to them • The system should allow customers to request for quotation upon selecting the product. • The system should allow administrator for CRUD operations on updating the commercial equipment with the details.
3.	Customer module	• The system should allow administrator to view the customer's information. • The system should allow view and delete operations on updating the customer information.
4.	Staff module	• The system should allow administrator to view the staff information. • The system should allow CRUD operations on updating the staff information.
5.	Category module	• The system should allow administrator and staff to keep track of the commercial equipment category list. • The system should allow CRUD operations on updating the categories.
6.	Sales module	• The system should allow administrator and staff to view all the order details. • The system should record the request for quotation details. • The system should allow administrator and staff to record the order details. • The system should allow administrator and staff to view the order and payment records. • The system should allow CRUD operations upon recording the sales details. • The system should allow to generate quotation.
7.	Reporting module	• The system should generate report for administrator to view. • The system should generate error message if the report cannot be generated.

Table 5: Non-functional requirements of the developed system

No	Requirements	Description
1.	Performance	• The system should be usable at all times
2.	Security	• User can only access their own account with username and password.
3.	Cultural and political	• The system should be able to work on any web browser

System analysis is carried out to investigate a system to determine its goals or objectives. The use case diagram in Figure 1 shows three actors which are administrator, staff and customer. Use case represents user interaction with the system [10]. The three users can login into the system while customers can register to use the system. Administrator and staff can manage products, category, and sales. The sales module includes manage orders with generating quotation and invoices. Administrator can also manage customers, staff and generate report. The customer can search for products, view the available product, add to quote s and request for quotation through the system.
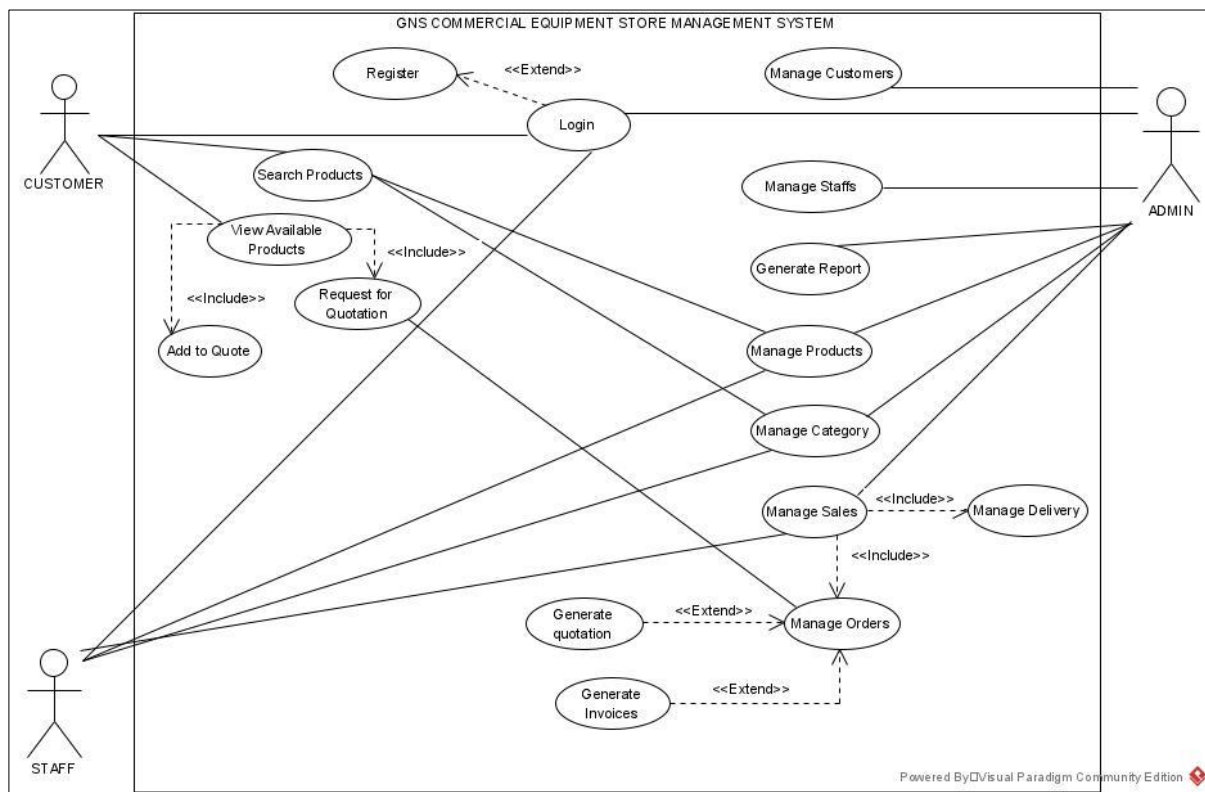

