



An Undergraduate Internship on Customer Relationship Management System

By

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Summer, 2021

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September 11, 2021

Dissertation submitted in partial fulfillment for the degree of Bachelor of
Science in Computer Science

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Attestation

This is to certify that the report titled “Customer Relationship Management System” is completed by me, Victor Francis Halder (1610026), submitted in partial fulfillment of the requirement for the Degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). It has been completed under the guidance of Ms. Moumita Asad (Supervisor). I also verify that all my work is authentic which I have presented and learned during my internship. All the sources of information used in this project and report has been duly acknowledged in it.

Signature

Date

Victor Francis Halder

Name

Acknowledgement

I want to express my gratitude to God for giving me the energy, confidence, and determination to continue my studies and enthusiasm towards Computer Science and Programming. It is my gain and opportunity, that I got the position in Aristo Technology.

I shall always be thankful to my supervisor Moumita Asad, Department of Computer Science and Engineering, Independent University, Bangladesh, for her important guidelines, help and knowledge throughout the Internship Program. I highly appreciate her patience, co-operations and positive attitude towards helping me when I faced problems, gave me very helpful and necessary advice and suggestions for career in future.

I express my sincere gratefulness to Mr. Anwarul Mamun (CEO, Aristo Technology), Mr. Khandoker Shafinul Haque (Managing Director, Aristo Technology) and Zahid Hassan (Business Development Manager, Aristo Technology) for giving me this opportunity and a platform to learn, work and gain experience. Likewise, I express my sincere thankfulness to all representatives of Aristo Technology for collaboratively helping me and assisting me to complete this Internship Report. Finally, I would like to thank my parents, friends, family members and teachers for their support, knowledge, motivation, and faith in me to succeed and develop as a person.

Victor Francis Halder

September 4, 2021

Dhaka, Bangladesh

Letter of Transmittal

September 4, 2021

Ms. Moumita Asad

Lecturer

Department of Computer Science and Engineering

Independent University, Bangladesh.

Subject: Internship Report Submission Summer, 2021.

Dear Miss,

It is a great pleasure and honor to submit my internship report on Customer Relationship Management System under your guidance. I have tried to present my project work, my accomplishments and experience in this report.

I have completed my Internship from Aristo Technology as a Full Stack Web Developer from the 1st June 2021 to date. During this time period, I have gained real life experience on working as a Web Developer and acquired knowledge in various aspects including software engineering, system design and advanced web app development. This report covers all the project works, work experiences and learning that I have accomplished during this internship.

I would like to thank you for your endless support, guidance and patience. I have tried to complete this with maximum honesty and sincerity. I pray and hope that this report will be interesting and fulfil your expectations. I have tried my best to avoid any kind of errors and deficiencies, and hope that my report fulfills all the requirements to your expectations.

Sincerely,

Victor Francis Halder.

Evaluation Committee

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Abstract

In this fast-moving time, technology is growing rapidly every day, new businesses are starting and growing in large scale, and they are quickly shifting to digital technology. It is very important and necessary for businesses to maintain a good communication between customers and companies to be fast, productive, and scalable. As every business grows, a huge number of customers and companies' data resides on the business database that needs to be kept in an organized manner so that it can be used to interact, follow up, and managed to produce insightful information about customers and companies. These information will help companies to handle thousands of customers at once and fasten the work and business process of sales in digital marketing, and maintain their customer satisfaction, customer loyalty and business growth.

Aristo Technology is a digital marketing company, that provides customer care, solutions, and services to growing companies to handle their excessive number of calls and business processes. They have large number of Sales Agents that communicates with companies and customers regarding any kind queries, transaction, or business process that needs to be handled. They mainly provide Call and Email service for marketing and promotions of products. In order, to have a good communication between companies and customers for promoting and selling their products. These business processes needs to be managed and handled in an organized manner, so that all the workflow and business process is fast, smooth, scalable, and centralized.

This can be done with a custom-tailored Customer Relationship Management System. In this software, there are two types of users, Sales Agents and Admins. Admins are the lead generators who looks for potential customers, business contracts, companies for promoting products. They provide leads for sales agents to follow up with, add different types of products the companies are offering, see total sales made and leads converted. Sales agents will be able to see all the leads and products from different admins, able to add customers, set appointments with them, make proposal between companies and customers, and convert leads to customers.

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Chapter 1

Introduction

We are living in time where most of the things we interact with are being digitized. Web Applications have made our lives smoother and efficient. As time goes by, they are increasingly being used in all major parts of businesses and organizations. Web Applications is getting popular and considered as an important tool for business with their uses for communication between customers, work together with employees and providing safe storage of data and providing insightful information from data. I was offered with this Internship opportunity by Aristo Technology to complete my CSE499 Internship Program course in Independent University, Bangladesh. I was assigned as a Full Stack Web Developer in Aristo Technology to help them develop a Customer Relationship Management System that will be used by The Sales Team to help them handle and manage their interaction and relationship with their customers and future customers, by streamlining their sales process, centralize company's customer information, keep track of the buyer's and seller's journey and all interactions, sync data with ease, automate tedious task to improve sales process. It will also be used by the Administrators who will add future customers and leads for the sales team. As a Full Stack Developer, I am solely responsible for the entire Software Development Lifecycle that includes the Planning, Requirement Gathering, Analyzing, Designing, and Developing and Deploying the System. I am assigned to develop a responsive, fast, and efficient CRM software tailored to Aristo Technology's Business and Sales needs.

1.1 Overview/Background of the Work

I was assigned as a Full Stack Web Developer in Aristo Technology to develop a fast, responsive and efficient Customer Relationship Management System to help them manage and handle their interaction with customers and future customers. In our fast-moving world, people have ideas that can revolutionize our world and help us make a better and efficient solutions that can create a huge impact in our lives. Nowadays most business

these days are growing rapidly, and heavy uses of e-commerce or business platform are used by billions of people every day. The more people who are using the platform and making transactions, the more the business is growing. As the business grows larger every day, it is important and necessary for every business to have a good customer care and support service, so that they can maintain their standards, customer loyalty and have positive image of the company. In recent times, most of the large business needs to have good customer service and hundreds to thousands of customers are calling every day for queries and solutions to various problems, but companies can only have fixed number of employees for customer support and many calls or messages are dropped due to overflow of customers calls. These dropped calls and messages can create a huge impact on business productivity, these missed calls or messages could have been a potential customer, but due to lack of customer service these potential customers and sales are lost. To solve this problem, Customer Relationship Management System used to forward calls and messages to a third-party organization that would help and assist the company's excessive calls and messages of customers and provide them with solutions.

1.2 Objectives

The main objective of Aristo Technology is to improve the worktime and efficiency of the sales team by providing them with solutions that will reduce the repetitive task, fasten the sales process and have an organized and automated system that keeps track of number of prospective customers turned into customers and manage all the records and customer details in an organized platform and keep the growing companies to have the positive image and maintain their standards and customer loyalty.

1.3 Scopes

Aristo Technology aims to develop a software that will provide them with high productivity in their workflow and reduce the time taken to make a proposal or sales through their website.

- Eliminate all the possible repetitive task that are performed by the Sales Team to fasten their work time taken for per customers.
- Administrator users will be able to Add / Remove or Edit Leads, Companies and Products.
- Sales users can Add / Remove or Edit Customers, Appointments and Proposals.
- Sales users can Convert Leads to Customers once a proposal has been accepted by Companies or Customers.

Chapter 2

Literature Review

A Customer Relationship Management System might consist of many modules and most of them are managing, handling, and organizing customers and their problems and opinions through the Internet. We have seen many companies struggling to maintain their positive image through Customer Support, in fact many companies go bankruptcy due to loss of large number of potential customers. The Customer Support and Care is very much essential in our current time as many people might easily move from one service provider to another if they sense slightest of poor customer care and support. But now, just with a simple CRM software we can manage and handle all customers, proposals, leads and products, synchronize sales of companies and their interactions with customers and future customers. The CRM software was introduced to help your daily home tasks, meetings, and schedules of a single individual. This idea has evolved to help and handle companies and organization's interactions with customers and future customers from a single individual to large group or corporations. This software is now widely used by most the large companies to maintain their company's standard and positive image by withholding their customers loyalty by providing them with quick and effective customer support and services.

2.1 Relationship with Undergraduate Studies

2.1.1 Introduction to Programming

This was the first and a foundation course in our Computer Science and Engineering. This course has helped us develop a strong pillar of computer programming and coding using C++. After completing this course, we had a complete breakdown and the basics foundation of complex and sophisticated programming problems into smaller segments.

2.1.2 Object-Oriented Programming

This was an intermediate course in our Computer Science and Engineering. It comes right after data structure course. It helped us understand the benefits of how objects are used in various software and makes our application come in simple design and yet a very fast development time. It reduces most of the development time because of its nature of reusing code and create models based on previous objects. The software development becomes very smooth, and the code is clean. This course has some fundamental concepts of Classes, Objects, Inheritance, Function Overloading and Polymorphism that is required in every software development.

2.1.3 Web Applications Internet

This was also an intermediate course in our Computer Science and Engineering. It comes right after System Analysis and Design. It teaches us the fundamentals of web technologies and their usages, understanding the Client-side and Server-side architecture and deliver dynamic contents for web applications using HTML, CSS, Bootstrap, JavaScript. It helped us learn about web application scalability, analyze, and model customer's requirements and User Interfaces. This course was in fact has the huge contribution to this project. It also helped us to understand some important libraries that are perquisite to the advanced technology that we will be using. This course helped us design and implement a client-server internet application that help specific requirements and constraints, based on analysis, modeling or requirements specification.

2.1.4 Database Management System

This was also an intermediate course in our Computer Science and Engineering. It comes right after Web Application Internet. It teaches us the fundamentals of database design and their uses of database management systems, the development process, architectural principles, relation algebra and SQL for a Database. It helped us develop and strong foundation on database design concepts and data modeling such as ER diagrams and BPMN diagrams and understanding the database query languages and components of a DBMS. It helped us understand the basics of data access structures, query processing and optimization techniques and database securities and data representations.

2.2 Related works

We have researched about various Customer Relationship Management System like Salesforce, HubSpot and Mailchimp that showed us how the CRM software works and their user interfaces, system flow, architecture, and setbacks of each of the CRMS websites and how we can improve it to make an even better CRM software. These websites can be called web applications for their tedious and sophisticated backend operations for managing the whole CRM software. One of the major services that Aristo Technology provide is the Customer Relationship Management System for the sales team to manage and handle their company's interaction with their customers by organizing all their emails and calls, automate their forms and proposals entry, synchronize sales made by per employee and keep records of all leads, customers. These Web applications can be really expensive and does not come in free and requires large monthly subscription, due to large monthly subscription, I was requested to develop a custom configured CRM System by Aristo Technology. Aristo Technology has a custom-tailored system requirements that include display of number of sales made by current sales user and show progress of their work and goal target, automated information fill up mechanism based on selected customer or company.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

Work Breakdown Structure is a way of finishing a complex, sophisticated and multi phased project into dividing into smaller portion and getting task completed by specific people. This helps us to divide and conquer a large project and complete the project fast and efficiently. Its main purpose is to make a huge project more manageable by breaking down into small segments and assigned to different team members to collaborative and simultaneously work together. This yields a better group productivity and efficient project management.

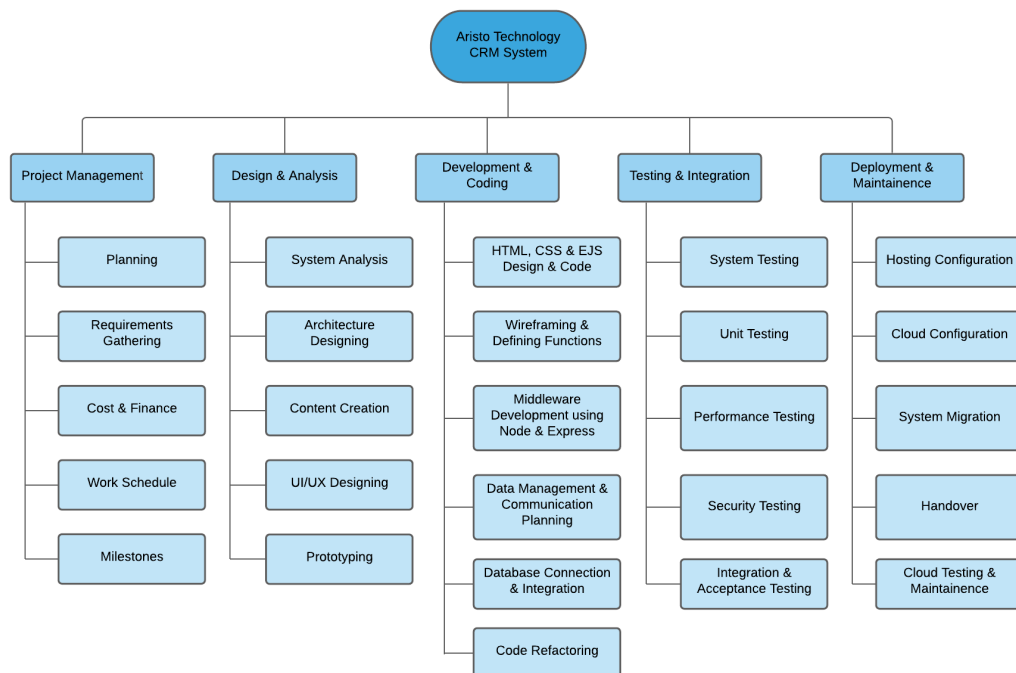


Figure 3.1: Work Breakdown Structure

Team members assigned to the project are actively involved in development to ensure consistency and high productivity. We can get a visual and hierarchical overview of the project and how each team members are going to work for the project this provides us with clarity and accurate understanding of the scope of work.

3.2 Process/Activity wise Time Distribution

The Process wise time distribution is an estimated time management planning that determines how much time will be required to successfully develop and finish a project in a given time. This creates a conceptual mapping of how efficiently team members have to work in order to complete a project and meet all the milestones and deadlines. It plays an important role in project management.

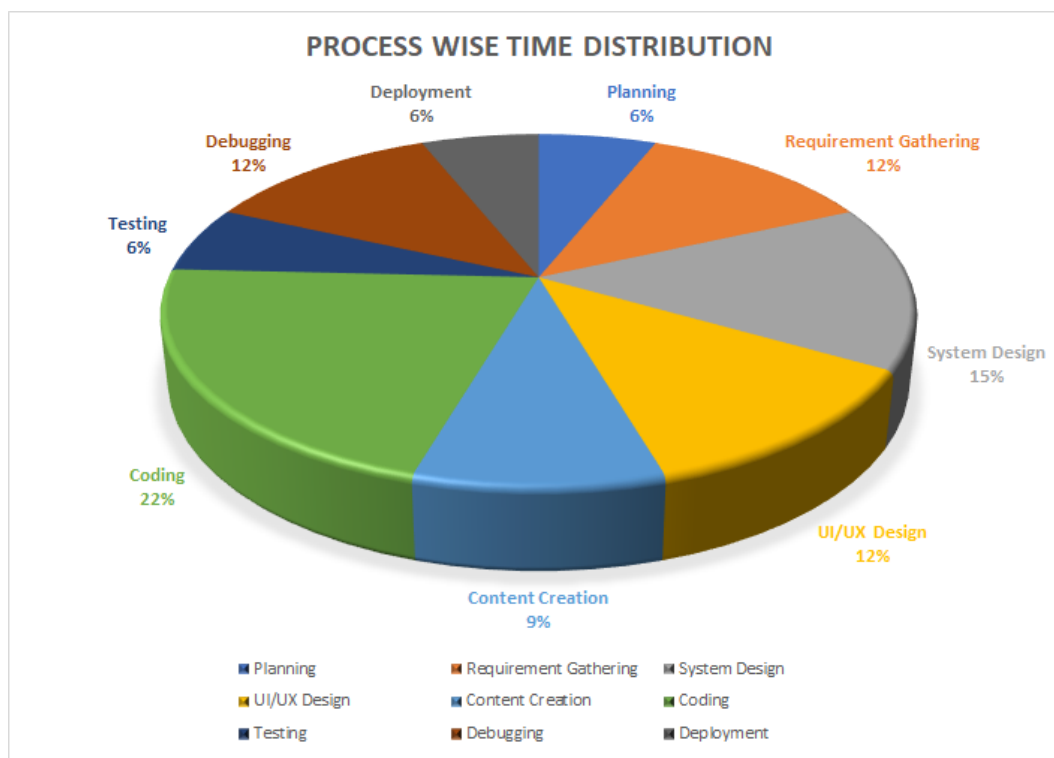


Figure 3.2: Activity Wise Time Distribution

In this chart we can see the Software Development Phases that we will go through to successfully complete the project. It also shows the list of phases we will go through with respect to time. All phases in this project are denote with specific color and percentage. The percentage (%) denotes the Time needed to complete each segment of the project on the total time allocated for the project.

