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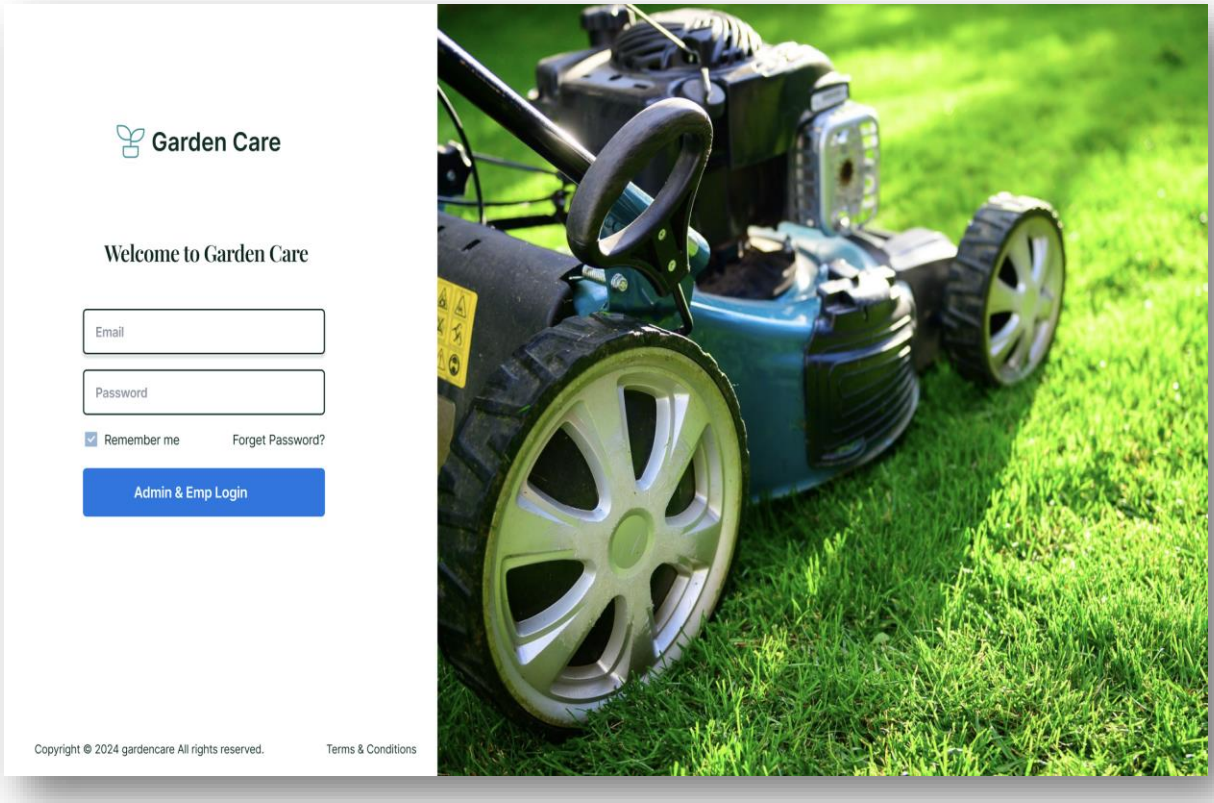
MBIS602 Systems Analysis and Process Modelling

LCS Lawn Care System



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I. Introduction and Analysis of Scope

Christchurch-based LCS is prepared to purchase another lawn care business, serving both commercial and residential clients. Ryan Wright, a reputable owner, is considering acquiring to grow his business and ensure a balanced work-life schedule. Ryan is exploring technologies to improve operations, handle inventory, manage accounts, taxes, payroll, and create a website to enhance LCS marketing efforts. To keep up with the company's growth, Ryan realized that the present approach of manual tracking was no longer viable. Ryan desperately needs a computer and a reliable software system to help him. The main function of the system is to improve the ability of LCS to cope with a larger volume of customers through computer assistance. After expanding the company, Ryan needs more sophisticated inventory management. An automated financial system was also needed so Ryan could better understand his income and expenses. At the same time, Ryan needs to be prepared for potential new business and competitors. Implementing systems such as GPS for route scheduling, CRM for customer management, and Inventory Management can enhance efficiency, reduce costs, and improve customer relationships for the Lawn Care Specialist (LCS). Furthermore, utilizing financial systems, developing a website, and using organic goods may help LCS boost profitability and sustainability by managing fleet expenses, automating invoicing, expanding its customer base, and attracting environmentally aware customers. The LCS project has challenges in terms of time, finance, and technical skills. Tight timelines owing to acquisition pressure, limited resources, and escalating costs necessitate effective management. To be successful, the system must be simple, user-friendly, and operate seamlessly.

Requirements Details

The functional requirements are grouped according to their priority status, category, and implementation in two phases (Phase I and II) based on justification and prioritization. Look at Table 1 for general functional requirements.

Table 1: Details of Functional Requirements

Requirement	Priority Status	Priority Category	Implementation Phase	Description
Route Scheduling	High	Essential to Business	Phase I	A mandatory feature to optimize daily route scheduling for Ryan and his employees through GPS integration, real-time updates, and job assignments. Enhances operational efficiency.
Customer Management	High	Essential to Business	Phase I	organizing data and improving communication, integrating CRM for upselling opportunities and personalized service.
Financial Management	High	Essential to Business	Phase I	It is mandatory to have a system that automates accounting functions such as invoicing, payment tracking, payroll, and financial reporting, enhancing efficiency by integrating with customer management and managing new employee payroll.
Inventory Management	High	Essential to Business	Phase I	A mandatory features to develop an inventory management system to track tools, supplies, and chemicals,

				integrate with route scheduling, and implement fleet management to manage business expansion demands efficiently.
Marketing and Online Presence	Medium	Good to Have	Phase I	Creating a website for LCS services with local SEO to attract customers in Ryan's area, enabling quote requests and future online booking features for growth and expansion.
Forecasting and Planning	Low	Value - Added	Phase II	It is useful after the business is operational. Research organic products, pilot with customers, develop a marketing plan and aim for long-term growth while maintaining core operations.
Adoption of Organic Products	Low	Value-Added	Phase II	This is low in priority because it is optional. It is a future opportunity rather than an immediate necessity. This can be considered once the core business operations are stable, and the initial expansion is well managed.

II. Project Schedule

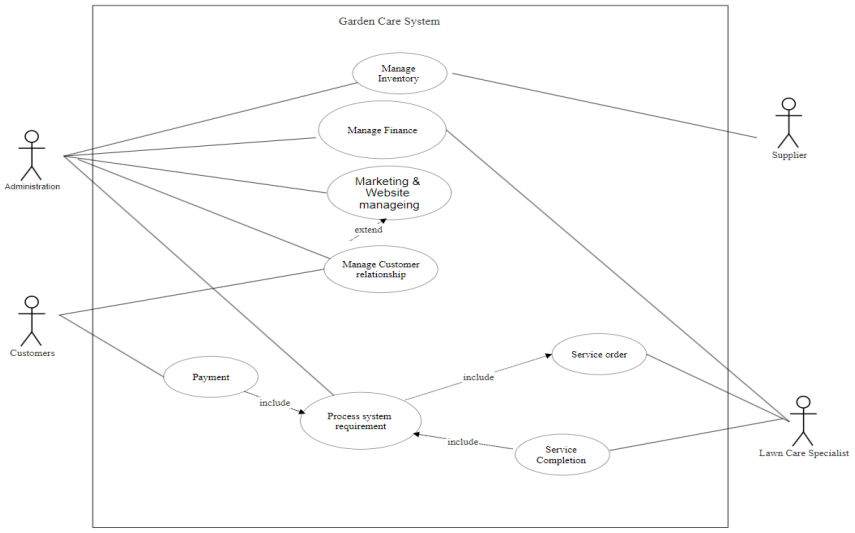
The project plan is to implement the functional requirements in two phases over a tenure of seven months as illustrated in Table 2 below. Phase 1 implementation by the LCS development team; it will GO LIVE on 1st April 2025 and the Phase 2 implementation for the Website requirement will GO live on 1st May 2025.

The detailed project plan with Gantt charts of all phases including hiring teams have been mentioned in Annexure II below.