Figure 1: Use Case Diagram

Figure 2 shows the class diagram that involved in the GNS commercial equipment management system. There are ten classes which are customers, users, products, categories, quotations, site_settings and contact. Each class had its own attribute values which can be linked to another class [11]. The to-be model is attached in Appendix A shows how the system will function. It shows the processes and capabilities of the developed system [12]. All the three users start by login into the system. The customers can search for products and request for quotation. Administrator and staff can quote the price for the product requested. Once the customer receives the quotation, they confirm the order by paying the deposit and an invoice be generated as the payment proof to the customers. Once the product is delivered, staff or administrator can update the delivery details with the signed invoice in the system. Administrator can view the sales summary in the generate report module.
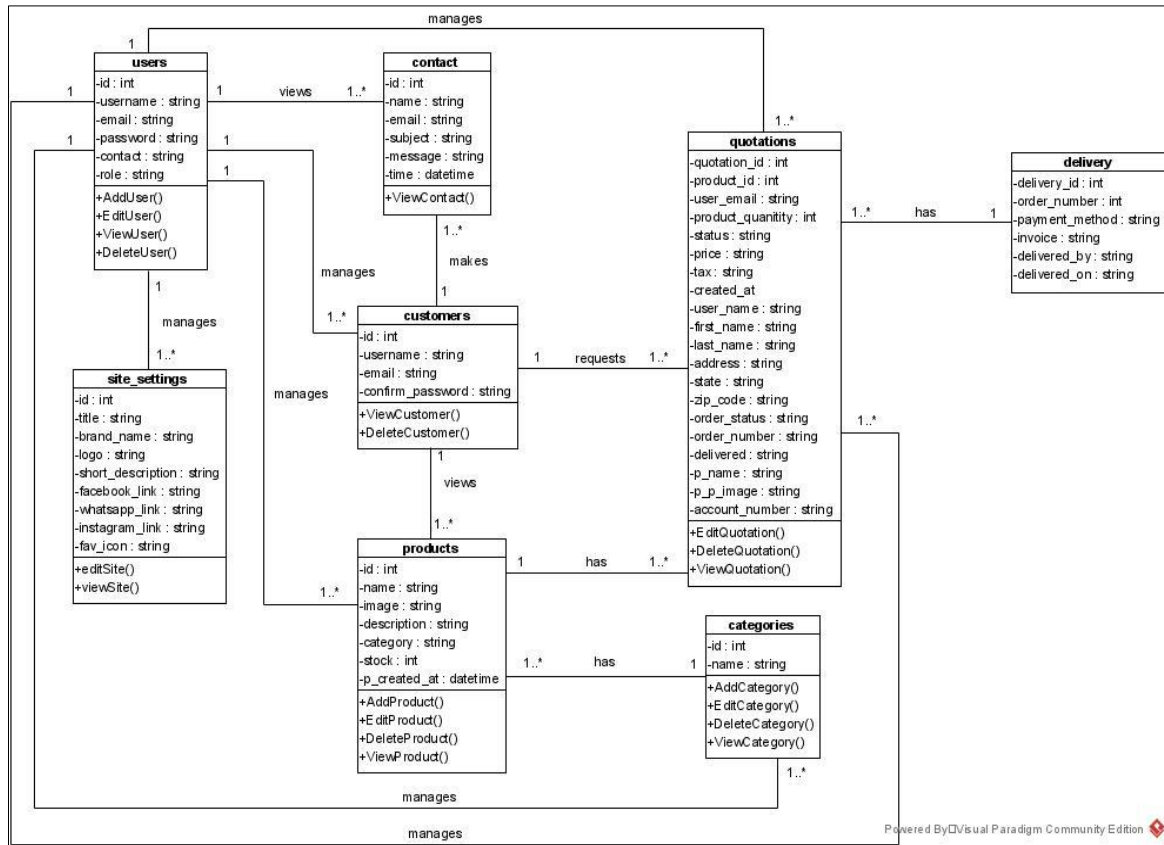
Figure 2: Class Diagram

The hardware and software that are used in developing the system is listed out as shown in Table 6 and 7.