3.3 Gantt Chart

The Gantt chart is one of the most widely used chart used for project management, it comes quite handy in planning a project and setting the sequence of tasks that is needed to complete a project. It is usually displayed in a graphical table with bar that denotes the time that will be taken to finish a certain phase of the project. It also includes the start date, end date, milestones and tasks. Gantt chart is very useful for scheduling, managing and monitoring specific tasks and resource in a project.[1]

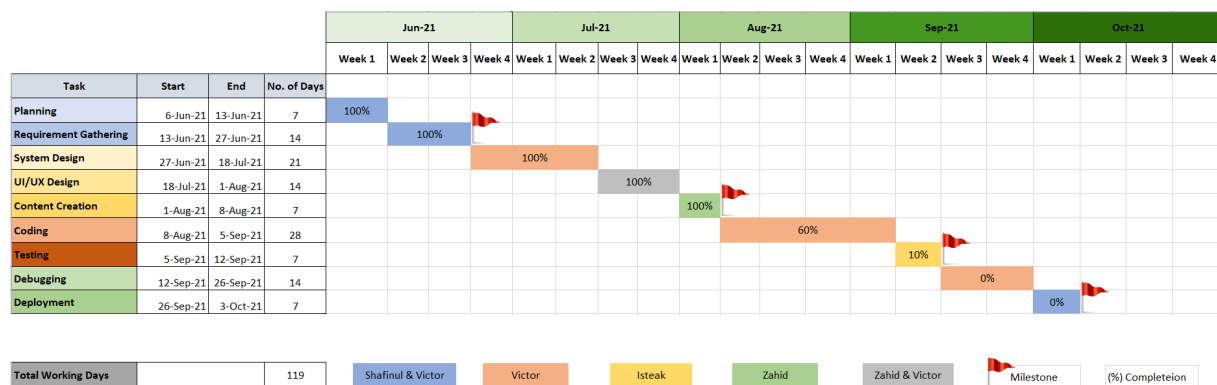


Table 3.1: Gantt Chart

In this chart we can see the Software Development Phases that we will go through to successfully complete the project. It also shows the list of phases we will go through with respect to the timeline. All members involved in this project are denoted with specific color and these colors are used in progress bar to denote specific person involved in the specific phase.

3.4 Process/Activity wise Resource Allocation & Estimated Costing

In project management, resource allocation is used to show or tabulate the schedule of activities and the resources that we will be needing to perform those activities by taking the resource availability and cost of the resources to account. It helps us to select the most preferable resources that are available to us for our project and manage them as we work.

Category	Name	Description	Availability	Cost
Hardware	Computers	Required Computers for work	High	TK 770,000
	Headphone	Required for Communication	High	TK 87,000
	Pen Drives	Required for data transfers	High	TK 5,000
	Routers	Required for connecting to the Internet	High	TK 15,000
Network	Internet Connection	Required for connecting to the Internet	High	TK 6,000 / monthly
	Domain	Required for website identification	High	TK 4,345 / 3 years
	Hosting	Required for storing website's files	High	TK 8,000 / 3years
	AWS EC2	Required for CRM software Computation and Storage	High	TK 55,000 / yearly
	VoIP Service	Required for making multiple voice calls through internet	Medium	TK 28,000 / yearly
Software	Microsoft Windows 10	Operating System required for all users	High	TK 0
	Microsoft Office	Required for writing, editing documents	High	TK 0
	Microsoft Visual Studio	Required for Developers for using frameworks	High	TK 0
	Atom	Text editor required for Web Developers	High	TK 0
	Adobe Photoshop	Digital Content Creation Tools for Graphic Designers	High	TK 0
	Adobe Illustrator	Digital Content Creation Tools for Graphic Designers	High	TK 0
	Skype	Required for Internal and External Communications	High	TK 0
	VC Dialer	Required for automatic telephone number dialing	Medium	TK 13,272 / yearly
Human	VPN Service	Required for secure and private connection	High	TK 3,128
	Sales Team	Required for making Sales	High	TK 18,000 / monthly / per employee
	Content Creators	Required for Content Creations	High	TK 15,000 / monthly / per employee
	Graphic Designer	Required for Digital Content Creations	High	TK 20,000 / monthly / per employee
	Web App Developer	Required for Developing Websites and Maintenance	High	TK 30,000 / monthly / per employee
	Project Manager	Required for organizing and managing work process	High	TK 40,000 / monthly / per employee

Table 3.2: Process/Activity wise Resource Allocation & Estimated Costing

In this figure we can see that, we have categorized the resources that are essential and necessary for our project mentioning their name and description of why we need it, mentioned their availability locally and estimated cost for each resource monthly and yearly.

Chapter 4

Methodology

Software Development Methodology is a process or a series of process in an organized manner or arrangement of procedures used in software development field to develop software by dividing the development work into smaller, parallel, or sequential steps to reduce time and follow a discipline to development process.[2] It is a very wide and enormous topic, it consists of certain phases to like Planning, Defining Requirements, Designing, Developing, Testing, Deployment and Maintenance. It defines how a software should be built and what discipline should be followed to produce a fruitful outcome in a given time.

There are different types of software development methodologies and practices, that includes:

1. **Agile**
2. **Waterfall**
3. **Spiral**
4. **Prototype**
5. **Iterative**
6. **Incremental**
7. **Scrum**
8. **Rapid Application Development**
9. **Extreme Programming**

For this software we have decided to choose the Agile methodology. It may sometimes take the iterative development too.

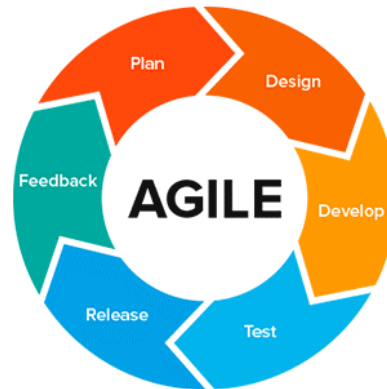


Figure 4.1: Agile Methodology

Agile is one of the most common and popular software development methodology. It mainly focuses on how to rapidly satisfy the customer and their requirements. In Agile methodology, all the tasks are broken down into smaller phases and requirements and solutions comes through collaboration between different team members of a particular project and frequent improvements and iteration at all phases.

The reason we choose this methodology are:

1. Faster development time:

Agile follows an iterative discipline which means the outcome of the product is ready to be market faster, staying one step ahead of the competition and quickly getting its benefits. Agile methods reduce the development cost and time to release.

2. Flexible Control:

Since Agile methodology follows an incremental development, works and phases can be broken into smaller parts and performed in fast and iterative cycles. This allows team members of the project to share progress and address problems and develop a solution through daily meetings, this creates a transparency to the whole process.

3. Productivity and Quality:

The Agile method follows the incremental nature which means that projects are finished in short phases, making them more manageable. It helps the project to be rolled out fast and development changes can be made at any time. It also has the ability to detect problems and develop a solution fast and efficiently which allows team members to get customer reaction and give a feedback and continuously improve the software.

4. Customer Satisfaction:

Regular meetings and collaboration between team members and customer reactions will help us provide quick feedback, this will allow us to make significant changes that will help to meet customers' expectations and demands through the development lifecycle. Which in results happy and satisfied customers.

Chapter 5

Body of the Project

The body of the project contains all the detailed analysis and study of the project and the application that we are building. It contains a detailed explanation of the project, its workflow and architecture, application requirements and process, design and outlook of the project. It is the heart of the project, that helps us clearly understand how the system will be built, the processes it will go through, what purpose it will serve and how it will look.

5.1 Work Description

Aristo Technology is a digital marketing and customer experience and support provider agency, specializing in Customer Care Services and Virtual Assistance Services to enhance for corporate to improve growth and sales of various business and organizations. By providing Phone support, E-mail Support, Chat Support with Professional Staffs, 24-hour support and autonomous operations. They are regularly implementing solutions to get quality leads and turn them into customers. Some of the industries they serve are Retail E-commerce, Financial, Healthcare, Real State, Energy and Utilities, Cleaning, Information Technology and Call Center. There system can be segmented into two major parts. One side is the admin side, admins will be able to add to leads into the system by entering the Company, Contact and Lead details. Admin can add Companies that they are serving and the Products that they are offering. Admins will be able to see which of their leads are turned into customers and how many sales are made by each of the sales team members. The other side are the Sales Team or Agents, where the sales members will be able to see newly added leads and see all the company, contact and lead details and follow up. Once they select a lead, they will be able to send product details to all the customers in their system and circulate promotional messages and calls to all the customers. If a customer responds to the messages or calls and seems interested, the sales member will set an appointment with the companies regarding the customer and product

offer and potential order. If companies' stocks are available, the customers will then send their Billing and Shipping details to the sales member. Once the details are received, sales member can make a proposal with product order details and net amount with both company and customer information with billing and shipping information and details. Then the proposal is sent to the companies offering the products, once the proposal is accepted a successful sale has been made. Then the sales member can convert the Lead into a Customer. Our system will be very simple, dynamic and user friendly, so that it will be easier for both the admin and sales members to use it and do not face any problems while using the system.

5.2 System Analysis

In order to identify the purpose and objective of a system, we need to conduct a system analysis by studying the system and its part to fully understand its purpose. It is the process of gathering and interpreting facts, identifying its problems and decomposition the system into its components. Its main purpose is conducting a study of the system and its parts in order to find its true purpose and objectives. It is a problem-solving technique that improves the system and ensures that all the components of the system work smoothly and effectively to serve its purpose.[3]

5.2.1 Six Element Analysis

PROCESS	HUMAN	NON-COMPUTING HARDWARE	COMPUTING HARDWARE	SOFTWARE	DATABASE	NETWORK & COMMUNICATION
Browsing Website	All Users	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Sign Up / Login	All Users	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Admin Dashboard	Admin	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Lead Management Page	Admin	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Company Management Page	Admin	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Product Management Page	Admin	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Sales Management Page	Admin	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Sales Member Dashboard	Sales Member	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Lead Display Page	Sales Member	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Customer Management Page	Sales Member	N/A	Laptop, Phone	Google Chrome/ Firefox	MongoDB	WAN
Appointment Management Page	Sales Member	N/A	Laptop, Phone	Google Chrome/ Firefox, Skype, VC Dialer	MongoDB	WAN
Proposal Management Page	Sales Member	N/A	Laptop, Phone	Google Chrome/ Firefox, Skype, VC Dialer	MongoDB	WAN

Table 5.1: Six Element Analysis

5.2.2 Feasibility Analysis

Feasibility can be expressed as the extent to which a project can be successfully made. It mainly determines whether the proposed solution can be considered as meeting the requirements as realistic and achievable in the system. The main objective of feasibility analysis is to determine the reasons for developing a system that is acceptable to users, adaptable to change and conforming to established standards, analyzing whether the system meets the requirements of the organization and determine that the system can be implemented using current technology and within the current budget and schedule.[4]

- Technical Feasibility

Technical feasibility determines whether the current resources including hardware, software and technology which will be required to accomplish the user requirements in the software can be meet within the given time and budget. It evaluates in detail, how we decide to deliver the system to the client.[5]

Aristo Technology will be using EJS, Node.js, Express.js and MongoDB frameworks and libraries to build their CRM software. The usage of EJS with compliment to HTML, CSS and JS will help us to build an efficient and faster software. Node.js will be used to handle all server-side operations, it is open source and free, it will be used for non-blocking and event-driven server operations. While Express.js will be used for easier creation of web application for its minimal and flexible framework nature. While MongoDB will be used store and retrieve data very fast, it uses a very powerful document data model to perform CRUD operations makes it highly scalable and powerful. These technologies are now very popular and are continuously used in modern day industries.

- Operational Feasibility

Operational feasibility determines the extent to which the required system performs a sequence of levels to solve business problems and customer requirements. It is mostly depending on human resources that includes the developer team and see if the system will operate correctly after it is developed and will be operative after installation.

Aristo Technology is developing the software with such a plan that it can be used with ease and people of all age can easily use the system, it will require very less physical and technical effort. It is planned in such a manner that it will not require too much of technical knowledge to use this system. Every instruction will be clear and precise.

- Economic Feasibility

Economic feasibility determines whether the software we are making will generating revenues or any kind of financial gain for the organization. It involves analyzing if the cost might increase from development team for production, an estimated cost of hardware and software. It usually accounts for the expenses in purchasing the hardware required for developing the software and tasks required to proceed through the software development.

Our system is basically a product that will yield revenues through out the time and most importantly it will reduce a huge amount of expenses. We know that CRM software's subscriptions can be very expensive, it will save us a lot of expenses. This CRM system will also help us manage our customers relationships. Customers are our biggest revenue generators, it will not only save expenses but rather gain revenue from good corporations and services we will provide when using the software.

5.2.3 Problem Solution Analysis

Problems: All systems encounter some problems while in development and after development. Our software may or may not create some problems like the followings:

- Internet Connection: Our system will be requiring fast and uninterrupted internet connection once the software is in use
- Website Loading Time: Even though EJS makes our web app fast, but it does incorporate with HTML, CSS and JS. It has been observed that these programming languages takes quite some time to load contents, especially if it has lots of animation and high-quality images.
- Power Loss: In order to use this software, we will be requiring Laptops and Wifi routers, power loss can be a major problem while users are using the system.
- Eye Strain: While using the system, users will be looking at all sorts of digital screens for long duration and are exposed to harmful radiations, it may cause some eye problems and strains in future.
- Cloud Space: In order to deploy this software, it will be requiring lots of computational power and storage. A good cloud service will be required to deploy this software and AWS, or Azure Services can be costly and expensive.
- Customer Tracking: It will be quite challenging to address and follow up with a large number of customers when it is in heavy use.

Solutions: When we face problems when using a software problem arises, but there are always some solutions available to use to some extent. Some of the solutions include:

- Internet Connection Solutions: In our modern times, there are various internet connection solutions are available as data connections are getting less costly. Purchasing Mobile Data or separate connections or backup purpose can help to provide us a solution.
- Power Loss Solutions: When we are using Laptops and Mobile, they run on high-capacity batteries and does not require electricity for 24 hours. Users can take advantage of the high-capacity batteries to resolve this problem.
- Eye Strain Solutions: By adjusting the brightness of the digital screen be used to help reduce eye strains problems. Some studies suggest that reducing the blue light of a screen or using a blue light glass can help reduce eye strains.

- Website Loading Time: Using EJS for our front end can effectively improve our website loading time as it reuses codes and loads content that needs to be loaded. It will help us to make fast and smooth working website.
- Customer Tracking: We will be employing more sales member to address and follow up with more customers in future to maintain a good and positive customer relation.

