A Business Management System for Antenna House, Kadawatha

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A Business Management System for Antenna House, Kadawatha

A dissertation submitted for the Degree of Master of Information Technology

A.R.P.D.N.Rajapakse University of Colombo School of Computing 2021



Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of Ms. A.R.P.D.N. Rajapakse under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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Abstract

The Business Management System was built for Antenna House, Kadawatha. Presently all the business functions at the shop are performed manually. The system implemented is intended to fully automate the business functions so that the day to day work of the shop is effective, efficient and easier. It also ensures that the customers get a first rate service and makes decision making easier for the management.

There are six types of user categories who interact with the system. They are customer, DEO (Data Entry Operator), technician, manager, supplier and administrator. They have separate profile pages which give them different privileges to perform certain authorized functions.

The proposed system supports product, customer, supplier and employee registration and the management of the aforesaid categories. Shopping cart facilities with search of products is also available. Furthermore, viewing of faults repaired at the shop, accepting repairs at shop, viewing status of repair jobs, and scheduling home-visit repairs are facilitated. Confirming of suppliers who have made supply requests, sending quotations to suppliers and accepting new supplies are also other functions available. Technicians are also able to view their repair jobs, update accepted job status and send e-mails upon change of status. Sale, repair and purchase reports are also generated to support decision making to managers. Employees are also able to request leave through the system.

The system was developed using the MVC Architecture and the iterative waterfall model was used in development. Use case diagrams, a class diagram, sequence diagrams and activity diagrams were drawn during the design phase. Visual Studio Code, XAMPP, Bootstrap and Codeigniter technologies were used in implementation.

The system was designed with the intention of supporting the day to day functions of the employees at Antenna House, and to help Antenna House maintain a good relationship with its customers and suppliers. The designed system will be able to fulfill the anticipated benefits successfully.

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List of Acronyms

DEO - Data Entry Operator

UML- Unified Modelling Language

Chapter 1-Introduction

This chapter provides an introduction to the project describing the project overview, motivation for the project, the project objectives, background of the study, scope of the project, feasibility of the project and a brief introduction to the structure of the dissertation.

1.1 Project Overview

The proposed project is a software development project to develop a Business Management System for Antenna House, Kadawatha. Sales and repairs of electrical items are conducted at the shop, under the supervision of Mr.Mohan Perera (the owner of Antenna House) and his wife. They are very much in the need of an automated system to carry out the day to day functions of the shop as everything is done manually.

The proposed system was developed in the form of a website to facilitate Customer Management, Supplier Management, Sales Management, Repair Management, Employee Management and Leave Management.

1.2 Motivation

The main motivation for the project is to complete the Master of Information Technology program. The Master of Information Technology Degree is offered by the University of Colombo, which is the most prestigious university in Sri Lanka. Obtaining this Masters Degree from the University of Colombo would definitely help in career advancement in the field of Information Technology.

Another reason to develop this system is to apply the knowledge gained during the past two years by following the Master's degree program for the benefit of the society. It is intended to help Antenna House provide an efficient service to its customers, maintain a good relationship with its suppliers and manage its employees. The employees of Antenna House would also be able to carry out their entitled functions efficiently.

Yet another reason, to develop this system is the experience and pleasure of developing the system using new technologies. It would also ensure career advancement in the field of information technology.

1.3 Objectives

The main objective of this project is to develop a system that will assist the management and staff in completing their tasks efficiently. The system should be developed so that it is user –friendly and easy to learn. Issues such as data consistency, availability, and security should also be addressed.

Authentication will be done at the first login to verify the identity of the user. Authorization will be carried out by assigning different privilege levels to the users, to make sure that the users can only do what they should be able to do.

The proposed system will handle Employee and Employee leave management, Supplier Management, Customer management, Sale of Items and Repair Management.

The customers will be able to view warranty details of items purchased by logging into the system.

1.4 Background of the study

As mentioned in section 1.1 above, this Business Management system is designed for a small shop which deals with the sales and repair of electrical items. Presently everything is done manually. They do not even use computers for their day to day functions.

The employees include a manager, sales assistants (they also act as cashiers) and technicians.

- The manager supervises the sales and repair of items.
- The sales assistants assist the customers in buying products. If a customer wishes to buy a product, the assistant manually writes the bill and accepts the payment. There is no proper record of which employee is responsible for each transaction .i.e., the assistant who issued the bill can forge another's signature or write an illegible signature.
- If the item is for repair, the assistant refers the product to a technician. The technician diagnoses the fault, and if the technician is willing to accept it, he provides a cost estimate. Then a manually written bill is issued with the repair-end date. The customer has no way to check the status of the repair, and he/she will not be notified if there is a delay in the repair-end date.

- A customer, who returns to collect the repair item, on the repair-end date, will be disappointed if the item has not been repaired by the previously agreed repair-end date.
- The name of the technician who attended to a repair is not recorded, for each repair. No proper records are maintained of the repairs done.
- Presently, they only repair items, like antennas, remote controls, TV, DVD players etc. They do not pay home visits to repair items.
- Supplier management and stock control are carried out manually, and need to be addressed properly.
- They have no proper and accurate way to calculate the costs for supplies purchased during the month.
- Employee Registration and Employee Leave Records are also of a very poor standard. No pay-slips are issued at the end of each month.
- There is no way to generate reports to analyze income from sales and repairs.

The proposed system was designed to overcome these problems and to help the business to function smoothly and efficiently.

1.5 Scope of the study

Figure 1.1 below shows the scope of the proposed project in a modular structure.



Figure 1.1 Modular Structure

The scope is discussed below under different user categories.

ALL USERS

All users shall be able to access the interfaces to:

- Login
- Change their passwords
- Change personal details

ADMINISTRATOR

The administrator shall be able to access the interfaces to:

- Update customer details
- Update supplier details
- Register employee categories and update them
- Register technicians, DEOs and managers and update their details
- Deactivation and re-activation of employees
- View leave requests by employees and approve leave requests

CUSTOMER

The customer shall be able to access the interfaces to:

- Register as a Customer
- Updating of personal details
- Select products using Shopping Cart Facility
- Schedule home-visits repairs
- Check status of home-visit repairs
- Check status of a handed-over repair job
- Search for an item by entering key words
- Deactivate and re-activate personal account
- View warranty details for items purchased
- View Order History and Invoices for each order

DATA ENTRY OPERATOR (DEO)

The DEO shall be able to access the interfaces to:

- Update personal details
- Registration of products for sale
- Viewing and updating details of products for sale
- Register faults and update them
- Register items for repair for hand-over to shop repairs
- View accepted repairs
- Schedule home-visits requested by customer
- View scheduled home-visits
- Generate invoices for home-visit repairs
- Generate invoices for sales orders

MANAGER

The manager shall be able to access the interfaces to:

- Update personal details
- View pending items by suppliers
- Confirm suppliers
- Send quotations to supplier
- Accept supplies
- View management reports

TECHNICIAN

The technician shall be able to access the interfaces to:

- Update personal details
- View repair jobs
- Update status of job and send e-mail
- View scheduled home-visit repairs

SUPPLIER

The supplier shall be able to access the interfaces to:

- Register as a supplier and request to supply items
- Update personal details
- Accept requests for supplies
- Deactivate and re-activate personal account

ALL EMPLOYEES

All employees shall be able to access the interfaces to:

- Request leave
- View leave history

REPORTS

The following reports shall be generated:

- Income from sales on a particular day
- Income from sales within a particular period
- Income from repairs on a particular day
- Income from repairs within a particular period
- Expenditure for purchases within a particular period

SENDING OF EMAILS

- As a notification when a home- visit repair is scheduled.
- As a notification when a repair is complete.
- As a notification when repair-end-date is postponed.
- As an invoice when items have been added to the shopping cart and submitted.

1.6 Feasibility Study

According to(Sommerville,2009,p.169)a feasibility study is a short, focused study that answers the questions as to whether the system contributes to the overall objectives of the organization, whether the system can be implemented using current technology, within given cost and schedule constraints and whether the system can be integrated with existing systems.

(Sommerville, 2009,p.169) further states that questions as to how the organization will function without the system, how the new system will solve existing problems, the contribution the system would make to business objectives, whether new technologies not used previously are needed and what features are supported, should be taken into consideration when conducting the feasibility study.

The system was found to be legally, operationally, technically, and economically feasible. The schedule was also found to be feasible and the recommendation was made to continue with the project considering the following factors:

- The proposed system can be technically implemented. The resources and expertise is available. (Open source software tools will be used in the development and hardware resources are also available.)
- The proposed system will not have any legal issues.
- The project time table proposed by myself in the project proposal is reasonable and the system can be developed within the proposed time period.
- The proposed solution will be able to fulfill the requirements identified and will support the objectives of Antenna House.
- The solution can be developed within budget and will be profitable. As open source software development tools, no cost will be incurred for development tools.

1.7 Chapter Outline

• Chapter 2

This chapter gives an analysis of the requirements. The requirements were split into functional and non-functional requirements. Use Case diagrams used to elaborate functional requirements in detail are included. A comparison of similar systems is also presented. The software development model used to develop the solution is also discussed here.

• Chapter 3

This chapter gives an insight in to the design architecture of the system. A class diagram, activity diagrams and a sequence diagram are included in this chapter. The principles of normalization used to design the tables are also discussed here. User interface design considerations have also been presented with examples.

• Chapter 4

The hardware and software implementation environment, software used in development, coding using the MVC architecture, re-use of existing coding are discussed here.

• Chapter 5

Chapter five is written about the testing and evaluation process. The test plan and test cases are listed here.

• Chapter 6

The last chapter provides a summary of the results of the project. Lessons learned and possibilities of future improvements are also included in this chapter.

Chapter 2- Background

This chapter presents an analysis of functional and non-functional requirements of the implemented solution. A review of similar systems and Use Case diagrams with use case descriptions are also included.

2.1 Requirement Analysis

Requirements can be divided into two groups, namely functional requirements and non-functional requirements.

2.1.1 Functional Requirements

There should be profile pages to different user categories (DEO, Manager, Supplier, Customer, Technician and Administrator).

CUSTOMER

• Customer Registration

The customer shall enter personal details and register. Customers shall be able to log in after registration.

The customer shall be able to change personal details such as "Contact No" and "Address". If he/she wishes to change the details such as" First name", "Last name" and "E-mail" he/she should contact the administrator.

Password change shall be possible.

The customers shall be able to purchase items and repair items.

• Purchase of items

A customer who wishes to purchase shall be able to select items he/she wants and add to a shopping cart. An invoice will be generated and sent to the customer via e-mail.

• Registration of Items for Home-Visit Repairs

After registration, the customer shall be able to see all the types of item faults repaired at the shop with the time duration taken to repair a specific item and the cost.

Then, the customer shall be able to enter the details of repair and submit (should enter the date when repair is possible).

Then, the DEO should send the customer an SMS/e-mail stating the name, Identity Card Number of the technician, and schedule of visit, if a technician can be assigned on the requested date.

• Checking Status of Home-Visit Repairs

The customer shall be able to check the status of the request made to schedule the repair.

• Checking the Status of Repair Job (for items handed-over to the shop)

The customer shall be able to check the status of the Repair Job after logging into the site.

• Searching for an item

The items shall be searchable online by entering key words.

Deactivation of Personal Account

The customer shall be able to deactivate his/her account.

• Re-activation of Personal Account

The customer shall be able to re-activate his/her personal account.

• Order History

The customer shall be able to view his/her order history and see the relevant invoices as well.

DATA ENTRY OPERATOR (DEO)

• Updating Personal Details

The DEO shall be able to change personal details such as "NIC", "Contact No" and "Address". If he/she wishes to change the details such as" First name ","Last name" and "E-mail" he/she should contact the administrator.

• Registration of Products for sale

The items (name, brand, quantity) shall be recorded. An image of the item shall be uploaded. It shall be possible to view registered items, and update stock as well.

• Sale of Items at shop

If the customer does not order online, but visits the shop to purchase items, the DEO shall be able to produce a bill and accept the payment.

• Add and View Faults of items

The DEO shall be able to add faults repaired by the technicians at Antenna House and view them later.

• Registration of small items for repair handed-over to the shop

The DEO shall be able to view all the types of item faults repaired at the shop with the time duration taken to repair a specific item and the cost.

If the item to be repaired is accepted at the shop, then the DEO shall record that.

• Viewing of all accepted repairs

DEO shall be able to view details of all accepted repairs.

• Schedule Home-Visit Repairs as requested by customer

After a customer makes a request for a home-visit repair, the DEO shall be able to schedule it by assigning an available technician. The DEO shall be able to reject or cancel a request as well.

• Request Leave

The DEO shall be able to request leave from the administrator through the system.

• View Leave History

Personal leave details shall be visible to the DEO.

ADMINISTRATOR

• Updating of Customer Details

The administrator is the only one who has the right to change a customer's "First name", "Last name" and "E-mail".

• Registration of Employee Categories and Updating them

The administrator shall be able to register different employee categories assigning different leave details and salary details to each category. Then, those category data shall be updatable.

• Registration of Employees

The administrator shall be able to register employees with different privilege levels as "DEO", "Technician", or "Manager".

• Viewing all Registered Employees

The administrator shall be able to view all registered employees and change the employee category of an employee if needed.

• Updating Employee Details

The administrator is the only one who has the right to change an employee's "First name", "Last name" and "E-mail".

• Viewing all Registered Suppliers and Updating their details on request

The administrator shall be able to view all registered suppliers and update their details at their request.

• View Leave Requests

The administrator shall be able to view leave requested by employees and approve the requests.

• Deactivation of employees and re-activation of employees

The administrator shall be able to change employee status to "Activated" or "Deactivated".

• Deletion of Customers, Suppliers and Employees

The administrator shall be able to delete customers, suppliers and employees if the need arises.

MANAGER

• Updating Personal Details

The Manager shall be able to change personal details such as "NIC", "Contact No" and "Address". If he/she wishes to change the details such as" First name", "Last name" and "E-mail" he/she should contact the administrator.

• Confirming suppliers

When a potential supplier makes a request to be a supplier (online) the manager shall confirm them as registered supplier/reject their request or keep them under pending.

• View items suppliers propose to supply

The manager shall be able to view items the supplier has proposed to supply and mark approved items as registered.

• Sending quotations to suppliers

At the end of each day, the manager shall be able to view the items whose quantity is less than 15, with the suppliers of that item. Then, the Manager shall send a request to his/her suppliers.

• Accept New Supplies

The Manager shall be able to generate an invoice when the supplier confirms the order.

• Generation of Management Reports

Reports shall be generated about the income at the end of each day and month.

Reports shall be generated with the expenditure for goods purchased at the end of each month.

• Request Leave

The manager shall be able to request leave from the administrator through the system.

• View Personal Leave History

The manager's personal leave details shall be visible to the manager.

TECHNICIAN

• Updating Personal Details

The technician shall be able to change personal details such as "NIC", "Contact No" and "Address". If he/she wishes to change the details such as" First name"," Last name" and "E-mail" he/she should contact the administrator.

• View Present Repair Jobs

The technician shall be able to view all the current jobs he/she is working on.

• Update Repair Delay

The technician shall be able to update the item status and inform the customer if repair-end date will be delayed.

• View Home-Visit repairs scheduled

The technician shall be able to view home-visits scheduled for him.

• Request Leave

The technician shall be able to request leave from the administrator through the system.

• View Leave History

Personal leave details shall be visible to the technician.

SUPPLIERS

• Supplier Registration

Potential suppliers shall be able to register themselves by entering their details. If the management approves the supplier, supplier shall be marked as active.

• Requests to supply items

After the manager activates the supplier account, supplier shall be able to make requests to supply items.

• Accept request for supplies

The supplier shall be able to confirm quotations for supplies and notify the management with date of delivery.

• Deactivation of Personal Account

The Supplier shall be able to deactivate his/her account.

• Re-activation of Personal Account

The Supplier shall be able to re-activate his/her personal account.

2.1.2 Non-Functional Requirements

• Efficiency

The proposed system shall be efficient. The system shall be able to perform tasks accurately without taking too much time. This requirement is important to achieve because otherwise users will reject the system if it is not fast enough.

Processed transactions per second should be high. User/Event response time should be low.

• Availability

The system shall be available. Availability is important because if the solution is not available when the user needs it, then the system is useless. Therefore the probability of availability should be high.

• Reliability

The proposed system shall be reliable. All users can rely on the system to fulfill their functions if Mean Time To Recover (MTTR) is less, and Mean Time Between Failures (MTBF) is high.

• User-friendliness

The solution shall be user-friendly. This means the system shall not be difficult to understand or to learn. If the system is not user-friendly the users will end up making mistakes when using the system and they will refuse to use it. This is specifically important as the employees of Antenna House are not very computer-literate. They need to familiarize themselves with the system operations within a short period of time.

• Security

Security is also very important. Authentication of users logging into the system should be done to verify the identity of the users. Authorization will be ensured to make sure that users can only do what they are supposed to do. Passwords will be encrypted using either MD5 or SHA algorithms.

2.2 Use Case Diagrams

The Use Cases and Use Case descriptions given below were used to analyze the functional requirements.

Figure 2.1 below shows the Use Case Diagram for a Customer



Figure 2.1 Use Case Diagram for Customer

Table 2.1 below shows the Use Case description for Create Account Use Case

Use Case	Create Account
Actors	Customer
Pre- Conditions	Customer should click on "Register as a Customer" on homepage.
Flow Events	Customer should enter his details and a password and submit.
Post Condition	 Customer should be able to login. Customer should be able to perform all the functions in the "Customer Profile Page".

Table 2.1 Use Case description for Create Account Use Case

Table 2.2 below shows the Use Case description for Update Details Use Case

Table 2.2 Use Case description for Update Details Use Case

Use Case	Update Details
Actors	Customer
Pre- Conditions	Customer should be registered
Flow Events	1. Customer should log in.
	2. Customer is directed to the "Customer Profile Page".
	3. Customer should click "Update Personal Details".
	4. Customer should make the necessary changes and click
	"Update My Details".
Post Condition	When the Customer clicks "Update Personal Details"
	again the changes should be reflected.

Table 2.3 below shows the Use Case description for Purchase Online Use Case

Use Case	Purchase Online
Actors	Customer
Pre- Conditions	Customer should log in.
	• Item should be available.
Flow Events	• If customer wishes to purchase he/she should add items
	to shopping cart and submit.
Post Condition	• Invoice should be sent to customer's email if purchase is
	online.

