

# **Industrial Internship Report**

**Tech Elecon Pvt. Ltd.**

*Submitted By*

**AVI PATEL**

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*In partial fulfillment for the award of the degree of*

**BACHELOR OF TECHNOLOGY**

*in*

**Computer Science Engineering with specialization in IOT**

**G H Patel College of Engineering & Technology**

**The Charutar Vidya Mandal (CVM) University,**

**Vallabh Vidyanagar – 388120**

**May, 2025**

**G H Patel College of Engineering & Technology**  
**Computer Science Engineering with specializations in IOT**

**CERTIFICATE**

This is to certify that Avi Patel (12102110501007) has submitted the Industrial Internship report based on internship undergone at Tech Elecon Pvt. Ltd. for a period of 16 weeks from 01/01/2025 to 30/04/2025 in partial fulfillment for the degree of Bachelor of Technology in CSE(IOT), G H Patel college of engineering & technology at The Charutar Vidya Mandal (CVM) University, Vallabh Vidyanagar during the academic year 2024 – 25.

Dr. Miral Patel  
Internal Guide(s)

Dr. Nikhil Gondaliya  
Head of the Department

## **Tech Elecon Pvt. Ltd.**

Date: 27/04/2025

### **TO WHOM IT MAY CONCERN**

This is to certify that AVI PATEL, a student of BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING (IOT) at G H PATEL COLLEGE OF ENGINEERING & TECHNOLOGY (GCET), affiliated with CVM UNIVERSITY, VALLABH VIDYANAGAR, has successfully completed his internship in the field of React.js from 01/01/2025 to 30/04/2025 under the guidance of Mr. Satyam Raval, Deputy General Manager at Tech Elecon Pvt Ltd. His internship activities include successful completion of the assigned project at the given period of time along with abiding by companies' rules and regulation. During the period of his internship program with us, he had been exposed to different processes and was found diligent, hardworking, and inquisitive. We Wish him every success in his life and career.

For Tech Elecon Pvt. Ltd.

## Internship Offer Letter



HR/TEPL/157

24.12.2024

To,

G H Patel College of Engineering & Technology,  
V V Nagar.

### Permission for Vocational Training

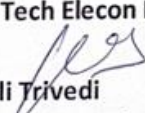
Dear Sir/M'am,

With reference to your letter dated.17.12.2024, we are pleased to grant permission to **Mr.Vraj Patel / Mr.Avi Patel / Mr.Ankit Adesara & Mr.Aayush Patel** student of **Information Technology for Vocational Training** in our organization from **01.01.2025 to 30.04.2025**.

*The following points are to be adhered by the student.*

- Laptops, Pen-Drives & other hard drives are not permitted inside the company premises.
- Appropriate dressing & grooming will be appreciated. Jeans & T Shirts are not allowed.
- Female students have to wear dress and Kurtis only.
- Photography & Videography is strictly prohibited in the premises.
- Trainee/s has to strictly comply with the Company's timings & schedule.
- In case of any casualty the Company will not be held responsible.
- On Completion of training the trainee/s has to submit a copy of Training Report duly signed by concern guide to obtain the Training Certificate.
- In case of any ambiguity / difficulty, the trainee is required to approach HR Department. The detailed guideline are attached overleaf.

For, Tech Elecon Pvt.Ltd.

  
Nirali Trivedi  
Group HR Head

Cc. Satyam Raval

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## **DECLARATION**

I, Avi Patel (12102110501001), hereby declare that the Industrial Internship report submitted in partial fulfillment for the degree of Bachelor of Technology in CSE (IOT), G H Patel college of Engineering & Technology, The Charutar Vidya Mandal (CVM) University, Vallabh Vidyanagar, is a Bonafide record of work carried out by me at Tech Elecon Pvt. Ltd. under the supervision of Satyam Raval and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the student

---

Sign of student

---

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to Tech Elecon Pvt. Ltd. for providing me with the opportunity to undertake my industrial internship at their esteemed organization. This experience has been invaluable for my professional growth and has significantly enhanced my understanding of real-world software development practices.

My special thanks to Mr. Satyam Raval, Deputy General Manager, for his guidance and support throughout my internship period.

I would also like to express my appreciation to Dr. Miral Patel, my internal guide from G H Patel College of Engineering & Technology, for the constant guidance, suggestions, and encouragement which helped me to complete this project successfully.

I am grateful to Dr. Nikhil Gondaliya, Head of the Department of Information Technology, for providing the necessary infrastructure and resources required for the completion of my internship project.

Finally, I would like to thank my family and friends for their unwavering support and encouragement throughout my academic journey.