5.2.4 Effect and Constraints Analysis

As we start adapting to the new system and implementing it some major effects and constraints are faced while using the system. Effects and Constraints Analysis detects how the new software might change the norms of the organizations and some setbacks and constraint of the system in the organization.

Some of the effects that are worth mentioning when using the new CRM system for Aristo Technology are, we might be needing fewer sales members as we can easily monitor and address many customers in very less time, therefore each sales member can follow up with at least 10 customers in few minutes, which will lead to requiring less sales members. This might be a positive effect for the organization but negative effect for sales members as it might get some sales member to unemployment. Some of the Constraints that our system may bring are there may lay some hidden cost that we might have not considered, one of the constraints include high expense on cloud storage and deployment which requires lots of integrations and large volumes of data, some people working in the sales team may not be on the technological standards which may led to resistance to cultural changes as they cannot adapt to the new technology.

5.3 System Design

5.3.1 Rich Picture

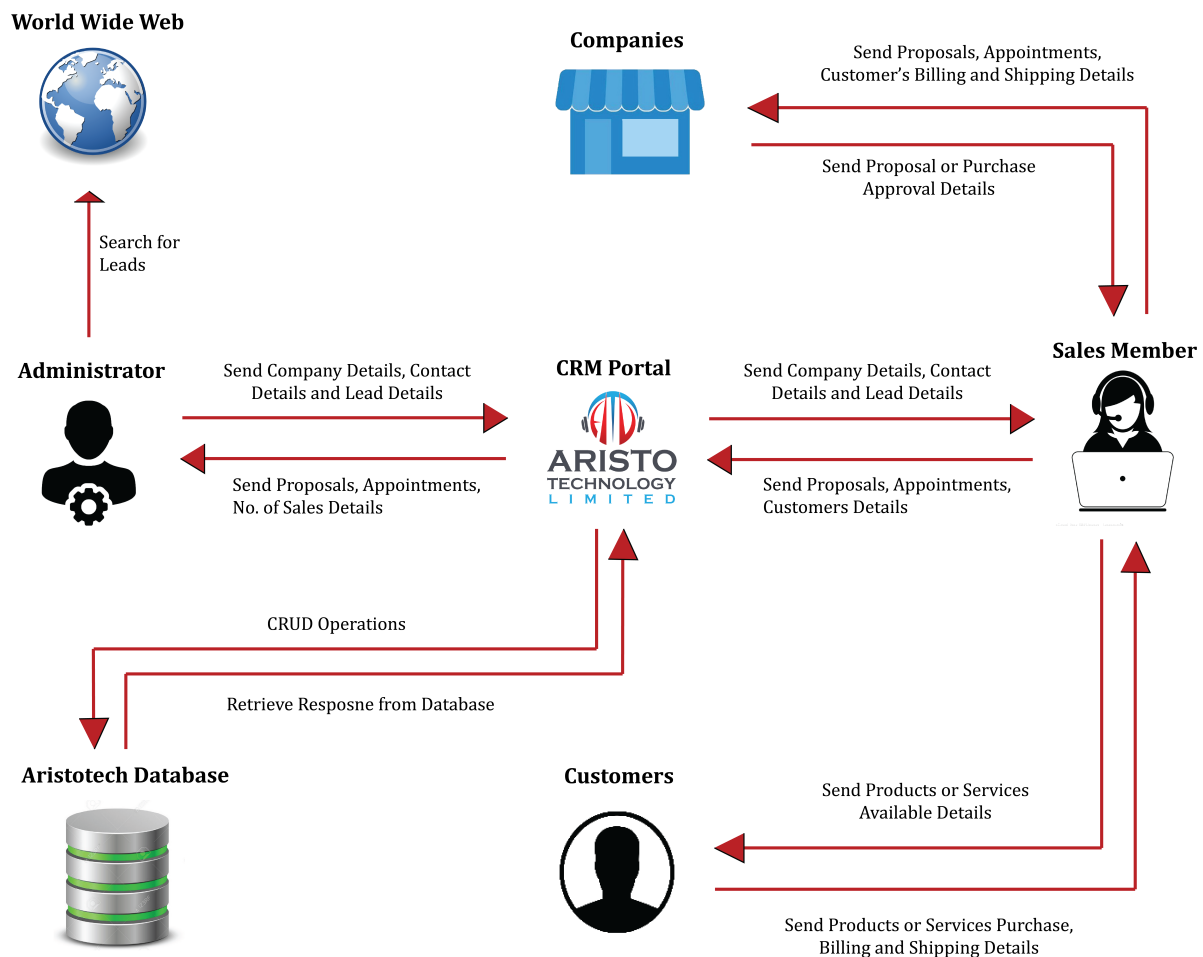


Figure 5.1: Rich Picture

In this CRM system, there are two types of users. The admin, who will be able to login to the CRM portal and manage, update or insert Leads to the system, first the admin search for leads from the internet and provide all kinds of information required for the sales team to follow up with potential customers, then these information are sent to the CRM portal and stored in the Database, it is displayed on the Sales Team dashboard, some of the information that are sent include Company, Contact and Lead Details. The admins will be able to see all the Proposals, Appointments and No. of successfully sales that are made from their leads. The other type of user is Sales Member (Sales Agent), who will be able to login to the system and see all the new leads provided by the admin, they can select each lead and contact with the company who need customer service or product promotion for their company. The Sales member sets an appointment with the company and gathers

what kind of product they need to promote and sell, once they have successfully gathered information then the Sales member calls and sends all available Product's information to the customers and contacts in the system. If a customer or a contact respond to any of the products that are circulated and decides to buy. The sales member collects Product purchase details and billing and shipping details from customer and creates a proposal. Once a proposal is created, it is sent to the Company or Product provider. If the Company accepts the proposal, then a successful sales have been made, than the sales member converts the Lead into a Customer and all the Proposal, Appointment and Customer details are sent to the CRM system and stored in the database.

5.3.2 UML Diagrams

In every software or system development, UML Diagrams are used to visualize a system using various types of diagrams, it is one the standard way of modeling a software before development to have a clear picture of the system, how it should be created and structured, to reduce development time and form an organized structure, clear and concise communication and process of the system. UML stands for Unified Modeling Language, it is made by connecting shapes that represents an object or class with other shapes to create a relationship and flow of information and data across the system.[6] There are various types of UML Diagrams, some of the well known and used diagrams are Class Diagrams, Activity Diagrams and Use Case Diagrams. The use case diagrams are used to model the functionality of the system using actors and use cases and activity diagrams are used for create the control flow of the system.