	1-Oct-24	1-Nov-24	1-Dec-24	1-Jan-25	1-Feb-25	1-Mar-25	1-Apr-25
Resources							
Project manager	Phase1, Phase2						
UI/UX Designer	Phase1			Phase2			
System Analyst		Phase1			Phase2		
Deleloper 1			Phase1			Phase2	
Deleloper 2							
Tester					Phase1		Phase2
	Go Live						
Phases	Development Module to be Delivered						
Phase1	LCS System						
Phase2	Website						

III. Design of Logical System

1. Use case diagram



Use case Title: Garden Care System
Primary Actor: Customer
Level: Kite
Stakeholder: Customer, Administration, Lawn Care Specialist, Supplier.
Precondition: The customer sends a job request
Minimal Guarantee: Service requested; customer notify of the status of the service.
Success Guarantee: Service is complete, customer made the payment.
Trigger: The customer requests a service.
Main Success Scenario: 1. The customer requests a service from Garden Care system. 2. The system verifies the request and send to administration. 3. The customer provides payment details to the system. 4. System Check with inventory and assign lawn care specialist to attend the service. 5. The lawn care specialist completes the service and advise job done to customer. 6. Customer makes the payment, the system close the request
Extension: 1a. Customer provided incomplete or invalid details for service: 1a1. The customer submits the service request, but the address or service details are incomplete or invalid. 1a2. The system informs the customer to correct or complete the service request. 1a3. The system cancels the service request and notifies the customer if the information is not provided within the required timeframe. 1a4. The customer re sends the request with correct service details, the system process with the service order. 2a. Inventory shortage: 2a1. The system checks inventory for the required service, find shortage of inventory

shortage.

2a2. The system notified the shortage and sent a order to the supplier automatically.

2a3. The customer is notified of the inventory shortage and delay in service.

2a4. The administration updates the system when the inventory is restocked, and the system reactivates the service.

2a5. The system notifies customers with a new service schedule, and the service is undergoing.

3a. Lawn care specialist is unavailable:

3a1. No lawn care specialist is available for the requested time.

3a2. The system marks the service to the administration to assign the service when specialist is available.

3a3. The system checks lawn care specialist schedule, offer a new time.

3a4. The customer chooses a new time, the system updates the administration and notifies the lawn care specialist.

4a. The customer fails to make payment:

4a1. After service is completed, the customer does not pay on the agreed date.

4a2. The system sends a reminder to the customer via text or email.

4a3. The customer failed to make the payment after serval reminder sent, and the system sent the information to administration for follow up.

4a4. The customer is marked by system for “No Service” until payment is made.

4a5. The customer makes the payment, system unmark and update the administration for future service.

5a. The customer cancels the service:

5a1. The customer wishes to cancel the service after the request is sent.

5a2. The customer informs the system to cancel the service.

5a3. The system sends notify the lawn care specialist and administration of the cancellation.

5a4. If the cancellation after the lawn care specialist starts the service, the system marks the service as cancelled and charges a cancellation fee.

6a. Supplier fails to deliver inventory:

6a1. The supplier fails to deliver inventory on time and causes service delay.

6a2. The system tracks supplier delivery status and pause the service.

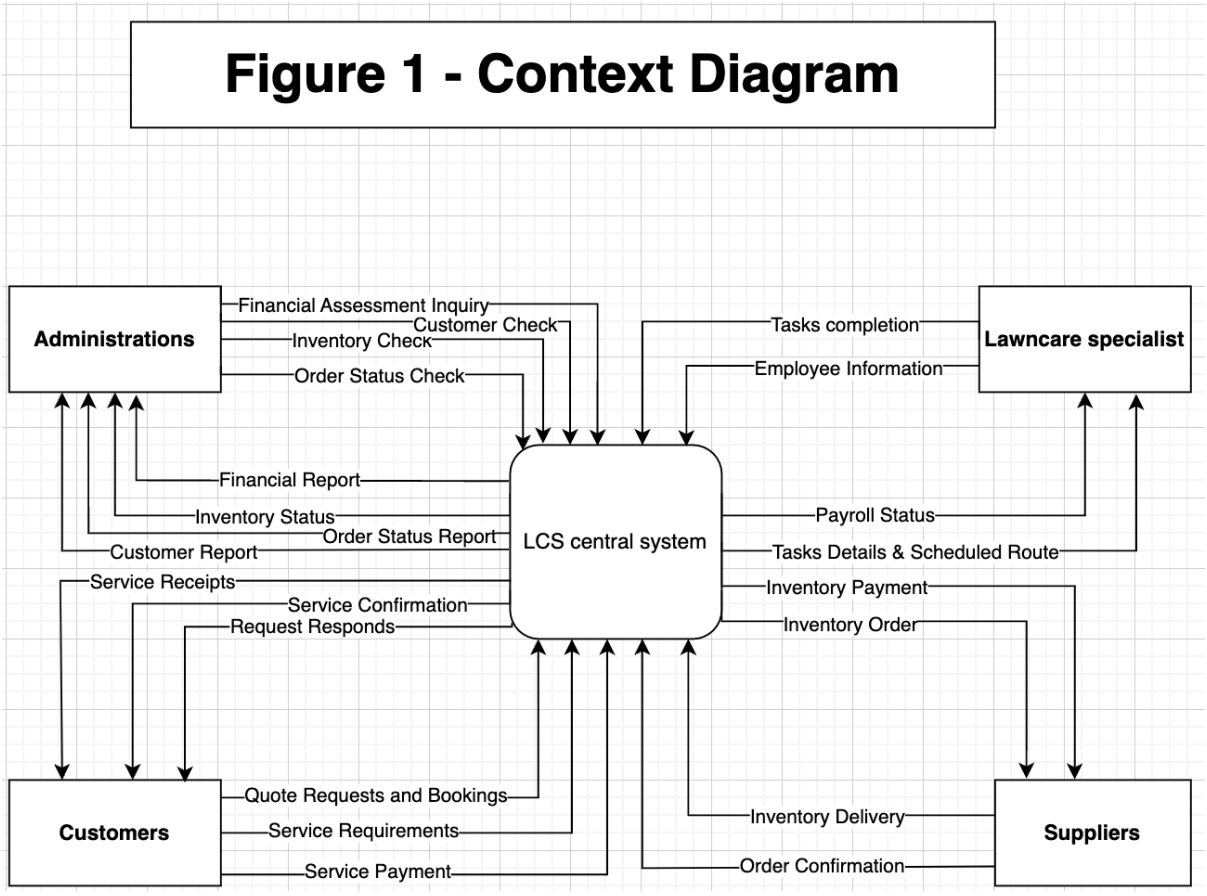
6a3. The system notifies administration to check with suppliers for update on delivery.

6a4. If the supplier is updated with delivery date, administration notify the customer of service delay.

2. Context Diagram

The context diagram is depicted in Figure 1 of this document which outlines the overview of the organization system as showing entities, how they interact with the system and the information flows. The Lawn Care Specialist (LCS) has one main data process which is the LCS central system and four major entities like Administrations, Lawncare specialists, Suppliers, and customers and their interdependency data flows.

Figure 1 - Context Diagram



1. Administrations:

- Four data flow input interfaces with the LCS central system: **Customer Check, Inventory Check, Order Status Check, and Financial Assessment Inquiry**
- Four data flow output interfaces with the LCS central system: **Financial Report Inventory Status, Order Status Report, and Customer Information.**

2. **Lawncare Specialist**:

- Two data flow input interfaces with the LCS central system: **Employee Information and Tasks Completion.**
- Two data flow output interfaces with LCS central system: **Tasks Detail & Scheduled Route and Payroll Status.**

3. **Suppliers**:

- Two data flow input interfaces with the LCS central system: **Inventory Delivery and Order Confirmation.**
- Two data flow output interfaces with the LCS central system: **Inventory Order and Inventory Payment.**

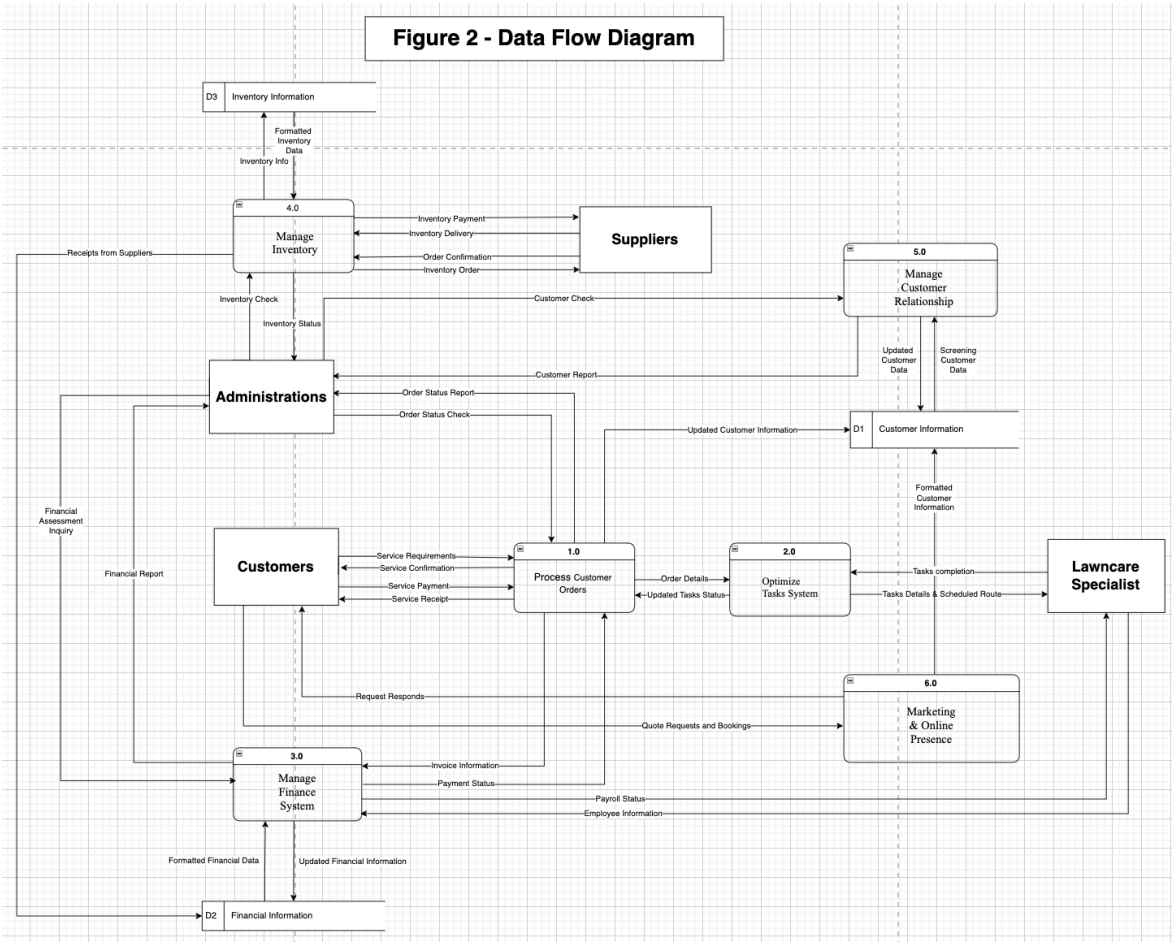
4. **Customers**:

- Three data flow input interfaces with the LCS central system: **Quote Requests and Bookings, Service Requirements, and Service Payment.**
- Three data flow output interfaces with the LCS central system: S**ervices Receipts, Service Confirmation, and Request Responds.**

3. Level 0 Data Flow Diagram (DFD)

The level 0 Data Flow Diagram depicted in Figure 2 of this document defines the relationship between all identified sources/sinks. The diagram also shows the dataflow between entities and six (6) identified data processes and three (3) data stores. The key processes in the system include managing inventory, handling customer relationships, optimizing task systems, managing the financial system, and processing customer orders. Each process interacts with both external entities (such as suppliers, customers, and lawncare specialists) and internal data

stores (such as financial information, customer information, and inventory information).



Entities

1. **Administration (Source/Sink):** The administration acts as a central entity interacting with different processes and managing critical data flows.

- It sends an Order Status Check to the data process (1.0 Process Customer Orders) procedure, ensuring that order statuses are monitored.
- The administration also handles Financial Assessment inquiries, which are sent to the 3.0 Manage Finance System. This query sends updated financial information to the D2 Financial Information database.
- The Customer Check data flow is directed to the (5.0 Manage Customer Relationship) data process, ensuring customer information is reviewed and updated.
- Inventory Check is sent to the (4.0 Manage Inventory) data process which then receives Formatted Inventory Data from the D3 Inventory Information store.

2. Suppliers (Source/Sink): Suppliers interact with the system primarily through the 4.0 Manage Inventory data process.

- Inventory Delivery data flows output interface from the suppliers to the (Manage 4.0 Inventory) data process, with Inventory Payments data flow input interface flowing back to suppliers to complete transactions.
- Suppliers also receive Inventory Orders and return Order Confirmations to the (4.0 Manage Inventory) data process.

3. Customers (Source/Sink): Customers play a key role in the system, initiating service requests and interacting with multiple processes.

- Service requirements are sent to the (1.0 Process Customer Orders) data process, where orders are confirmed and reported back to the customer through Service Confirmation data flow output interface to customer.
- Customers send Service Payments, which are processed, and they receive Service Receipts as confirmations.
- Quote Requests and Bookings data flow from the customers to the (6.0 Marketing & Online Presence) data process, which processes these requests and updates customer information. This data is then stored in D1 Customer Information and flows to the 5.0 Manage Customer Relationship process for further updates and screenings.

4. Lawncare Specialist (Source/Sink)

- Lawncare specialists provide Employee Information to the 3.0 Manage Finance System, where it is processed and linked to Updated Financial Information, ultimately stored in D2 Financial Information.
- lawncare specialists receive Task Details & Scheduled Routes from the 2.0 Optimize Task System. Upon completion, they report back through the Tasks Completion flow, updating the system on task statuses.

Data Processes

1. 1.0 Process Customer Orders:

- This process handles incoming orders from customers, ensuring that orders are processed and confirmed.
- This process is connected to the 2.0 Optimize Task System, where task statuses are updated and monitored.
- It also manages Service Payments from customers and sends them Service Receipts.

2. 2.0 Optimize Task System:

- The task optimization system is responsible for managing and updating the status of tasks assigned to lawncare specialists.
- It sends Task Details & Scheduled Routes to lawncare specialists and receives Task Completion updates to maintain task progress.

3. 3.0 Manage Finance System:

- This process handles all financial aspects of the system, including managing employee payroll, customer payments, and supplier transactions.
- Financial data is updated in the D2 Financial Information store, ensuring that accurate and up-to-date information is available for other processes.

4. 4.0 Manage Inventory:

- The inventory management process ensures that inventory levels are maintained and managed efficiently.
- It processes deliveries from suppliers, handles payments, and updates inventory status information, which is stored in D3 Inventory Information.

5. 5.0 Manage Customer Relationship:

- This process is responsible for managing customer relationships, including customer data screenings and updates.
- It interacts with the (D1 Customer Information) data store, ensuring that all customer data is accurate and up to date.

6. 6.0 Marketing & Online Presence:

- The marketing process handles customer inquiries related to quote requests and bookings.
- It also ensures that customer data is updated in the (D1 Customer Information) data store, feeding into the (5.0 Manage Customer Relationship) data process.

Data Stores

1.D1 Customer Information:

- This store holds all customer-related data, which is accessed and updated by the 6.0 Marketing & Online Presence and 5.0 Manage Customer Relationship processes.

2.D2 Financial Information:

- This store holds all financial data, including customer payments, employee payroll information, and supplier transactions. It is updated by the 3.0 Manage Finance System.

3.D3 Inventory Information:

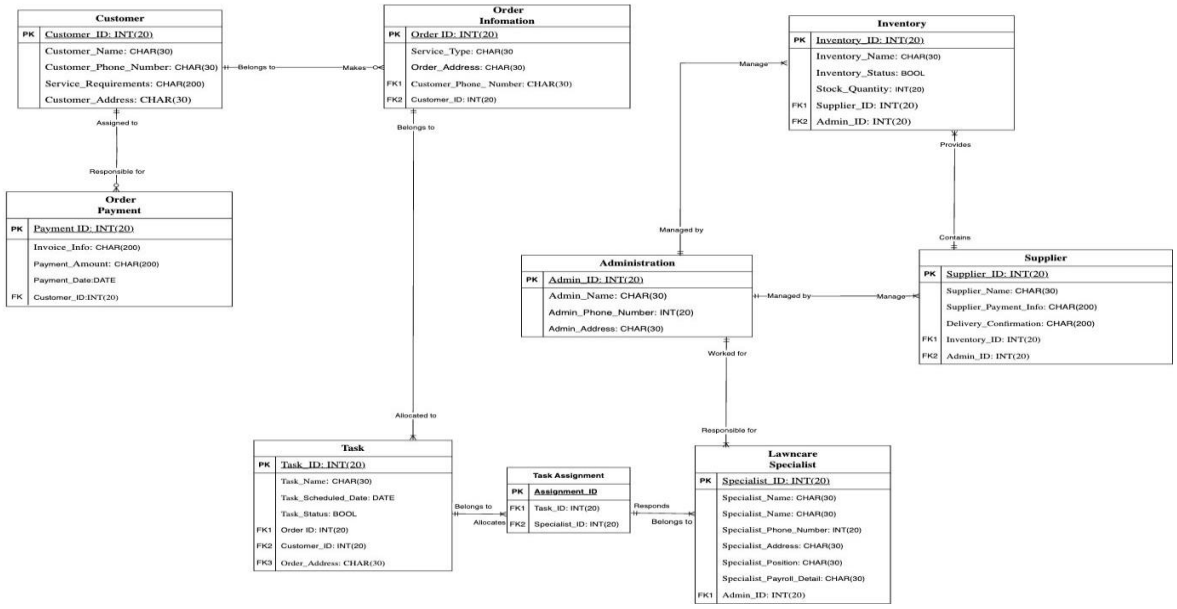
- This store holds all inventory-related data, which is updated by the 4.0 Manage Inventory process based on deliveries and inventory checks.

4. Entity Relationship Diagram (ERD)

The Entity Relationship Diagram, shown in Figure 3, depicts the entities, their multiplicity, and their relationships with each other. Details of the same have been provided herewith.