Table 2.3 Use Case description for Purchase Online Use Case

Table 2.4 below shows the Use Case description for Request Home-visit Repair Use Case

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Use case	Request Home-visit Repair
Actors	Customer
Pre- Conditions	Customer should log in.
Flow Events	1. Customer should be able to see the "List of Faults" when
	he/she selects "Schedule Home-Visit Repair".
	2. Customer should click "Add Job" where the given fault
	matches his/her item's fault.
	3. Customer should enter the details and "Save".
Post Condition	1.DEO should assign a technician and send an email/SMS to
	customer with schedule and technician details
	2. Customer should be able to view the status of the request by
	logging into the system.

Table 2.5 below shows the Use Case description for Check Status of Repair Job Use Case

Table 2.5 Us	e Case descri	ption for (Check Status	of Repair	Job	Use Case
		1				

Use Case	Check Status of Repair Job
Actors	Customer
Pre- Conditions	DEO should have saved the repair details.
Flow Events	1. Customer should log in.
	2. Customer should click "Check Status of Repair Job".
Post Condition	The customer should be able to see the status of the job.

Table 2.6 below shows the Use Case description for Search Items Use Case

Table 2.6 Use Case description for Search Items Use Case	
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Use Case	Search Items	
Actors	Customer	
Pre- Conditions	Items should be registered	
Flow Events	1. Customer should enter key words and search.	
	2. If customer wishes to search for items within a price	
	range, customer should select price range.	
Post Condition	Items with the keywords should appear.	
	If a price range is set, items within that range should appear	

Table 2.7 below shows the Use Case description for View Order History Use Case

Table 2.7 Use Case description for View Order History Use Case

Use Case	View Order History
Actors	Customer
Pre- Conditions	Customer should have placed at least one order and customer
	should log in.
Flow Events	Customer should click "View Order History".
Post Condition	All orders should be visible with relevant invoices and details.



Figure 2.2 below shows the Use Case Diagram for a DEO.

Figure 2.2 Use Case diagram for DEO

Table 2.8 below shows the Use Case description for Register Item for Sale Use Case.

Table 2.8 Use Case description for Register Item for Sale Use Case

Use Case	Register Item for Sale
Actors	DEO
Pre- Conditions	-
Flow Events	DEO should enter item details and save.
Post Condition	• Updating item stock and prices should be possible.
	• Item should appear when searched
	• Item should appear in shopping cart item list.

Table 2.9 below shows the Use Case description for Accept Payments for Sales Use Case.

Use Case	Accept payments for sales
Actors	DEO
Pre- Conditions	The customer shall be a customer without an e-mail account who has arrived at the shop to purchase items.
Flow Events	DEO should select items the customer requests to the shopping cart and submit.
Post Condition	Invoice should be printed.

Table 2.9 Use Case description for Accept Payments for Sales Use Case

Table 2.10 below shows the Use Case description for Add Fault Details Use Case

Table	2.10	Use Case description	for Add Fault Details Use Case
		a	

Use Case	Add Fault Details	
Actors	DEO	
Pre- Conditions	DEO should log in.	
Flow Events	DEO should click "Add Faults" on DEO Profile Page and enter	
	the fault details and "Save".	
Post Condition	• Fault details should be updatable and deleteable.	
	• List of Faults appear when DEO clicks "Accept Repairs"	
	on the DEO Profile Page.	
	• List of Faults appear when Customer clicks "Schedule	
	Home-Visit Repairs" on the Customer Profile Page.	
Pre- Conditions Flow Events Post Condition	 DEO should log in. DEO should click "Add Faults" on DEO Profile Page and enter the fault details and "Save". Fault details should be updatable and deleteable. List of Faults appear when DEO clicks "Accept Repairs" on the DEO Profile Page. List of Faults appear when Customer clicks "Schedule Home-Visit Repairs" on the Customer Profile Page. 	

Table 2.11 below shows the Use Case description for Accept for Repair Use Case.

Table 2.11 U	Jse Case	description	for Accept	for Repair	Use Case
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Use Case	Accept for Repair
Actors	DEO
Pre- Conditions	Fault should be listed in "List of Faults" when DEO clicks
	"Accept Repairs" in the DEO Profile Page.

Flow Events	1. DEO should click "Add Job" where the fault matches the		
	item's fault .		
	2. DEO should enter repair item details, assign a technician and		
	click "Save".		
Post Condition	• Invoice should be printed with repair-end date.		
	• Item should appear in the selected technician's job list		
	• DEO should be able to change the Technician if		
	necessary.		

Table 2.12 below shows the Use Case description for Manage Home-Visit Repair Use Case.

Use Case	Manage Home-Visit Repairs
Actors	DEO
Pre- Conditions	Customer should have made a schedule request through his/her
	Customer Profile Page.
Flow Events	1. DEO should log in.
	2. DEO should view the request.
	3. DEO should view the Technicians available on that day.
	4. DEO should assign a Technician if a technician is available
	on the requested date.
	5. If a Technician is available DEO should send an e-mail
	confirming the schedule.
	6. If a Technician is not available DEO should send an e-mail
	rejecting the schedule.
Post Condition	 Customer should receive the Invoice by e-mail if schedule was confirmed. Customer should receive e-mail rejecting the schedule if a technician is not available. Customer should be able to view request status through profile page

Table 2.12 Use Case description for Manage Home-Visit Repairs Use Case



Figure 2.3 below shows the Use Case Diagram for Administrator.

Figure 2.3 Use Case Diagram for Administrator

Table 2.13 below shows the Use Case description for Update Customer Details Use Case.

Table 2.13 Use Case description for	[•] Update Customer Details Use Cas
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Use Case	Update Customer Details
Actors	Administrator
Pre- Conditions	Customer should be registered.
Flow Events	1. Administrator should log in.
	2. Administrator should click "View Customers" on the Admin
	Profile Page.
	3. The administrator should be able to update First name, Last name and e-mail of customers at their request.
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Post Condition	• Changes to First name, Last name and E-Mail should be updated in both "Customers" and "Users" tables.

Table 2.14 below shows the Use Case description for Register Employee Category Use Case.

Table 2.14	Use Ca	se descriptic	n for F	Register	Employee	Category	Use Case
1 4010 2.1 1	050 00	se deseriptie	II IOI I	Cog istor	Linployee	Cutogory	Obe Cube

Use Case	Register Employee Category
Actors	Administrator
Pre- Conditions	-
Flow Events	1. Administrator should log in.
	2. Administrator should click on "Add Employee Category".
	3. The administrator should be able to save employee category,
	no of leave available and salary.
Post Condition	• The Admin will be able to register employees under
	these categories.
	• Category details should be updatable.

Table 2.15 below shows the Use Case description for Register Employees Use Case.

Table 2.15 Use Cas	e description for	Register	Employees	Use	Case
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Use Case	Register Employees
Actors	Administrator
Pre- Conditions	Employee category details should have been saved.
Flow Events	Admin should enter employee details, a password and submit.
Post Condition	• Employees should change the password.

Table 2.16 below shows the Use Case description for Update Employee Details Use Case.

Use Case	Update Employee Details
Actors	Administrator
Pre- Conditions	Employee should be registered and employee details should be
	listed when Admin clicks on "Update Employee".
Flow Events	1. Administrator should click "Update" option respective to the
	employee whose details should be updated.
	2. Administrator should be directed to the page with employee
	details of the chosen record.
	3. Administrator can update employee details and click "Update
	Employee".
Post Condition	If Administrator changes First name or Last name or
	E-mail of an employee, both "Employees" and "Users"
	tables should be updated.
	• If Administrator selects "Deactivated" as status in an
	employee record, that employee will not be able to log
	in.
	• If Administrator selects "Activated" as status in an
	employee record(that has been "Deactivated"), that
	employee will be able to log in.

Table 2.16 Use Case description for Update Employee Details

Table 2.17 below shows the Use Case description for Update Supplier Details Use Case.

Table 2.17 Use C	Case description	for Update Supplier	Details Use Case
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Use Case	Update Supplier Details
Actors	Administrator
Pre- Conditions	Supplier should be registered and Supplier details should be
	listed when Admin clicks on "Update Supplier".

Flow Events	1. Administrator should click "Update" option respective to the
	supplier whose details should be updated.
	2. Administrator should be directed to the page with supplier
	details of the chosen record.
	3. Administrator can update supplier details and click "Update
	Supplier".
Post Condition	• If Administrator changes "First name" or "Last name"
	or "E-mail "of a Supplier, both "Suppliers" and "Users"
	tables should be updated.
	• If Administrator selects "Deactivated" as status in a
	Supplier record, that Supplier will not be able to log in.
	• If Administrator selects "Activated" as status in a
	Supplier record(that has been "Deactivated"), that
	Supplier will be able to log in.

Table 2.18 below shows the Use Case description for Delete Customer Use Case.

Table 2.18 Use Case description for Delete Customer Use Case

Use case	Delete Customer
Actors	Administrator
Pre- Conditions	Customer should be registered and should be listed when Admin clicks "Update Customers" in the Admin Profile Page.
Flow Events	 Admin should log in. Admin should click "Update Customers". Admin should click the "Delete" option in the respective row
Post Condition	 The Customer should be deleted from both "Customer" and "Users" Tables. Customer cannot log in.

Table 2.19 below shows the Use Case description for Delete Supplier Use Case.

Use Case	Delete Supplier
Actors	Administrator
Pre- Conditions	Supplier should be registered and should be listed when Admin
	clicks "Update Supplier" in the Admin Profile Page.
Flow Events	1. Admin should log in.
	2. Admin should click "Update Suppliers".
	3. Admin should click the "Delete" option in the respective row
Post Condition	• The Supplier should be deleted from both "Supplier" and
	"Users" Tables.
	• Supplier cannot log in.

Table 2.19 Use Case description for Delete Supplier Use Case

Figure 2.4 below shows the Use Case Diagram for a Technician.



Figure 2.4 Use Case Diagram for Technician

Table 2.20 below shows the Use Case description for View Accepted Repair Jobs Use Case.

Table 2.20 Use Case description for View Accepted Repair Jobs Use Ca
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Use Case	View Accepted Repair Jobs		
Actors	Technician		
Pre- Conditions	• The DEO should have assigned the technician to the job		
	• The job should not have been assigned the Status		
	"Delivered".		
Flow Events	Technician should log in.		
	Technician should click "View Jobs" on their Profile		
	Page.		
Post Condition	• The jobs for each technician should be displayed.		

Table 2.21 below shows the Use Case description for Update Status Use Case

Table 2.21 Use Case description for Update Status Use Case

Use Case	Update Status	
Actors	Technician	
Pre- Conditions	• The DEO should have assigned the technician to the job.	
	• The job should be displayed in the technician's job list.	
Flow Events	• Technician should select "Ready", "Delayed" or	
	"Delivered".	
	• If there is a delay in the repair-end date, technician	
	should send an email.	
Post Condition	• A customer who logs in will be able to view the job	
	status through his/her profile page.	
	• Customer will receive an email if there is a delay in the	
	repair-end date.	

Table 2.22 below shows the Use Case description for View Home-Visit Repairs Scheduled Use Case.

Use Case	View Home-Visit Repairs Scheduled
Actors	Technician
Pre- Conditions	• The DEO should have assigned the technician to the home-visit job.
Flow Events	 Technician should log in. Technician should click "View Home-Visit Repair Jobs".
Post Condition	Technician should take the copy of the invoice given by theDEO and accept the payment from the customer.

Table 2.22 Use Case description for View Home-Visit Repairs Scheduled Use Case



Figure 2.5 below shows the Use Case Diagram for the Manager.

Figure 2.5 Use Case Diagram for Manager

Table 2.23 below shows the Use Case description for Confirm Supplier Use Case.

	Table 2.23	Use	Case	descrip	otion	for	Confirm	Supplier	Use	Case
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Use Case	Confirm Supplier
Actors	Manager
Pre- Conditions	Supplier should have entered his/her details and submitted.

Flow Events	1. Manager should log in.		
	2. Manager should mark supplier as "Activated".		
Post Condition	• Supplier will be able to receive quotations for items if		
	marked as "Activated".		
	• Manager should be able to edit supplier details at their		
	request.		

Table 2.24 below shows the Use Case description for View Pending Items Use Case.

Table 2.24 Use Case description for View Pending Items Use Case

Use Case	View Pending items		
Actors	Manager		
Pre- Conditions	Supplier should have saved items that he/she is willing to supply.		
Flow Events	 Manager should log in. Manager should click "View Pending Items". Manager should click "Register Item" if he/she is willing to purchase the proposed products. 		
Post Condition	• Supplier will be able to receive quotations for the registered item.		

Table 2.25 below shows the Use Case description for Send Quotations Use Case.

Table 2.25 Use Case description for Send Quotations Use Case

Use Case	Send Quotations
Actors	Manager
Pre- Conditions	• Supplier should be registered as "Activated".
	• Item should be listed in the list of items whose quantity
	is less than 15.
Flow Events	1. Manager should log in.
	2. Manager should click" Send Requests to Supplier".

	 Manager should click "Update Request" on the row of the respective item he/she wishes to purchase.
	4. Manager should enter the "Date required" and "Quantity needed" and click "Request".
Post Condition	• Supplier will be able to view requests.

Table 2.26 below shows the Use Case description for Accept Supplies Use Case.

Table 2.26 Use Case description for Accept Supplies Use Case

Use Case	Accept Supplies			
Actors	Manager			
Pre- Conditions	• Supplier should confirm the availability of requested			
	items and specify delivery date			
Flow Events	1. Manager should log in.			
	2.Manager should view confirmed requests			
	3.Manager should send invoice via e-mail			
Post Condition	• Stock will be updated when supplies are received			

Table 2.27 below shows the Use Case description for Generate Reports Use Case.

Table 2.27 Use Case description for Generate Reports Use Case

Use Case	Generate Reports		
Actors	Manager		
Pre- Conditions	• Sales and Repair Item payment details should have been		
	recorded.		
	• Details of supplies purchased should have been entered.		
Flow Events	Manager should select a day/ period of time		
Post Condition	• Relevant details will be displayed with total cost for the		
	selected day/period.		

Figure 2.6 below shows the Use Case Diagram for a Supplier.



Figure 2.6 Use Case Diagram for a Supplier

Table 2.28 below shows the Use Case description for Request to be a Supplier Use Case

Use Case	Request to be a Supplier				
Actors	Supplier				
Pre- Conditions	Supplier should access the homepage and click "Register as a Supplier".				
Flow Events	Supplier should enter details and submit.				
Post Condition	• A supplier account will be created				
	• The Manager will be able to confirm them as approved suppliers or keep them under pending.				
	• Suppliers should be able to update their details.				

Table 2.29 below shows the Use Case description for Request to Supply Items Use Case.

Use case	Request to Supply Items				
Actors	Supplier				
Pre- Conditions	Supplier's account should have been activated.				
Flow Events	Supplier should log in.				
	• Supplier should click "Save Supply Items".				
	• Supplier should enter details and save.				
Post Condition	The requests should be visible to the Manager under "Pending				
	Items" in Manager's profile page.				

Table 2.29 Use Case description for Request to Supply Items Use Case

Table 2.30 below shows the Use Case description for Accept Request for Supplies Use Case.

Use case	Accept request for supplies
Actors	Supplier
Pre- Conditions	Supplier should be registered.
	Supplier should log in.
	Manager should have sent quotations.
Flow Events	The Supplier confirms the quotations and sends the date of
	delivery.
Post Condition	The Manager will send an invoice.

Table 2.30 Use case description for Accept Request for Supplies Use Case

Figure 2.7 below shows the Use Case Diagram Common to All Users.



Figure 2.7 Use Case Diagram Common to All Users

Table 2.31 below shows the Use Case description for Log In Use Case.

Table 2.31 Use Case description for Log In Use Case

Use Case	Log In
Actors	User
Pre- Conditions	Users should be registered under their respective categories.
Flow Events	1. Enter E-Mail address
	2. Enter password
	3. Submit
Post Condition	Users will be able to perform authorized tasks

Table 2.32 below shows the Use Case description for Change Password Use Case.

Table 2.32 Use Case description for Change Password Use Case

Use Case	Change Password
Actors	User
Pre- Conditions	Users should be registered under their respective categories.

Flow Events	1. Log in
	2. Select "Change Password" in Profile Page.
	3. Enter existing password
	4. Enter new password
	5. Confirm new password
	6. Submit
Post Condition	Users will be able to log in with the new password

Table 2.33 below shows the Use Case description for Request Leave Use Case.

Use Case	Request Leave					
Actors	Employee (DEO, Technician, Manager)					
Pre- Conditions	• The above actors should be registered as employees and should log in.					
Flow Events	 Employee should log in. Employee should click "Request Leave". The above actors should enter leave details and submit. 					
Post Condition	Leave details will be recorded					

Table 2.33 Use Case description for Request Leave Use Case

Table 2.34 below shows the Use Case description for View Leave History Use Case.

Table 2.34 Use Case description for View Leave History Use Case

Use Case	View Leave History				
Actors	Employee (DEO, Technician, Manager)				
Pre- Conditions	• The above actors should be registered as employees and previous leave details should have been recorded in the database.				
Flow Events	Employee should log in.Employee should click "Leave History".				
Post Condition	Previous leave records should be visible.				

Table 2.35 below shows the Use Case description for Update Personal Details Use Case.

Use Case	Update Personal Details						
Actors	Customer, Supplier, DEO, Technician, Manager						
Pre- Conditions	The above actors should be registered						
Flow Events	1. The above actors should go their respective pages and click						
	on 'Update Personal details".						
	2. Above actors should make the changes and click "Update My						
	Details".						
Post Condition	When the actors click "Update Personal Details" again the						
	changes should be reflected.						

Table 2.35 Use Case description for Update Personal Details Use Case

2.3 Review of Similar Systems

A study of similar systems was carried out prior to the designing of the proposed solution. Four well-known companies, specializing in the sales and repair of electronic items were chosen to be evaluated. They are namely:

- The Singer Sri Lanka website (singersl.com,2020)
- The Softlogic Sri Lanka website (mysoftlogic.lk,2020)
- The Arpico SuperCenter Sri Lanka website (arpicosupercenter.com, 2019)
- The Abans Service Sri Lanka website(abansservice.lk,2015)

All the above sites promote online shopping and some of them also provide service after sales.

The Abans service centre also provides an Abans Mobile Service in addition to the quick repair service. The customers are also able to get an estimate of the repair cost online and the customers can also view the status of repair jobs by entering the Job-ID.

Table 2.36 shows a comparison of some of the features available in the above mentioned sites.