Use Case Diagram

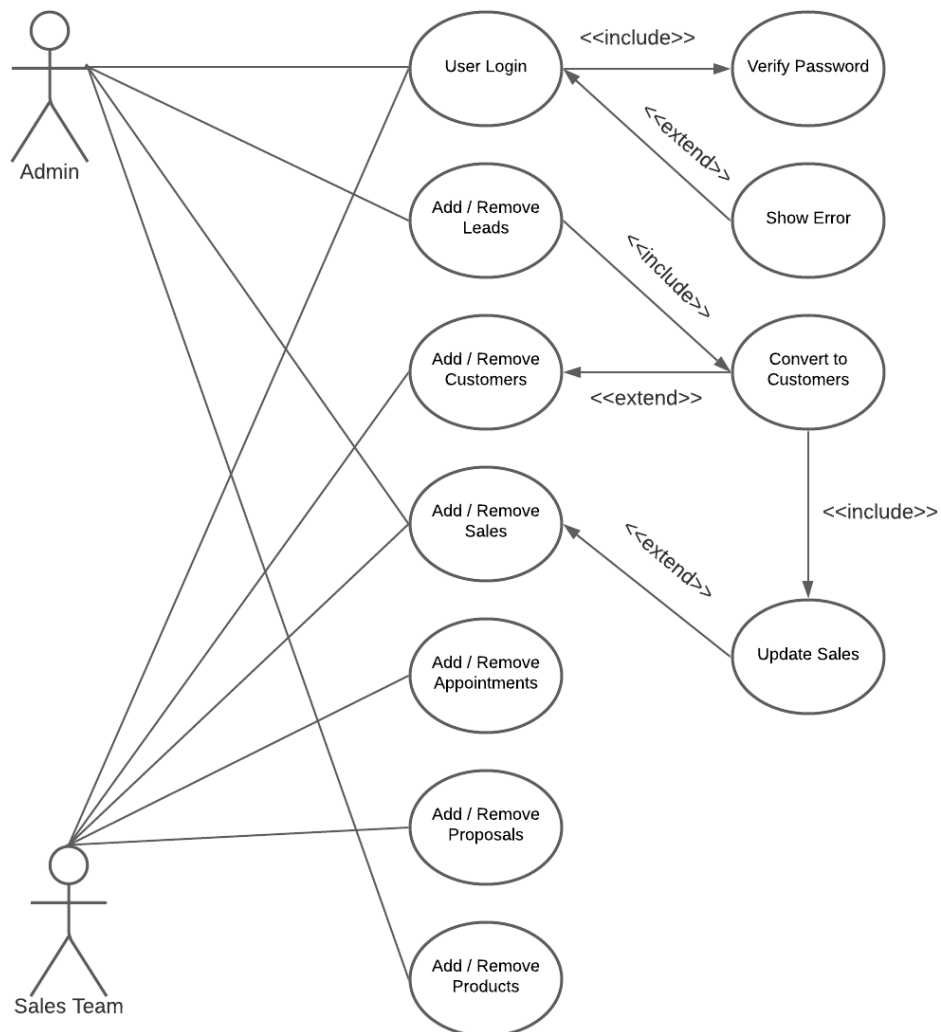


Figure 5.2: Use Case Diagram

Activity Diagram

- Admin Activity

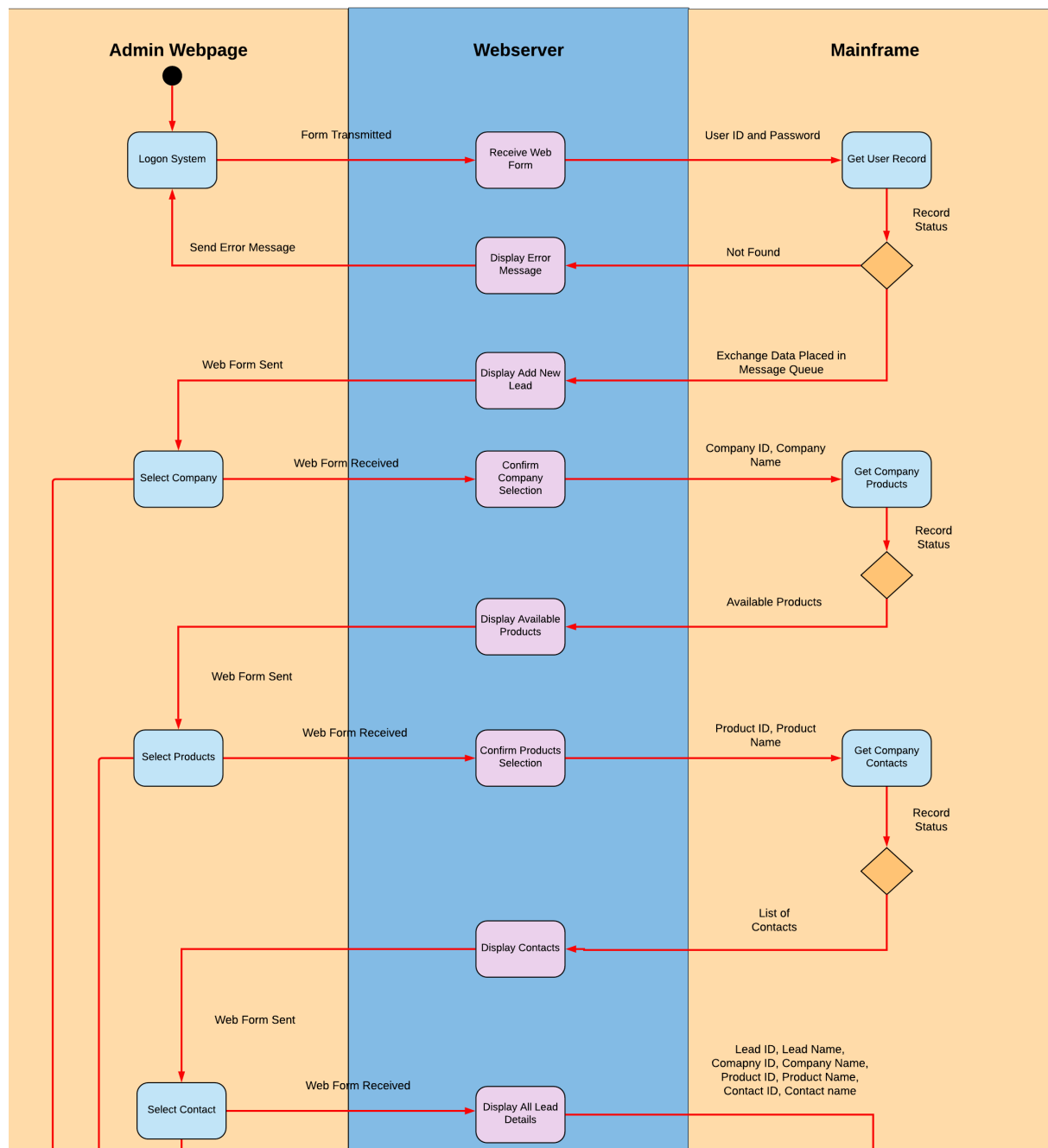


Figure 5.3: Activity Diagram - Admin - 1

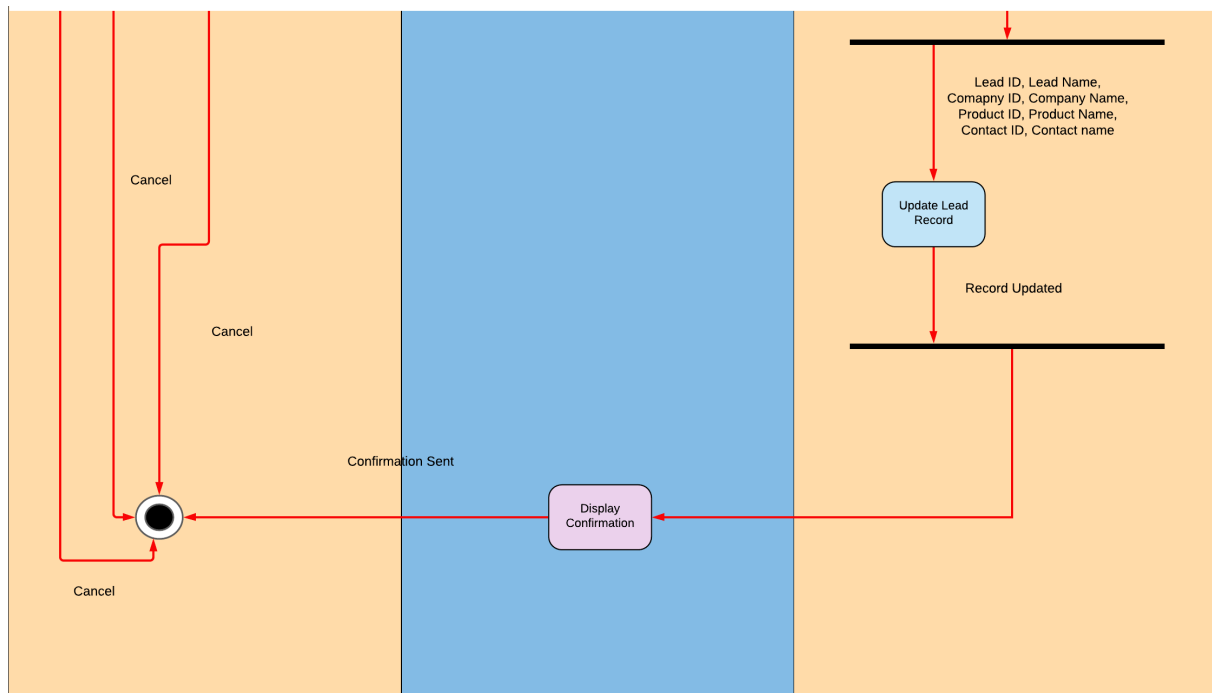


Figure 5.4: Activity Diagram - Admin - 2

- Sales Agent Activity

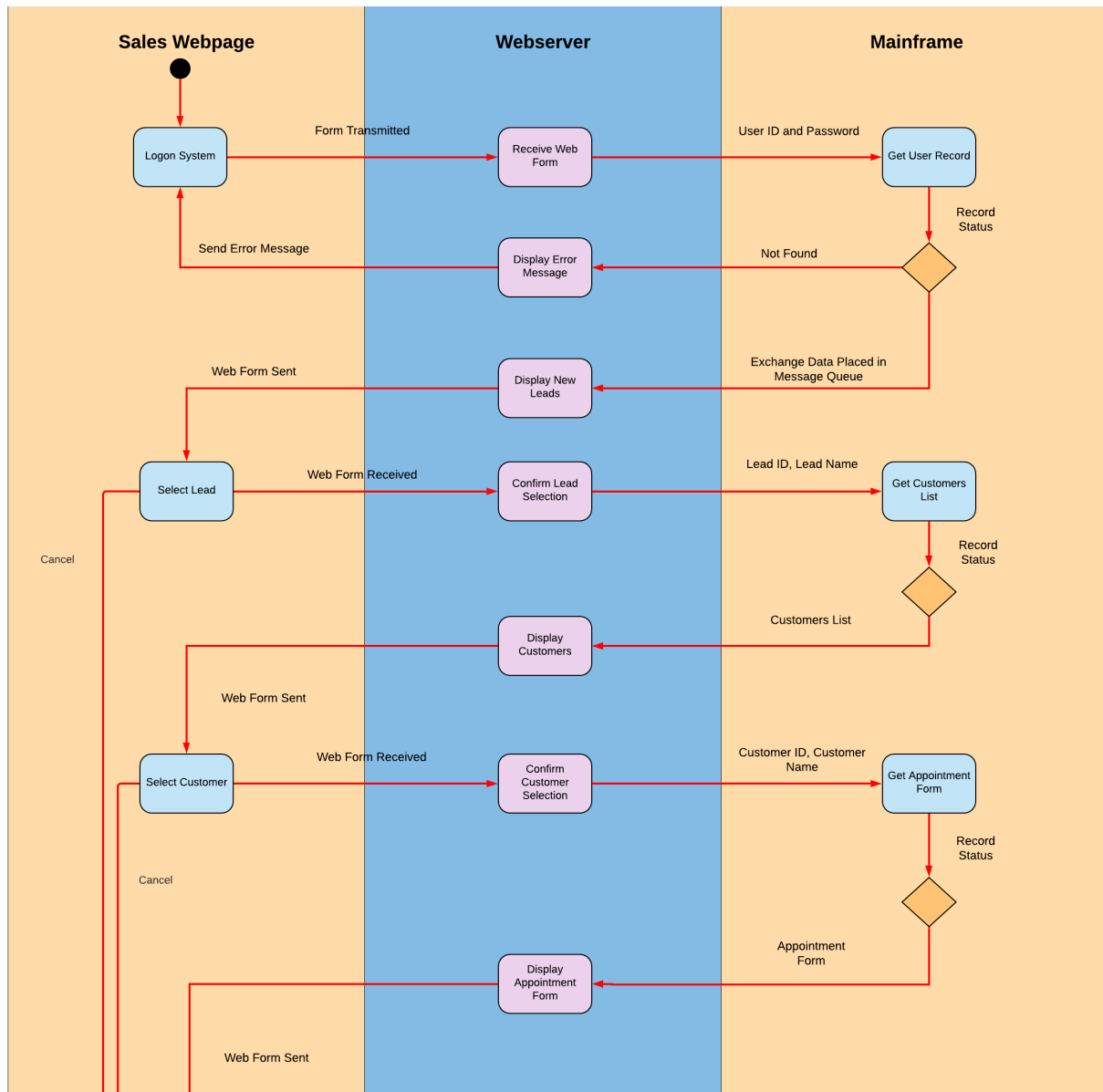


Figure 5.5: Activity Diagram - Sales Agent - 1

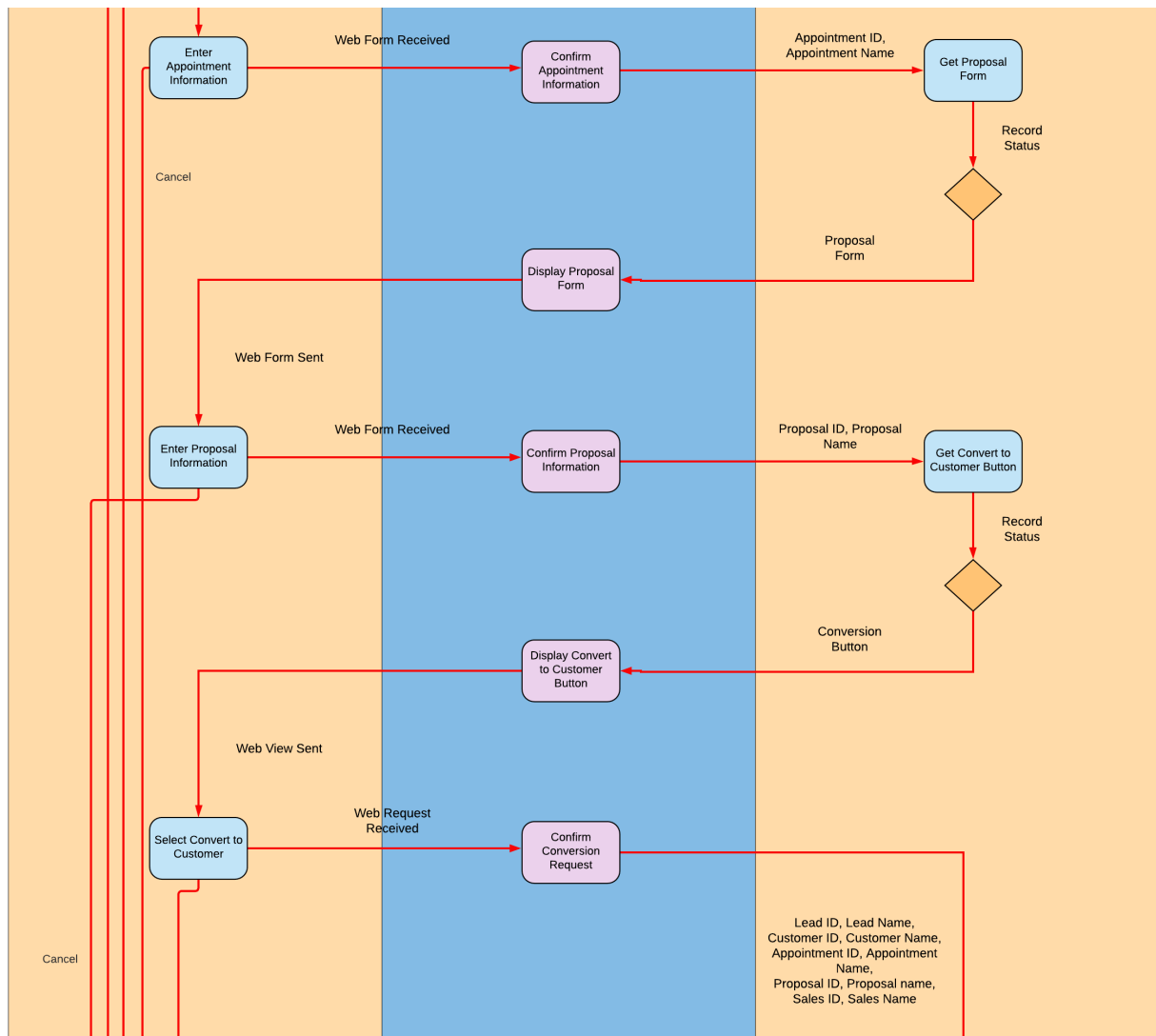


Figure 5.6: Activity Diagram - Sales Agent - 2

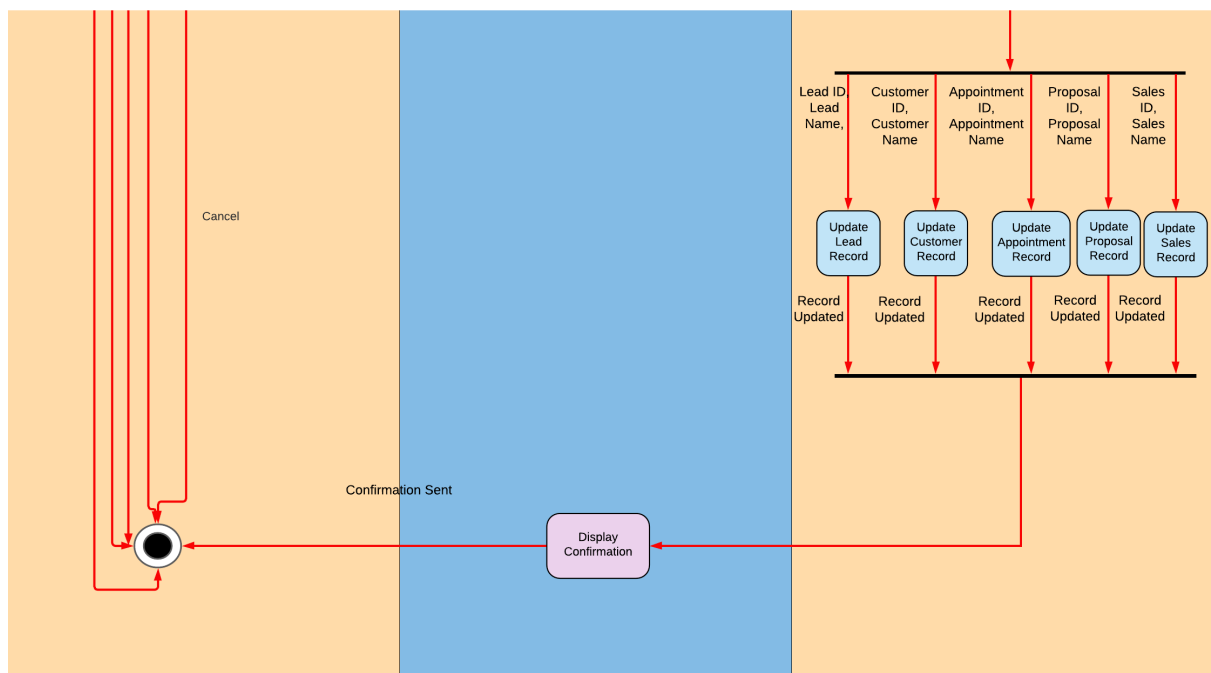


Figure 5.7: Activity Diagram - Sales Agent - 3

- Entity Relationship Diagram

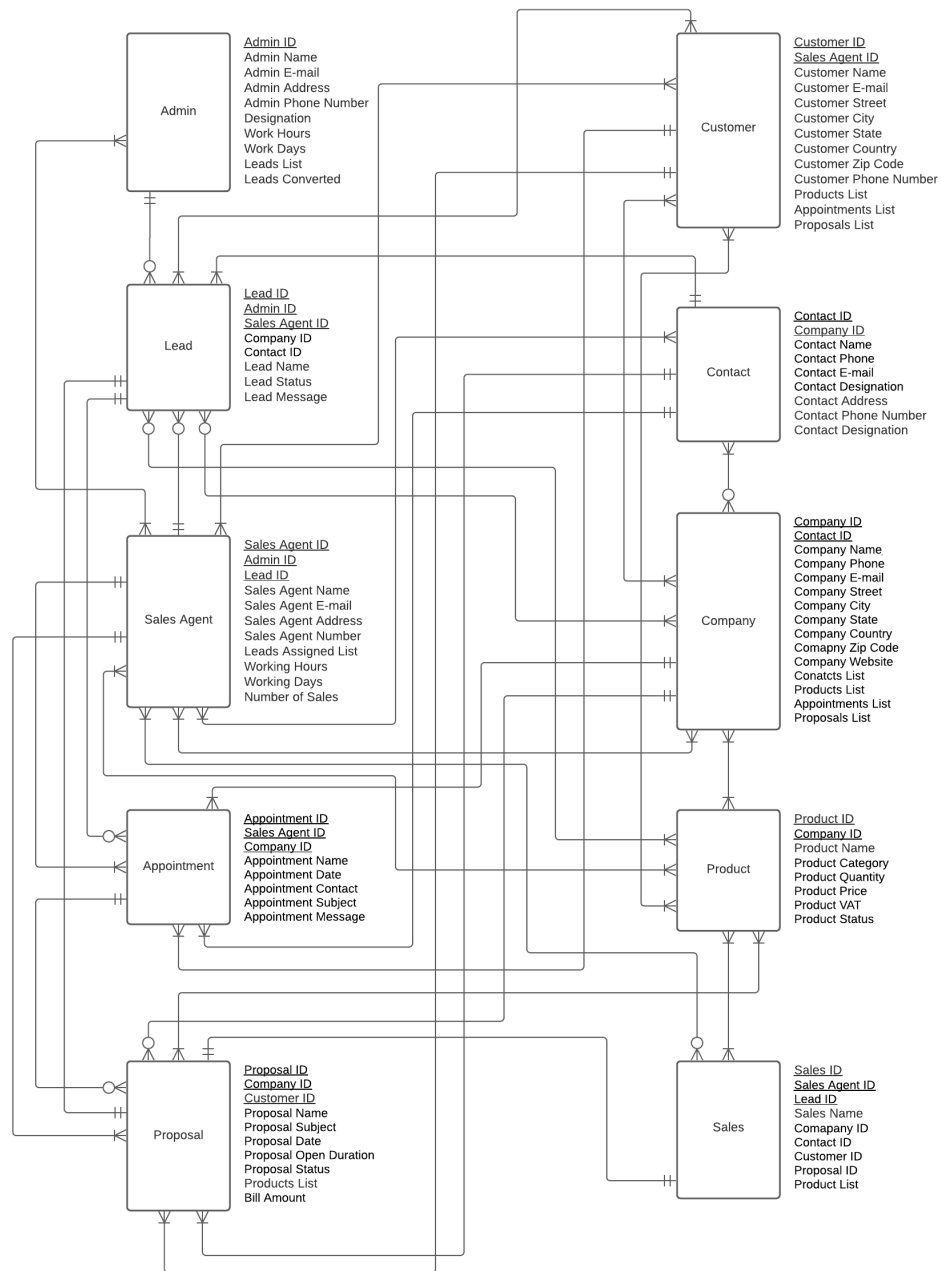


Figure 5.8: Entity Relationship Diagram

5.3.3 Functional and Non-Functional Requirements

Functional Requirements

Functional requirements are usually a software or system's features and functions that needs to be implemented to make a user accomplish its task or goal, it basically describes the system's behaviors under certain conditions, this includes what the system will do, their features, interfaces and focus on the user's requirements and how the system will respond to given inputs.[7] These are few of the functional requirements our system must have in order to achieve and accomplish its goals:

- Users will be able to sign up and login into the CRM system
- Admin will be able to add, remove and edit Leads Details
- Admin will be able to add, remove and edit Customers Details
- Admin will be able to add, remove and edit Products Details
- Admin will be able to add, remove and edit Company Details
- Admin will be able to check number of successful sales made by each Sales Member from the leads provided.
- Admins will be able to see all the proposals and appointments set by Sales Member according to their leads.
- The text in the entries may be of any length.
- Sales Member will be able to see newly added leads in their dashboard
- Sales Member will be able to see number of successful leads converted to customers
- Sales Member will be able to select a lead and see all details of the leads
- Sales Member will be able to see all Company, Contact and Lead details
- Sales Member can make a call or send messages to all customers in their system
- Sales Members can add, remove or edit appointments and proposal
- Sales Members can collect or receive mails or order request from Customers
- Sales Members can receive customers Billing and Shipping Details
- Sales Members can send proposals and appointment details to Companies in their system
- Sales Members can receive confirmation messages when a proposal is accepted
- Sales Members can convert the leads into customers

Non-Functional Requirements

Non-Functional requirements are the general properties of a system they describe the qualities of a system. It does not define the functions of a system rather describes how the system should perform when it is in use. It describes how the system will work, their properties and focus on user's expectations and the quality of the system in overall. These are few of the non-functional requirements our system must have in order to achieve and accomplish its goals:

- Performance & Response Time

Our system must have a good performance and response time, it has to be fast and responsive and fully optimized so that Admins can add leads easily and fast, sales members can easily communicate with customers and companies properly and require less loading time with minimal waste. The performance and response time will be measured using Google Page Insights and GTmetrix.