Table 6: List of Hardware

Specification of Hardware	
Processor	1.19 GHz or higher
Memory	4 GB RAM or higher
Internet Connection	At least 2MB per second
Storage	100 GB or higher

Table 7: List of Software

Type of Software	Specification
Visual Studio Code	To create interface for the system and function of the entire system.
XAMPP Control Panel	To create and manage database
Web browser such as Google Chrome	To test and run the system

4.2 Implementation

This section shows the implementation of developed system. The GNS commercial equipment store management system involves writing the software code and building the database which were both carefully planned and assessed during the system's planning and design phases. The GNS Commercial Equipment Management System is developed using Visual Studio Code software. System database is developed through MySQL Database which is managed by phpMyAdmin. The user interface for the

web-based system includes Login and Registration module, Manage Products module, Manage Category module, Manage Sales module, Manage Customer module, Manage Staff module and Generate Report module. The implementation of interfaces is shown in Figure 3, 4,5 and 6. Other interfaces can be seen in Appendix A.

The login and registration modules help in authenticating the system users who are staff, administrator and customer of GNS commercial equipment management system. User need to enter email and password to enter into the system as shown in Figure 3(a) and 3(b). Once the user clicks on the Login button, users will be redirected to their respective homepage. If the email or password entered is wrong, the system will display error message.
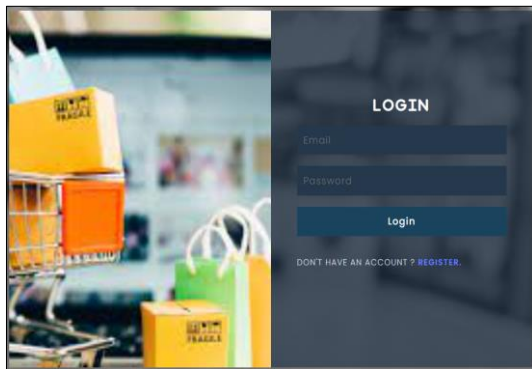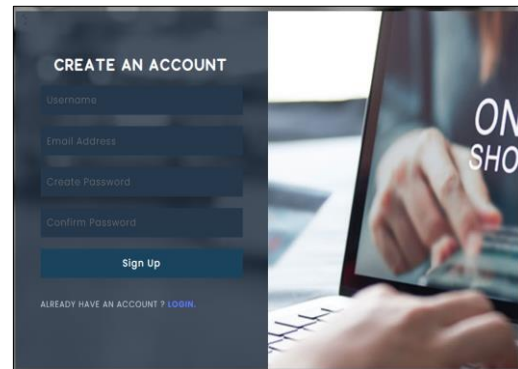