Table 2.36 Comparison of Related Sites

Feature	Softlogic	Singer	Arpico	Abans
Service provided	Sales and repair	Sales and repair	Sales	Sales and repair
Items for sale	Phone and	Home and	Grocery items,	TV, Washing
	accessories, TV,	kitchen	household items,	machines,
	computers,	appliances,	personal care	computers, home
	printers, kitchen	furniture, mobile	items, home	appliances,
	and home	phones, tablets,	ware, furniture,	kitchen
	equipment,	laptops,	and baby needs	appliances
	furniture etc.,	refrigerators,	other than	,Mobile phones
		washing	electronic items	etc.,
		machines etc.,	etc.,	
Classification of	Classified by	Classified by	Classified by	Classified by
items	product type	product type and	product type	product type
~		brands		
Customer	Available	Available	Available	Available
registration				
Log in	Available	Available	Available	Available
Shopping Cart	Available	Available	Available	Available
Display of new	Available	Available	-	Available
arrivals				
Wish List	Available	-	Available	Available
Search facility	Available	Available	Available	Available
Sorting of items	Available	Available	Available	Available
facility				
Filtering by price	Available	Available	Available	Available
Facility to clear	Available	-	-	-
filters				
Breadcrumbs	Not Available	Available	Not Available	Available
Online payment	Available	Available	Available	Available
facility				
Delivery	Island-wide	Available	24 Hour Door	Island-wide
	delivery		Step	delivery
			delivery, Quick	
x 1			orders	
Loyalty program	Available	Available	Available	Available
Online chat	Not Available	Available	Not Available	Available
Order History	Available	-	-	Available
Signing up for	Available	-	Available	Available
news letter				
On social media	Available	Available	Available	Available
Pagination in	Available	Available	Not Available	Available
viewing items				
Duty Free facility	Available	Available	-	Available
Carousels	Not Available	Not Available	Not Available	Available

The layout, theme, usage of colours, menu-structure and navigation structure of the above websites were taken in to account during the design of the system. Log in and customer registration interfaces similar to the above sites were implemented. Shopping cart facility is also available.

Antenna House Kadawatha (for whom the proposed site is being developed), presently only provides repairs at the shop. The idea of home-visit repair to expand the business was taken from the Abans Service Centre website. The facility of the Abans Service Centre site for customers to check the status of a job online is also included in the developed solution.

The Abans Service Centre provides this facility by asking the customer to enter a Job-ID. The system implemented by myself shows the repair history and status of all items handed over to the shop.

However, online payment facility is not provided by the developed solution, even though online payment facility is available in the above discussed sites. Payments will be accepted by representatives of Antenna House when they deliver the item after items have been selected to the shopping cart and submitted online. The invoice will be emailed to the customer.

It should be noted that existing systems are problem specific solutions and are not commercially available.

2.4 Software Development Process Model

There are many models used in the software development process such as the waterfall model, throw away and evolution prototyping, spiral model, rapid application development etc.,

The Software Development Life Cycle used to develop the system was the Iterative Waterfall model.

The orderly flow of sequential activities in this model include "System Analysis", "Design", "Implementation", "Testing" and finally concludes in "Maintenance".

Generally, the waterfall model is recommended in instances where the requirements are identified to be clear and stable. During the requirement gathering process, it was evident that the requirements of Antenna House were straight-forward and stable.

However, there were uncertainties regarding the design of the system straight after analysis and the waterfall does not accommodate the general level of uncertainty that exists at the beginning of a project. Real projects rarely follow the sequential flow in the waterfall model.

Therefore, the "iterative" waterfall model was used to overcome these issues. In the iterative waterfall model, (as the name implies) it is possible to go back to the previous stages and follow the sequence of steps again until you arrive at the stage that you were at earlier. This was helpful when changes in the design were required at the time of implementation. For example, initially it was intended to send an e-mail to the customer when the warranty of an item expires. However, during the implementation phase, this had to be changed so that the customer will be able to view warranty details of all purchased items. Therefore, the design was changed, and implementation took place after that, to suit the new design.

The MVC architecture was used in the development and the architecture will be further explained in Chapter 3.

Chapter 3-Design

This chapter provides an insight into the design architecture, and includes UML diagrams such as a class diagram, a sequence diagram and activity diagrams. It also contains details of database design with normalization.

3.1 Design Architecture

As there are six different categories of users who should interact with the system, the idea of a stand-alone system was eliminated. The system was developed as a web-based system allowing users to log in to the system from anywhere in the world, granting users anytime, anywhere global access. Usability was taken into consideration during interface design to make the system user-friendly and informative so that users would find it easy to use and understand the system, minimizing mistakes.

The MVC Architecture (Model-View-Controller) was used in the system development. In the MVC architecture, the application is separated in to three main logical components, namely "Model", "View" and "Controller".

According to (Sommerville, 2009), the MVC architecture "supports the presentation of data in different ways and separate interaction with each of these presentations."

MVC Architecture was chosen for development because the logical separation of the three main components makes the implementation much easier. The model object is reusable so it is possible to create multiple views of the same model. For example, a function written in the model class to be used in a specific interface can be used in another interface without any change. Therefore, it saves time and effort.

As the business logic is separated from presentation, the interface can be changed without changing the business logic and vice-versa. The impact of change will not be drastic and hence the application will have better maintainability.

During maintenance if another developer tries to find issues with system, he/she will find it easier to understand the system and make the necessary changes because of the logical structure of the three components.

Figure 3.1 below shows how three different folders exist for "View", "Model" and "Controller". More details of how the MVC Architecture was used in the implementation is discussed under section 4.2.



Figure 3.1 MVC Folder Architecture

3.2 UML Diagrams

According to (Sommerville,2009)the UML Modeling Language is a graphical language that is used in object-oriented development that has become a de facto standard for object oriented modeling.

UML Diagrams such as a Class Diagram, Sequence Diagram and Activity Diagrams were drawn to help in the design of the system. Use case diagrams were included in Chapter 2.

3.2.1 Class Diagram

Figure 3.2 shown below is the class diagram.



Figure 3.2 Class Diagram

3.2.2 Activity Diagrams

Figure 3.3 shown below is the activity diagram for Sending Requests for Supplies.



Figure 3.3 Activity Diagram for Sending Requests for Supplies

The Manager logs in to the system and views the items for which the quantity is less than 15 and sends request to the supplier. The Supplier confirms the order if the items can be supplied after logging into the system. If the order cannot be accepted the supplier rejects the order after logging in to the system.



Figure 3.4 shown below is the activity diagram for scheduling an online repair job.

Figure 3.4 Activity Diagram for Scheduling an Online Repair Job

The customer logs in to the system and views details about repairs. Then, the customer requests a schedule based on his/her convenience. The DEO then views the requests and if a technician is available, assigns a technician and sends an email with the details.

Figure 3.5 shown below is the activity diagram for online search, browse and shopping cart.

The diagram from(uml-diagrams.org ,2020) was modified as shown below.



Figure 3.5 Activity Diagram for online search, browse and shopping cart

The customer either browses through the content on the site or enters key words to search. If the item is found when searching, the customer views it. After viewing, the customer should make decision: whether to buy, search again or browse the site.

After the customer decides to buy, he/she can add items to the shopping cart and he/she can view the shopping cart. After viewing, the customer can either update the cart, browse further for items or check out.

3.2.3 Sequence Diagram

Figure 3.6 is the sequence diagram for a registered customer placing an order using the shopping cart facility after logging into the system.



Figure 3.6 Sequence Diagram for purchases by logged in customer

3.4 Database Design

Normalization

Normalization can be described as a technique of organizing the data in a database which uses a systematic approach to decompose tables to eliminate insertion, updation, deletion anomalies and reduce redundancy.(Studytonight.com,2021)

Normalization is a multi-step process and mainly there are three steps in normalization. The following definitions of the three normal forms are given below with reference to (Elmasri and Navathe(2008).

1st Normal Form

For a relation to be in the 1st Normal Form, it should not have multi-valued attributes. In other words it should only have single (atomic) valued attributes/columns. (Elmasri and Navathe, 2008).

2nd Normal Form

For a relation to be in the 2nd Normal Form, it should be in the 1st Normal Form and should not have partial functional dependencies. (Elmasri and Navathe,2008). This means every non-primary-key attribute is fully functionally dependent on the primary key

3rd Normal Form

For a relation to be in the 3rd Normal Form, it should be in the 2nd Normal Form and should not have transitive dependencies.(Elmasri and Navathe,2008).

The tables in the database were designed by following the rules of normalization.

Figure 3.7 below shows the Users table. UserID is the primary key. The passwords have been encrypted.

UserID	Email	FirstName	LastName	Password	Category	Status
1	AnnPerera@gmail.com	Ann	Perera	7c222fb2927d828af22f592134e8932480637c0d	Customer	Activated
2	PeterPerera@gmail.com	Peter	Perera	7c222fb2927d828af22f592134e8932480637c0d	Customer	Activated
33	Molly@gmail.com	Molly	Weasely	7c222fb2927d828af22f592134e8932480637c0d	Supplier	Activated
34	Arthur@gmail.com	Arthur	Weasely	7c222fb2927d828af22f592134e8932480637c0d	Supplier	Deactivated
59	gemma@gmail.com	Gemma	Perera	7c222fb2927d828af22f592134e8932480637c0d	DEO	Deactivated
60	Andy@gmail.com	Andy	Perera	7c222fb2927d828af22f592134e8932480637c0d	Technician	Activated
61	Fred@gmail.com	Fred	Weasely	7c222fb2927d828af22f592134e8932480637c0d	Administrator	Activated
62	Ron@gmail.com	Ron	Weasely	7c222fb2927d828af22f592134e8932480637c0d	Manager	Activated
63	Percy@gmail.com	Percy	Weasely	7c222fb2927d828af22f592134e8932480637c0d	DEO	Activated

Figure 3.7 Users Table

Figure 3.8 below shows the Products table. Id is the primary key.

Id	ProductName	ProductBrand	ProductPrice	Quantity	Warranty	Image	Status
BA-234567	Antenna	Batapola	2500	12	6 months	Batapola_Antenna1.PNG	Registered
GJK-PG10	Outdoor Wireless Speaker	Sony	3000	22	1 year	Sony_Outdoor_Wireless_Speaker.PNG	Registered
HU-CM 510- SP-G	Mini Speaker	Huawei	2500	10	1 year	Huawei_Mini_Speaker.PNG	Registered
MAS-VU3BVJ	Antenna	Maspro	2500	20	6 months	Maspro_Antenna.PNG	Registered
SRS-XB40	Portable Bluetooth Speaker	Sony	2000	10	<mark>1</mark> year	Sony_Portable_Bluetooth_Speaker.PNG	Registered

Figure 3.8 Products Table

Figure 3.9 below shows the Items table. ID is the primary key and SupplierID and ModelNo are foreign keys.

ID	ModelNo	Price	SupplierID	RequestStatus
1	BA-234567	2500	1	Requested
3	GJK-PG10	3000	1	Requested
4	HU-CM 510-SP-G	2500	2	Registered
5	MAS-VU3BVJ	2000	2	Registered
6	SRS-XB40	2000	1	Registered
41	BA-234567	2500	2	Registered

Figure 3.9 Items Table

Figure 3.10 below shows the Suppliers table. SupplierID is the primary key.

SupplierID	FirstName	LastName	SupplierName	Address	LandLine	MobileNo	Email
1	Molly	Weasely	ABC Company	24,Park Street,Colombo 5	11234567	771234567	Molly@gmail.com
2	Arthur	Weasely	Orange Electrics	43,Queens Road, Colombo 4	11234567	771234566	Arthur@gmail.com
3	Bill	Weasely	Singer	Colombo 7	112345678	771234567	Bill@gmail.com

Figure 3.10 Suppliers Table

3.5 User Interface Design

Interfaces were designed to make user interaction with the interface user-friendly and effective. Form validation messages and error messages were implemented to ensure the accuracy of data entered into the system. For example, as shown in Figure 3.11, error messages are generated when required fields are empty and when data entered do not meet the system requirements.

Register Customer

The Address field is required.

The ContactNo field must be at least 10 characters in length.

The Username field must contain a valid email address.

FirstName:	Peter
LastName:	Perera
Address:	
Contact Number:	12345678
E-mail: (Username)	Petergmail.com

Figure 3.11 Validation errors

Error messages are produced when inaccurate data or data unacceptable to the system are entered. Figure 3.12 below shows the error produced when a day in the past is chosen as the return date in the accept repairs interface. The return date should be a date in the future.

The Return Date should be in the future.Unable to Add Job.
--

Figure 3.12 Incorrect return date

Selection fields were populated through the database (where necessary) to ensure consistency. Figure 3.13 below shows how the Contact No selection box in the accept repairs interface is populated through the existing contact numbers in the customers table.

Contact Number				
Select Contact No				
771234567				
771234568				
771234569				
771234566				

Figure 3.13 Populated Contact Numbers

Certain fields in certain interfaces were added to provide existing information for clarity and were shown as disabled fields. Figure 3.17 below shows the employee personal detail updating page where certain records were shown as disabled fields.

Fields such as "FirstName", "LastName" and "E-Mail address" are not allowed to be updated by the employee and that privilege was granted only to the administrator for security reasons.

Employee ID:	25
FirstName:	Percy
LastName:	Weasely
NIC Number:	12345678
Address:	Colombo 7
ContactNo:	771234565
Gender:	Male
Date-Of-Birth:	2/7/2008

Update Personal Details

Figure 3.14 Disabled fields

Chapter 4-Implementation

4.1 Implementation Environment

4.1.1 Hardware Environment

Table 4.1 below shows the description of hardware used in the implementation.

Type of Computer	Acer
Processor Type	Intel(R) Core(TM) i7
Processor Speed	1.80 Ghz
RAM	8.00 GB
Usable RAM	7.86 GB
Hard Disk(Free space in C	472 GB
Drive)	

Table 4.1 Hardware Environment

4.1.2 Software Environment

The Operating System used was Windows 10 Home 64-bit operating system. As the system is a web based system it will run on any operating system.

Bootstrap, Codeigniter and XAMPP were used for development. All these technologies are free and open source. Therefore, no cost was incurred for development technologies.

Bootstrap

Bootstrap is a popular, free and open-source CSS framework for developing responsive, mobile-first websites.(w3schools.com, 2021) It consists of Cascading Style Sheets and (optionally) JavaScript-based design templates which produce artistically pleasing interfaces.

• Codeigniter

Codeigniter is an open-source software rapid development web framework, which is loosely based on the popular MVC (model–view–controller) architecture. It is used for building dynamic web sites with PHP.

• XAMPP

XAMPP is a free and open-source platform web-server solution stack package developed by Apache. It consists of Apache HTTP Server, MariaDB Database and interpreters for scripts written in PHP and Perl. The database for the proposed solution was created in XAMPP.

4.2 Code Features

Code segments from Suppliers_Controller, Suppliers_Model and Supplier_view Classes are given below to provide an insight into the implementation of the system.

• The code below is an extraction from the Suppliers_Controller class.

```
<?php
class Suppliers_Controller extends CI_Controller
{
    public function __construct(){
    parent::__construct();
    $this->load->database();
    $this->load->model("Suppliers_Model");
    $this->load->helper(array('form'));
    $this->load->helper(array('form_validation'));
    $this->load->helper('url');
    $this->load->helper('url');
    $this->load->helper('email');
    }
    public function savedata(){
    $this->form_validation->set_rules('FirstName','FirstName','required');
    $this->form_validation->set_rules('LastName','LastName','required');
    }
}
```

• The code below is an extraction from the Suppliers_Model class

```
<?php
class Suppliers_Model extends CI_Model
{
    public function __construct()
    {
        /* Call the Model constructor */
        parent::__construct();
    }
    function
    saverecords($FirstName,$LastName,$SupplierName,$Address,$LandLine,$MobileNo,$Email){
        $query="Insert into Suppliers
        values(",'$FirstName','$LastName','$SupplierName','$Address','$LandLine','$MobileNo','$Email'
)";
        $this->db->query($query);}
```

• The code below is an extraction from the "SupplierRegistration" Interface. It belongs to the view component.

```
<html>
<head>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
k rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/css/bootstrap.min.css"
integrity="sha384-9aIt2nRpC12Uk9gS9baDl411NQApFmC26EwAOH8WgZl5MYYxFfc+NcP
b1dKGj7Sk" crossorigin="anonymous">
<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js"
integrity="sha384-DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+Or
CXaRkfj" crossorigin="anonymous"></script>
<script src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/js/bootstrap.min.js"
integrity="sha384-OgVRvuATP1z7JjHLkuOU7Xw704+h835Lr+6QL9UvYjZE3Ipu6Tp75j7Bh/
kR0JKI" crossorigin="anonymous"></script>
<h6 align="left"><a href="<?php echo base_url('index.php/Homepage_Controller/'); ?>">Go
back to Profile Page</a></h6>
<h1 align="center";> Register Supplier</h1>
</head>
<body>
<div class="container">
<form method="post">
<div class="form-group">
<label for="FirstName">FirstName:</label>
<input type="text" class="form-control" id="FN"name="FirstName" value="<?php echo
set_value('FirstName');?>"/>
<?php if(form_error('FirstName'))
echo "<span style='color:red'>".form_error('FirstName')."</span>";
}
?>
</div>
```

The interaction between the Suppliers_Controller, Suppliers_Model and Suppliers_View can be understood using the image shown in Figure 4.1 below.(tutorialspoint.com, 2021)



Figure 4.1 MVC Diagram

- a. The Suppliers_Controller receives input from the Suppliers_View and interacts with it.(Sometimes, Controllers validate the inputs as well. The Suppliers_Controller code segment shown above validates the input from the Suppliers_view.)
- b. The Suppliers_Model is connected to the database.So the Suppliers_Controller interacts with the database through the Suppliers_Model.
- Coding from(codeigniter.com,2019) was taken to upload images and modified to suit the system.
- Coding from (codexworld.com,2020) was taken for the implementation of the shopping cart and modified to suit the system. The codeigniter cart library was used.

Chapter 5 - Testing and Evaluation

5.1 The Testing Process

According to (Sommerville,2009,p.562) the software testing process is used to prove to the customer and developer that the software meets the requirements, discover instances where the software is incorrect, has undesirable results or does not conform to its specification.

Unit Testing, Integration Testing, Regression Testing, System Testing, Usability Testing, Validation Testing and Verification Testing were carried out during the testing process.

According to(tutorialspoint,2021) the above mentioned test types can be described as follows.

- Individual modules are tested during unit testing which is concerned with the functional accuracy of test units.
- The modules tested in unit testing are then integrated and tested during integration testing and regression testing.
- This is followed by system testing which includes both functional and non-functional testing.
- During system testing, the functionality, inter-operability, performance, scalability are tested.
- Usability testing is conducted to measure how easily the users can perform typical tasks using the system.
- Validation testing is about building the right product to ensure that the product meets the client's requirements.
- Verification testing is about building the product right.

5.2 Test Plan

Table 5.1 below is the Test Plan.