- Information

Our system must be able to handle up to 1 million data circulations in a minute. It should have enough space capacity to store user information online. All data collected from users should be handled and stored in an organized manner with correct accuracy and format. Our system requires a lot of messages sending for promoting products, it should be able to send 1000 messages in 3 seconds.

- Economy

Our system should not be too costly to be produced and yield a stable profitable income through sales. We will be using open-source software for developing the system which will require no cost for purchasing packages or features. Node.js, MongoDB, Express.js are free to use and implement.

- Control Security

Our system must be safe and easy to control, it must have a safe information storage, so that not private information regarding the system can be easily hacked or accessed by outsider or locally. It should be easy to control and manipulated by our users so that they do not face any problem using the system. Our system will be encrypted user's authentication information with SHA1 encryption technique.

- Service and Error Handling

Our system must have a good support system to handle any kind of problems or error regarding the system, proper service should be available to troubleshoot problems in future. Our system should have user manuals telling what we can and what we cannot do with our system and keeping our system reliable, flexible and expandable in future.

5.4 Product Features

All the Product Features and the user will experience and navigate through are listed below. Our Product Feature consists of important and significant Input Data that will be entered by the Admins and Sales Agent and a corresponding output the users will see on different scenarios.

5.4.1 Input

In our Application, there are many different types of input we will take from users. Here are some of the most important and significant input data the system will be collecting from user to make the software functional.

- User Registration and Login

In Registration page, the users needs to input data that are necessary for authenticating the user to our system. Here are some of the input fields that our system will have Full Name, E-mail, Password, Address, Phone Number, User type.

In Login page, the users needs to input data that are necessary for authorizing the user to our system. Here are some of the input fields that our system will have ID, Password, User type.

- Adding Leads

In Add Lead page, the admins need to input data that are necessary for sales team to follow up with their sales activity. Here are some of the input fields that our system will have here Company Name, Company Phone, Company E-mail, Company Street, Company City, Company State, Company Zip Code, Company Website and Company Country, Contact Name, Contact Phone, Contact E-mail, and Contact Designation, Lead Source, Lead Assigned Employee, Lead Message, Lead Status.

- Adding Products

In Add Product page, the admins need to input data that are necessary for sales team to sell products to their customers. Here are some of the input fields that our system will have here Name, Category, Quantity, Price, VAT and Status.

- Adding Customers

In Add Customer page, the sales agent need to input data that are necessary for sales team store customer information for proposals and sales purpose. Here are some of the input fields that our system will have here Customer Name, Customer Phone, Customer Street, Customer City, Customer State, Customer Zip Code,

Customer Country, Billing Street, Billing City, Billing State, Billing Zip Code, Billing Country, Shipping Street, Shipping City, Shipping State, Shipping Zip Code, Shipping Country.

- Adding Appointments

In Add Appointment page, the sales agent need to input data that are necessary for sales team store appointment information to follow up with customers. Here are some of the input fields that our system will have here Appointment Date, Appointment With, Subject, Message.

- Adding Proposals

In Add Appointment page, the sales agent need to input data that are necessary for sales team store proposal or contract information to follow up with customers. Here are some of the input fields that our system will have here Customer Name, Customer Address, Customer City, Customer State, Customer Country, Customer Zip Code, Customer E-mail, Customer Phone, Proposal Company, Proposal Subject, Proposal Date, Proposal Open Duration, Proposal Status, Order Items, Order Quantity, Order Rate, Order VAT, Order Amount.

5.4.2 Output

In our Application, there are many different types of output that will be displayed to users. Here are some of the most important and significant output the system will display to user to make the software functional and serve its purpose.

- Admin Sales Agent Dashboard

In Admin Dashboard page, the admin will be able to see his/her information, the total number of leads, number of leads converted, proposals sent and sales made. Further below they will be able to see Active Leads, Active Proposals and Sales.

In Sales Agent Dashboard page, the Sales Agent will be able to see his/her information, the total number of leads, number of leads converted, proposals sent and sales made. Further below they will be able to see Active Leads, Active Appointments and Active Proposals.

- Display Leads

In Leads page, both the admin and sales agent will be able to see all the leads that are added to the system. They can see the significant lead information that are in our database. These are the following information that will be displayed, Contact Name, Company Name, Contact E-mail, Contact Phone, Contact Designation, Lead Message, Lead Status, Lead Source.

On the lead page, two different users will have two different views. The Admin will have View Details, Edit and Remove functionality in the action button drop down. While the Sales agent will have Call, Make an Appointment, Make a Proposal functionality in the action button drop down.

- Display Products

In Products page, both the admin and sales agent will be able to see all the products that are added to the system. They can see the significant product information that are in our database. These are the following information that will be displayed Name, Category, Quantity, Price, VAT and Status.

- Display Customers

In Customers page, both the admin and sales agent will be able to see all the customers that are added to the system. They can see the significant customer information that are in our database. These are the following information that will be displayed Customer Name, Customer Phone, Customer Street, Customer City, Customer State, Customer Zip Code, Customer Country.

- Display Appointments

In Display Appointment page, both the admin and sales agent will be able to see all the appointments that are added to the system. They can see the significant appointment information that are in our database. These are the following information that will be displayed Appointment Date, Appointment With, Subject, Message.

- Display Proposals

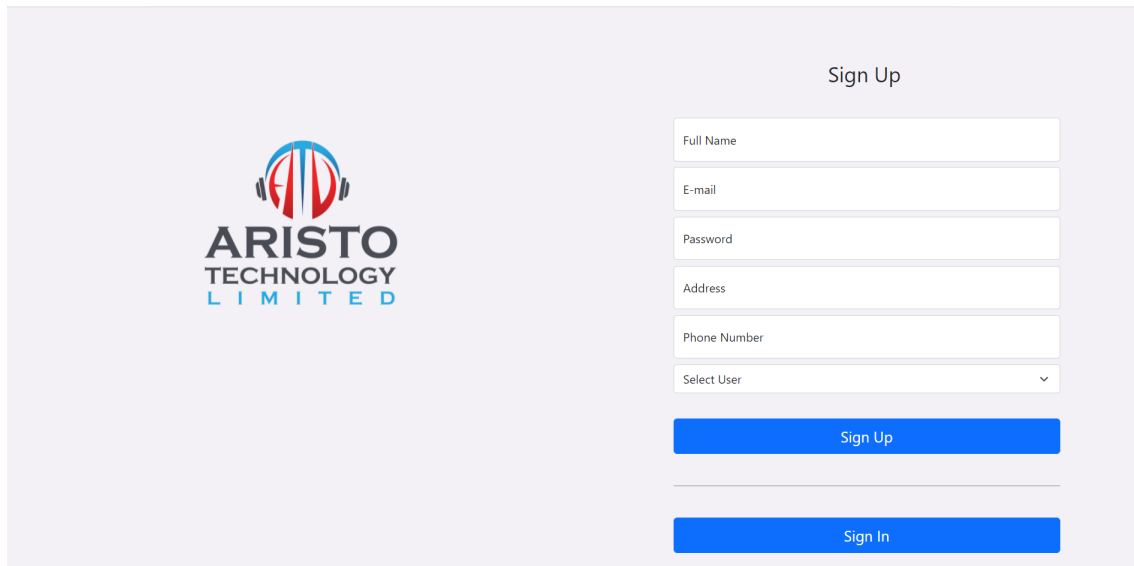
In Display Appointment page, both the admin and sales agent will be able to see all the proposals that are added to the system. They can see the significant proposal information that are in our database. These are the following information that will be displayed Customer Name, Company Name, Proposal Subject, Proposal Date, Proposal Status, Order Items, Order Quantity, Order Amount.

- Display Sales

In Display Sales page, only the admin will be able to see all the sales that are added to the system. They can see the significant sales information that are in our database. These are the following information that will be displayed Sales Name, Sales Agent Name, Company Name, Contact Name, Customer Name, Proposal Subject, Order Items, Order Quantity, Order Amount.

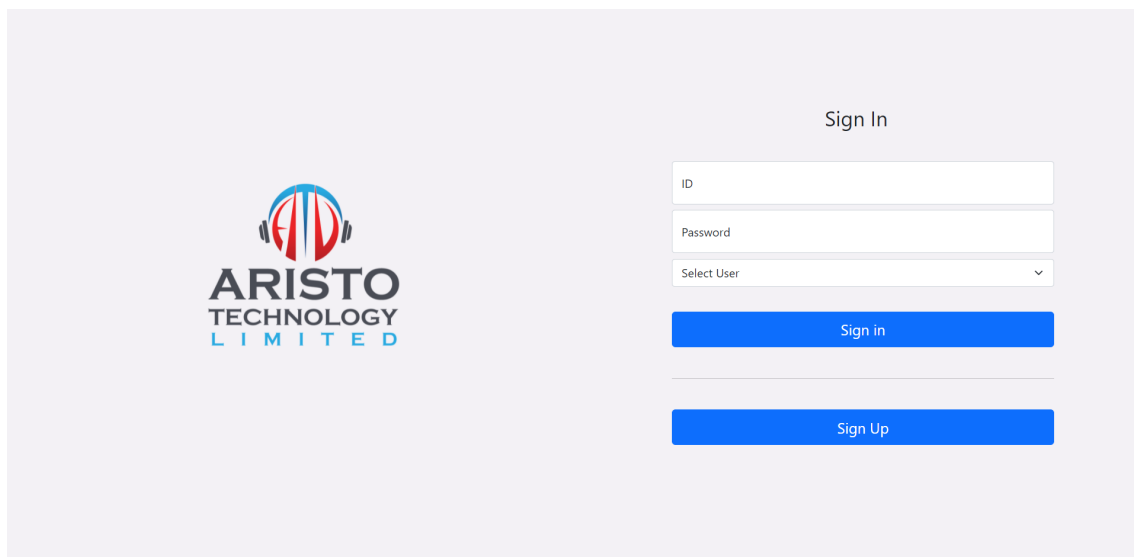
5.4.3 UI/UX

A user can use this view to signup to the system.



The image shows a 'Sign Up' form for ARISTO TECHNOLOGY LIMITED. On the left is the company logo, which consists of a stylized 'ATD' inside a blue and red circular graphic with headphones, and the text 'ARISTO TECHNOLOGY LIMITED' below it. The form itself is titled 'Sign Up' and contains the following fields: 'Full Name', 'E-mail', 'Password', 'Address', 'Phone Number', and a 'Select User' dropdown menu. Below these fields are two blue buttons: 'Sign Up' and 'Sign In'.

A user can use this view to signin to the system.



The image shows a 'Sign In' form for ARISTO TECHNOLOGY LIMITED. On the left is the company logo, which consists of a stylized 'ATD' inside a blue and red circular graphic with headphones, and the text 'ARISTO TECHNOLOGY LIMITED' below it. The form itself is titled 'Sign In' and contains the following fields: 'ID', 'Password', and a 'Select User' dropdown menu. Below these fields are two blue buttons: 'Sign in' and 'Sign Up'.

An Admin can only access this input form. This will be used to Add Leads.

ARISTO TECHNOLOGY LIMITED

Add Lead

Company Details

Company Name

Company Phone

Company Street

Company City

Company State

Company Zip Code

Company Website

Company Country

Contact Details

Contact Name

Contact Phone

Contact E-mail

Contact Designation

Lead Details

Lead Source

Lead Assigned Employee

Lead Status
Active

Lead Message

Save **Cancel**

An Admin can only access this input form. This will be used to Add Products.

ARISTO TECHNOLOGY LIMITED

Add Product

Company Details

Company Name

Company Phone

Company Street

Company City

Company State

Company Zip Code

Company Website

Company Country

Product Details

Product Name

Product Category

Product Quantity

Product Price

Product VAT

Product Status

Save **Cancel**

A Sales Agent and Admin, both can access this page. This will be used to Add Customers

The screenshot shows the 'Add Customer' form within the ARISTO TECHNOLOGY LIMITED application. The interface features a dark sidebar on the left with navigation links: Leads, Customers, Appointments, Proposals, and Products. The main content area is titled 'Add Customer' and is divided into three columns: Customer Details, Billing Details, and Shipping Details. Each column contains several text input fields for customer information. The Customer Details column includes fields for Customer Name, Customer Phone, Customer Street, Customer City, Customer State, Customer Zip Code, and Customer Country. The Billing Details column includes fields for Billing Street, Billing City, Billing State, Billing Zip Code, and Billing Country. The Shipping Details column includes fields for Shipping Street, Shipping City, Shipping State, Shipping Zip Code, and Shipping Country. At the bottom right of the form, there are two blue buttons labeled 'Save' and 'Cancel'.

A Sales Agent can access this page. This will be used to Add Appointments

The screenshot shows the 'Add Appointment' form within the ARISTO TECHNOLOGY LIMITED application. The interface features a dark sidebar on the left with navigation links: Leads, Customers, Appointments, Proposals, and Products. The main content area is titled 'Add Appointment' and contains a section labeled 'Appointment Details'. This section includes four text input fields: Appointment Date, Appointment With, Subject, and a larger Message field. At the bottom of the form, there are two blue buttons labeled 'Save' and 'Cancel'.