Figure 3 (a) : Login Interface   **Figure 3(b): Register Interface**

The product management module will have list of products available in the store for CRUD (Create, Retrieve, Update, Delete) purpose. It helps administrator and staff to manage product efficiently. Figure 6 shows the interface for product management system.
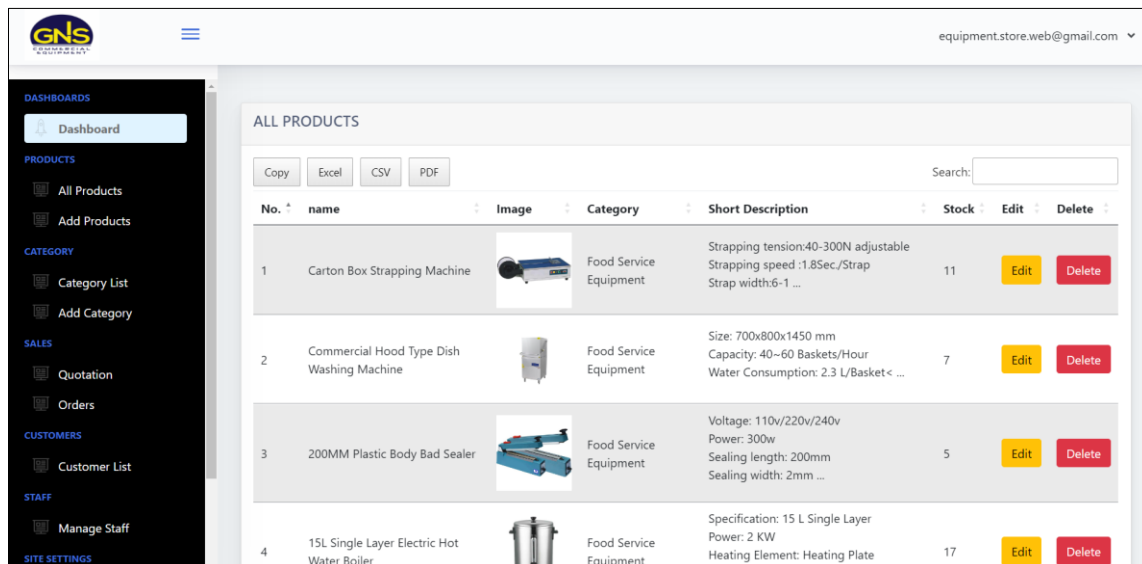

Figure 4: Manage Product Module

The category management module will have list of product categories of GNS commercial equipment management system. This module helps administrator and staff to view product categories, add new product categories, edit categories and also delete a category from the system. Figure 5 shows the interface for category management system.
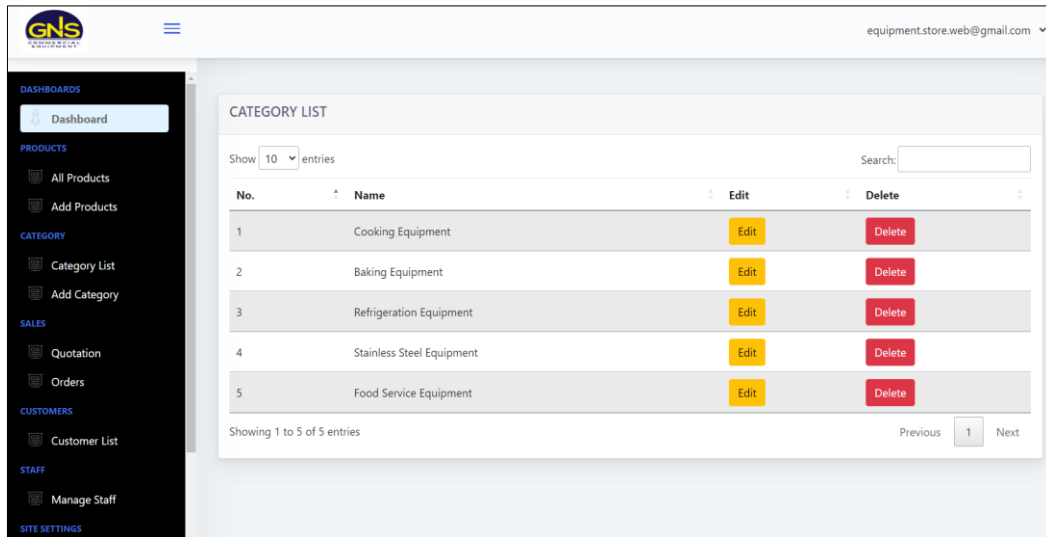
Figure 5: Manage Category Module