Table 5.1 Test Plan

Feature	Test Type	Start Date	End Date	Result
Log in	Unit Testing	February- week 2	February-week 3	Functions
				Properly
Profile Page	Unit Testing	February-week 3	February- week 3	Functions
Creation				Properly

Change	Unit Testing	February-week 3	February-week 3	Functions
Password				Properly
Registration of	Unit Testing	February-week 4	February-week 4	Functions
Employee				Properly
Categories and				
updating them				
(In				
Administrator				
Profile Page)				
Registration of	Unit Testing	March-week 1	March-week 1	Functions
employees				Properly
(In				
Administrator				
Profile Page)				
Viewing and	Unit Testing	March-week 1	March-week 1	Functions
updating of				Properly
employees				
(In				
Administrator				
Profile Page)				
De-activation of	Unit Testing	March-week 1	March-week 1	Functions
Employee				Properly
(In				
Administrator				
Profile Page)				
Re-activation of	Unit Testing	March-week 1	March-week 1	Functions
Employee				Properly
(In				
Administrator				
Profile Page)				

Updating	Unit Testing	March-week 2	March-week 3	Functions
Personal Details				Properly
(In Employee				
Profile Page)				
Registration of	Unit Testing	March-week 3	March-week 3	Functions
items for sale				Properly
(In DEO Profile				
Page)				
Viewing and	Unit Testing	March-week 3	March-week 3	Functions
updating items				Properly
for sale				
(In DEO Profile				
Page)				
Registration of	Unit Testing	March-week 4	March-week 4	Functions
repairs accepted				Properly
at shop				
(In DEO Profile				
Page)				
Viewing and	Unit Testing	March-week 4	March-week 4	Functions
updating repairs				Properly
accepted at shop				
(In DEO Profile				
Page)				
Generation of	Unit Testing	March-week 4	March-week 4	Functions
Invoice				Properly
(In DEO Profile				
Page)				
View Present	Unit Testing	March-week 4	March-week 4	Functions
Repair Jobs				Properly
(In Technician				
Profile Page)				

Customer	Unit Testing	April-week 1	April-week 1	Functions
Registration and				Properly
updating				
personal details				
(In Customer				
Profile Page)				
Updating	Unit Testing	April-week 1	April-week 1	Functions
Customer				Properly
details				
(In				
Administrator				
Profile Page)				
Requesting	Unit Testing	April-week 2	April-week 2	Functions
Home-visit				Properly
Repair				
(In Customer				
Profile Page)				
Scheduling	Unit Testing	April-week 3	April-week 4	Functions
Home-visit				Properly
Repair				
(In DEO Profile				
Page)				
Checking Status	Unit Testing	May-week 1	May-week 1	Functions
of Home-Visit				Properly
schedules				
(In Customer				
Profile Page)				
View visit	Unit Testing	May-week 1	May-week 1	Functions
schedules				Properly
(In Technician				
Profile Page)				
Update Repair	Unit Testing	May-week 2	May-week 3	Functions
-----------------------	--------------	------------	------------	-----------
delay &				Properly
send-email				
(In Technician				
Profile Page)				
Checking the	Unit Testing	May-week 3	May-week 3	Functions
status of repairs				Properly
given to shop				
(In Customer				
Profile Page)				
De-activation of	Unit Testing	May-week 3	May-week 3	Functions
Account				Properly
(In Customer				
Profile Page)				
Re-activation of	Unit Testing	May-week 3	May-week 3	Functions
Account				Properly
(In Customer				
Profile Page)				
Supplier	Unit Testing	May-week 4	May-week 4	Functions
Registration				Properly
Updating	Unit Testing	May-week 4	May-week 4	Functions
Suppliers				Properly
details				
(In Manager				
Profile Page)				
De-activation of	Unit Testing	May-week 4	May-week 4	Functions
Account				Properly
(In Supplier				
Profile Page)				

Re-activation of	Unit Testing	May-week 4	May-week 4	Functions
Account				Properly
(In Supplier				
Profile Page)				
Confirming	Unit Testing	May-week 4	May-week 4	Functions
Suppliers				Properly
(In Manager				
Profile Page)				
Sending	Unit Testing	June- week 1	June- week 1	Functions
quotations to				Properly
supplier				
(In Manager				
Profile Page)				
View and	Unit Testing	June- week 1	June- week 1	Functions
confirm/reject				Properly
Supply Requests				
(In Supplier				
Profile Page)				
Accept New	Unit Testing	June- week 1	June- week 1	Functions
Supplies				Properly
(In Manager				
Profile Page)				
Generation of	Unit Testing	June-week 2	June-week 2	Functions
Invoice				Properly
(In Manager				
Profile Page)				

Generation of	Unit Testing	June-week 2	June-week 2	Functions
Reports				Properly
(In Manager				
Profile Page)				
Request Leave	Unit Testing	June-week 3	June-week 3	Functions
(In all Employee				Properly
Profile Pages)				
Shopping Cart	Unit Testing	June-week 3	June-week 3	Functions
				Properly
Displaying	Unit Testing	June-week 3	June-week 3	Functions
warranty details				Properly
(In Customer				
Profile Page)				
Search Facility	Unit Testing	June-week 4	June-week 4	Functions
				Properly
Homepage	Regression and	June-week 4	June-week 4	Functions
	Integration			Properly
	Testing			
Running the	System Testing	July- week 1	July-week 2	Functions
system				Properly

5.3 Test Cases

Table 5.2 below shows the Test Cases for the Log In Interface

Table 5.2 Test Cases for the Log In Interface

Test Case Description	Input	Expected Result	Output
Allows Log in	Correct username and	User is directed to the	As expected
C	password	respective Profile	I
		Page	
Prevents Log in	Incorrect username	Error Message(Figure	As expected
	and/or password	5.1)	

If the user provides a combination of a wrong user name and password the following message shown in Figure 5.1 is displayed.



Figure 5.1 Log In error message

Table 5.3 below shows the Test Cases for the Profile Page

Table 5.3 Profile Page Test Cases

Test Case Description	Input	Expected Result	Output
Display name of the	Log in	Name of user should	As expected
user		appear at	
		left-hand-corner	
Log out	Click "Log out"	User is directed to	As expected
		"Log In" interface	

Table 5.4 below shows the Test Cases for the Online Customer Registration and Customer Personal Detail Updating. These test cases test whether the customer enters acceptable details to the system during online customer registration.

Table 5.4 Test Cases for Online Customer Registration and Customer Personal Detail Updating

Test Case Description	Input	Expected Result	Output
View the Customer	Click" Register as a	User is directed to the	As expected
Registration interface	Customer".	customer registration	
		interface.	
Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled.	

Contact No entered	Enter more/less no of	Error message saying	As expected
should be limited to 10	digits than ten digits	number entered cannot	
digits		be accepted.(Figure	
		5.2)	
E-Mail entered should	Enter incorrect e-mail	Error message saying	As expected
be a valid e-mail		e-mail address entered	
		is invalid. (Figure 5.2)	
E-Mail entered should	Enter e-mail of an	Error message saying	As expected
not exist in the "Users"	already existing	e-mail address entered	
Table.	account	is in use and asks to	
		register with another	
		e-mail.	
Password and confirm	Enter different values	Error message saying	As expected
password fields should	into password fields.	passwords do not	
match		match.(Figure 5.2)	
Save details in to	Data acceptable by the	Message saying	As expected
"Customer" and	system	"Record saved	
"Users" Tables.		successfully".	
Update allowed	Log in to the Profile	Message saying "The	As expected
Personal Details	Page.	record was updated"	
	Click "Undate		
	Chek Opdate		
	Personal Details" in		
	Personal Details" in the menu.		
	Personal Details" in the menu. Change details and		
	Personal Details" in the menu. Change details and click "Update		
	Personal Details" in the menu. Change details and click "Update Personal Details"		

Figure 5.2 shows some error messages generated when incorrect data is entered.

The ContactNo field cannot exceed 10 characters in length.

There is another account with this email.Please use another e-mail address to register.

The ConfirmPassword field does not match the Password field.

Figure 5.2 Error Messages in Customer Registration

Table 5.5 below shows the Test Cases for DEO registering a customer who comes to the shopTable 5.5 Test Cases for DEO Registering a Customer

Test Case Description	Input	Expected Result	Output
View Customer	Click "Register	DEO is directed to the	As expected
Registration page	Customer" on DEO	customer registration	
	profile page.	interface.	
Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled	
Should allow to save	Leave e-mail address	Details should be	As expected
details without e-mail	empty	saved to both	
address		"Customer" and	
		"Users" tables.	

Table 5.6 below shows the Test Cases for Scheduling and Checking Home-Visit Repairs. The customer can schedule and check the status of the home-visit repair.

Table 5.6 Test Cases for Scheduling and Checking Home-Visits

Input	Expected Result	Output
Click "Schedule	Home-Visit schedule	As expected
Home-Visits" on	interface should be	
Customer ProfilePage.	displayed.	
Leave required field	Error message	As expected
empty	requesting fields to be	
	filled.	
	Input Click "Schedule Home-Visits" on Customer ProfilePage. Leave required field empty	InputExpected ResultClick "ScheduleHome-Visit scheduleHome-Visits" oninterface should beCustomer ProfilePage.displayed.Leave required fieldError messageemptyrequesting fields to befilled.

Date of Repair	Select a date in the	Error message saying	As expected
selected should not be	past.	"Unable to Schedule	
in the past		Job".(Figure 5.3)	
Save details	Enter acceptable data.	Message saying	As expected
		"Record saved	
		successfully".	
View status of	Click on "Check status	Requests should be	As expected
Home-Visit requested	of Home-Visit	displayed.	
	schedule" on		
	Customer Profile		
	Page.		

Figure 5.3 shows the error displayed when "Date of Repair" is in the past.

Unable to Schedule Job. Selected Date for Repair is in the past.

Figure 5.3 Date in past error

Table 5.7 below shows the Test Cases for checking status of repair items handed-over to the shop. The customer can check the status of repair items through his/her profile page.

Table 5.7 Test Cases for Checking Status of Handed-over Repair Items

Test Case Description	Input	Expected Result	Output
View Status of	Click on" Check	Repair item details	As expected
Accepted Repairs	Status of Repair" on	with status should be	
	customer profile page.	displayed.	

Table 5.8 shows the Test Cases for De-Activating and Re-activating Account. (This feature is only for Customers and Suppliers.)

Test Case Description	Input	Expected Result	Output
De-activate Account	Click on" De-activate	Account status is	As expected
	My Account" on	changed to	
	Profile Page.	"De-activated".	
		User cannot access	
		Profile Page".	
Re-activate Account	Enter Log In details	A link will appear	As expected
	and click "Log in".	requesting user to	
		click it, if they want to	
		re-activate.	
		When they click it, the	
		account is activated	
		again, and they are	
		redirected to their	
		profile page.	

Table 5.8 Test Cases for De-activating and Re-activating Account

Table 5.9 below shows the Test Cases for registering items and updating them. The DEO is the employee responsible for registering items and updating them.

Table 5.9 Test Cases for Registering and Updating Items

Test Case Description	Input	Expected Result	Output
View Register Items	Click "Register Items"	"Register items"	As expected
interface	on DEO profile page.	interface should	
		appear.	
Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled.	

Save details	Enter acceptable data.	Message saying	As expected
		"Record saved	
		successfully".	
Prevent uploading	Try to upload a word	Error message saying	As expected
image of incorrect	document	file type is not allowed	
format			
Updating details	Click "Update Items"	Message saying "	As expected
	on profile page.	Record was updated"	
	Make necessary		
	changes and click		
	"Update"		

Table 5.10 below shows the Test Cases for Accepting Repairs at shop. The DEO is the employee responsible for accepting repairs at the shop.

Table 5.10 Test Cases for Accepting Repairs at Shop

Test Case Description	Input	Expected Result	Output
View Accept Repairs	Click "Accept	Accept Repairs	As expected
interface	Repairs" on DEO	interface should be	
	profile page and click	displayed.	
	"Add Job" on a row.		
Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled.	
Accept Date selected	Enter date in past	Error message saying	As expected
should not be in the		accept date should be	
past		today.(Figure 5.4)	
Return Date should be	Enter date in past	Error message saying	As expected
in the future		return date should be	
		in the future(Figure	
		5.5)	

Advance paid should	Enter a amount greater	Error message saying	As expected
not be more than total	than total cost	advance is	
cost		greater.(Figure 5.6)	

Accepted date should be today. Unable to Add Job.

Figure 5.4 Accept Date error

The Return Date should be in the future.Unable to Add Job.

Figure 5.5 Return Date error

Advance paid is greater than Total Cost. Unable to Add Repair Job.

Figure 5.6 Advance paid error

Table 5.11below shows the Test Cases for Updating accepted repairs at shop. The DEO and technician are responsible for updating repairs accepted at the shop.

Table 5.11	Test Cases	for	Updating	Accepted	Repairs at	Shop
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Test Case Description	Input	Expected Result	Output
View details of a	Click" Update Repair	Separate page with the	As expected
repair item accepted at	Items" in	respective item details	
shop	DEO/Technician	should appear.	
	Profile Page.		
	Click "Update" on the		
	row of the item you		
	wish to update.		
Return Date should be	Enter date in past	Error message saying	As expected
updated to a future		date should be in	
date		future	
Status should be	Select an option from	E-mail should be sent	As expected
updatable and e-mail	status menu and click	according to selected	
should be sent to	"Update Item".	"Status".	
customer			

Table 5.12 below shows the Test Cases for Scheduling a requested home-visit repair. The employee responsible for scheduling a requested home-visit repair is the DEO.

Test Case Description	Input	Expected Result	Output
Requests for	Click" Schedule	Unscheduled Requests	As expected
home-visits should be	Home Visit Repairs"	should be displayed.	
listed.	on DEO Profile Page.		
When the DEO clicks	Click" Update" on the	All scheduled and	As expected
on "Update" in a	respective record to be	unscheduled requests	
record of a specific	scheduled.	with the same date as	
date, all scheduled and		the selected record	
unscheduled requests		will be displayed.	
on that day should be			
displayed.			
Check if a technician	Click" Update" on the	The selected	As expected
is available to	respective record to be	technician's last job	
schedule the job.	scheduled and select a	details with end time	
	technician in the	will be displayed.	
	resulting interface and	(if any)	
	click "Search".		
Start Time for the new	Select Status of the job	Start Time is updated	As expected
repair job should be	and the Technician.	as 2 hours from last	
automatically	Click "Update	job's end time(if any).	
recorded as 2 hours	Home-Visit	If the technician does	
later from last job's	Schedule".	not have any jobs on	
end-time.		that day, Start time is	
(if the technician has		set to 9.00AM.	
any jobs on that day).			

Table 5.12 Test Cases for Scheduling a Requested Home-visit Repair

Jobs cannot be added	Select Status of the job	Error Message saying	As expected
if newly assigned	and the Technician.	that time slots are full.	
StartTime is later than	Click "Update	(Figure 5.7)	
6.00PM.	Home-Visit		
	Schedule".		
	Select Status of the job	The number of hours	As expected
EndTime for the Job	and the Technician.	for the repair should	
must be set by the	Click "Update	be added to the	
system	Home-Visit	StartTime and set as	
	Schedule".	the EndTime	
Save details	Enter acceptable data.	Message saying	As expected
		"Record saved	
		successfully".	

Time slots for the selected technician are full.

Figure 5.7 Slots full message

Table 5.13 below shows the Test Cases for viewing home-visit schedules (within a selected period). The employee responsible for viewing home-visit schedules is the DEO.

Table 5.13 Test (Cases for V	/iewing Home-	visit Schedules	(within a selected	period)
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Test Case Description	Input	Expected Result	Output
View interface to	Click "View	The interface to select	As expected
select dates.	Home-Visits" on DEO	the dates should	
	profile page.	appear.	
Two dates should be	Click" Search"	Error message	As expected
selected	without selecting two	requesting two dates	
	dates	to be selected	

Display schedules	Clicking on "Search"	Records between the	As expected
within two dates	after selecting two	two dates should be	
	dates.	displayed.	

Table 5.14 below shows the Test Cases for Viewing repair jobs. A technician should be able to view his repair jobs through his profile page.

Test Case Description	Input	Expected Result	Output
View all repair jobs	Click" View Repair	All repair jobs	As expected
relevant to the logged	Jobs" on Technician's	(relevant to the logged	
in technician.	profile page.	in technician)without	
		jobs with status	
		"Delivered" should be	
		displayed.	
View job details for a	Click "Update" on a	Details of the selected	As expected
selected row.	row.	repair job will be	
		displayed on a new	
		page.	
The status of the job	Change status and	Job status should be	As expected
should be updatable.	click update on the	updated and the new	
	repair job's detail	status should be	
	page.	reflected in the	
		Customer's Profile	
		Page as well as the	
		Technician's page.	
View all Home-visit	Click" View	All repair jobs	As expected
Repair jobs scheduled	Home-Visit Repair	(relevant to the logged	
relevant to the logged	Jobs" on Technician's	in technician)will be	
in technician.	profile page.	displayed.	

Table 5.14 Test Cases for Viewing Repair Jobs for a Technician

Table 5.15 below shows the Test Cases for Viewing and updating Suppliers. The employee responsible for viewing and updating suppliers is the manager.

Test Case Description	Input	Expected Result	Output
View all Suppliers	Click" View	All Suppliers will be	As expected
	Suppliers" on	displayed.	
	Manager's profile		
	page.		
Activate Suppliers	Click "Update" on the	Details for the selected	As expected
who have requested to	respective row.	supplier should be	
be suppliers so that		displayed on the	
they can access the		relevant page.	
profile page.		Manager should be	
		able to change	
		"Status" to	
		"Activated".	
Changing Supplier	Click "Update" on the	Details for the selected	As expected
Details	respective row of the	supplier should be	
	supplier.	displayed on a	
		separate page.	
		Manager should be	
		able to change	
		supplier details.	
Delete Supplier	Click "Delete" on the	Supplier should not be	As expected
	respective row.	able to log in now.	

Table 5.15 Test Cases for Viewing and Updating Suppliers

Table 5.16 shows the Test Cases for Viewing items that suppliers have proposed to supply and for the manager to mark those items as registered.

Test Case Description	Input	Expected Result	Output
View all pending	Click "View Pending	All pending items will	As expected
items	Items" on Manager's	be displayed.	
	profile page.		
Register pending	Click "Register Item"	The status of the item	As expected
items	on the respective row.	in the "Items" table	
		should change to	
		"Registered".	
1	1		1

Table 5.16 Test Cases for Viewing Pending Items and Registering them

Table 5.17 below shows the Test Cases for Sending requests to suppliers. The manager is the employee responsible for sending requests to suppliers.