A Sales Agent can access this page. This will be used to Add Proposals

ARISTO TECHNOLOGY LIMITED

Leads

Customers

Appointments

Proposals

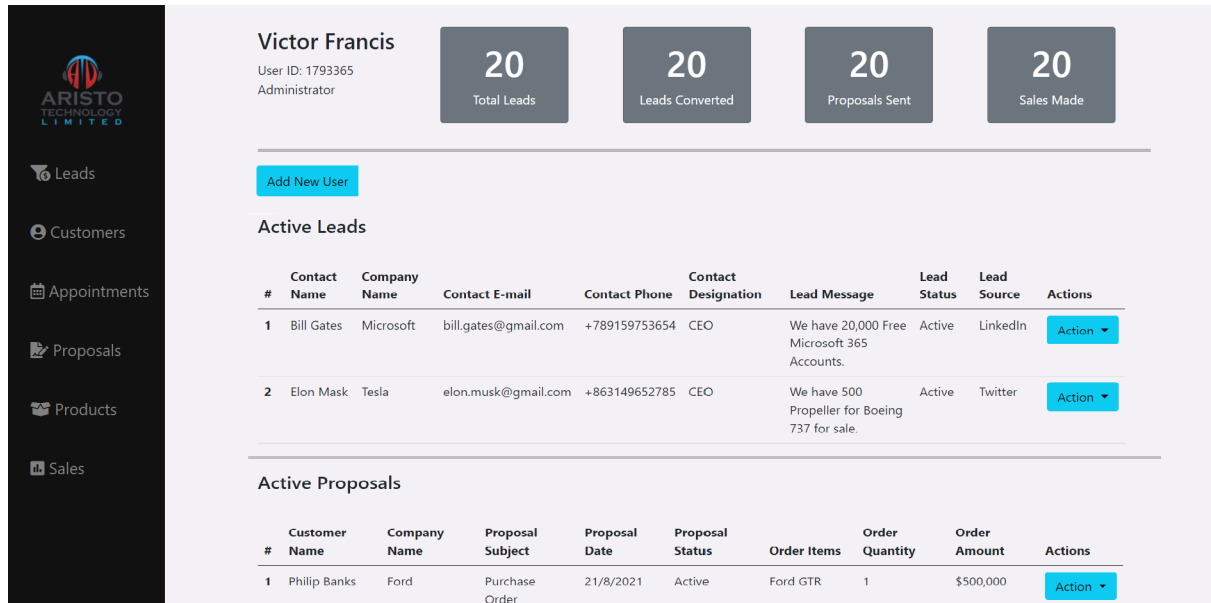
Products

Add Proposal

Customer Details	Proposal Details	Order Details
Customer Name <input type="text"/>	Proposal Company Microsoft	Order Items Product 1
Customer Address <input type="text"/>	Proposal Subject <input type="text"/>	Order Quantity <input type="text"/>
Customer City <input type="text"/>	Proposal Date <input type="text"/>	Order Rate Active
Customer State <input type="text"/>	Proposal Open Duration <input type="text"/>	Order VAT <input type="text"/>
Customer Country <input type="text"/>	Proposal Status Active	Order Amount \$245
Customer Zip Code <input type="text"/>		
Customer E-mail <input type="text"/>		
Customer Phone <input type="text"/>		

Save Cancel

An Admin can access this page. This will be the Dashboard page once an admin logs in.



Victor Francis
User ID: 1793365
Administrator

20 Total Leads

20 Leads Converted

20 Proposals Sent

20 Sales Made

[Add New User](#)

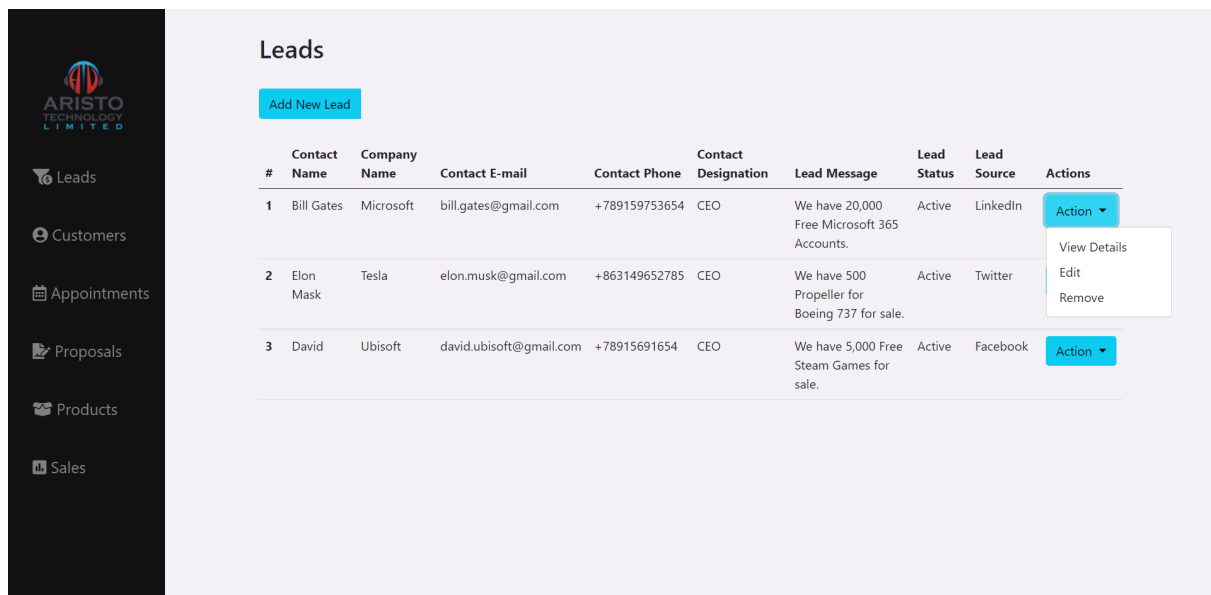
Active Leads

#	Contact Name	Company Name	Contact E-mail	Contact Phone	Contact Designation	Lead Message	Lead Status	Lead Source	Actions
1	Bill Gates	Microsoft	bill.gates@gmail.com	+789159753654	CEO	We have 20,000 Free Microsoft 365 Accounts.	Active	LinkedIn	Action
2	Elon Mask	Tesla	elon.musk@gmail.com	+863149652785	CEO	We have 500 Propeller for Boeing 737 for sale.	Active	Twitter	Action

Active Proposals

#	Customer Name	Company Name	Proposal Subject	Proposal Date	Proposal Status	Order Items	Order Quantity	Order Amount	Actions
1	Philip Banks	Ford	Purchase Order	21/8/2021	Active	Ford GTR	1	\$500,000	Action

An Admin can access this page. This will be where admin can see all leads

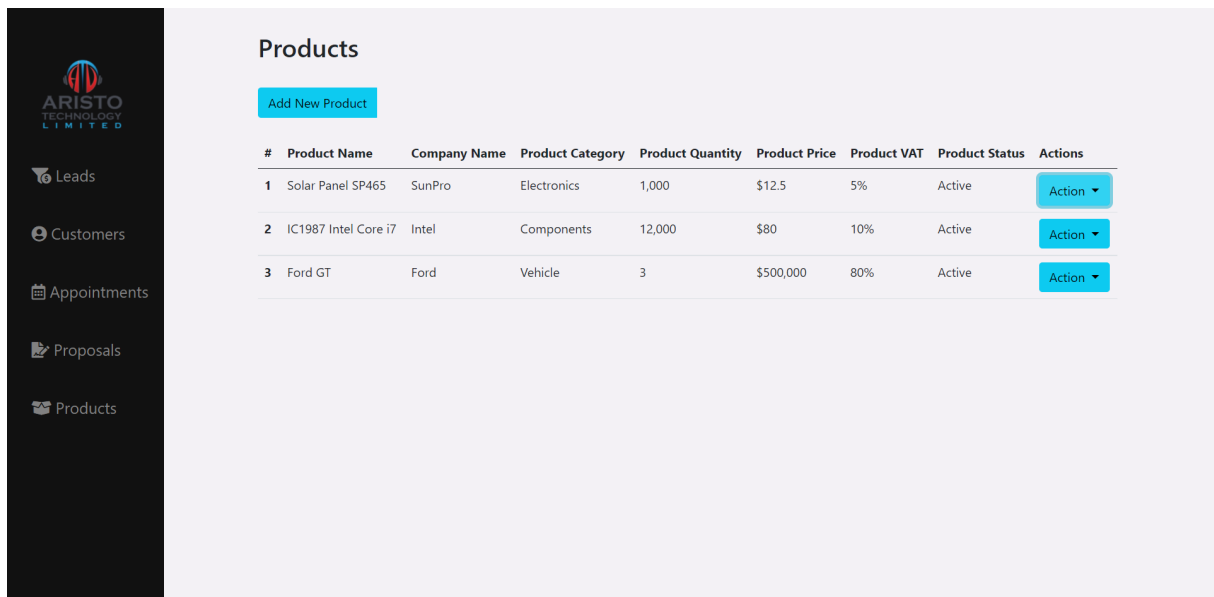


Leads

[Add New Lead](#)

Contact #	Contact Name	Company Name	Contact E-mail	Contact Phone	Contact Designation	Lead Message	Lead Status	Lead Source	Actions
1	Bill Gates	Microsoft	bill.gates@gmail.com	+789159753654	CEO	We have 20,000 Free Microsoft 365 Accounts.	Active	LinkedIn	Action
2	Elon Mask	Tesla	elon.musk@gmail.com	+863149652785	CEO	We have 500 Propeller for Boeing 737 for sale.	Active	Twitter	View Details Edit Remove
3	David	Ubisoft	david.ubisoft@gmail.com	+78915691654	CEO	We have 5,000 Free Steam Games for sale.	Active	Facebook	Action

An Admin and a Sales Agent can access this page. This will be where users can see all products.

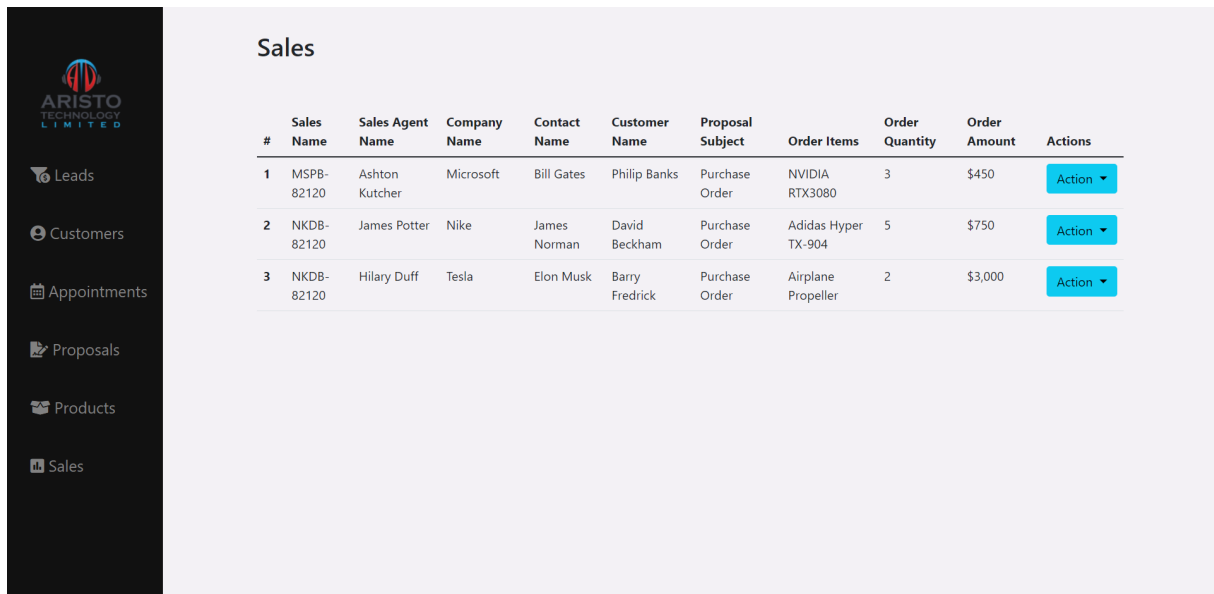


Products

[Add New Product](#)

#	Product Name	Company Name	Product Category	Product Quantity	Product Price	Product VAT	Product Status	Actions
1	Solar Panel SP465	SunPro	Electronics	1,000	\$12.5	5%	Active	Action
2	IC1987 Intel Core i7	Intel	Components	12,000	\$80	10%	Active	Action
3	Ford GT	Ford	Vehicle	3	\$500,000	80%	Active	Action

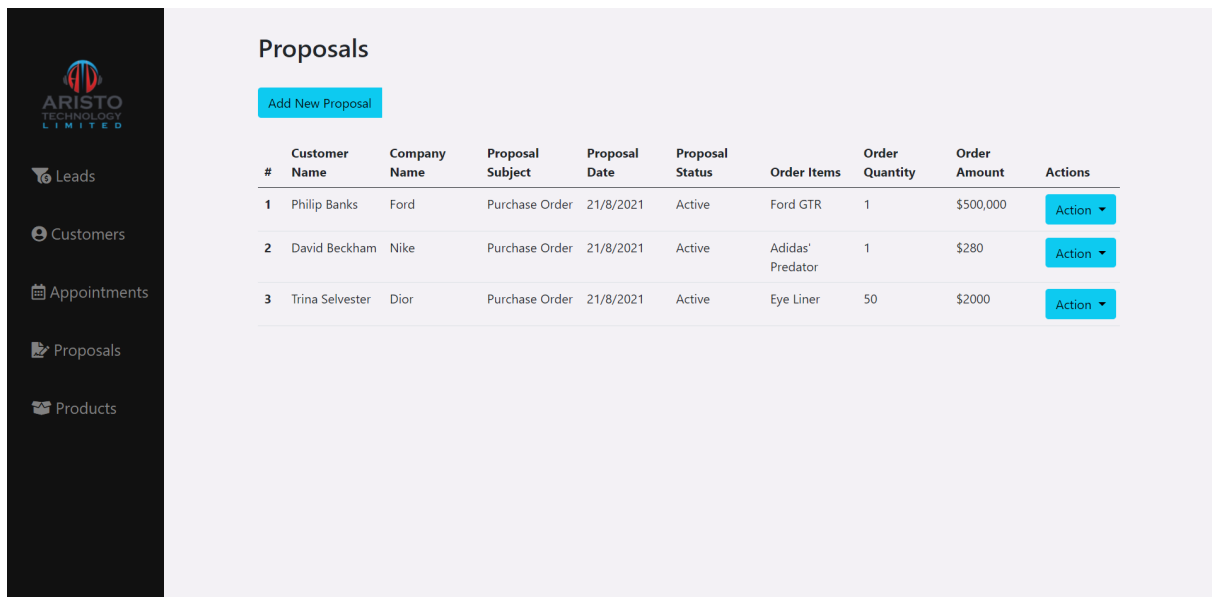
An Admin can only access this page. This will be where admins can see all sales made by the Sales Agents.



Sales

#	Sales Name	Sales Agent Name	Company Name	Contact Name	Customer Name	Proposal Subject	Order Items	Order Quantity	Order Amount	Actions
1	MSPB-82120	Ashton Kutcher	Microsoft	Bill Gates	Philip Banks	Purchase Order	NVIDIA RTX3080	3	\$450	Action
2	NKDB-82120	James Potter	Nike	James Norman	David Beckham	Purchase Order	Adidas Hyper TX-904	5	\$750	Action
3	NKDB-82120	Hilary Duff	Tesla	Elon Musk	Barry Fredrick	Purchase Order	Airplane Propeller	2	\$3,000	Action

An Admin and a Sales Agent can access this page. This will be where users can see all Proposals Made.