Figure 3 - Entity Relationship Diagram

LAWN CARE SPECIALISTS (LCS) -ERD DIAGRAM



A total of 9 entities have been identified for the new system. Customer, Order Information, Order Payment, Administration, Inventory, Supplier, Task, Task Assignment and Lawncare specialist. Relationships and Cardinality description as below:

Entities	Relationship	Description
Customer and Order Information	One-to-Many	A customer can place many orders, but each order belongs to one customer. A single customer can have many orders. The Customer_ID in Order Information is a foreign key that references the Customer entity.
Order Information and Task	One-to-Many	An order can have multiple tasks assigned, but each task is related to one order. A single order can be assigned many tasks. The Order_ID in Task is a foreign key referencing Order Information.
Order Information and Payment	One-to-One	An order has one payment, and a payment is associated with only one order. Each order is responsible for one payment (1:1). The Order_ID in Payment is used as a foreign key for this relationship.
Task and Task Assignment	One-to-One	Each task is assigned to one specialist, and a specialist is assigned a single task at a time through this table. A task is allocated to one specialist at a time, while each

		task assignment involves one task and one specialist (1:1).
Task and Customer	Many-to-One	Many tasks may be associated with one customer. Orders allow for many tasks to be allocated to a single customer.
Inventory and Supplier	Many-to-One	Many inventory items are supplied by a single supplier, but a supplier may provide many different inventory items. A supplier can provide many inventory items. The Supplier_ID in Inventory is a foreign key that references the Supplier entity.
Inventory and Administration	Many-to-One	An administration entity is responsible for managing multiple inventory items, but each inventory item is managed by only one administration entity. The Administration unit can manage many inventory items. The Admin_ID in Inventory is a foreign key referencing the Administration entity.
Administration and Inventory	One-to-Many	Each administrator manages multiple inventories, but each inventory item is managed by one administrator. Each administrator manages many inventories. The Admin_ID is a foreign key.
Supplier and Inventory	One-to-Many	A supplier provides multiple inventory items, but each inventory item is associated with only one supplier. A supplier can provide many inventory items.
Task Assignment and Lawncare Specialist	One-to-One	Each task assignment involves one specialist. A specialist is responsible for exactly one task assignment at a time (1:1).

IV. Recommendation of a solution

Recommendation of a Solution for Lawn Care Specialists (LCS):

After a thorough analysis of what LCS requires for current and future operations, recommendations are to implement a comprehensive integrated software including functionalities of GPS-guided route scheduling and up-to-date real-time task optimization for lawn care specialists; CRM to manage customers' information and personalized service & promotions; financial management of automate invoices, payment tracking, payroll, taxing and

generate a financial report; inventory management of track tools, supplies and chemicals along with fleet management. All those features are crucial for optimizing LCS's daily operation, improving customer experience, ensuring financial stability, and managing inventory effectively. The use of such a system also ensures LCS' future expansion and potential further business acquisitions can be up and running in no time.

Estimated Cost（Cost Analysis for Economic Feasibility Table)

The estimated cost for this software is in total of $248,000 to develop in-house. It is a significant cost for Ryan and his LCS especially for his current personal situation. Moreover, the required functionalities can be substituted by off-the-shelf options such as Saleforce & MYOB Business Pro. The specific function of GPS-guided route scheduling and task optimization would prefer to be developed as required which will incur the majority of the cost.

System acquisition approach (Analysis of Pros and Cons of the Buy and Build Approach)

A combination acquisition approach is recommended for LCS, with the purchase of ready-to-use software with customized functionalities to meet what LCS requires. For the CRM, financial management, and inventory management parts, ready-to-use software is ideal and put into use in no time whilst the route scheduling would be better to have customized from specific functionalities. This approach could allow LCS to shorten the waiting time with ready-to-use software functions to deploy and up and running which enable its operation efficiency resulting positive impact financially.

Conclusion

To summarize, LCS will greatly benefit from the purposed functions of software including route scheduling, CRM, financial management, and inventory management. The suggestion for LCS will be better off to have a combination acquisition approach, first purchase the ready-to-use software from a reliable and reputable provider to take advantage of fast deployment time and put in action for CRM, financial management, and inventory management, meanwhile, hiring a developer for joint venture to develop a route scheduling software with tasks optimization. With the iterative development method, the business will benefit from efficiency.

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Appendices I: Prototype Screen Shots