Table 5.17 Test Cases	for Sending	Requests to Suppliers
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Test Case Description	Input	Expected Result	Output
View all items with	Click" Send Requests	Items with quantity	As expected
quantity less than 15	to Suppliers" on	less than 15 will be	
	Manager's profile	displayed.	
	page.		
Request Supplies	Click "Update	Details of the selected	As expected
	Requests" on the	item will be displayed	
	respective row.	on a new page.	
Send Request	Select "Date	Message saying	As expected
	Required" and enter	"Request was saved	
	"Quantity Needed"	successfully" appears.	
	and click "Request" on		
	the respective item's		
	page.		

Date Required should	Select a date in the	Message saying "The	As expected
be in the future.	past as "Date	date the order is	
	required"	required should be in	
		the future" appears.	
		(Figure 5.8)	

The date the order is required should be in the future.

Figure 5.8 Date in past for date- required error

Table 5.18 below shows the Test Cases for viewing order status and sending invoices to confirmed orders. The manager is responsible for viewing order status and sending invoices to confirmed orders.

Test Case Description	Input	Expected Result	Output
View all orders	Click" Send Invoice"	All orders will be	As expected
	on profile page,	displayed	
Send Invoice	Click "Send Invoice"	The Invoice will be	As expected
	on the respective row	generated.	
	if the Scheduled Status		
	of that item is set as		
	"Confirmed".		

Table 5.18 Test Cases for Viewing Order Status and Sending Invoices to Confirmed Orders

Table 5.19 shows the Test Cases for Viewing one day reports for repair item payments. The manager is the employee who can view this report.

Test Case Description	Input	Expected Result	Output
Interface to view	Click "One day repairs	Interface to select a	As expected
repair payments on a	report" on Manager's	date should appear.	
day	profile page.		
Date should be	Click "Search"	Error message	As expected
selected	without selecting a	requesting to select a	
	date.	date appears.	
View Repair	Click "Search" after	Payment details will	As expected
Payments	selecting a date.	appear with grand	
		total	

Table 5.19 Test Cases for Viewing One day Repair Payment Reports

Table 5.20 below shows the Test Cases for Viewing reports for repair item payments(within a selected period). The manager can view this report.

Test Case Description	Input	Expected Result	Output
Interface to select	Click "View Repairs	Interface to select	As expected
dates	Report" on Manager's	dates should appear.	
	profile page.		
Dates should be	Click "Search"	Error message	As expected
selected	without selecting both	requesting to select	
	dates.	two dates should	
		appear.	
View Repair	Click "Search" after	Payment details (for	As expected
Payments	selecting two dates.	the selected period)	
		will appear with grand	
		total	

Table 5.20 Test Cases for Viewing Repair Payment Reports (within a selected period)

Table 5.21 below shows the Test Cases for Viewing reports for purchase payments(within a selected period). The manager should be able to view this report.

Test Case Description	Input	Expected Result	Output
Interface to select	Click "View Purchase	Interface to select	As expected
dates	Report" on Manager's	dates should appear.	
	profile page.		
Dates should be	Click "Search"	Error message	As expected
selected	without selecting both	requesting to select	
	dates.	two dates appears.	
View Purchase	Click "Search" after	Payment details (for	As expected
Payments	selecting two dates.	the selected period)	
		will appear with grand	
		total	

Table 5.21 Test Cases for Viewing Purchase Payment Reports (within a selected period).

Table 5.22 below shows the Test Cases for Supplier Registration and Supplier Personal Detail Updating.

Table 5.22 Test Cases for Supplier Registration and Supplier Personal Detail Updating

Test Case Description	Input	Expected Result	Output
View supplier	Click "Register as a	Supplier Registration	As expected
registration page.	Supplier".	interface should	
		appear.	
Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled.	
Contact No entered	Enter more/less no of	Error message saying	As expected
should be limited to 10	digits than ten digits	number entered cannot	
digits		be accepted.	
E-Mail entered should	Enter incorrect e-mail	Error message saying	As expected
be a valid e-mail		e-mail address entered	
		is invalid.	

E-Mail entered should	Enter e-mail of an	Error message saying	As expected
not exist in the "Users"	already existing	e-mail address entered	
Table.	account	is in use and asks to	
		register with another	
		e-mail.	
Password and confirm	Enter different values	Error message saying	As expected
password fields should	for password fields.	passwords do not	
match		match.	
Save details in to	Data acceptable by the	Message saying	As expected
"Suppliers" and "Users" Tables	system	"Record saved successfully"	
Update allowed Personal Details	Log in to the Profile Page. Click "Update Personal Details" in the menu. Change details and click "Update Personal Details" button.	Message saying "The record was updated".	As expected

Table 5.23 below shows the Test Cases for Suppliers to save items that they are willing to supply.

Table 5.23 Test Cases for Supplier to Save Items

Input	Expected Result	Output
Click" Save supply	Interface to make	As expected
items" on Supplier's	requests to supply	
profile page.	supplies should	
	appear.	
Leave required field	Error message	As expected
empty	requesting fields to be	
	filled	
	Input Click" Save supply items" on Supplier's profile page. Leave required field empty	InputExpected ResultClick" Save supplyInterface to makeitems" on Supplier'srequests to supplyprofile page.supplies shouldappear.appear.Leave required fieldError messageemptyrequesting fields to befilled

Save details	Enter acceptable data.	Message saying	As expected
		"Record saved	
		successfully".	

Table 5.24 below shows the Test Cases for Supplier to Confirm orders

Table 5.24 Test Cases for Supplier to Confirm Orders

Test Case Description	Input	Expected Result	Output
View requests by	Click "Confirm	Orders should be	As expected
manager	Requests for supplies"	displayed.	
	on the Supplier's		
	profile page		
View details of a	Click "update" on a	Details of the selected	As expected
selected order to	selected row.	record will be	
confirm		displayed on a	
		separate page.	
Confirm Order	Select date that item	Message saying	As expected
	can be supplied, the	"Request was	
	quantity that can be	confirmed	
	supplied and click"	successfully" appears.	
	Update".		

Table 5.25 below shows the Test Cases for Employee category registration and updating. The administrator is responsible to add and update employee categories.

Table 5.25 Test Cases for Employee Category Registration and Updating

Test Case Description	Input	Expected Result	Output
	Click "Add Employee	Page to enter details	As expected
Add an employee	Category" on Admin	should appear.	
category	profile page.		

Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled.	
Save details	Enter acceptable data.	Message saying	As expected
		"Record saved	
		successfully".	
Search for an	Click on "Update	Details of selected	As expected
employee category to	Employee category"	category should	
update	on Admin profile	appear.	
	page.		
	Select the category		
	you wish to update		
	and click "Search".		
Update Employee	Make the necessary	Message appears	As expected
category details	changes and click	saying "Record was	
	"Update category".	updated".	

Table 5.26 below shows the Test Cases for Employee registration and updating. The administrator is responsible for employee registration and updating.

Table 5.26 Test Cases for Employee Registration and Updating

Test Case Description	Input	Expected Result	Output
View interface to	Click "Register	Employee	As expected
register employees.	Employee" on Admin	Registration interface	
	profile page.	should appear.	
Validate if all required	Leave required field	Error message	As expected
fields are entered	empty	requesting fields to be	
		filled.	

Contact No entered	Enter more/less no of	Error message saying	As expected
should be limited to 10	digits than ten digits	number entered cannot	
digits		be accepted.	
E-Mail entered should	Enter incorrect e-mail	Error message saying	As expected
be a valid e-mail		e-mail address entered	
		is invalid.	
E-Mail entered should	Enter e-mail of an	Error message saying	As expected
not exist in the "Users"	already existing	e-mail address entered	
Table.	account	is in use and asks to	
		register with another	
		e-mail.(Figure 5.9)	
Date of birth entered	Enter a date in the		As expected
should not be in the	future as date of birth.	Error message as	
future.		shown in Figure 5.10	
Date joined cannot be	Enter a date in the	Error message shown	As expected
a date in the future.	future as date joined.	in Figure 5.11.	
Password and confirm	Enter different values	Error message saying	As expected
password fields should		passwords do not	
match		match.	
Save details in to	Data acceptable by the	Message saying	As expected
"Employees" and	system	"Record saved	
"Users" Tables.		successfully".	

There is another account with this email.Please use another e-mail address to register.

Figure 5.9 Existing e-mail error

Unable to save details. You have selected a day in the future as Date of Birth.

Figure 5.10 Date of birth error

Unable to save details. The Employee Joined date cannot be in the future.

Figure 5.11 Employee joined date error

Table 5.27 below shows the Test Cases for Updating customer details. The administrator can update customer details at their request.

Table 5.27 Test Cases for Updating Customer Details

Test Case Description	Input	Expected Result	Output
View all customer	Click "View	All registered	As expected
details	Customers" on Admin	customers should	
	profile page.	appear.	
Viewing customer	Click "update" on the	Details of the	As expected
details of a selected	respective row of the	customer should	
customer	customer.	appear in a separate	
		page.	
Updating customer	Make the necessary	Message saying	As expected
details of a selected	changes and click	"updation successful'	
customer	"update".	should appear.	
Deleting a customer	Click "Delete" on the	Message saying	As expected
	respective row of the	"Record was deleted'	
	customer.	should appear.	

Table 5.28 below shows the Test Cases for Updating personal details. All users can update their personal details.

Table 5.28 Test Cases for Updating Personal Details

Test Case Description	Input	Expected Result	Output
View Personal Details	Click "Update	Details of the user	As expected
	Personal Details" on	logged in should	
	profile page.	appear.	

Updating details	Make the necessary	Message saying	As expected
	changes and click	"Updation Successful"	
	"Update".	appears.	

Table 5.29 below shows the Test Cases for Change Password.

 Table 5.29 Test Cases for Change Password

Test Case Description	Input	Expected Result	Output
View Change	Click "Change	Change Password	As expected
Password Interface	Password" on profile	interface should	
	page.	appear.	
New password and	Enter values less than	Error message in	As expected
confirmed password	8 digits to password	Figure 5.12 appears.	
should be at least 8	fields.		
digits.			
New Password entered	Enter different values	Error message in	As expected.
should match with	to "new password"	Figure 5.13 appears.	
entered confirm	and "confirmed		
password.	password".		
should match with entered confirm password.	to "new password" and "confirmed password".	Figure 5.13 appears.	

The NewPassword field must be at least 8 characters in length.

The ConfirmPassword field must be at least 8 characters in length.

Figure 5.12 Password length error

The ConfirmPassword field does not match the NewPassword field.

Figure 5.13 Passwords do not match error

Table 5.30 below shows the Test Cases for Online shopping.

Test Case Description	Input	Expected Result	Output
The products should	Load the homepage or	Products will be listed	As expected
be displayed with	click "Purchase Items"		
product details	on customer profile		
	page.		
The products should	Click "Add Item" on	Product will be shown	As expected
be added to the	the product.	in shopping cart.	
shopping cart			
Add more than one	Click "Add More	Customer should be	As expected
item	Items" on the	redirected to the	
	shopping cart.	products view and	
		another item should be	
		added to the cart when	
		the customer clicks	
		"Add Item" again.	
Shopping cart should	More products should	Cart should show	As expected
display more than one	be added to the	multiple items.	
product.	shopping cart.		
Total Cost of products	Add multiple products	Cart total should be	As expected
selected should appear	to cart.	displayed.	
in cart.			
Remove products	Click the remove	Confirmation message	As expected
from cart.	button on the	to delete the product	
	respective row in the	should appear.	
	cart.	When confirmed,	
		product should be	
		deleted from cart.	

Table 5.30 Test Cases for Online Shopping

Customer should	Click "Check out" on	Customer registration	As expected
register if customer	cart.	form should appear.	
has not already logged			
in.			
Customer should be	If the customer has not	Order confirmation	As expected
able to place the order.	already logged in,	details should appear.	
	customer should enter		
	details to register and		
	click "Place Order".		
Order confirmation	Click "Check out".	Order confirmation	As expected
details should appear		details should appear.	
for a customer who is			
already logged in.			

Table 5.31 below shows the Test Cases for the Search functionality on the Hompage to search for product items by entering keywords.

Table 5.31 Test Cases for Search for Products

Test Case Description	Input	Expected Result	Output
View products by	Enter key words and	Products which	As expected
searching by product	click "Search".	contain the keywords	
name.		in Product Name will	
		be displayed.	

Table 5.32 shows the Test Cases for Shopping Cart Order Management.

Test Case Description	Input	Expected Result	Output
View all Shopping	Click "Sales Orders"	An interface with all	As expected
Cart orders	on DEO profile page.	Shopping Cart orders	
		will be displayed.	
Update an Order	Click "Update Order	The details of the	As expected
Status to "Delivered".	Status" on the	selected order will be	
	respective row in	displayed on a	
	"Sales Orders"	separate page. Change	
	interface.	the "Status" to	
		"Delivered" and click	
		"Update Status".	
Generate Invoice	Click "Generate	The invoice will be	As expected
	Invoice" on the	displayed.	
	respective row in		
	"Sales Orders"		
	interface.		

Table 5.32 Test Cases for Shopping cart Order Management

Table 5.33 below shows the Test Cases for View Warranty details.

Table 5.33 Test Cases for View Warranty Details

Test Case Description	Input	Expected Result	Output
View Warranty	Click "Warranty	The Warranty expiry	As expected
Details	Details" on Customer	dates of all purchased	
	Profile Page.	items will be shown.	

Table 5.34 below shows the Test Cases for the Homepage.

Test Case Description	Input	Expected Result	Output
Log in	Click "Log in" on the	Log in form should be	As expected
	navigation bar.	displayed.	
Register Customer	Click "Register	Customer registration	As expected
	Customer" on the	form should be	
	navigation bar.	displayed.	
Register Supplier	Click "Register	Supplier registration	As expected
	Supplier" on the	form should be	
	navigation bar.	displayed.	
Send message to	Click "Contact Us" on	Contact us form	As expected
Antenna House	the navigation bar.	should be displayed.	

Table 5.34 Test Cases for the Homepage.

5.4 Evaluation

The system was successfully implemented to meet the identified requirements. Customer management, Supplier management, Employee management, Repair Management, Sales Management, Leave Management were successfully addressed. Report generation for informed decision making was also implemented.

Even though there were some instances where the design had to be changed to improve the quality of the design, the overall objectives of implementing the system were achieved. More details of future work to be carried out and problems encountered are discussed in Chapter 6.

5.4.1 User Evaluation

The system was demonstrated to the owner of Antenna House and he was asked to provide his feedback using the questionnaire shown below in Figure 5.14. The owner expressed his satisfaction of the design and functioning of the system.

Acceptance testing will be conducted as soon as the situation permits, and the users of the system will be given an opportunity to provide their feedback.

USER EVALUATION FORM

Please tick the correct column to show your satisfaction of the features of the implemented system.

Feature	Excellent	Good	Poor
Customer Management		~	
Employce Management		V	
Supplier Management		~	
Sales Management		1	
Repair Management		~	
Leave Management		1	
Reports		~	

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Proprietor

Antenna House

Figure 5.14 User Evaluation Form

Chapter 6 - Conclusion

This chapter discusses lessons learnt, future work to be carried out and problems encountered in the system development.

6.1 Lessons learnt

Throughout the development process, I gained the valuable experience of working with new technologies such as bootstrap, xampp server and codeigniter. I learnt how to gather requirements, analyze them, and draw UML diagrams to design the system. I also learnt how to plan, schedule, monitor and control a software development process.

6.2 Future work to be carried out

- A payment gateway to support online payments could be implemented.
- Employee pay slips at the end of each month could also generated through the system and employee payment management could be facilitated.
- Measures can be taken to see if an online e-commerce platform like "Open Cart" could be integrated with the present system.

6.3 Problems encountered

- The employees and owners of Antenna House were very busy with their day to the day work and it was difficult to find time to question them during system analysis.
- The employees and owners are all not computer-literate so measures will have to be taken to train them.
- I have had no previous experience in web designing and the technologies I used for the development were totally new to me. This issue was resolved using the knowledge that I gained by following the subject of "Agile Development" in Semester 2 and by referring to web-sites. The coding taken from (Codexworld, 2020) to implement the shopping cart had to be modified to suit my system.

However, the functional and non-functional requirements were implemented successfully according to the user's needs. Customer Management, Supplier Management, Employee Management, Sales Management, Repair Management and Leave Management modules are now functioning as intended.

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APPENDIX A –System Manual

Hardware and Software Requirements

- A computer with at least 4.00 GB RAM and processor speed 1.8 GHz is needed.
- XAMPP Server ,codeigniter,bootstrap have to be installed for development. The system runs on Microsoft Edge or Google Chrome browsers.

APPENDIX B – Design Documentation

A few important tables designed in the database(other than those included in Section 3.4) are shown below.

Figure B.1 below is the Customer Table. CustomerID is the primary key.

CustomerID	FirstName	LastName	Address	ContactNo	Email	Created	Modified
1	Ann	Perera	23, Bodhi Mawatha, Kelaniya	771234567	AnnPerera@gmail.com	2021-07-11	2021-07-11
2	Peter	Perera	12, Flower Road, Colombo	771234568	PeterPerera@gmail.com	2021-07-11	2021-07-11
42	Ginny	Weasely	Colombo 1	771234569	Ginny@gmail.com	2021-07-11	2021-07-11
43	Janani	Perera	Colombo	771234566	Janani@gmail.com	2021-07-11	2021-07-11

Figure B.1 Customer Table

Figure B.2 below shows the Employee Categories Table. CatID is the primary key.

CatID	CatName	Salary	FullDays	HalfDays	ShortLeave
1	DEO	20000	3	2	2
2	Technician	<mark>45000</mark>	3	2	4
3	Manager	35000	4	2	3
4	Administrator	45000	3	2	3

Figure B.2 Employee Categories Table

Figure B.3 below shows the Employees Table. EmpID is the primary key and CatID is a foreign key.

EmpID	FirstName	LastName	NIC	Address	ContactNo	Gender	DateOfBirth	DateJoined	Email	CatID
21	Gemma	Perera	12345676	Colombo 7	771234567	Female	2013-04-29	2021-04-05	gemma@gmail.com	1
22	Andy	Perera	12345678	Colombo	771234569	Male	2010-04-03	2021-04-05	Andy@gmail.com	2
23	Fred	Weasely	12345678	Colombo	771234567	Male	<mark>1981-</mark> 04-07	2021-04-07	Fred@gmail.com	4
24	Ron	Weasely	12345678	Colombo	771234569	Male	2003-03-07	2021-04 <mark>-0</mark> 7	Ron@gmail.com	3
25	Percy	Weasely	12345678	Colombo 7	771234565	Male	2008-02-07	2021-04-07	Percy@gmail.com	1

Figure B.3 Employees Table

FaultID	ItemName	Fault	TotalCost	TimeToRepair
1	TV	No Display	2000	04:00:00.000000
2	TV	Blurred Images	2000	04:00:00.000000
3	DVD Player	Does not switch on	1500	03:00:00.000000
6	Camera	Flasher	1500	02:00:00.000000

Figure B.4 below shows the Faults Table. FaultID is the primary key.