The administrator can manage sales by managing quotations and orders with read, update and delete operations. Figure 6 shows the quotation module interface. It shows the list of quotation requests by customer with quotation no, user email, username, product name, category, quantity, quotation status, price, tax and date. Once the customer confirms the order, Administrator and staff can view, update delivery status and delete order by clicking on the given buttons. Administrator can update the status by clicking mark as delivered button.
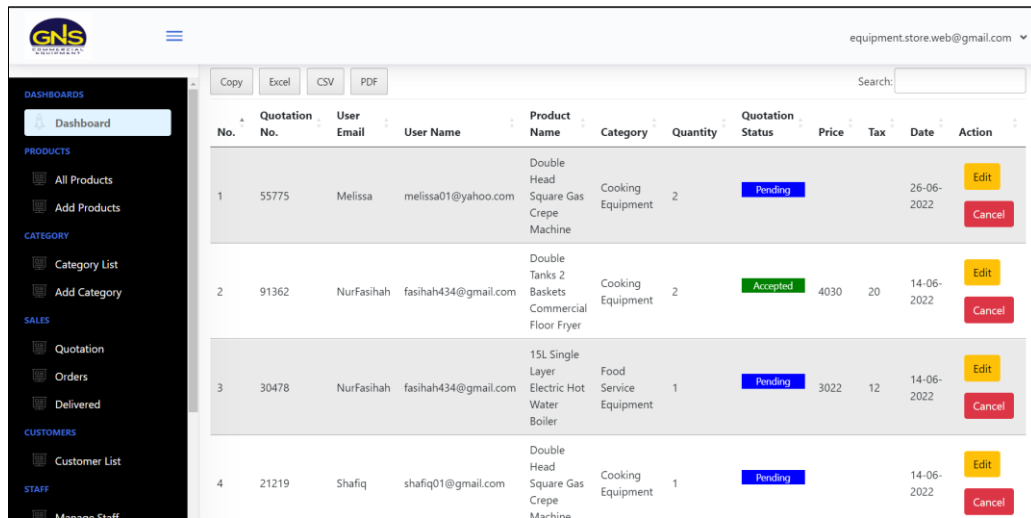

Figure 6: Manage Quotation Module

4.3 Testing

When the program is completely designed and implemented, a validation step will be conducted to ensure all functions are operating properly. Therefore, it ensures the system meets all the specified requirements [13].

4.3.1 Functional Testing

The functional testing is to test all the functions of components and features of this system [14]. This is to ensure the system performs as the expectations. The test cases are produced for the functional testing for every module. Table 8 shows the test cases that used to summarize the system's functionality test.

Table 8: List of test cases

No.	Test Cases	Description	Status
		TEST_100 Login and Registration	
1.	TEST_100_001	The system should allow the user to log into the system using valid username and password	PASS
2.	TEST_100_002	The system should display error message if the username or password is invalid.	PASS
3.	TEST_100_003	The system should display respective dashboards for successful login.	PASS
4.	TEST_100_004	The system indicates an error when finding empty space.	PASS
5.	TEST_100_005	The system allows new users to register into the system.	PASS
		TEST_200 Manage Product	
1.	TEST_200_001	The system should allow new product to be added into the system.	PASS
2.	TEST_200_002	The system should allow selected product to be edited.	PASS
3.	TEST_200_003	The system should allow deletion of a product.	PASS
4.	TEST_200_004	The system should be able to search the product using search box.	PASS
5.	TEST_200_005	The system should allow customers to add any products to quote.	PASS
		TEST_300 Manage Category	
1.	TEST_300_001	The system should allow new category to be added into the website.	PASS
2.	TEST_300_002	The system should allow selected category name to be edited.	PASS
3.	TEST_300_003	The system should allow deletion of a category.	PASS
No.	Test Cases	Description	Status
		TEST_400 Manage Customer	
1.	TEST_400_001	The system should display the details of customer added into the system.	PASS
2.	TEST_400_002	The system should allow deletion of a customer.	PASS
3.	TEST_400_003	The system should be able to search the customer using search box.	PASS
		TEST_500 Manage Staff	
1.	TEST_500_001	The system should allow new staff to be added into the website.	PASS
2.	TEST_500_002	The system should allow required staff to be edited.	PASS
3.	TEST_500_003	The system should allow deletion of a staff.	PASS
4.	TEST_500_004	The system should be able to search the staff using search box.	PASS
		TEST_600 Manage Sales	
1.	TEST_600_001	The system should be able to edit a quotation.	PASS
2.	TEST_600_002	The system should be able to delete a quotation.	PASS
3.	TEST_600_003	The system should receive new quotation requests from customer.	PASS
4.	TEST_600_004	The system should be able to confirm order from customers.	PASS
5.	TEST_600_005	The system should be able to edit an order.	PASS
6.	TEST_600_006	The system should be able to delete an order.	PASS
7.	TEST_600_007	The system should receive payment proof from customer.	PASS
8.	TEST_600_008	The system should generate and send the invoice to customer.	PASS