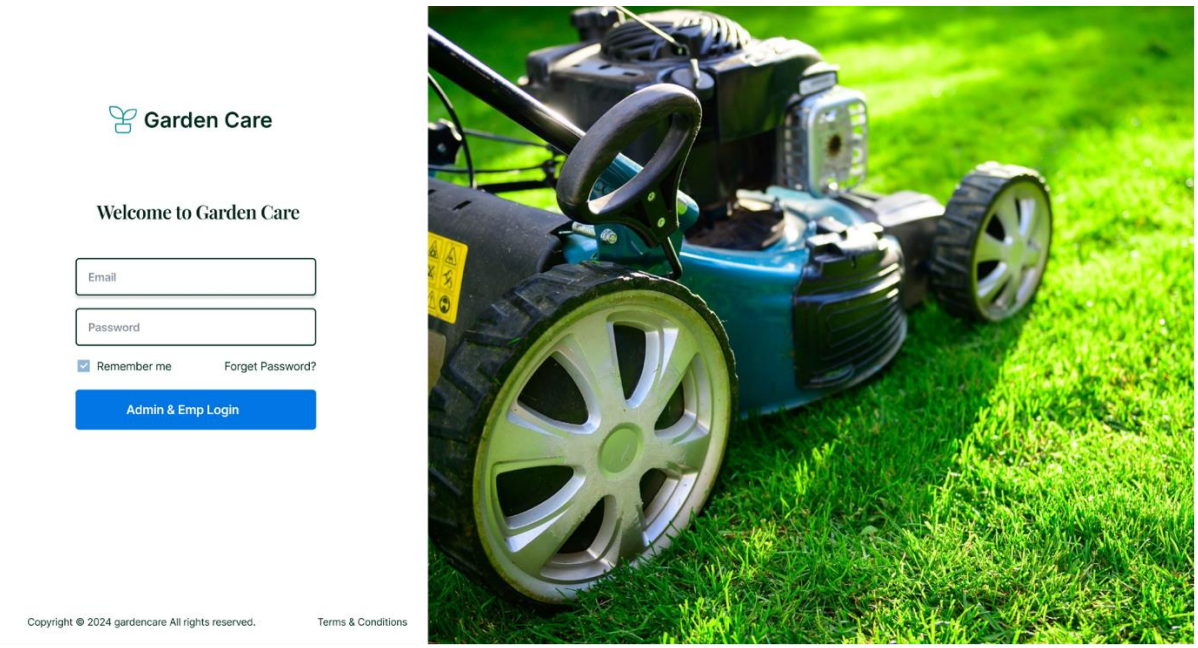


Figure 1 Login Page

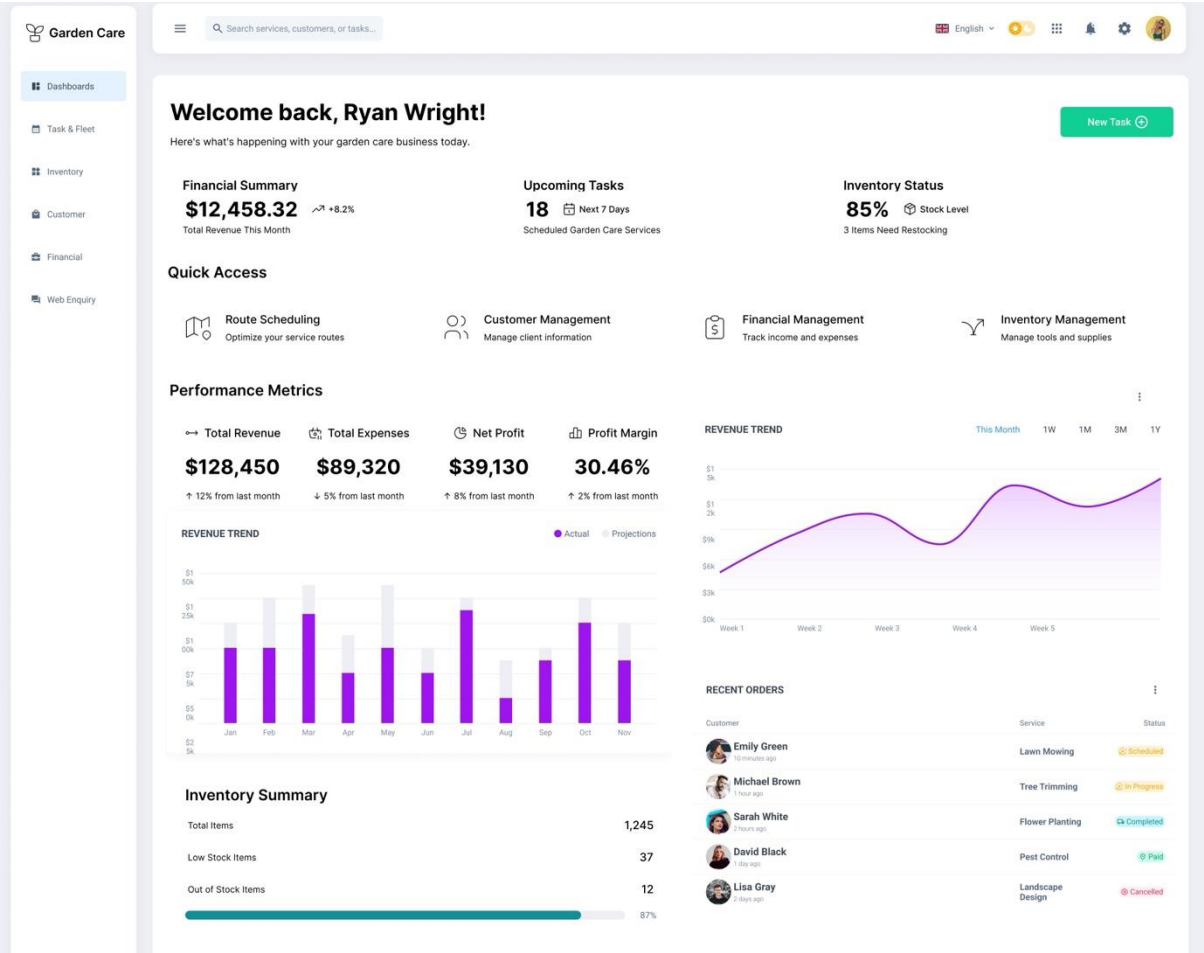


Figure 2 Dashboard Page

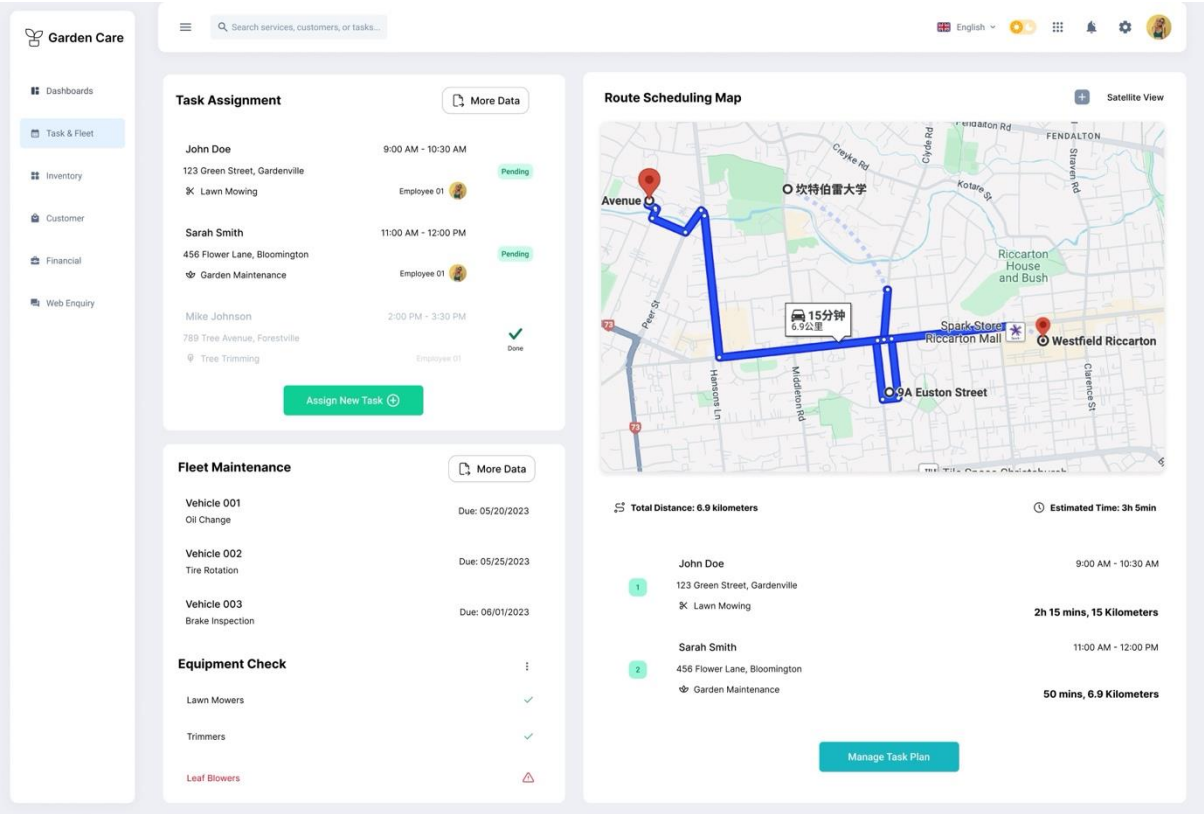


Figure 3 Route Scheduling