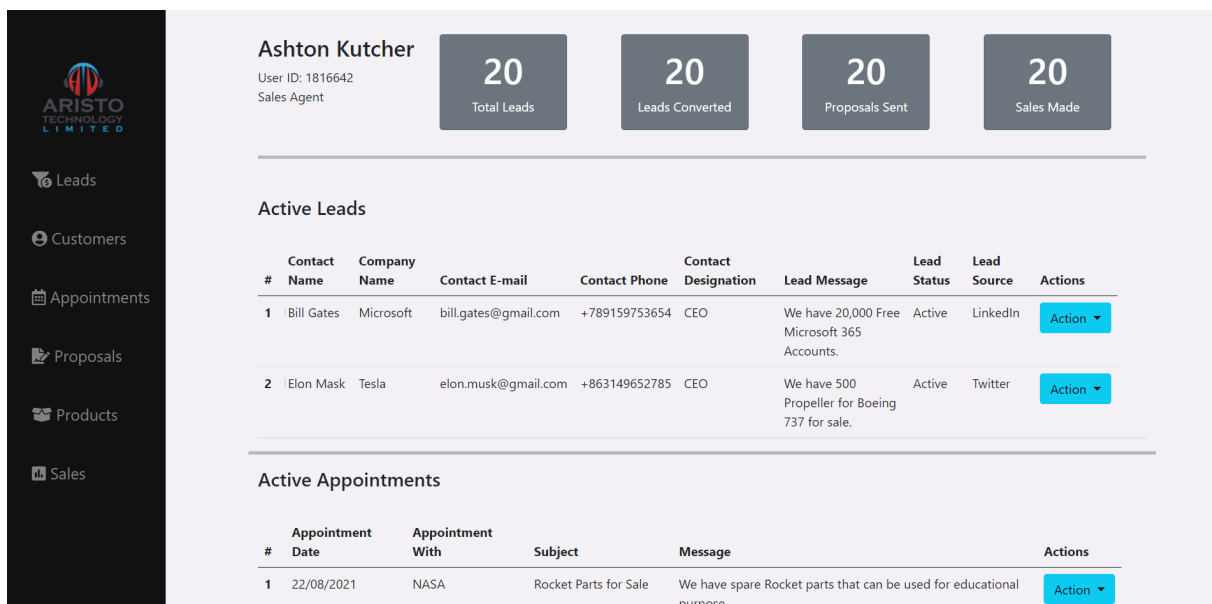


Proposals

[Add New Proposal](#)

#	Customer Name	Company Name	Proposal Subject	Proposal Date	Proposal Status	Order Items	Order Quantity	Order Amount	Actions
1	Philip Banks	Ford	Purchase Order	21/8/2021	Active	Ford GTR	1	\$500,000	Action
2	David Beckham	Nike	Purchase Order	21/8/2021	Active	Adidas' Predator	1	\$280	Action
3	Trina Selvester	Dior	Purchase Order	21/8/2021	Active	Eye Liner	50	\$2000	Action

A Sales Agent can access this page. This will be the Dashboard page once an Sales Agent logs in.



Ashton Kutcher
User ID: 1816642
Sales Agent

20 Total Leads

20 Leads Converted

20 Proposals Sent

20 Sales Made

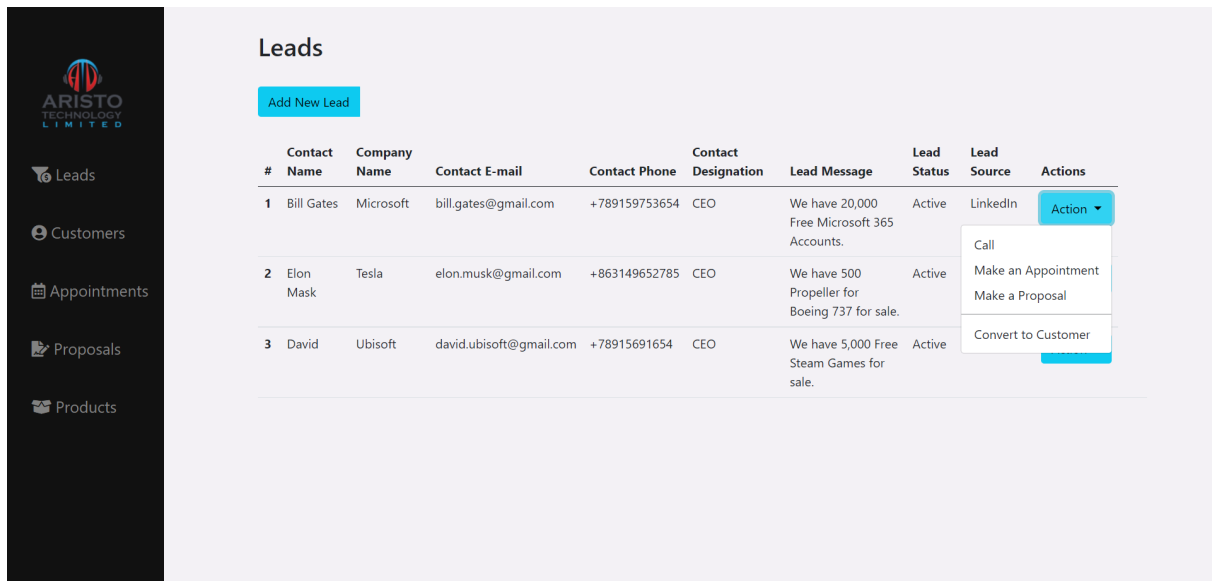
Active Leads

Contact #	Contact Name	Company Name	Contact E-mail	Contact Phone	Contact Designation	Lead Message	Lead Status	Lead Source	Actions
1	Bill Gates	Microsoft	bill.gates@gmail.com	+789159753654	CEO	We have 20,000 Free Microsoft 365 Accounts.	Active	LinkedIn	Action
2	Elon Mask	Tesla	elon.musk@gmail.com	+863149652785	CEO	We have 500 Propeller for Boeing 737 for sale.	Active	Twitter	Action

Active Appointments

#	Appointment Date	Appointment With	Subject	Message	Actions
1	22/08/2021	NASA	Rocket Parts for Sale	We have spare Rocket parts that can be used for educational purpose	Action

A Sales Agent can access this page. This will be where Sales Agent can see all leads and convert them.

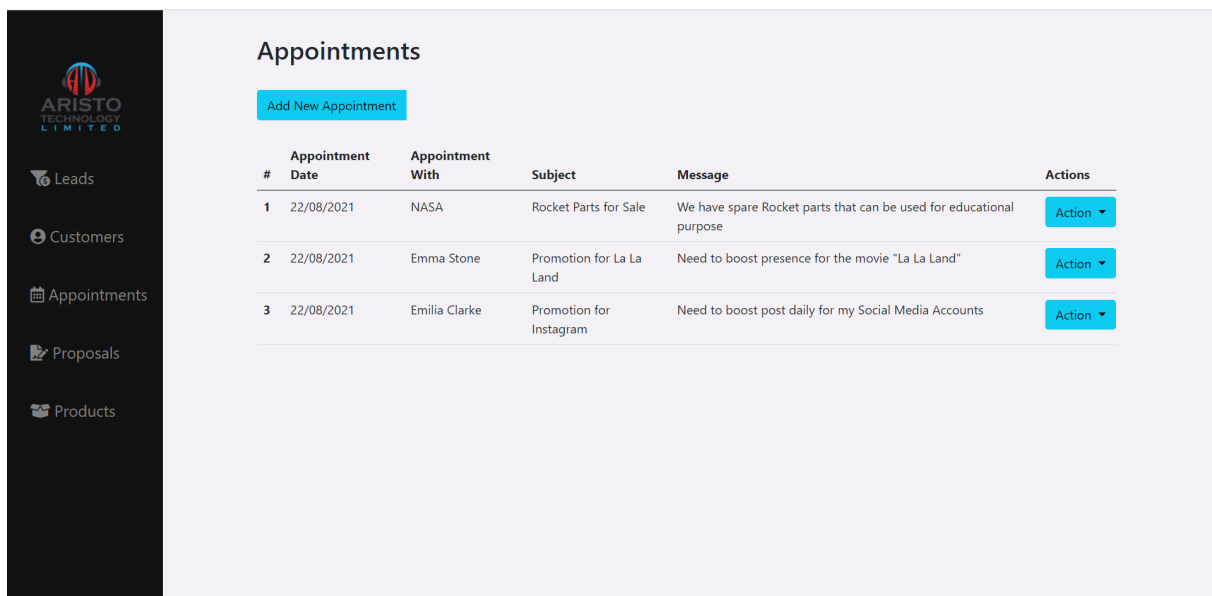


Leads

[Add New Lead](#)

Contact #	Contact Name	Company Name	Contact E-mail	Contact Phone	Contact Designation	Lead Message	Lead Status	Lead Source	Actions
1	Bill Gates	Microsoft	bill.gates@gmail.com	+789159753654	CEO	We have 20,000 Free Microsoft 365 Accounts.	Active	LinkedIn	Action <ul style="list-style-type: none"> Call Make an Appointment Make a Proposal Convert to Customer
2	Elon Musk	Tesla	elon.musk@gmail.com	+863149652785	CEO	We have 500 Propeller for Boeing 737 for sale.	Active		
3	David	Ubisoft	david.ubisoft@gmail.com	+78915691654	CEO	We have 5,000 Free Steam Games for sale.	Active		

An Admin and a Sales Agent can access this page. This will be where users can see all appointments.



Appointments

[Add New Appointment](#)

Appointment #	Appointment Date	Appointment With	Subject	Message	Actions
1	22/08/2021	NASA	Rocket Parts for Sale	We have spare Rocket parts that can be used for educational purpose	Action
2	22/08/2021	Emma Stone	Promotion for La La Land	Need to boost presence for the movie "La La Land"	Action
3	22/08/2021	Emilia Clarke	Promotion for Instagram	Need to boost post daily for my Social Media Accounts	Action

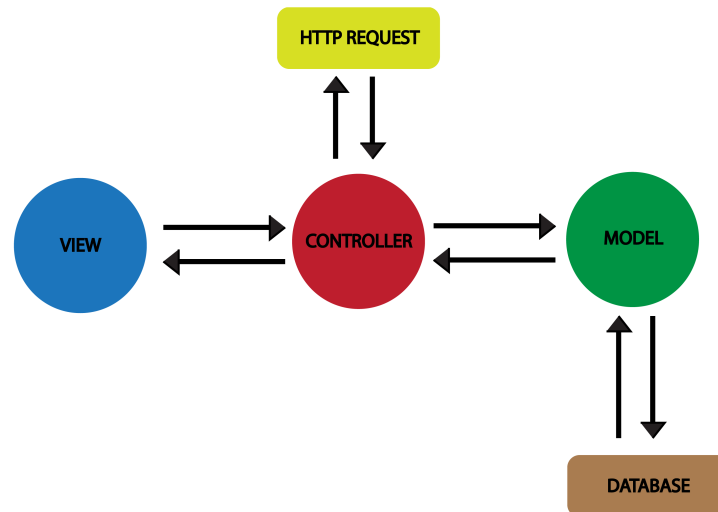
An Admin and a Sales Agent can access this page. This will be where users can see all customers.

Customers

[Add New Customer](#)

#	Customer Name	Customer E-mail	Customer Phone	Customer Street	Customer City	Customer State	Customer Zip Code	Customer Country	Actions
1	Jake	jake.parker@gmail.com	+789159753654	36th Avenue Street	New York	Manhattan	10001	USA	Action ▼
2	Alan	alan.banks@gmail.com	+78912313654	67th Avenue Street	Miami	Flo Rida	20001	USA	Action ▼
3	Damon	damon.pike@gmail.com	+789159369754	56th Avenue Street	Ontario	Ottawa	674	Canada	Action ▼

5.4.4 Architecture



In order to make our system, we will be using EJS, Node.js, Express.js and MongoDB which is a very powerful, declarative, minimalist, fast and unopinionated JavaScript framework. It is constructed on the Model View Controller architecture.[8] The Model contains a function that performs the CRUD operations like inserting, retrieving and update data and information from the database, it is mainly handled by MongoDB which will be using document-oriented model. The view is constructed using EJS which contains the data and views that the user sees, mainly the User Interfaces. The controller is used to bind model and view to process HTTP access mainly the request and response, which generates the web pages, this is handled by Node.js and Express.js. The controller receives all the requests and passes them to the model and view and creates a response. When the user interacts with the website it views information. When the user performs any kind of activity the request is received by the controller which works as a medium between the model and the view.[9]

Chapter 6

Results & Analysis

Black box Testing, is a type of testing where testers don't have access to the actual or the source code of the application. It is mainly conducted at the application's interface without focusing too much on the internal logic or the structure. This is mostly done by trial-and-error method. These tests can be both functional and non-functional, but in most cases, they are functional in nature.[10]

I have performed unit testing and functional testing to troubleshoot various problems and bugs of the application. The table below shows the results of my testing done on the CRM software. At an early stage, there were several bugs and problems were detected, after several iterations of running the tests and applying various test cases, some of the bugs and problems were resolved. But there still remain few testing of modules to have a solid working and functional application. These module testing and further troubleshooting will be performed and focused on a later time. All of the testing that are performed until now are all on local hosting and has shown significantly positive and less error prone results. The functionalities that have been tested showed no bugs or error will have hundred percent success rate. After the project is fully complete and ready to be deployed, more detailed and in-depth testing will be performed before migrating to the cloud, changes and updates will be made according to test results.

- Results from Admin Panel

Test Case	Input Test	Steps Performed	Expected Result	Actual Result	Success Rate	Pass / Fail
User Login	User ID, Password	1. Enter UserID and Password 2. Click on Login	Will be redirected to Dashboard	Redirected to Dashboard	100%	Pass
Add Users	Name, E-mail, Password, Address, Phone Number, User Type	1. Click on Add New User 2. Enter User Information 3. Click on Signup	Add New User success message will be displayed	Success Message was displayed	100%	Pass
Add Leads	Company Name, Company Phone, Company E-mail, Company Street, Company City, Company State, Company Zip Code, Company Website and Company Country, Contact Name, Contact Phone, Contact E-mail, and Contact Designation, Lead Source, Lead Assigned Employee, Lead Message, Lead Status	1. Click on Add New Lead 2. Enter Lead Information 3. Click on Save	Add New Lead success message will be displayed	Add New Lead success message was displayed	100%	Pass
Remove Leads	N/A	1. Click on Lead tab 2. Select specific lead 3. Click on Remove	Specific lead will no longer be displayed	Specific lead was no longer displayed	100%	Pass
Edit Leads	Company Name, Company Phone, Company E-mail, Company Street, Company City, Company State, Company Zip Code, Company Website and Company Country, Contact Name, Contact Phone, Contact E-mail, and Contact Designation, Lead Source, Lead Assigned Employee, Lead Message, Lead Status	1. Click on Lead tab 2. Select specific lead 3. Click on Edit 4. Enter New information 5. Click on save	Specific lead will be updated with new information	Specific lead was updated with new information	100%	Pass
Display Leads	N/A	1. Click on Lead tab	Correct Leads will be displayed from database	Correct Leads were displayed from database	100%	Pass
Add Products	Name, Category, Quantity, Price, VAT and Status	1. Click on Add New Product 2. Enter Product Information 3. Click on Save	Add New Product success message will be displayed	Add New Product success message was displayed	100%	Pass

Table 6.1: Result Table for Admin

Remove Products	N/A	1. Click on Product tab 2. Select specific Product 3. Click on Remove	Specific product will no longer be displayed	Specific product was no longer displayed	100%	Pass
Edit Products	Name, Category, Quantity, Price, VAT and Status	1. Click on Product tab 2. Select specific product 3. Click on Edit 4. Enter New information 5. Click on save	Specific product will be updated with new information	Specific product was updated with new information	100%	Pass
Display Products	N/A	1. Click on Product tab	Correct Products will be displayed from database	Correct Products were displayed from database	100%	Pass
Display Appointments	N/A	1. Click on Appointments tab	Correct Appointments will be displayed from database	Correct Appointments were displayed from database	100%	Pass
Display Proposals	N/A	1. Click on Proposal tab	Correct Proposals will be displayed from database	Correct Proposals were displayed from database	100%	Pass
Display Sales	N/A	1. Click on Sales tab	Correct Sales will be displayed from database	Correct Sales were displayed from database	100%	Pass
Display Dashboard	N/A	1. Click on Company Logo	Correct Active Leads, Proposals and Sales will be displayed from database	Correct Active Leads, Proposals and Sales were displayed from database	100%	Pass