Figure B.4 Faults Table

Figure B.5 below shows the "RepairItems" table. RepairID is the primary key and FaultID is a foreign key.

RepairID	CustomerID	FaultID	Description	ContactNo	AcceptDate	ReturnDate	Warranty	TotalCost	AdvancePaid	Balance	EmpID	Status
111	1	1	Sony Large TV	771234567	2021-06-17	2021-06-20	Yes	0	0	0	22	Accepted
112	2	3	Sony	771234568	2021-06-17	2021-06-18	No	1500	200	1300	22	Accepted
113	42	2	Singer	771234569	2021-06-17	2021-06-17	No	2000	0	2000	27	Delivered
114	2	2	Samsung	771234568	2021-06-17	2021-06-17	Yes	0	0	0	22	Delivered
115	42	2	Sony	77 <mark>123</mark> 4569	20 <mark>21-06-</mark> 17	2021-06-20	Yes	0	0	0	22	Accepted

Figure B.5 RepairItems Table

Figure B.6 below shows the "Shoprepairpayments" Table used to record payments for repairs accepted at the shop. InvoiceNo is the primary key and RepairID, FaultID, CustomerID and UserID are foreign keys. UserID is the UserID of the DEO who accepts the payment.

InvoiceNo	RepairID	FaultID	Payment	CustomerID	Date	UserID
80	111	1	0	1	2021-06-17	63
81	112	3	200	2	2021-06- <mark>1</mark> 7	63
82	113	2	0	42	2021-06-17	63
83	113	2	2000	42	2021-06-17	63
84	114	2	0	2	2021-06-17	63
85	114	2	0	2	2021-06-17	63
86	115	2	0	42	2021-06-17	63

Figure B.6 ShopRepairPayments Table
APPENDIX C- User Manual

HomePage

Figure C.1 below shows the HomePage.



Figure C.1 HomePage

When "Register as a Customer" is clicked on the navigation bar in Figure C.1, the Customer Registration page shown below in Figure C.2 will appear.

Go back to Profile Page

	Register Customer
FirstName:	Peter
LastName:	Perera
Address:	Colombo
Contact Number:	123456789
E-mail: (Username)	Peter@gmail.com
Password:	******
Re-enter Password:	••••••
Category:	Customer
Register	

Figure C.2 Customer Registration Interface

When "Register as a Supplier" is clicked on the navigation bar in Figure C.1,the Supplier Registration page shown below in Figure C.3 will appear.

Go back to Profile Page

	9
FirstName:	Ann
LastName:	Perera
Supplier Name:	ABC Company
Address:	Colombo
LandLine:	01121234567
Mobile No:	123456789
E-mail: (Username)	Ann@gmail.com
Password:	******
Re-enter Password:	•••••

Reaister Supplier

Figure C.3 Supplier Registration Interface

Figure C.4 below shows how the items for sale are displayed on the homepage.



Figure C.4 Display of Items for Sale

You can add items from the homepage product list to the shopping cart. Whenever, you click "Add Item" on a product, the shopping cart will be displayed.

Figure C.5 below shows the shopping cart with three products selected.

Pr	oduct	Price	Quantity	Subtotal
Ar	itenna	Rs.2500	1	Rs.2500
Pc	rtable Bluetooth Speaker	Rs.2000	1	Rs.2000
Ou	utdoor Wireless Speaker	Rs.3000	1	Rs.3000
			Caret Tatal	P- 7500

Figure C.5 Shopping Cart Interface

When you click "Check out" in the above interface, the interface shown in Figure C.6 is displayed if the customer is unregistered and has not logged in. This interface is skipped if customer has logged in.

Go back		
CHECKOUT		
Contact Details	Items in Your Cart:	3
FirstName		Rs.2500
Peter	Antenna	
LastName	Rs.2500(1)	
Perera		Rs.2000
Address	Portable Bluetooth Speaker	
Colombo	13-2000(1)	
ContactNo		Rs.3000
0771234567	Outdoor Wireless Speaker Rs.3000(1)	
Email	Total	Rs.7500
Peter@gmail.com		
New Order	Add More Items	
Place Order		

Figure C.6 Customer Registration for Placing an Order Interface

Figure C.7 below shows the order confirmation message which appears upon the successful completion of the ordering process.

ORDER	STATUS			
Your order has been Order Info	placed successfully.			
Reference ID: #51				
Total: Rs.7500				
Placed On: 2021-0	7-16			
Buyer Name: Peter				
Email: Peter@gma	il.com			
Phone: 771234567				
Model No	Product	Price	Quantity	Sub Total
BA-23456	7 Antenna	Rs.2500	1	Rs.2500
SRS-XB4	Portable Bluetooth Speaker	Rs.2000	1	Rs.2000
GJK-PG10	Outdoor Wireless Speaker	Rs.3000	1	Rs.3000
Fig	ure C.7 Order confirm	ation p	age	

Figure C.8 below shows the Contact Us page.

Go back to Home	age	
		Contact Us
	FirstName:	Peter
	LastName:	Perera
	Subject:	Great Work!
	Contact Number:	123456789
	E-mail:	Peter@gmail.com
	Submit	

Figure C.8 Contact Us page

<u>Log In</u>

Figure C.9 below shows the Log in form. The users have to enter their login details and an error message is displayed if login details are not valid.

Log In		
Enter Email	Percy@gmail.com	
Enter Password	•••••••	
Login		

Figure C.9 Log in Interface.

If the login details are valid, the user is directed to the relevant Profile Page.

Change Password

Click "Change Password" on the profile page and the interface shown in Figure C.10 will appear.

Welcome Percy Weasely Logout			
DEO Profile Pag	ge		
Update Personal Details		Change Password	
Register Products For Sale	Existing Password:	******	
Upload Item Image	New Password:	•••••	
View Products For Sale	Confirm New Decements		
Register Items	Commit New Password.	••••••	ି
Register Customer	Update Password		

Figure C.10 Change Password Interface

DEO Profile Page

Figure C.11 below shows the DEO profile page.

Welcome Percy Weasely Logout

DEO Profile Page

Update Personal Details	Update Personal Details			
Register Products For Sale	Employee ID:	25		
Upload Item Image	FirstName:	Percy		
View Products For Sale	LastName:	Weasely		
Register Items	NIC Number:	823456784V		
Register Customer	Address:	Colombo 8		
Register Faults	ContactNo:	771234565		
View Faults	Gender:			
Accept Repair Items		Male		
Update Repair Items	Date-Of-Birth:	2/7/2008		

Figure C.11 DEO Profile Page

The functions that can be performed by the DEO are listed below.

• Update Personal Details

Click on "Update Personal Details" on the DEO profile page, and the interface shown in Figure C.11 will appear. Make the necessary changes and click on "Update My Details".

• Register Products for Sale

Click on "Register Products for Sale" on the DEO profile page, and the interface shown in figure C.12 will appear. Enter the product details and click" Add Item".

Welcome Percy Weasely Logout

Update Personal Details	Register Products For Sale		
Register Products For Sale	Model No:	SR-345	
Upload Item Image	Product Name:	Remote Controller	
View Products For Sale	Product Brand:		
Sales Orders		Sony	
Register Items	Unit Price:	3000	
Register Customer	Quantity:	10	
Register Faults			
View Faults	1 year	~	
Accept Repair Items	Add Item		

Figure C.12 Register Products for Sale Interface

• Upload Item Image

Click on "Upload Item Image" on the DEO profile page, and the interface shown in figure C.13 will appear.

1.Select the Model No.

2.Click "Browse" and select the image.

3.Click "Upload".

Welcome Percy Weasely Logo	ut	
DEO Profile	Page	
Update Personal Details	Upload Image for Sale Items	
Register Products For	ModelNo	
Sale	BA-234567	~
Upload Item Image		
	Browse upload	

Figure C.13 Upload Image Interface

• View Products for Sale

Click on "View Products for Sale" on the DEO profile page, and the interface shown in figure C.14 will appear.

DFO Profile Page	2							
Update Personal Details		Produ	ucts Reg	gisterd	For Sa	le		
Register Products For Sale	ModelNo	Product Name	Product Brand	Product Price	Quantity	Warranty	Delete	Update
Upload Item Image View Products For Sale	1-XS1605	Single Burner Gas Cooker	Abans	5990	22	1 year	Delete	Update
Sales Orders	AC06TR1	Rice Cooker	Abans	4190	16	1 year	Delete	Update
Register Items	BA-234567	Antenna	Batapola	2500	46	6 months	Delete	Update

Figure C.14 View Products Registered for Sale Interface

You can update product details by clicking "Update" on the respective row. You will be directed to the respective page as shown below in Figure C.15. Make the changes and click "Update".

DEO Profile Page							
Update Personal Details Register Products For	Model No:	BA-234567					
Sale	Product Name: Antenna						
Upload Item Image View Products For Sale	Product Brand:	Batapola					
Sales Orders	Unit Price:	2500					
Register Items	Quantity to be added:	20 ×					
Register Customer	Warranty:	6 months					
Register Faults	Undate Item						
VIEW I duits	opure tem						



• Register Customer without an E-mail account

By clicking on "Register Customer" on the DEO profile page, the DEO can save details of a customer without an e-mail address. The interface shown in Figure C.16 would appear. Note: This customer would not be able to login through the "Log in" interface. However, he/she can activate the account later by informing the administrator.

Welcome Percy Weasely Logo	put	
DEO Profile	Page	
Update Personal Details Register Products For	Go back to HomePage	Register Customer
Sale Upload Item Image	FirstName:	Tom
View Products For Sale	LastName:	Perera
Sales Orders	Address:	Colombo
Register Items	Contact Number:	0711234567 ×
Register Customer		
Register Faults	E-mail: (Username)	

Figure C.16 Register Customer without an e-mail account

• Register Faults for Items Repaired at the shop

Click on "Register Faults" on the DEO profile page, and the interface shown below in Figure C.17 will appear. Enter the details and click "Add Fault".

DEO Profile Pag	je		
Update Personal Details		Register Faults	
Register Products For Sale	Item Name:	TV	
Upload Item Image	Fault:	No Display	
View Products For Sale Sales Orders	Total Cost:	2000	
Register Items	Select No of hours for repai	n	
Register Customer	01:00:00.000000		~
Register Faults	Add Fault		

Figure C.17 Add Fault Interface

• View, Update and Delete Fault Details

Click on "View Faults" on the DEO profile page, and the interface shown in Figure C.18 will appear.

Welcome Percy Weasely Logout

DEO Profile Page

Update Personal Details			Viev	v Fault	S		
Register Products For Sale	FaultID	ItemName	Fault	TotalCost	TimeToRepair(Hours)	Update	Delete
Upload Item Image	1	TV	No Display	2000	04:00:00.000000	Update	Delete
View Products For Sale	2	TV	Blurred Images	2000	04:00:00.000000	Update	Delete
Sales Orders	3	DVD Player	Does not switch on	1500	03:00:00.000000	Update	Delete
Register Items	6	Camera	Flasher	1500	02:00:00.000000	Update	Delete
Register Customer	9	Remote Controller	Buttons do not work	1500	01:00:00.000000	Update	Delete
Register Faults							

Figure C.18	View	Faults	Interface
-------------	------	--------	-----------

Click "Update" on a particular row and you will be directed to the respective page. Make the necessary changes and click "Update Fault".

You can also delete a fault record by clicking "Delete".

• Accept Repair Items

Click on "Accept Repair Items" on the DEO profile page, and the interface shown below in Figure C.19 will appear.

FaultID	ItemName	Fault	TotalCost	TimeToRepair(Hours)	AddJob
1	TV	No Display	2000	04:00:00.000000	Add Job
2	TV	Blurred Images	2000	04:00:00.000000	Add Job
3	DVD Player	Does not switch on	1500	03:00:00.000000	Add Job
6	Camera	Flasher	1500	02:00:00.000000	Add Job

Add Job

Figure C.19 Add Job interface

Look for the fault that your item has and click "Add Job" on the respective row. You will be directed to the interface shown in Figure C.20. Enter the details and click "Add Item".

Go back to Profile Page

FaultID:	1
ItemName:	TV
Fault:	No Display
TotalCost:	2000
Time To Repair(Hours):	04:00:00.000000
Contact Number	
Select Contact No	
Warranty	
Yes	
Item Description:	

Accept Repairs

Figure C.20 Accept Repairs Interface

• View, Update and Delete Repair Items

Click on "Update Repair Items" on the DEO profile page, and the interface shown below in Figure C.21 will appear.

Note: Only part of the interface which appears is shown in Figure C.21 as the interface is long.

L	ItemName	Description	Fault	Contact No	Accept Date	Return Date	Warranty	Total Cost	Advance Paid	Balance	Technician	Status	Delete	Update
@gmail.com	TV	Sony	Blurred Images	771234569	2021- 06-17	2021- 06-20	Yes	0	0	0	AndyPerera	Accepted	Delete	Update
'erera@gmail.com	TV	Samsung	Blurred Images	771234568	2021- 06-17	2021- 06-17	Yes	0	0	0	AndyPerera	Delivered	Delete	Update
@gmail.com	TV	Singer	Blurred Images	771234569	2021- 06-17	2021- 06-17	No	2000	0	2000	TeddyLupin	Delivered	Delete	Update
'erera@gmail.com	DVD Player	Sony	Does not switch on	771234568	2021- 06-17	2021- 06-18	No	1500	200	1300	AndyPerera	Accepted	Delete	Update
rera@gmail.com	TV	Sony Large TV	No Display	771234567	2021- 06-17	2021- 06-20	Yes	0	0	0	AndyPerera	Accepted	Delete	Update

Figure C.21 View Repair Items Interface

Click "Update" on the respective row you need to update, and the interface shown in Figure C.22 will appear. Make the necessary changes and click "Update Item".

Update Item For Repair

CustomerID :	42
Email :	Ginny@gmail.com
ItemName :	TV
Fault :	Blurred Images
Description :	Sony
Contact No:	771234569
Accept Date:	6/17/2021
Return Date:	6/20/2021
Warranty:	Var

Figure C.22 Update Repair Interface

• Manage Home Visit Repairs

Click on "Manage Home Visit Repairs" on the DEO profile page, and the interface shown below in Figure C.23 will appear.

Unscheduled Jobs

VisitJobID	FaultID	ItemName	Fault	CustomerID	Address	Email	Warranty	DateOfRepair	Technician	StartTime	EndTime
16	1	TV	No Display	42	Colombo 1	Ginny@gmail.com	No	2021-06-06	0	00:00:00.000000	00:00:00.000000
15	1	TV	No Display	2	12, Flower Road, Colombo	PeterPerera@gmail.com	Yes	2021-06-06	0	00:00:00.000000	00:00:00.000000

Figure C.23 Manage Home Visits Interface

Click "Update" on the row you wish to schedule and you will be directed to the interface shown below in Figure C.24 which will show all the scheduled and unscheduled jobs with the same date as the row you selected.

	Sch	nedule	ed Jobs							
Fault	CustomerID	Address	Email	Warranty	DateOfRepair	Technician	StartTime	EndTime	ScheduleStatus	Update
Blurred Images	1	23, Bodhi Mawatha, Kelaniya	AnnPerera@gmail.com	No	2021-06-06	Andy Perera	09:00:00.000000	13:00:00.000000	Scheduled	Update
	Job	s to S	chedule							
Fault	CustomerID	Address	Email	Warranty	DateOfRepair	Technician	StartTime	EndTime	ScheduleStatus	Update
No Display	2	12, Flower Road, Colombo	PeterPerera@gmail.com	Yes	2021-06-06	0	00:00:00.000000	00:00:00.000000	Requested	Update
No Display	42	Colombo 1	Ginny@gmail.com	No	2021-06-06	0	00:00:00.000000	00:00:00.000000	Requested	Update

Figure C.24 All Jobs on the Same Day Interface

If you click "Update" on a row in the "**Scheduled Jobs**" section, you can mark the job of the respective row as "Cancelled" or "Completed".

To schedule a job, click "Update" on the row you wish to schedule (in the "**Jobs to Schedule**" section) and the interface shown below in Figure C.25 will appear asking you to select a technician.

Go back to Profile Page		
Technician	Select Technician $\!$	Search
Figure C.25 Sel	ect Technician Interface	

Click "Search" and details of the technician's last scheduled job(if any) will appear along with the details of the job that you are trying to schedule as shown in Figure C.26 below.

The Last Scheduled Details of the Technician you selected are listed below.					
Emp ID :	22				
Technician :	AndyPerera				
DateOfRepair :	2021-10-24				
Last StartTime :	9:00 AM				
Last EndTime :	1:00 PM				
The HomeVisit request details are as follows.					
VisitJob ID :	33				
Fault ID :	1				
ItemName :	TV				

Figure C.26 Schedule Job Interface

You can either reject the request to schedule or schedule the job by selecting the Status (as shown in Figure C.27). This option is available on the interface shown in Figure C.26 above.

Status	Select Status
	Scheduled
Upd	Rejected

Figure C.27 Select Status of Job Option

If you choose to schedule the job, and the technician you selected is not available you will get a message saying that the technician's time slots are full. Otherwise, the job can be scheduled.

• Generate Invoices to Home Visit Schedules

Invoices for Home Visit schedules that have been successfully scheduled can be printed by the DEO and handed over to the Technician who will be collecting the payment from the customer. Click "Generate Invoices" on the DEO profile page, and click the row with the home-visit of which you need to print the invoice. An invoice as shown below in Figure C.28 will be printed.

		•	
I	nv	$\cap \mathcal{L}$	2
I	110		2

From: Antenna House, Kadawatha					
Contact No: 0771234567					
Date: 2021-07-16					
Invoice No	88				
VisitJobID	14				
Customer Name	Ann Perera				
Customer E-Mail	AnnPerera@gmail.com				
Customer Address	23, Bodhi Mawatha, Kelaniya				
Technician	Andy Perera				
Technician's NIC	12345678				
Item Name	TV				
Fault	Blurred Images				
Warranty	No				
Date Of Repair	2021-06-06				
StartTime	09:00:00.000000				
EndTime	13:00:00.000000				
Payment	2000				
Payment Accepted By:	Andy Perera				

Figure C.28 Invoice for Home Visit Repair

• View Sales Orders

Click on "Sales Orders" in the DEO profile page, and the interface shown in Figure C.29 will appear.