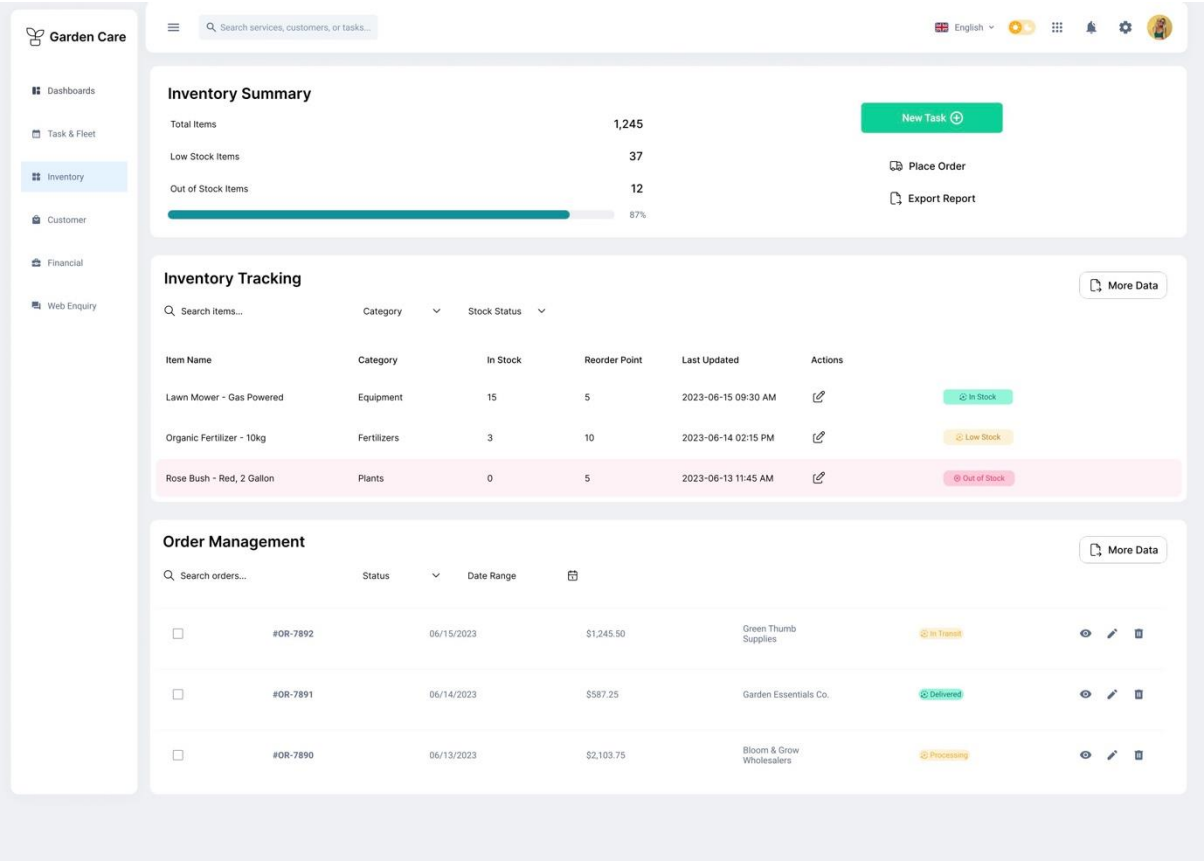


Figure 4 Inventory Management

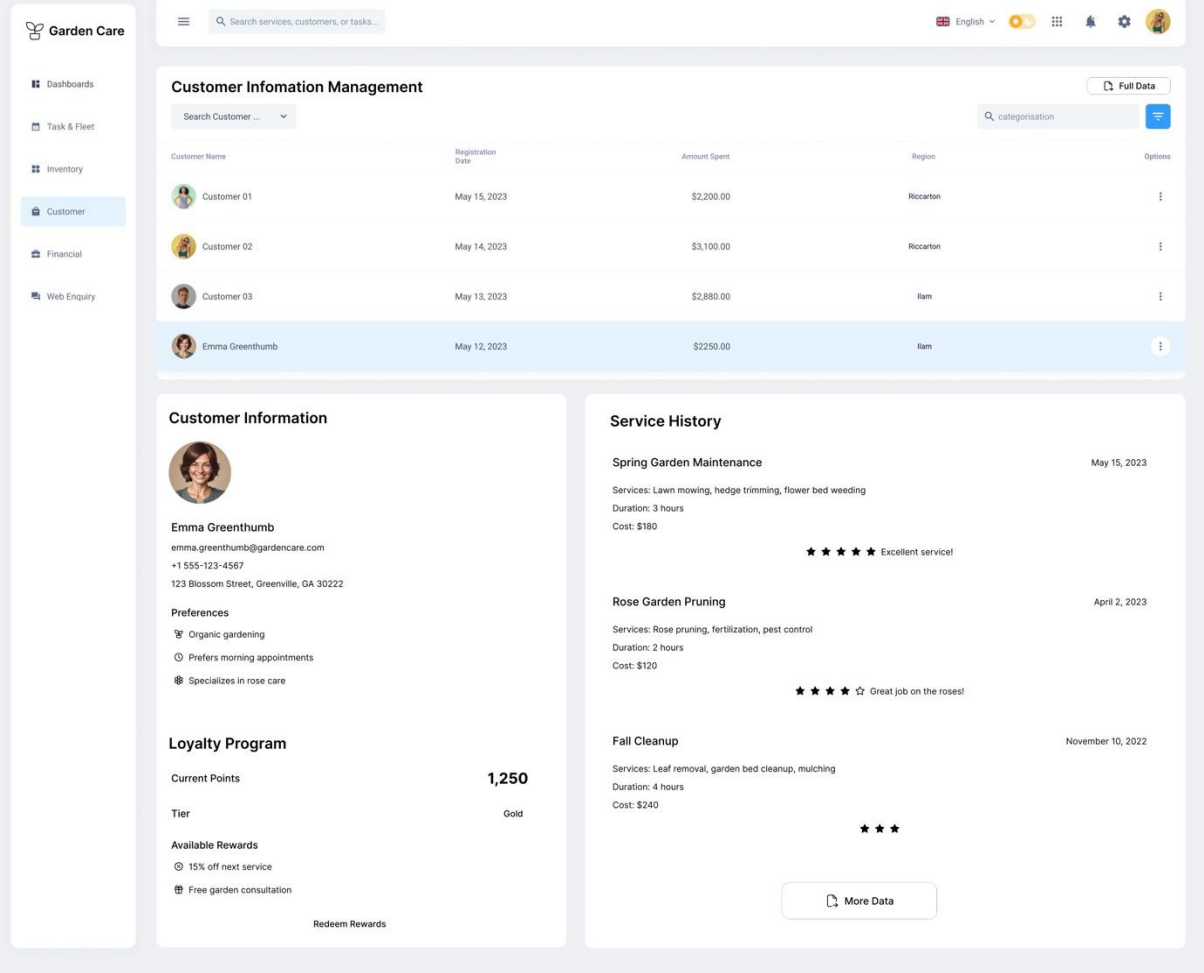


Figure 5 Customer Management

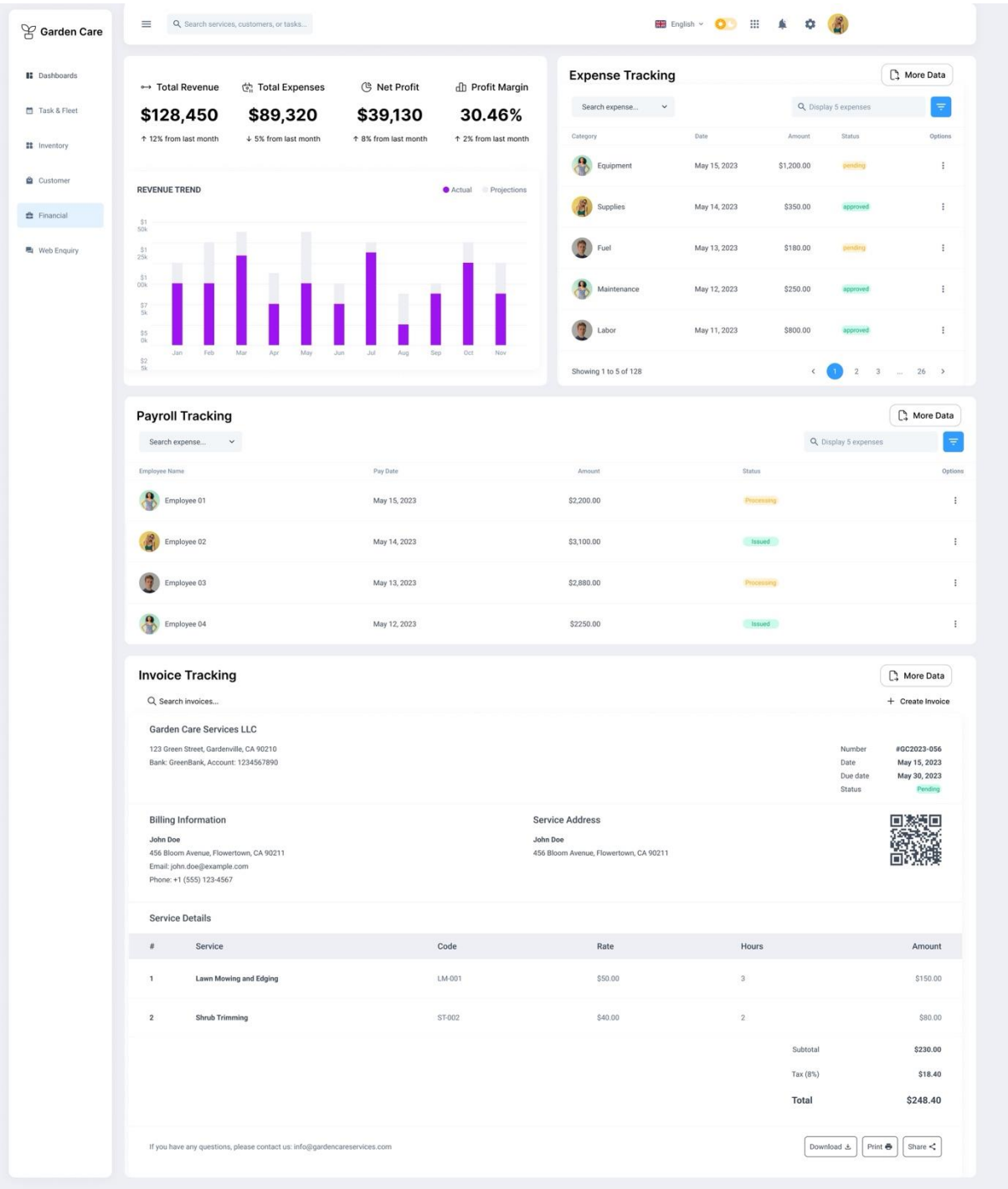


Figure 6 Financial Management