No.	Test Cases	Description	Status
9.	TEST_600_009	The system displays the confirmed order list to users.	PASS
10.	TEST_600_010	The system should allow users to update the delivery status.	PASS
11.	TEST_600_011	The system should be able to search quotation using search box.	PASS
12.	TEST_600_012	The system should be able to search orders using search box.	PASS
TEST_700 Generate Report			
1.	TEST_700_001	The system should be able to generate sales summary report.	PASS
2.	TEST_700_002	The system displays error if the process not completed successfully.	PASS

4.3.2   User Acceptance Testing

User acceptance testing is mainly for users to test and evaluate the system whether it meet their expectations [15]. This helps the developer to check and identify the problems which they might have missed and also in order to improve the system in the future. The GNS Commercial Equipment Management System was tested by using Google Form which was responded by 20 respondents consists of customers, staffs and owner of GNS Commercial Equipment Store. Figure 7 illustrates the results of user interface evaluation while Figure 8 show the results of system modules evaluation.
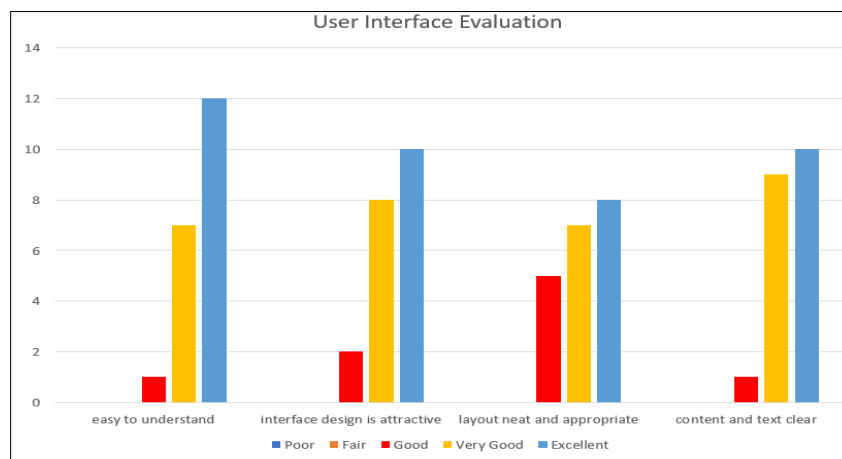

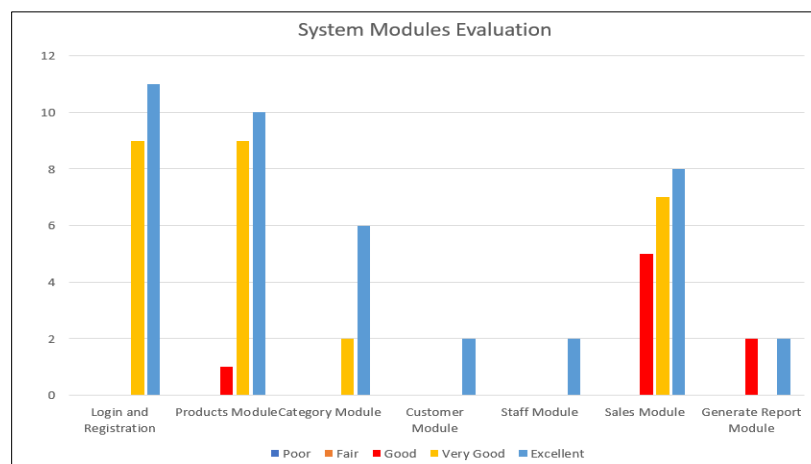**Figure 7: Results of User Interface Evaluation**

Figure 8: Results of System Modules Evaluation

From the results, most of the respondents are satisfied with the user interface design. In the terms of system modules, majority of the respondents answered excellent with the developed system functionalities. The overall graph represents that the users are satisfied with user interface design and the system modules of the developed GNS Commercial Equipment Management System.