30 back to Profile	Page							
			Shop	ping C	art Ord	ders		
	OrderID	Cutomer Name	Address	Contact No	GrandTotal	Status	Update Order Status	View Invoice
	73	GinnyWeasely	Colombo 1	771234569	4500	Delivered	Update Order Status	Generate Invoice
	74	AnnPerera	23, Bodhi Mawatha, Kelaniya	771234567	5500	Ordered	Update Order Status	Generate Invoice

Figure C.29 Shopping Cart Orders Interface

• Update Shopping Cart Order Status after Delivery

Click on "Update Order Status" on a row in the interface shown above in Figure C.29.Order details of the respective order will appear in a separate page as shown below in Figure C.30. Change the order status to "Delivered" and click "Update Status".

Order Details

Order ID:		73						
Customer Name	e:	GinnyWe	GinnyWeasely					
Customer Addr	ess:	Colombo	Colombo 1					
Customer Conta	actNo:	771234569						
Status Delivered						~		
Model No	Product	Price	Quantity	Sub Total	Warranty Expires On			
BA-234567	Antenna	2500	1	Rs. 2500	2021-09-01			
SRS-XB40	Portable Bluetooth Speaker	2000	1	Rs. 2000	2022-09-01			
GrandTotal			Rs. 450	0				

Figure C.30 Update Order Status after Delivery Interface

• Generate Invoices for Shopping Cart Orders

Click on "Generate Invoice" on a row in Figure C.29 shown above. The invoice for the respective order will be generated as shown below in Figure C.31.

		Inve	oice	<u>e</u>		
From: Antenna H	House, Kadawatha					
Contact No: 077	1234567					
Date: 2021-09-0	3					
OrderID				73		
Customer's Nam	Customer's Name GinnyWeasely					
Address				Colombo	o 1	
ContactNo				7712345	69	
Model No	Product	Price	Qua	ntity	Sub Total	Warranty Expires On
BA-234567	Antenna	2500	1		Rs. 2500	2021-09-01
SRS-XB40	Portable Bluetooth Speaker	2000	1		Rs. 2000	2022-09-01
GrandTotal				Rs. 450	D	

C.31 Shopping Cart Order Invoice

• View Leave History

Click on "View Leave History" on the DEO profile page, and the interface shown below in Figure C.32 will appear showing your leave history.

Leave History

				-			
Leave ID	Leave Date	Leave Type	Duration	Reason	Year	Status	Date
20	2021-06-20	Short Leave	9.00 A.M -10.00 A.M	Casual	2021	Approved	2021-06-19
21	2021-06-21	Short Leave	9.00 A.M -10.00 A.M	Casual	2021	Approved	2021-06-19
23	2021-06-22	Short Leave	9.00 A.M -10.00 A.M	Medical	2021	Requested	2021-06- <mark>1</mark> 9

Figure C.32 Leave History Interface

Note: This interface is shown on all employee profile pages.

• Request Leave

Click on "Request Leave" and the interface shown in Figure C.33 will appear. Enter the details and click "Request".

Rea	uest	Leave

Select Leave Type:	
Short Leave	×
Select Reason:	
Casual	~
Select a date:	
mm/dd/yyyy	
If you chose Short Leave select a duration:	If you chose Half Day select a duration:
9.00 A M -10.00 A M	9.00 A.M -1.00 P.M

Figure C.33 Request Leave interface

Note: This interface is shown on all employee profile pages.

Customer Profile Page

Figure C.34 below shows the Customer Profile Page

urchase Items		Update Personal Details
pdate Personal Details	Note: If you wish to update Fi	rstName, LastName and E-mail address please contact the Administrator
hedule Home Visit epair	Customer ID:	42
neck Status of omeVisit Schedule	FirstName:	Ginny
eck Status of Repair	LastName:	Weasely
ew Order History	Address:	Colombo 1
rranty Details	ContactNo:	771234560
ange Password		111234303
activate My Account	E-Mail:	Ginny@gmail.com

Figure C.34 Customer Profile Page

The functions that can be performed by the Customer are listed below.

• Update Personal Details

Click "Update Personal Details" on the customer profile page, and the interface shown above in Figure C.34 appears. You can make the necessary changes and click "Update My Details".

• Purchase items

You can click on "Purchase Items" on the customer profile page, and the products for sale will be displayed and the same procedure that happens when you add products to the cart on the homepage will occur. Please refer Figure C.5 and Figure C.7.The interface shown in Figure C.6 will be skipped.

• Schedule Home visit Repair

When you click "Schedule Home Visit Repair" on the Customer profile page, the faults repaired by the technicians of Antenna House will be shown.(refer Figure C.35 below).

Welcome Ginny Weasely Logout Customer Profile Page

Purchase Items	Add Job								
Update Personal Details	FaultID	ItemName	Fault	TotalCost	TimeToRepair (Hours)	AddJob			
Schedule Home Visit Repair	1	TV	No Display	2000	04:00:00.000000	Add Job			
Check Status of HomeVisit Schedule	2	TV	Blurred Images	2000	04:00:00.000000	Add Job			
	3	DVD Player	Does not switch on	1500	03:00:00.000000	Add Job			
Check Status of Repair	6	Camera	Flasher	1500	02:00:00.000000	Add Job			

Figure C.35 Add Jobs for Home-Visits

Click "Add Job" on the row that matches the fault of the item you wish to repair. Then, you will be able to make a request to schedule a home-visit repair in the interface shown in Figure C.36.Enter the details and click "Schedule".

Welcome Ginny Weasely Logout

Customer Profile Page

Purchase Items	Sch	nedule Home-Visit Repair
Update Personal Details	FaultID:	1
Schedule Home Visit Repair	ItemName:	TV
Check Status of HomeVisit Schedule	Fault:	No Display
Check Status of Repair	TotalCost:	2000
Warranty Details	Time To Repair(Hours):	04:00:00.000000
Change Password	Warranty	
Deactivate My Account	Yes	×.
	Date for Repair:	10/24/2021

Figure C.36 Request Home-Visit Schedule Interface

• Check Status of Home-Visit Schedule

Click "Check Status of Home-Visit Schedule" and the interface shown below in C.37 will appear. Note: Only part of the interface which appears is shown in Figure C.37 as the interface is long.

Customer Pr	rofile Pag	je							
Purchase Items Update Personal Details	ne-Vis is page. If the R	it Rep equest is reje	oair Statu	S ncelled,it will	be displayed				
Schedule Home Visit Repair	CustomerID	Address	Email	Warranty	DateOfRepair	Technician	StartTime	EndTime	ScheduleStatus
Check Status of HomeVisit Schedule	42	Colombo 1	Ginny@gmail.com	Yes	2021-05-05	22	09:00:00.000000	13:00:00.000000	Scheduled
Check Status of Repair Change Password	42	Colombo 1	Ginny@gmail.com	No	2021-06-06	0	00:00:00.000000	00:00:00.000000	Requested

Figure C.37 Check status of Home-Visit Schedule interface

• Check Status of Repair Item

Click "Check Status of Repair" and the interface Figure C.38 will be shown.

Note: Only part of the interface which appears is shown in Figure C.38 as the interface is long.

Welcome Ginny Weasely Logout Customer Profile Page

Purchase Items	pairID	FaultID	ItemName	Fault	Description	Accept Date	Return Date	Warranty	Total Cost	Advance Paid	Balance	Technician	Status
Update Personal Details			-										
Schedule Home Visit Repair		2	IV	Blurred	Sony	2021- 06-17	2021- 06-20	Yes	U	U	0	Andy Perera	Accepted
Check Status of HomeVisit Schedule		2	TV	Blurred Images	Singer	2021- 06-17	2021- 06-17	No	2000	0	2000	Teddy Lupin	Delivered

Figure C.38 Check Status of Repair Interface

• View Order History

Click "View Order History" on the Customer profile page, and the interface shown below in Figure C.39 will be shown.

Go back to Profile Page

My Orders

OrderID	GrandTotal	Date Ordered	Status	View Order Details	View Invoice
73	4500	2021-09-01	Delivered	View Order Details	Generate Invoice
78	3000	2021-09-20	Ordered	View Order Details	Generate Invoice
79	7500	2021-09-20	Ordered	View Order Details	Generate Invoice

Figure C.39 View Order History Interface

Click "View Order Details" on a row in the above interface (shown in Figure C.39) and the interface shown below in Figure C.40 will appear.

Go back

		Order	Detail	S						
Date Ordered			2021-0	09-01						
Order ID:		73	73							
Customer Name:		GinnyWe	easely							
Customer Address:		Colombo	Colombo 1							
Customer Conta	actNo:	7712345	69							
Model No	Product	Price	Quantity	Sub Total	Warranty Expires On					
BA-234567	Antenna	2500	1	Rs. 2500	2022-03-01					
SRS-XB40	Portable Bluetooth Speaker	2000	1	Rs. 2000	2022-09-01					
GrandTotal			Rs. 450	10						

Figure C.40 View Order Details Interface

Click "Generate Invoice" in the interface shown in Figure C.39 and an invoice as shown below in Figure C.41 will appear.

		Inve	oice)		
From: Antenna I	House, Kadawatha					
Contact No: 077	1234567					
Date Ordered			2	021-09-0	1	
OrderID				73		
Customer's Nan	ne		GinnyW			
Address				Colomb		
ContactNo				771234	569	
Model No	Product	Price	Qua	ntity	Sub Total	Warranty Expires Or
BA-234567	Antenna	2500	1		Rs. 2500	2022-03-01
SRS-XB40	Portable Bluetooth Speaker	2000	1		Rs. 2000	2022-09-01
GrandTotal				Rs. 450	0	

- Figure C.41 Order Invoice
- De-Activate Account

Click "De-Activate Account" on the Customer profile page, and your account will be de-activated as shown in Figure C.42.

Customer Pr	ofile Page
Purchase Items	Your Account is now de-activated. If you wish to reactivate, log in again and activate your account
Update Personal Details	
Schedule Home Visit Repair	
Check Status of HomeVisit Schedule	
Check Status of Repair	
View Order History	
Warranty Details	
Change Password	
Deactivate My Account	

Figure C.42 De-Activate Account Interface

• Reactivate Account

To reactivate your account, enter login details and click the link shown in Figure C.43. You will be directed to your profile page upon the re-activation of your account.

Welcome Ginny Weasely Logout Your Account is currently deactivated. Click this to reactivate



• View Warranty Details

Click "Warranty Details" on the Customer Profile Page and the interface shown in Figure C.44 will appear.

Warranty Details

The warranty of the following items has expired

Your CustomerID	ProductID	ProductName	WarrantyExpiredOn	Warranty Duration
42	BA-234567	Antenna	2021-09-01	6 months

The warranty of the following items has not yet expired

Your CustomerID	ProductID	ProductName	WarrantyExpires On	Warranty Duration
42	SRS-XB40	Portable Bluetooth Speaker	2022-09-01	1 year

C.44 View Warranty Details

Technician Profile Page

Welcome Andy Perera Logout

Figure C.45 below shows the Technician profile page.

Technician Pro	ofile Page	
Update Personal Details		Update Personal Details
View Repair Jobs	Employee ID:	22
Jobs	FirstName:	Andy
Leave History Request Leave	LastName:	Perera
Change Password	NIC Number:	823456781V
	Address:	Colombo 1
	ContactNo:	771234569
	Gender:	Male
	Date-Of-Birth:	4/3/2010

Figure C.45 Technician Profile Page

The functions that can be performed by the Technician are listed below.

• Updating Personal Details

Click on "Update Personal Details" on the Technician profile page, and the interface shown in figure C.45 above will appear. Make the necessary changes and click on "Update My Details".

• View Repair Jobs

Click "View Repair Jobs" on the Technician profile page, and the technician's repair jobs will be displayed as shown in figure C.46.

Note: Only part of the interface which appears is shown in Figure C.46 as the interface is long.

Welcome Andy Perera Logout Technician Profile Page

Update Personal Details	ne	Description	Fault	Contact	Accept	Return	Warranty	Total	Advance	Balance	Technician	Status	Update
View Repair Jobs					Dute	Dute		cost	Turd				n Nachaol
View Home Visit Repair Jobs		Sony	No Display	771234569	2021- 10-21	2021- 10-24	Yes	0	0	0	AndyPerera	Accepted	Update
Leave History		Sony	Flasher	771234567	2021- 09-26	2021- 09-27	No	1500	1000	500	AndyPerera	Ready	Update

Figure C.46 View Repair Jobs Interface

• Update Repair Jobs

Click "Update" on the respective row shown in Figure C.46 above. Then, interface shown in Figure C.47 will be shown. The technician can update the return date and status of the repair job.

Welcome Andy Perera Logout

Technician Profile Page

ate Personal Details	Go back							
w Repair Jobs		Update Item For Repair						
w Home Visit Repair	CustomerID :	42						
ve History	Email :	Ginny@gmail.com						
quest Leave	ItemName :	TV						
ange Password	Fault :	No Display						
	Description :	Sony						
	Contact No:	771234569						
	Accept Date:	10.01 (001)						

Figure C.47 Update Repair Job Interface

• View Home visit repair jobs

Click "View Home visit repair jobs" on the technician's profile page, and the interface shown in Figure C.48 will appear.

Note: Only part of the interface which appears is shown in Figure C.48 as the interface is long.

Welcome Andy Perera Logout									
Technician P	rofile	Page	9						
Update Personal Details	aure	ed lo	DS	1					
View Repair Jobs	merID	Address	Email	Warranty	DateOfRepair	Technician	StartTime	EndTime	ScheduleStatus
View Home Visit Repair Jobs		Colombo 7	bilbo@gmail.com	Yes	2021-09-26	AndyPerera	13:00:00.000000	16:00:00.000000	Scheduled
Leave History									
Request Leave		Colombo 7	bilbo@gmail.com	Yes	2021-09-26	AndyPerera	18:00:00.000000	21:00:00.000000	Scheduled

Figure C.48 View Home visit repair jobs interface

Supplier Profile Page

You will be able to log in to the Supplier profile page shown below in Figure C.50 below only if the Manager has activated your account. Otherwise, the message shown in Figure C.49 would appear.

Your Supplier Account has not been activated

Figure C.49 Supplier Account not activated message.

Figure C.50 below shows the Supplier profile page.

Supplier Profile Page

Update Personal Details	Supplier ID:	
Save Supply Items		1
Confirm Requests For	FirstName:	Molly
Change Password	LastName:	Weasely
Deactivate My Account	Supplier Name:	ABC Company
	Address:	24,Park Street,Colombo 5

Figure C.50 Supplier Profile Page

The functions that can be performed by the Supplier are listed below.

• Updating Personal Details

Click on "Update Personal Details" on the Supplier profile page, and the interface shown in figure C.50 above will appear. Make the necessary changes and click on "Update My Details".

• Save Supply Items

If you need to request to supply items, click "Save Supply Items" on the Supplier profile page, and the interface shown in Figure C.51 will appear. Enter the details and click "Add Item".

Welcome Molly Weasely Logout Supplier Profile Page

Update Personal Details	Requesting Items To Supply							
Save Supply Items	Model No:	R-234						
Confirm Requests For Supplies	Item Name:	Remote Controller						
Change Password Deactivate My Account	Brand:	Sony						
	Unit Price:	1200						
	Quanity:	10						
	Warranty:							
	1 year	~						
	Add Item							

Figure C.51 Save Supply Items interface

• View and Confirm Requests made by Antenna House

Click "Confirm Requests for Supplies" and the interface shown below in Figure C.52 will appear.

Welcome Molly Weasely Logout Supplier Profile Page

		1000								
Update Personal Details			View	Reques	ts for	Supp	lies			
Save Supply Items	uestID	ModelNo	ProductName	ProductBrand	UnitPrice	Warranty	DateRequired	QuantityNeeded	RequestStatus	Confirm
Confirm Requests For Supplies		BA- 234567	Antenna	Batapola	2500	6 months	2021-07-12	20	Confirmed	Update
Change Password		BA- 234567	Antenna	Batapola	2500	6 months	2021-07-13	12	Confirmed	Update

Figure C.52 View Supply Requests Interface

To either confirm/reject the order the supplier should click "Update" on the respective row shown in Figure C.52 above. Then, the respective page of that order will appear as shown below in Figure C.53 below. The supplier can select a date to supply, enter quantity that can be supplied and confirm the request.

Welcome Molly Weasely Logout Supplier Profile Page

Update Personal Details		Confirm Requests	
Save Supply Items	Select order status:		
Confirm Requests For Supplies	Confirmed		\sim
Change Password	RequestID:	51	
Deactivate My Account	Model No:	GJK-PG10	
	Product Name:	Outdoor Wireless Speaker	
	Product Brand:	Sony	
	Unit Price:	3000	
	Warranty:	1 year	
	Date Required:	2021-10-24	

Figure C.53 Confirming Supplies Interface

Manager Profile Page

Figure C.54 below shows the manager profile page.

Welcome Ron Weasely Logout Manager Profile Page

Update Personal Details		Update Personal Details			
Manage Suppliers	Employee ID:	24			
Update Items					
Delete Items	FirstName:	Ron			
View Pending Items	LastName:	Weasely			
Send Requests to Suppliers	NIC Number:	823456783V			
Generate Invoice	Address:	Colombo			
View Sales Income Report	ContactNo:	771234569			
View One Day Sales Income Report	Gender:	Male			
View One Day Repairs	Date-Of-Birth:	3/7/0000			

Figure C.54 Manager Profile Page

The functions that can be performed by the manager are listed below.

• Updating Personal Details

Click on "Update Personal Details" on the manager profile page, and the interface shown in figure C.54 above will appear. Make the necessary changes and click on "Update My Details".

• Manage Suppliers

You can activate suppliers and change their details by clicking "Manage Suppliers" on the manager profile page. The interface shown below in Figure C.55 will appear.

Welcome Ron Weasely Logout Manager Profile Page

Update Personal Details		View Suppliers									
Manage Suppliers	þ	FirstName	LastName	SupplierName	Address	LandLine	MobileNo	E-Mail	Status	Update	Del
Jpdate Items		Molly	Weasely	ABC Company	24,Park	11234567	771234567	Molly@gmail.com	Activated	Update	Dele
Delete Items					Street,Colombo 5						
view Pending Items		Arthur	Weasely	Orange	43,Queens	11234567	771234566	Arthur@gmail.com	Activated	Update	Dele
iend Requests to Suppliers				Electrics	Road, Colombo 4						
Generate Invoice		Bill	Weasely	Singer	Colombo 7	112345678	771234567	Bill@gmail.com	Activated	Update	Dele

Figure C.55 Manage Suppliers Interface.

Click "Update" on the respective row of the supplier to be updated. Interface shown below in Figure C.56 will appear.

Welcome Ron Weasely Logout

Manager Profile Page

Update Personal Details							
Manage Suppliers	FirstName:	Molly					
Update Items	LastName:	Weasely					
Delete Items	Supplier Name:	ABC Company					
View Pending Items	Address:	24,Park Street,Colombo 5					
Send Requests to Suppliers	Land Line:	11234567					
Generate Invoice	Mobile No:	771234567					
View Sales Income Report	E-Mail:	Molly@gmail.com					
View One Day Sales Income Report	Status						
View One Day Repairs Report	Activated						

Figure C.56 Update Supplier Interface

• View Items for sale with their suppliers and update

To view items for sale with their suppliers click "Update Items" on the manager profile page.