Table 6.2: Result Table for Admin

- Results from Sales Agent Panel

Test Case	Input Test	Steps Performed	Expected Result	Actual Result	Success Rate	Pass / Fail
User Login	User ID, Password	1. Enter UserID and Password 2. Click on Login	Will be redirected to Dashboard	Redirected to Dashboard	100%	Pass
Add Customers	Customer Name, Customer Phone, Customer Street, Customer City, Customer State, Customer Zip Code, Customer Country, Billing Street, Billing City, Billing State, Billing Zip Code, Billing Country, Shipping Street, Shipping City, Shipping State, Shipping Zip Code, Shipping Country	1. Click on Add New Customer 2. Enter Customer Information 3. Click on Save	Add New Customer success message will be displayed	Success Message was displayed	100%	Pass
Edit Customer	Customer Name, Customer Phone, Customer Street, Customer City, Customer State, Customer Zip Code, Customer Country, Billing Street, Billing City, Billing State, Billing Zip Code, Billing Country, Shipping Street, Shipping City, Shipping State, Shipping Zip Code, Shipping Country	1. Click on Customer tab 2. Select specific customer 3. Click on Edit 4. Enter New information 5. Click on save	Specific customer will be updated with new information	Specific lead was updated with new information	100%	Pass
Remove Customers	N/A	1. Click on Customer tab 2. Select specific customer 3. Click on Remove	Specific customer will no longer be displayed	Specific customer was no longer displayed	100%	Pass
Display Customers	N/A	1. Click on Customers tab	Correct Customers will be displayed from database	Correct Customers were displayed from database	100%	Pass
Add Appointments	Appointment Date, Appointment With, Subject, Message	1. Click on Add New Appointment 2. Enter Appointment Information 3. Click on Save	Add New Appointment success message will be displayed	Add New Appointment success message was displayed	100%	Pass
Remove Appointments	N/A	1. Click on Appointments tab 2. Select specific Appointments 3. Click on Remove	Specific Appointment will no longer be displayed	Specific Appointment was no longer displayed	100%	Pass

Table 6.3: Result Table for Sales Agent

Edit Appointments	Appointment Date, Appointment With, Subject, Message	1. Click on Appointment tab 2. Select specific Appointment 3. Click on Edit 4. Enter New information 5. Click on save	Specific Appointment will be updated with new information	Specific Appointment was updated with new information	100%	Pass
Display Appointments	N/A	1. Click on Appointments tab	Correct Appointments will be displayed from database	Correct Appointments were displayed from database	100%	Pass
Add Proposal	Customer Name, Customer Address, Customer City, Customer State, Customer Country, Customer Zip Code, Customer E-mail, Customer Phone, Proposal Company, Proposal Subject, Proposal Date, Proposal Open Duration, Proposal Status	1. Click on Add New Proposal 2. Enter Proposal Information 3. Click on Save	Add New Proposal success message will be displayed	Add New Proposal success message was displayed	100%	Pass
Remove Proposals	N/A	1. Click on Proposals tab 2. Select specific Proposals 3. Click on Remove	Specific Proposal will no longer be displayed	Specific Proposal was no longer displayed	100%	Pass
Edit Proposals	Customer Name, Customer Address, Customer City, Customer State, Customer Country, Customer Zip Code, Customer E-mail, Customer Phone, Proposal Company, Proposal Subject, Proposal Date, Proposal Open Duration, Proposal Status	1. Click on Proposal tab 2. Select specific Proposal 3. Click on Edit 4. Enter New information 5. Click on save	Specific Proposal will be updated with new information	Specific Proposal was updated with new information	100%	Pass
Convert to Customer	N/A	1. Click on Customer tab 2. Select specific Customer 3. Click on Action 4. Click on Convert to Customer	Lead Contact will be displayed in Customer List	Lead Contact was be displayed in Customer List	100%	Pass
Display Dashboard	N/A	1. Click on Company Logo	Correct Active Leads, Appointments and Proposals will be displayed from database	Correct Active Leads, Appointments and Proposals were displayed from database	100%	Pass

Table 6.4: Result Table for Sales Agent

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

Our CRM software has been made sustainable by providing few simple, yet convenient changes:

- **Centralized Database:** All of the important data and information that are needed to perform daily business processes are stored in one particular database. It provides users with more organized and manageable data center and smooth access. It is beneficial for all users involved in the main business process, it reduces time, improves reliability in long term and reduces cost in total.
- **Current Benchmark Technology:** We have used some modern software development technologies that are open-source and up to the technological standard of modern-day web applications. We have used MongoDB, Node.js, Express.js and EJS to make our software more sustainable by reducing the less chances of language and architecture depreciation and making it fast, efficient and scalable in the long run.
- **Maintenance and Usability:** Our software is designed in such a way that it is simple and easier for users to use this software and perform their daily business process, it requires very few clicks to find the necessary information or perform an action. This software will be maintained after several months by cleaning cache memories and unnecessary files to improve performance and free up space.

7.2 Social and Environmental Effects and Analysis

- **Social Effect:** In our modern times, everyday people are looking for solutions to make their lives easier by reducing human effort and business processing time. Our software helps people in organization to perform their daily business process and interaction in a more faster, organized and easier manner. It reduces the time for sales agents and lead providers to communicate and interact with each other, it helps them achieve their goals in less time and produce greater output and provide faster communication. It will also help people in the organization to better understand their business process and have better knowledge on their customers, segmentation, and interest. Which in turns creates more leads, opportunities and productivity.
- **Environment Effect:** As every business grows, companies and organizations need to adapt to new technology and practices to survive in real world. A software might affect the environment in many ways. Some effects include when business grows large, it needs to be able to handle large numbers of users and customers, which means it has to be efficient, scalable and fast, as large numbers of users will be using this system simultaneously. It should also be mentioned that Web Apps require less energy and power consumption in general as new technology are eco-friendly, hardware and server hosting will be handled by the cloud service.

7.3 Addressing Ethics and Ethical Issues

In our modern times, we have a vast population of people to live and adjust with and different people have a different type of thinking and mentality, which produces a different ethical value to people. Sometimes various problems occur due to ethical differences and addressing of ethical problems. It has been observed that certain people might not accept certain way the software is built and designed, some people might become overly reliant on the software, some people might have difficulty adapting to the new system from the software they have used before. Some organizations feel that new software is highly prone to getting hacked or vulnerable to internet threats and viruses. Furthermore, ethical issues that can be addressed may be using company or customer information for personal or off-the-business purpose without their permission, exploitation of customers and company data. Sometimes, unauthentic information can reside on this app, these can be unproductive and detrimental for business. All of these problems are dully acknowledged and addressed, and certain steps will be implemented in future to provide solutions to these problems. These problems will be monitored by system administrators detecting unauthenticated information and proper documentation and manual will be created for using the app easily and efficiently. All these steps will be performed in future to avoid any ethical issues.

Chapter 8

Lesson Learned

During my internship program, I have learned about different types of Customer Relationship Management System, how they work, the user interfaces, workflow of the system, how data are manipulated, what data fields are necessary. What technologies are being used for this type of software. Read through few journal papers to understand the current research or development stages of CRM software. Studied some benefits and advantages of CRM software, how it will help to improve people's lives and easier to use. I have discovered that Salesforce and HubSpot has a very complicated system, yet very beneficial and productive. Recent research paper suggest people are trying their very best to reduce the complexity of the system and looking for more simpler interface.

Learned about different types of Software Development Life Cycles, mainly the Agile Methodology, when should we use it, what are the benefits of it. What is Work Breakdown Structure? How it is beneficial for Software Development, created WBS using lucid chart. What are Gantt Charts? created Gantt Charts using Excel. What is Activity wise Time Distribution? What is Resource allocation, how it is beneficial for business and software development.

Learned about System Analysis, Six Element Analysis, Feasibility Analysis, Problem Solutions, Effect and Constraints Analysis. How it is beneficial for software development. Created Rich Picture using Adobe Illustrator. What are Use Case Diagrams? How it is beneficial. Created diagrams using Lucid Chart. What are Activity Diagrams? Created diagrams using Lucid Chart. What are Entity Relationship Diagrams? Created ER Diagrams using Lucid Chart. What are Functional and Non-Functional Requirements? What are Model View Controller Architecture, how it works, how it is beneficial for the system. How all of the analysis are connected and helpful for development process.

Learned about modern day technologies used for Web App Development. How JavaScript can easily communicate with both client side and server side in a web app, how it makes web apps much faster, efficient and scalable. Explored different types of popular JavaScript libraries and framework, Node.js and Express.js used for middleware, where express is a framework used to communicate with node, a popular server platform, how both makes a web app fast, unopinionated and minimalist, how it effectively and easily handle http requests and responses and provide powerful URL routings, how it can incorporate with front ends like ejs, html, css by calling GET and POST methods, how it incorporates with MongoDB and Mongoose to easily store data, it is highly scalable and document based database, that store data in JSON structure. Which together makes the data flow from front to back end, natural and fast. Explored EJS, how to reduce codes by reusing it, how it can be used to render pages dynamically and load data in response to URL request. Learned about testing in minimal, mostly about Blackbox testing and how to represent results of testing.

Learned about different types of problems faced in an organization when introducing a new software, studied about social effects, environmental effects, ethical problems and sustainability of a software. How it can create impacts and ways to resolve it.

8.1 Problems Faced During this Period

Some of the problem that I have faced during this Internship Program is mostly managing time properly and scheduling work and maintaining the deadlines. It wasn't easy developing the software, learning, and adapting to the new technology parallelly at the same time.

In addition to the system planning, project management, system analysis and system design, a lot of proper thinking, analysis and best judgement call were necessary to meet deadlines, balance work and make an overall good and solid system plan.

Collaborative work can require good patience and communication skills, clearly understanding client's needs and requirements, how effectively it will serve its purpose and beneficial for the organization. How working with a team can require synchronization, group planning and understanding between team members and integrating phases milestones together to successfully complete segments of the project and maintain project management timeline.

Adapting to the new technology, it can be challenging in a very short time. It takes an average of 3-6 months to learn about a new programming language. Even though, I had some pre-existing knowledge about programming, but it takes a lot of time to learn the basics of new language or framework, practicing it and understanding it.

Some of the major problems that I have faced was debugging the software when in production. It can be very challenging when something doesn't work and have absolutely no idea where it is going wrong, a lot of researching, judgement call and learning new techniques and methods to resolve them.

Team communication, it is very difficult to have a good communication among team members in this COVID-19 pandemic. Even though, we had platforms that enables us to communication using video and audio calls. But it is not enough to have good and productive group discussions and planning.

8.2 Solution of those Problems

To encounter the problems, I have faced during my internship. I have taken several approaches to get the solutions.

For the Time management, I have followed one of the old and famous strategy "Divide and Conquer". It breaks down the problems into several segments or sub problems and doing it parallel and finally joining it. At the beginning of my Internship Program, I had basic to intermediate knowledge about Programming and Web App Development. But not about the new technology that I will be using. I have divided my time by, learning the new technology framework, and side by side planning and collecting software requirements for the CRM software. Once I have finished learning the basics of new frameworks and collecting software requirements. I moved to next phase by designing the UI/UX of the web app and creating the front-end portion of my software and parallelly creating the system designs like rich picture, use case diagrams, activity diagrams and ER diagrams and writing the functional and non-functional requirements at the same time. This parallel and divided work plan helped me to get the right thing at the right time. Now, I have an intermediate knowledge about the new technology and framework and the detailed analysis and design of the system, I am now fully equipped with the necessary and important documents and knowledge to start building the CRM software. On the next phase, I divided the software into modules and detected the common functionalities of the system and worked on them. I have estimated that, if I am able to complete the important functionalities of one module, then I am halfway to resolve my problems and building the App. Yet it seems very straight forward and perfectly planned. But I did face various challenges through out this period between the phases, I had to do office

works, meetings and discussion in between the phases. But with this strategy it helped me fasten my work to an extent and effective to a certain level.

During my entire Undergraduate journey in Independent University, Bangladesh. I have received help from several faculties and supervisors, their assistance, support, and co-operations have helped me resolve many serious and critical problems while writing the report and building the App. I have learned and received knowledge and help from my supervisors both internal and external guiding me and suggesting me where I should focus, where my problems are, how I will be able to improve it and giving honest feedback and appreciations. These may seem simple, but it was highly beneficial for me throughout the journey. I have received several resources from various courses I have taken during my undergrad including, Object Oriented Programming, Database Management, System Analysis and Web App Development courses that were extremely knowledgeable, helpful, and resourceful for my Internship Program, and to grow as a good programmer. It has provided me with incredible resources that made my work faster, easier, and efficient. I still use some of these contents and resources on developing new software every day, these shall always remain a fortune to me throughout my life as a Programmer.

While adapting to the new technology and frameworks, I have faced various challenges I have mentioned above. It was by far the most difficult problem I faced and had to resolve it with good judgement call and researching about the frameworks, reading framework documentations, searching for problems in Google, Stack Overflow, watching tutorial videos, and mostly importantly practicing it and trying different things and harnessing my knowledge. Before I took the attempt to develop the CRM software, I had to have a clear and solid knowledge and practice of the new technology. I had to build several mini applications like Newsletter App, Weather App, Blogging App, To-Do List App and Simon Game for learning and practicing purpose. I had to go on several critical thinking phases and planning to finally understand and implement the CRM App using the new technologies.

Yet most of the problems that I have mentioned above are reasonable solutions, but there still remains some problems that are not easy to resolve with smart strategies and planning. Collaboration and Communication with team members were difficult, but I had to attend several important meetings and discussions in person, as it is not possible to do it from online calls. Some meetings were held for Software Requirements, System Design, Content Creation and UI/UX design that were had to be physical and in person. Other minor meetings regarding company work were mainly discussed through video calls.

Chapter 9

Future Work & Conclusion

9.1 Future Works

Some of the future works for this software include:

- Data Analytical and Representations module will be implemented for Sales Statistics and Business Intelligence
- VC Dialer Integration
- Voice over Internet Protocol Service will be integrated
- Instant Messaging Service
- Data Mining and AI powered Lead Generator to produce new business insights and connections
- White Box Testing
- Convert Front End to React.js

9.2 Conclusion

I have given an overall and detailed information about the Web App in this report. These include the background of the project, the objectives and what we want to achieve, how the CRM system works, why we need it, how it is beneficial for the organization and how it is related to my undergraduate study in Independent University, Bangladesh. I have provided a rigorous Project Management and Financing plan, the methods that has used for developing the software, a broad section of my work description, analysis of the system and the system design for the project to understand the system, this involves the architecture, use cases, activity and entity relationship of the software, how it is made and built. I have provided with results from Blackbox testing, the problems that I have faced through this time and emphasized the importance of this App in Aristo Technology. This project consists of Front-end (UI/UX Design, HTML, CSS, JS, Bootstrap, EJS) and Back-end with (MongoDB, Node.js and Express.js) were used for developing the software. These include, Leads, Products and Sales Management for Admins and Customer, Appointment and Proposal Management for Sales Agents, and Dashboard for both Admins and Sales Agents and everything that I have worked on during this time in my internship program.

In our software, admin can add or post new leads to the system, add product that are for sale or for companies willing to sell. Admins can also delete leads and products information, if necessary. Sales Agent will have the ability to see newly added leads, add new customers, set appointments with customers or companies, make proposal for both customers and companies, convert leads to customers if certain criteria are met, they can also delete certain appointments, proposals, and customers if necessary. Sales members and Admins both can see total number of sales made, number of leads converted and proposals made.

Currently, the CRM software is still in Development Phase. All Front-End portion of the project has been successfully made, API and routes between pages and views has been made, certain level of code reusing has been made using EJS, All CRUD operations functionality has been made and implemented for Lead, Customer, Product, Appointment and Proposal Management Modules. All database formation and structure are made. A minimal testing has been performed for clarifying the functionality of the modules. The only remaining works that are needed are the code refactoring, white box testing, quality assurance testing and deployment. We are currently exploring options for proper cloud computing web service and hosting plan that is suitable for deploying this system.

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