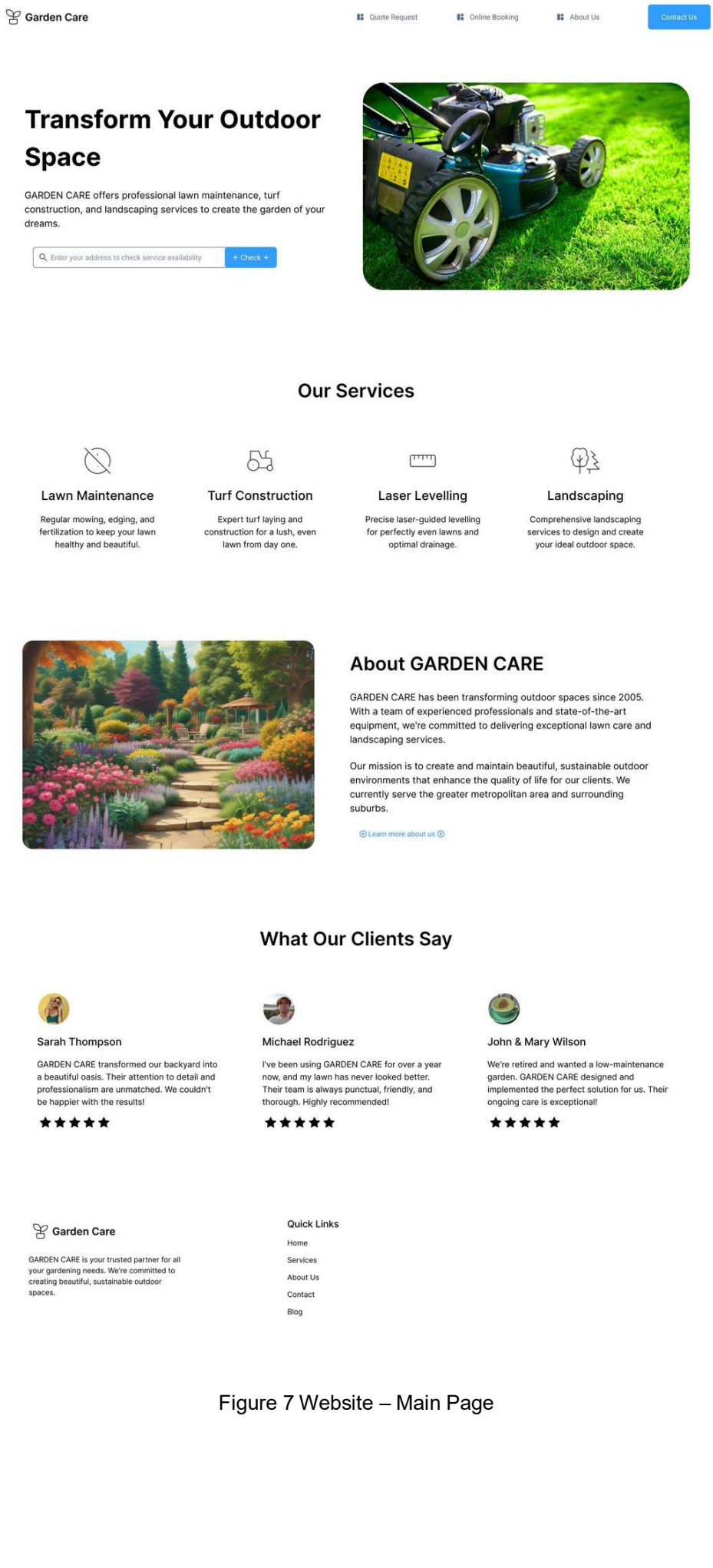


Figure 7 Website – Main Page

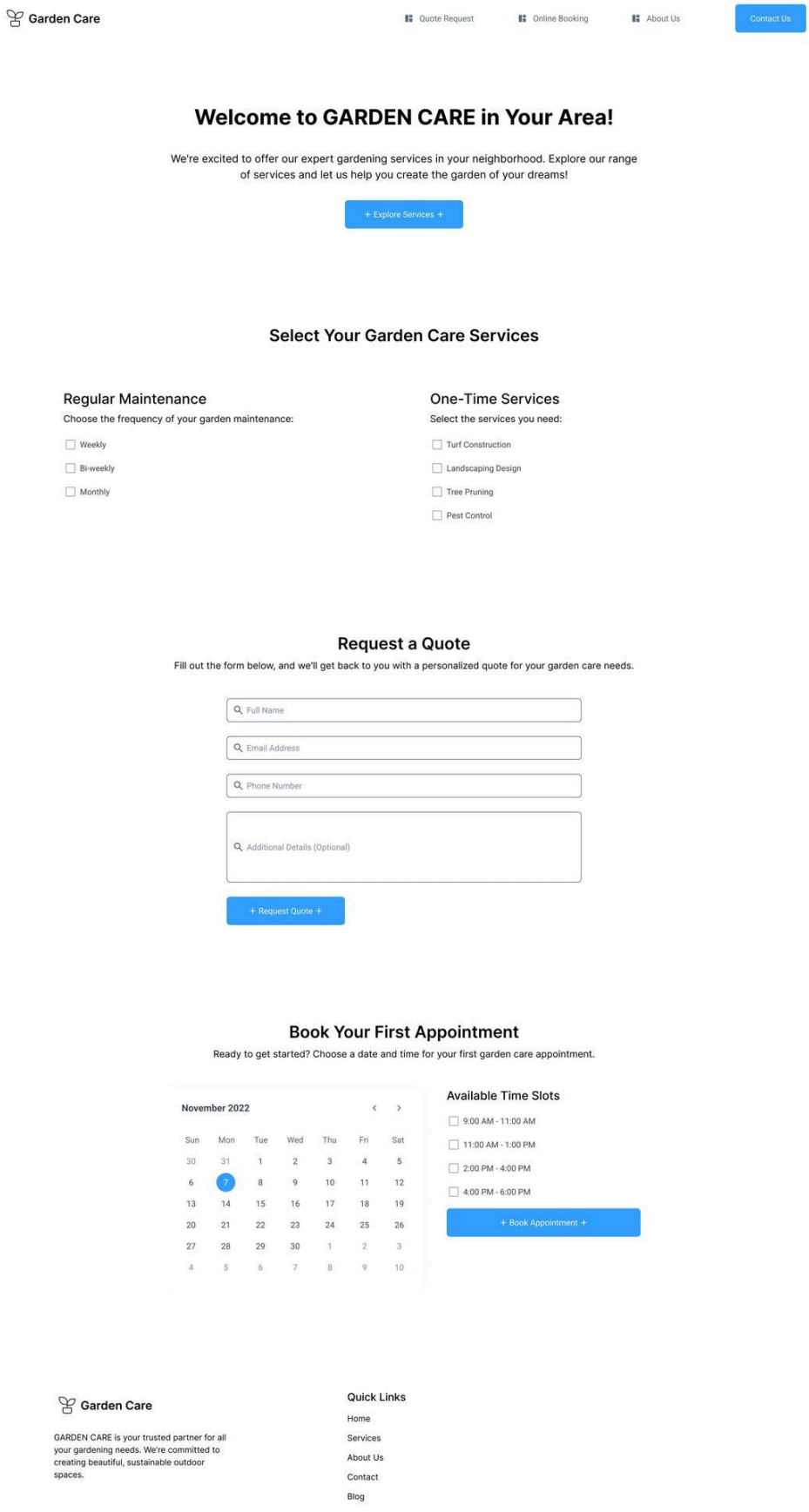


Figure 8 Website - Services

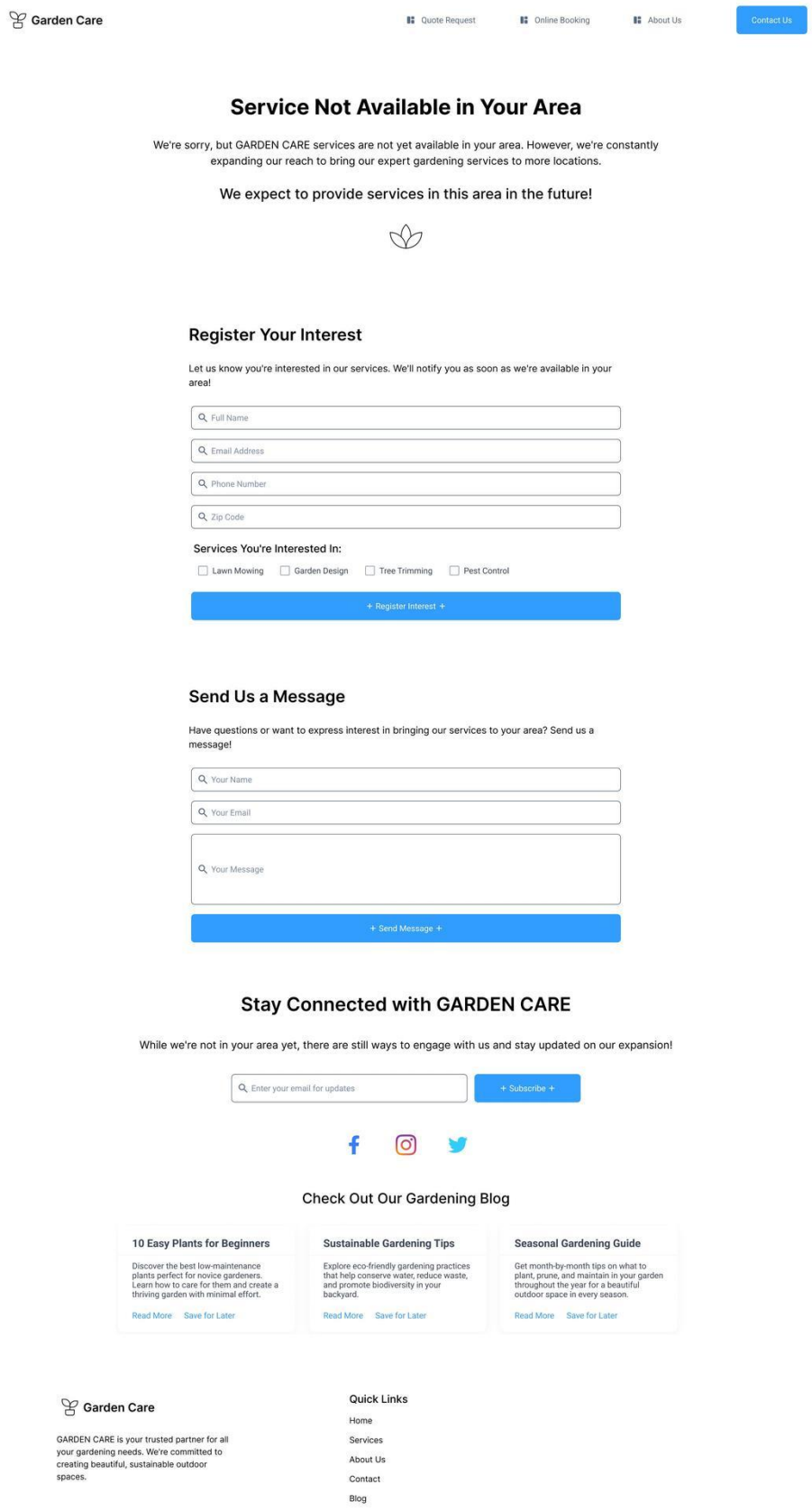
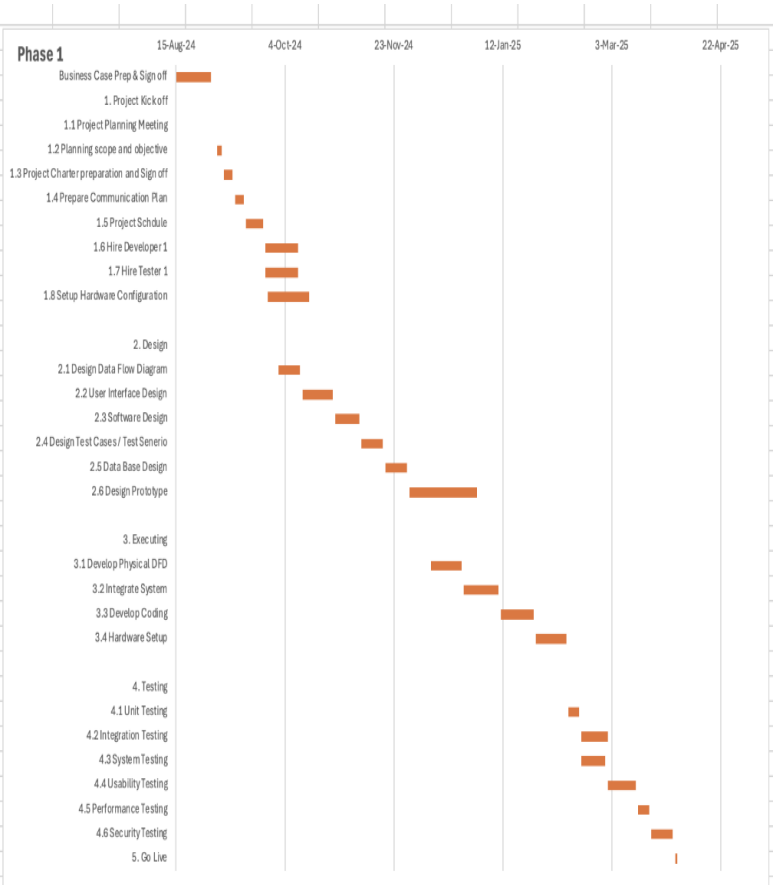