The interface shown below in Figure C.57 will appear.

Click "Update" on the respective row and you will be directed to the respective page that will allow you to update the price and supplier of an item.

Welcome Ron Weasely Logout

Manager Profile Page

Update Personal Details				ŀ	tems				
Manage Suppliers	ModelNo	Product	Product	Product	Warranty	SupplierName	Request	Delete	Update
Update Items		Name	branu	Frice			Status		
Delete Items	GJK-PG10	Outdoor Wireless	Sony	3000	1 year	ABC Company	Requested	Delete	Update
View Pending Items		speaker							
Send Requests to Suppliers	SRS-XB40	Portable Bluetooth Speaker	Sony	2000	1 year	ABC Company	Registered	Delete	Update
Generate Invoice	SL-TF313	Table Fan	Sisil	6199	2 years	ABC Company	Registered	Delete	Update

Figure C.57 View Items with Suppliers Interface

• View Pending Items interface

Click "View Pending Items" on the manager profile page, and the interface shown below in Figure C.58 will appear. The manager can register the item by clicking "Register Item".

Welcome Ron Weasely Logout Manager Profile Page Pending Items Update Personal Details Manage Suppliers SupplierName ModelNo Product Delete Product Product Warranty Update Name Brand Price Update Items MAS-Antenna Maspro 2500 Orange 6 months Register Delete Delete Items VU3BVJ Electrics Item Send Requests to Suppliers



• Send Requests to Suppliers

To view items at reorder level and send requests to suppliers, click "Send Requests to Suppliers" and the interface shown in Figure C.59 will appear.

Welcome Ron Weasely Logout Manager Profile Page

Update Personal Details		Items At Reorder Level									
Manage Suppliers	ID	ModelNo	Product	Product	Product	Quantity	SupplierID	SupplierName	Warranty	RequestStatus	Update
Update Items			Name	Brand	Price						Request
Delete Items	3	GJK-PG10	Outdoor Wireless	Sony	3000	14	1	ABC Company	1 year	Requested	Update Request
View Pending Items			Speaker								
Send Requests to Suppliers	5	MAS- VU3BVJ	Antenna	Maspro	2500	8	2	Orange Electrics	6 months	Registered	Update Request

Figure C.59 Items at Re-order level

Click" Update Request" on the respective row of the item you wish order and interface shown in Figure C.60 will appear. Enter the order details and click "Request'.

Welcome Ron Weasely Logout

Manager Profile Page

Update Personal Details		Send Requests
Manage Suppliers	Model No:	GJK-PG10
Delete Items	ProductName:	Outdoor Wireless Speaker
View Pending Items	Quantity Available:	14
Send Requests to Suppliers	Unit Price:	3000
Generate Invoice	Supplier:	ABC Company
View Sales Income Report	Warranty:	1 year
View One Day Sales Income Report	Date Required:	10/24/2021
View One Day Repairs Report	Quanity Needed:	10 ×

Figure C.60 Send Requests to Supplies Interface

• Generate Invoice for supplies

If you need to view orders that have been confirmed by suppliers and generate invoices to be emailed to them, click "Generate Invoice' on the manager profile page. The confirmed orders will be listed as shown in Figure C.61.

Confirmed	Requests
commuca	ricquests

RequestID	ModelNo	ProductName	ProductBrand	SupplierID	SupplierName	Date Required	Date of Supply	Quantity Needed	Quantity Available	Unit Price	RequestStatus	Send Email
36	BA- 234567	Antenna	Batapola	1	ABC Company	2021-07- 13	2021- 07-14	12	12	2500	Confirmed	Send Invoice
37	BA- 234567	Antenna	Batapola	1	ABC Company	2021-07- 12	2021- 07-12	20	20	2500	Confirmed	Send Invoice
38	GJK-PG10	Outdoor Wireless Speaker	Sony	1	ABC Company	2021-07- 14	2021- 07-14	20	20	3000	Confirmed	Send Invoice

Figure C.61 Generate Invoice for Supplies interface

Click "Send invoice" and an invoice as shown in Figure C.62 will be generated.

Invoice

From: Antenna House, Kadawatha	
Contact No: 0771234567	
Date: 2021-07-16	
Invoice No	16
RequestID	36
ModelNo	BA-234567
SupplierID	1
Supplier Name	ABC Company
Supplier Email	Molly@gmail.com
Date Agreed to Supply	2021-07-14
Quantity Supplied	12
Unit Price (In Rupees)	2500
Total Payment (In Rupees)	30000

Figure C.62 Invoice for Confirmed Supplies

• Generation of Reports

The Manager can generate five different types of reports.

1. To view income from sales within a particular period, click "View Sales Income Report" on the manager's profile page. The interface shown in Figure C.63 would appear. Select two dates and Click "Search".

Go back to Profile Page		
	Search I	ncome From Sales Records
Start Date:	End Date:	
mm/dd/yy	/yy mm/dd/yyyy	Search



Figure C.64 shows the details of such a report produced.

Search Income From Sales Records

Start Date:	End Date:				
7/17/2021	7/19/2021	Search			
OrderID	CustomerID	ProductID	Quantity	SubTotal	Date
52	1	BA-234567	1	2500	2021-07-17
52	1	GJK-PG10	1	3000	2021-07-17
53	42	BA-234567	2	5000	2021-07-17

Total Income 10500

Figure C.64 Income from Sales Report

2.To view income from sales on a selected date click" View One Day Sales Income Report" on the manager profile page. The interface shown in Figure C.65 would appear.

Go back to Profile Page
Select a Day: mm/dd/yyyy
Search

Figure C.65 View Income from Sales 2

3.To view income from repairs on a selected day, click "View One Day Repairs Report" on the Manager profile page. The interface shown in Figure C.66 would appear.



Figure C.66 View Income from Repairs 1

4.To view income from repairs within a selected period, click "View Repairs Report" on the Manager profile page. The interface shown in Figure C.67 would appear.

Go back to Profile Page		
		Search Payment Records
Start Date:	End Date:	
mm/dd/yyy	y mm/dd/yyyy	Search

Figure C.67 View Income from Repairs 2

5. To view expenditure for purchases within a period, Click "View Purchase Report" on the Manager profile page. The interface shown in Figure C.68 will appear.

Go back to Profile Page		
	Sea	arch Payment Records
Start Date:	End Date:	
mm/dd/yyyy	mm/dd/yyyy	Search

Figure C.68 View Expenditure from Purchases Interface

Administrator Profile Page

Figure C.69 below shows the Admin profile page.

Welcome Fred Weasely Logout

d Employee Category	Register Employee Categories		
Employee y	Category Name:	DEO	
ployee	Salary Rs:	20000	
yee	Full Days:		
iers		5	
	Half Days:	5	
ers	Short Leave:	5	
3			
iests	Add Category		



The functions that can be performed by the Administrator are listed below.

• Register employee categories

Click "Register employee categories" on the Administrator profile page, and the interface shown above in Figure C.69 will appear. Enter the details and click "Add Category".
• Search and Update Employee Category

Click "Update Employee Category" and the interface shown below in Figure C.70 will appear. Select a category and search. When the record of the category is displayed, make the changes and click "Update category".

dd Employee Category	Update Employee Categories							
Update Employee Category	Category Select Category Your search returned the follo	✓ Search owing details :						
Register Employee	Category:	Technician						
Jpdate Employee								
Manage Suppliers	Salary Rs:	45000						
/iew Customers	Full Days:	3						
pdate Customers	Half Days:	2						
'iew Repair Items								
	ShortLeave:	4						



• Register Employee

Click "Register Employee" on the Administrator profile page, and the interface shown in Figure C.71 will appear. Enter the details and click "Register".

Welcome Fred Weasely Logout Admin Profile Page

Add Employee Category		Register Employee	
Update Employee Category	Category		
Register Employee	DEO		~
Update Employee	FirstName:	Ann	
Manage Suppliers	LastName:	Perera	
Update Customers	NIC Number:	823456789V	
View Repair Items	Address:	Colombo	
View Leave Requests	Contact Number:	0771234567	×
change rassword	Gender:	Male O Female	
	Date of Rirth		

Figure C.71 Register Employee Interface

• Update Employee Details

Click "Update Employee" on the Administrator profile page, and the interface shown below in Figure C.72 will appear.

Note: Only part of the interface which appears is shown in Figure C.72 as the interface is long.

Welcome Fred Weasely Logout Admin Profile Page

Welcome Fred Weasely Logout

Add Employee Category Update Employee Category	NIC Number	Address	Contact No	Gender	Date- Of- Birth	Date Joined	E-Mail	Category	Status	Delete	Update
Register Employee	823456789V	Colombo 7	771234567	Female	2013- 04-29	2021- 04-05	gemma@gmail.com	DEO	Deactivated	Delete	Update
Update Employee	823456781V	Colombo 1	771234569	Male	2010- 04-03	2021- 04-05	Andy@gmail.com	Technician	Activated	Delete	Update
Manage Suppliers View Customers	823456782V	Colombo	771234567	Male	1981- 04-07	2021- 04-07	Fred@gmail.com	Administrator	Activated	Delete	Update

Figure C.72 View Employees Interface

When you click "Update" on a row, you will be directed to the respective employee detail page (shown below in Figure C.73) where you can make the changes and click "Update Employee".

Admin Profile Page Update Employee Details Add Employee Category Update Employee Employee ID: Category 21 Register Employee FirstName: Gemma Update Employee LastName: Perera Manage Suppliers NIC Number: 12345676 View Customers Update Customers Address: Colombo 7 View Repair Items ContactNo: 771234567 View Leave Requests Gender: Change Password Female Data Of Ritth

Figure C.73 Individual Update Employee Interface

• View Customers

Click "View Customers" and the interface shown below in Figure C.74 will appear.

Welcome Fred Weasely Logout								
Admin Profile Page	e e e e e e e e e e e e e e e e e e e							
Add Employee Category	CustomerID	FirstName	LastName	Address	Contact No	E-Mail	Delete	Update
Category Register Employee	1	Ann	Perera	23, Bodhi Mawatha, Kelaniya	771234567	AnnPerera@gmail.com	Delete	Update
Update Employee Manage Suppliers	2	Peter	Perera	12, Flower Road, Colombo	771234568	PeterPerera@gmail.com	Delete	Update
View Customers	42	Ginny	Weasely	Colombo 1	771234569	Ginny@gmail.com	Delete	Update
Update Customers	43	Janani	Perera	Colombo	771234566	Janani@gmail.com	Delete	Update

Figure C.74 View Customers

Click "Update" on a row and that customer's details will be displayed in a separate page as shown in Figure C.75. You can make the changes at the customer's request.

Welcome Fred Weasely Logout	e Page		
Add Employee Category	Up	date Customer Personal Details	
Update Employee Category	FirstName:	Ann	
Register Employee	LastName:	Perera	
Update Employee Manage Suppliers	Address:	23, Bodhi Mawatha, Kelaniya	
View Customers	ContactNo:	771234567	
Update Customers	E-Mail:	AnnPerera@gmail.com	
View Repair Items			
View Leave Requests	Update Customer		

Figure C.75 Individual Customer Update Interface

• View Leave Requests

Click "View Leave Requests" on the administrator profile page, and the interface shown in Figure C.76 will appear. The administrator can approve the leave requests.

Welcome Fred Weasely Logout

Admin Profile Page

Add Employee Category	View Leave Requests											
Update Employee Category	Leave ID	Emp ID	Employee Name	Employee Category	Leave Date	Leave Type	Duration	Reason	Year	Status	Date	Approve
Register Employee Update Employee	20	25	PercyWeasely	DEO	2021- 06-20	Short Leave	9.00 A.M -10.00 A.M	Casual	2021	Approved	2021- 06-19	Approve
Manage Suppliers View Customers	21	25	PercyWeasely	DEO	2021- 06-21	Short Leave	9.00 A.M -10.00 A.M	Casual	2021	Approved	2021- 06-19	Approve
Update Customers View Repair Items	23	25	PercyWeasely	DEO	2021- 06-22	Short Leave	9.00 A.M -10.00 A.M	Medical	2021	Requested	2021- 06-19	Approve
View Leave Requests Change Password	26	25	PercyWeasely	DEO	2021- 08-01	Half Day	9.00 A.M -1.00 P.M	Casual	2021	Approved	2021- 08-31	Approve

Figure C.76 View Leave Requests Interface

APPENDIX D- Management Reports

The following MIS Reports have been created.

Sales Payment Reports

1. Income from sales on a particular day

This report shows the total payments received for sales on a selected date. Figure D.1 below shows the Income from sales on a selected date.

Select a Day:	7/16	i/2021					
OrderID		CustomerID	Prod	luctID	Quantity	SubTotal	Date
50		1	BA-2	34567	1	2500	2021-07-16
50		1	MAS	-VU3BVJ	1	2500	2021-07-16

Search Income Records

Total Income 5000

Figure D.1 Income from Sales Report1

2. Payments received for sales within a particular period

This report shows the total payments received for sales within a particular period.

Figure D.2 below shows the income from sales within a particular period.

Search Income Records

Start Date:	End Date:				
7/10/2021	7/16/2021				
OrderID	CustomerID	ProductID	Quantity	SubTotal	Date
34	42	BA-234567	1	2500	2021-07-11
34	42	MAS-VU3BVJ	1	2500	2021-07-11
34	42	SRS-XB40	1	2000	2021-07-11
35	42	GJK-PG10	1	3000	2021-07-11
35	42	MAS-VU3BVJ	1	2500	2021-07-11
36	42	MAS-VU3BVJ	1	2500	2021-07-11
36	42	GJK-PG10	1	3000	2021-07-11
40	1	BA-234567	1	2500	2021-07-11
40	1	GJK-PG10	1	3000	2021-07-11
50	1	BA-234567	1	2500	2021-07-16
50	1	MAS-VU3BVJ	1	2500	2021-07-16

Total Income 28500

Figure D.2 Income from Sales Report 2

Repair Payment Reports

3. Payments received for repair jobs on a particular day

This report contains details of payments received for both shop-accepted and home-visit repairs on a particular day. The grand total is shown at the end of the report.

Figure D.3 below shows a report generated to view payments received for repairs on a particular day.

Search Payment Records

InvoiceNo	RepairID	FaultID	CustomerID	Date	Payment
62	97	1	1	2021-06-13	1000
63	98	2	2	2021-06-13	0
64	99	2	42	2021-06-13	1000
65	100	1	42	2021-06-13	0
Total Payment for Shop Repairs					2000

InvoiceNo	VisitJobID	FaultID	CustomerID	Date	Payment
73	14	2	1	2021-06-13	2000
Total Payment for Home-Visit Repairs					2000

Grand Total 4000

Figure D.3 Repair Payments Report 1

4. Payment received for repair jobs within a particular period

This report contains details of payments received for both shop-accepted and home-visit repairs within a particular period. The grand total is shown at the end of the report.

Figure D.4 below shows a report generated to view payments received for repairs within two selected dates.

Search Payment Records

		,								
Start Date:	End Date:	_								
6/5/2021	6/14/2021									
Payments For Shop Visits										
InvoiceNo		RepairID	FaultID	CustomerID	Date	Payment				
62		97	1	1	2021-06-13	1000				
63		98	2	2	2021-06-13	0				
64		99	2	42	2021-06-13	1000				
65		100	1	42	2021-06-13	0				
66		101	3	42	2021-06-14	1000				
Total Payment for Shop	Repairs					3000				
Payments for Home-Visit	s.									

InvoiceNo	VisitJobID	FaultID	CustomerID	Date	Payment
73	14	2	1	2021-06-13	2000
Total Payment for Home-Visit Repairs					2000

Grand Total 5000

Figure D.4 Repair Payments Report 2

5. Purchase Payment Reports

This report shows the cost for purchases purchased from suppliers within a period.

Figure D.5 below shows a report generated to view payments for purchases within two selected dates.



S	tart Date:	End Dat	te:				
	6/10/2021 6/16/2		021				
	InvoiceNo	RequestID	ModelNo	SupplierID	SupplierName	TotalCost	Date
	12	24	SRS-XB40	1	ABC Company	20000	2021-06-13
	13	23	BA-234567	1	ABC Company	25000	2021-06-13

Total Payment for purchases 45000

Figure D.5 Purchase Payments Report

APPENDIX E- Coding

• The coding used to integrate bootstrap and jquery into the view pages is given below.

<html>

```
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/css/bootstrap.min.css"
integrity="sha384-9aIt2nRpC12Uk9gS9baDl411NQApFmC26EwAOH8WgZl5MYYxFfc+NcP
b1dKGj7Sk" crossorigin="anonymous">
<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js"
integrity="sha384-DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+Or
CXaRkfj" crossorigin="anonymous">
<script src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/js/bootstrap.min.js"
integrity="sha384-OgVRvuATP1z7JjHLkuOU7Xw704+h835Lr+6QL9UvYjZE3Ipu6Tp75j7Bh/
kR0JKI" crossorigin="anonymous"></script>
```

• The coding below is used to validate input fields. It checks if the required fields are filled, if the Contact No has more/less than 8 digits, if the e-mail entered is valid and also if there is another user account with the same e-mail address.

\$this->form_validation->set_rules('ContactNo','ContactNo','required|min_length[10]|max_length
[10]');

```
$this->form_validation->set_rules('Gender','Gender','required');
```

\$this->form_validation->set_rules('DOB','DOB','required');

```
$this->form_validation->set_rules('DateJoined','DateJoined','required');
```

\$this->form_validation->set_rules(

'Username', 'Username',

'required|is_unique[Users.Email]|valid_email',

array(

'required' => 'Email field is required.',

'is_unique' => 'There is another account with this email.Please use another e-mail address to register.'

)

);

• Part of the coding used to upload an image is shown below. It was taken from (codeigniter.com,2019).

```
$fileData = array();
$config['upload_path'] = './uploads/';
$config['allowed_types'] = 'gif|jpg|png';
$config['max_size'] = 100;
$config['max_width'] = 1024;
$config['max_height'] = 768;
$this->load->library('upload', $config);
$this->upload->initialize($config);
```

• The code below is the coding used to implement the displaying of products for sales on the homepage. It is part of a coding taken and modified from (codexworld.com,2020).

```
<?php if(!empty($products)){ foreach($products as $row){ ?>
	<div class="card col-lg-3">
	<img class="card-img-top" src="<?php echo base_url('uploads/'.$row['Image']); ?>"
	alt="" style="width:20% ;height:30% ">
```