**AVI PATEL**  
**12102110501007**

## ABSTRACT

*This industrial internship report outlines the development of a Customer Relationship Management (CRM) system using the MERN stack (MongoDB, Express.js, React.js, Node.js). The internship was completed at Tech Elecon Pvt. Ltd., part of the Elecon group, which has over 25 years of expertise in IT solutions.*

*The CRM system aims to streamline business operations by integrating customer management, sales tracking, marketing, and support services into a unified platform. It consists of three components: a landing website, an admin dashboard, and a user dashboard — each tailored for specific user roles while ensuring a consistent experience.*

*The landing website offers CRM information and authentication features. The admin dashboard includes tools for analytics, lead and customer management, tasks, sales, appointments, campaigns, and support. The user dashboard enables customers to raise support tickets, give feedback, and manage profiles.*

*The system follows modern software engineering practices, including SDLC methodology, responsive design, secure authentication, and role-based access control. It also integrates real-time notifications and data visualization to boost efficiency and user engagement.*

*This report covers the entire development lifecycle — from planning and analysis to implementation and testing — and highlights key challenges, solutions, and future improvements.*

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# List of Abbreviations

Table 1 : List of Abbreviations

API	Application Programming Interface
CRUD	Create, Read, Update, Delete
CRM	Customer Relationship Management
CSS	Cascading Style Sheets
DGM	Deputy General Manager
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
JWT	JSON Web Token
MERN	MongoDB, Express.js, React.js, Node.js
DB	Database
OTP	One Time Password
REST	Representational State Transfer
UI	User Interface
UX	User Experience
2FA	Two Factor Authentication

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# **CHAPTER 1**

## **COMPANY PROFILE**

## **1.1 COMPANY PROFILE**

Tech Elecon Pvt. Ltd. is the It division of the Elecon group of companies and has more than 25 years of experience in the fields of hardware, software, and networking solutions.

It is situated in the heart of Vithal Udyognagar Industrial Estate and in the proximity of the educational town of Vallabh Vidyanagar.

Tech Elecon is all set to reach new heights in the field of IT solutions. Tech Elecon is ready with all sorts of solutions and delivers any application that is web based and further our solutions are designed to adapt your business rather than your business adapting the software. Their solutions are 100% fruitful and empower you to take control of client's business online and in real time.

Tech Elecon have more than 100 employees with specialized skills in software development, custom software development, and e-commerce software development using custom software programming including .NET, C#.NET, PHP, and Open Source and Oracle.

Tech Elecon delivers quality products and services with a focus on integrating the same with existing technologies, providing the required automation to our customers to help them achieve their business objectives.

Mr. Nilesh Naik, the company's Vice President, is at the helm of the Tech Elecon organization. Mr. Satyam Raval, as Deputy General Manager, and after that, Manager and Associate Manager positions are listed. At the bottom, there are trainees at entry level, who follow up to engineer, senior engineer, also executive and senior executive manager.

### **Different Services of the Company**

Tech Elecon has extensive experience in providing IT services and has successfully adapted to technological advancements, making it the leading IT infrastructure management service provider in the region. Our cutting-edge delivery model covers all the stages of the solution lifecycle, including planning, deploying, managing, maintaining, auditing, upgrading, and improving.

Tech Elecon recognize that each client has unique needs and expectations when it comes to infrastructure and service providers. Our clients have the flexibility to choose from a wide range of IT infrastructure management and performance services based on their specific requirements. They can opt for on-site services on hybrid solutions that include on-site troubleshooting and support services.

Tech Elecon provides various services for business:

- Hardware maintenance and repairing
- Service desk management
- Desktop management
- Network management
- Messaging administrator

- Back-up management

Other services:

- Software Development Services
- Software Licensing
- Microsoft Product Implementation
- Linux Servers/ Desktop Implementation.

## **CHAPTER 2**

### **INTRODUCTION TO PROJECT**



## 2.1 PROJECT SUMMARY

The CRM (Customer Relationship Management) system developed during this internship is a comprehensive web-based application built using the MERN stack (MongoDB, Express.js, React.js, Node.js) with Git for version control. The system is designed to streamline and enhance the management of customer relationships, sales processes, marketing campaigns, and customer support operations.

The CRM system consists of three primary components:

1. **Landing Website:** Serves as the public-facing interface of the CRM system, providing information about the product, showcasing features, displaying customer testimonials, and facilitating user authentication. The landing website is designed to attract potential customers and provide existing users with access to the system.
2. **Admin Dashboard:** A comprehensive management interface for administrators, featuring data analytics, lead management, customer information management, task management, sales tracking, appointment scheduling, marketing campaign creation, and customer support tools. The admin dashboard provides a centralized control center for managing all aspects of customer relationships.
3. **User Dashboard:** A streamlined interface for customers to interact with the organization, create and track support tickets, provide feedback, and manage their profile settings. The user dashboard enhances customer experience by providing direct access to support resources and communication channels.