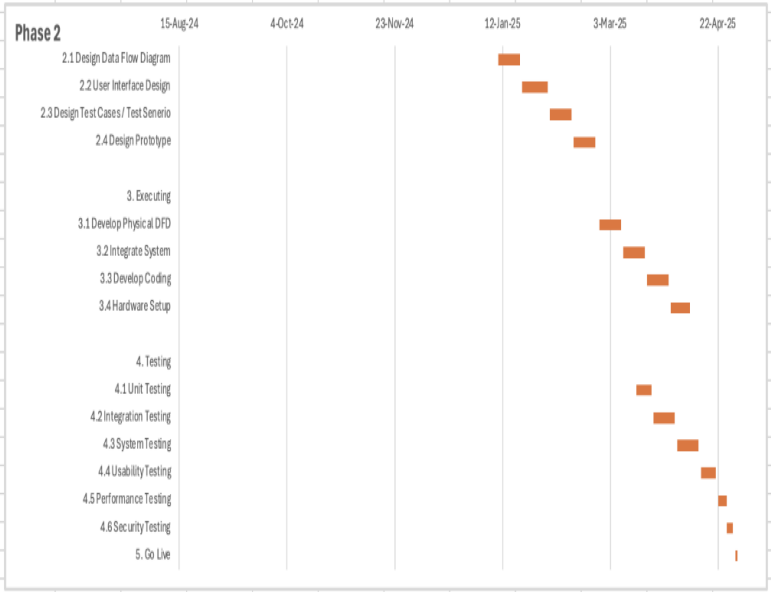
Figure 9 Website - Not In Area

Appendices II: Project Allocation and Gantt Chat

Phase 1			
1. Planning	**Start Date**	**End Date**	**Duration**
Business Case Prep & Sign off	15-Aug-24	31-Aug-24	16
1. Project Kick off	1-Sep-24	1-Sep-24	0
1.1 Project Planning Meeting	2-Sep-24	2-Sep-24	0
1.2 Planning scope and objective	3-Sep-24	5-Sep-24	2
1.3 Project Charter preparation and Sign off	6-Sep-24	10-Sep-24	4
1.4 Prepare Communicatio	11-Sep-24	15-Sep-24	4
1.5 Project Schdule	16-Sep-24	24-Sep-24	8
1.6 Hire Developer 1	25-Sep-24	10-Oct-24	15
1.7 Hire Tester 1	25-Sep-24	10-Oct-24	15
1.8 Setup Hardware Configuration	26-Sep-24	15-Oct-24	19
2. Design			
2.1 Design Data Flow Diagram	1-Oct-24	11-Oct-24	10
2.2 User Interface Design	12-Oct-24	26-Oct-24	14
2.3 Software Design	27-Oct-24	7-Nov-24	11
2.4 Design Test Cases / Test Senerio	8-Nov-24	18-Nov-24	10
2.5 Data Base Design	19-Nov-24	29-Nov-24	10
2.6 Design Prototype	30-Nov-24	31-Dec-24	31
3. Executing			
3.1 Develop Physical DFD	10-Dec-24	24-Dec-24	14
3.2 Integrate System	25-Dec-24	10-Jan-25	16
3.3 Develop Coding	11-Jan-25	26-Jan-25	15
3.4 Hardware Setup	27-Jan-25	10-Feb-25	14
4. Testing			
4.1 Unit Testing	11-Feb-25	16-Feb-25	5
4.2 Integration Testing	17-Feb-25	1-Mar-25	12
4.3 System Testing	17-Feb-25	28-Feb-25	11
4.4 Usability Testing	1-Mar-25	14-Mar-25	13
4.5 Performance Testing	15-Mar-25	20-Mar-25	5
4.6 Security Testing	21-Mar-25	31-Mar-25	10
5. Go Live	1-Apr-25	2-Apr-25	1



Phase 2			
2. Design	**Start Date**	**End Date**	**Duration**
2.1 Design Data Flow Diagram	10-Jan-25	20-Jan-25	10
2.2 User Interface Design	21-Jan-25	2-Feb-25	12
2.3 Design Test Cases / Test Senerio	3-Feb-25	13-Feb-25	10
2.4 Design Prototype	14-Feb-25	24-Feb-25	10
3. Executing			
3.1 Develop Physical DFD	26-Feb-25	8-Mar-25	10
3.2 Integrate System	9-Mar-25	19-Mar-25	10
3.3 Develop Coding	20-Mar-25	30-Mar-25	10
3.4 Hardware Setup	31-Mar-25	9-Apr-25	9
4. Testing			
4.1 Unit Testing	15-Mar-25	22-Mar-25	7
4.2 Integration Testing	23-Mar-25	2-Apr-25	10
4.3 System Testing	3-Apr-25	13-Apr-25	10
4.4 Usability Testing	14-Apr-25	21-Apr-25	7
4.5 Performance Testing	22-Apr-25	26-Apr-25	4
4.6 Security Testing	26-Apr-25	29-Apr-25	3
5. Go Live	30-Apr-25	1-May-25	1



Cost Analysis for Economic Feasibility Table:

Development Expense					
	Staff	Months	Hourly Rate (NZD)	No. of Hours	Costs (NZD)
Project Manager	1	7	$65	840	$54,600
UI/UX Designer	1	4	$55	640	$35,200
System Analyst	1	5	40	800	$32,000
Developer	2	5	$50	1600	$80,000
Tester	1	3	$50	480	$24,000
Hardware costs					$8,000
Integration costs					$15,000
Total Expenses					$248,800

Analysis of Pros and Cons of the Buy and Build Approach:

Pros:	Cons:
✧ Lower up front cost. ✧ Purchasing off the shelf software greatly reduce need waiting time and enable fast implement and deploy process. ✧ Purchasing off the shelf software greatly reduce need waiting time and enable fast implement and deploy process. ✧ Purchasing reliable software will be more cost efficient ✧ Lower system maintenance and training cost. ✧ Free update on new functions.	✧ Off-the-shelf software may require customization which could cause high costs and longer implementation time. ✧ Limited customization may differ from what LCS required. ✧ Potential new Software integrate difficulties.