5.   Conclusion

In conclusion, the management system is developed and implemented successfully for commercial equipment store to run their business more efficiently. The developed system has achieved its objective based on the system requirements. The developed system is more efficient compared to existing system which only manual way to do their business activities. Customers can shop through online and request for quotations for available products. Administrator and staff can manage the process of selling and purchasing with customers through online easily. The invoice will be generated automatically in the system. The functions in this system run successfully but there are improvements can be made in the future. As for the future system enhancement, it is recommended to implement notification function which notifies users once an activity is done in the system instantly. The system also can be enhanced by implementing online payment in the system itself to make the functionality of the system more efficient. Finally, the report module may give more options for users to view various types of graphs based on their selection of data. Although there are limitations existed in this application, more work could be put into fixing and enhancing extra features to make it more beneficial to all the users.
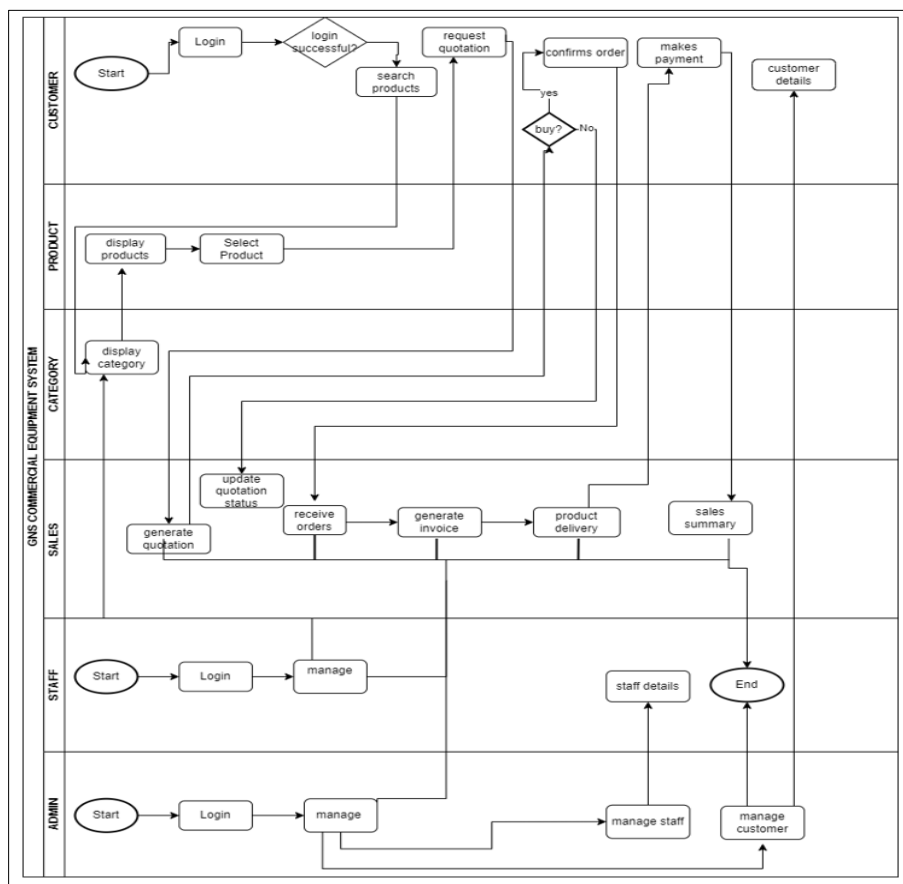
Acknowledgement

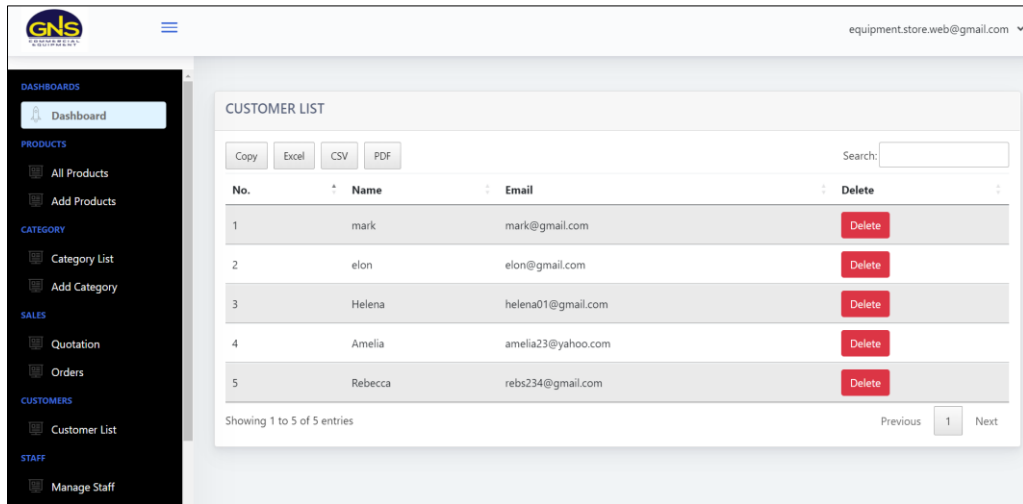## Appendix A

Figure 9: To-Be-Model

Figure 10: Manage Customers Module
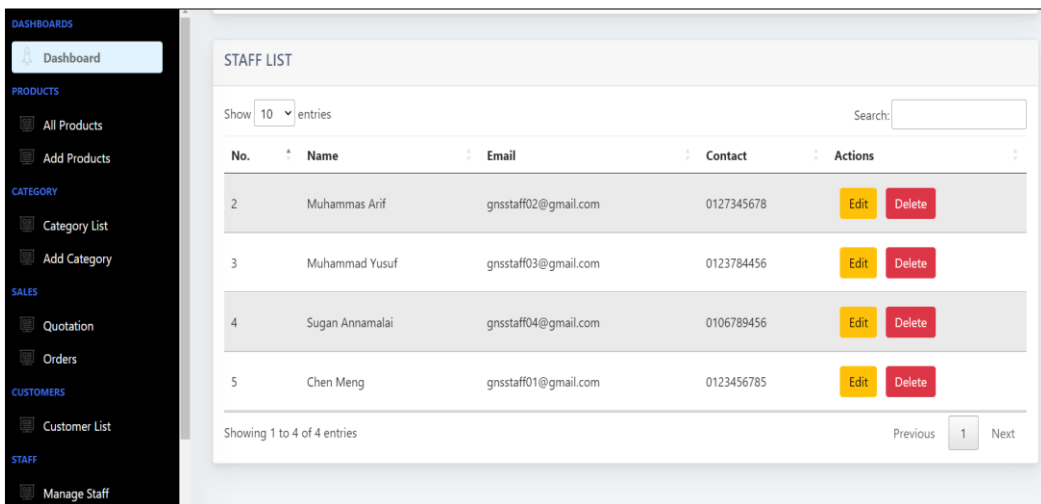

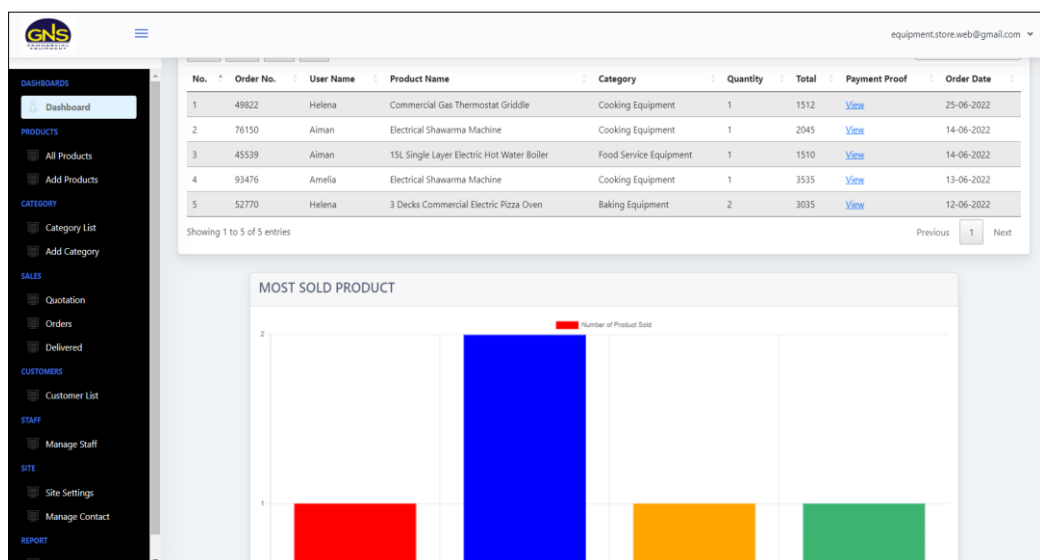**Figure 11: Manage Staff Module**

Figure 12: Generate Report Module

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