Key features of the CRM system include:

- Secure authentication with role-based access control (admin/user)
- Password recovery with email OTP verification
- Comprehensive lead and customer management
- Sales tracking and analytics
- Task management with status tracking
- Appointment scheduling with Google Meet integration
- Marketing campaign management for email and SMS
- Customer support ticket system with real-time chat
- Real-time notifications
- Dark mode support

- Profile and settings management
- Data export, backup, and restoration capabilities

The project was developed using modern software engineering practices, including iterative waterfall methodologies, component-based architecture, responsive design, and secure coding principles. Git was used for version control to maintain code quality and facilitate collaboration.

This CRM system represents a significant advancement over traditional customer management approaches, offering a unified platform that integrates various aspects of customer relationship management into a cohesive, user-friendly interface.

## **2.2 PURPOSE**

The purpose of developing the CRM system is to address the growing need for businesses to efficiently manage and optimize their customer relationships in an increasingly digital environment. The system aims to provide a centralized platform that unifies various customer-facing processes, enabling organizations to deliver superior customer experiences while improving operational efficiency.

The primary purposes of the CRM system include:

### **1. Business Process Optimization**

The CRM system is designed to streamline and automate various business processes related to customer relationship management. By centralizing customer data and providing integrated tools for lead management, sales tracking, and customer support, the system eliminates redundant tasks, reduces manual data entry, and minimizes the risk of errors. This optimization leads to increased productivity and allows staff to focus on high-value activities rather than administrative tasks.

### **2. Enhanced Customer Insights**

A fundamental purpose of the CRM system is to provide organizations with comprehensive insights into their customer base. By consolidating customer data from various touchpoints, the system enables businesses to develop a holistic understanding of customer behaviours, preferences, and needs. These insights drive more informed

decision-making and allow for personalized customer interactions, ultimately strengthening customer relationships.

### **3. Improved Collaboration**

The CRM system facilitates better collaboration among different departments within an organization. By providing a unified platform where sales, marketing, and customer support teams can access and update customer information, the system breaks down information silos and promotes cross-functional coordination. This collaborative approach ensures that all customer-facing teams work with consistent, up-to-date information, leading to more coherent customer experiences.

### **4. Sales Process Enhancement**

A key purpose of the CRM system is to enhance the sales process by providing tools for lead management, opportunity tracking, and sales analytics. The system helps sales teams identify promising leads, track customer interactions, and analyze sales performance, enabling more effective sales strategies and improved conversion rates.

### **5. Marketing Effectiveness**

The CRM system aims to increase marketing effectiveness by providing tools for creating, managing, and analyzing marketing campaigns. By segmenting customers based on various criteria and tracking campaign performance, the system enables more targeted marketing efforts and better resource allocation, resulting in higher marketing ROI.

### **6. Superior Customer Support**

Enhancing customer support capabilities is a crucial purpose of the CRM system. By providing a ticketing system with real-time chat functionality, the system enables prompt and effective resolution of customer issues. This focus on customer support helps improve customer satisfaction and loyalty, which are essential for long-term business success.

### **7. Data-Driven Decision Making**

The CRM system promotes data-driven decision making by providing comprehensive analytics and reporting features. By visualizing key performance indicators and trends,

the system helps management make informed decisions based on actual data rather than intuition, leading to better strategic planning and resource allocation.

In summary, the purpose of the CRM system is to transform how organizations manage their customer relationships by providing a comprehensive, integrated platform that enhances efficiency, collaboration, and customer experience while delivering valuable insights for strategic decision-making.

## **2.3 OBJECTIVES**

The CRM system development project is guided by a set of clear, measurable objectives that define its intended outcomes and success criteria. These objectives encompass technical, business, and user experience goals that the system aims to achieve: (Corporation, n.d.)

### **2.3.1 Primary Objectives**

#### **1. Develop an Integrated Customer Management Platform**

- Create a unified system that consolidates customer data from various touchpoints
- Implement seamless data flow between different modules of the CRM system
- Ensure consistency and accuracy of customer information across the platform

#### **2. Enhance Lead Management and Conversion**

- Design an intuitive lead capture and tracking system
- Implement lead qualification and scoring mechanisms
- Provide tools for monitoring conversion rates and identifying bottlenecks in the sales funnel

#### **3. Streamline Sales Process Management (Corporation, n.d.)**

- Create a comprehensive sales tracking system with pipeline visualization
- Implement features for managing deals, opportunities, and sales activities
- Provide sales analytics to identify trends and forecast future performance

#### **4. Optimize Customer Support Operations**

- Develop an efficient ticket management system for tracking customer issues
- Implement real-time chat functionality for immediate customer assistance
- Create a knowledge base system for consistent problem resolution

#### **5. Facilitate Effective Marketing Campaign Management**

- Design tools for creating and managing email and SMS marketing campaigns

- Implement audience segmentation capabilities for targeted marketing
  - Provide analytics for measuring campaign effectiveness and ROI
- 6. Create an Intuitive and Responsive User Interface**
    - Design a modern, user-friendly interface for both admin and user dashboards
    - Ensure full responsiveness across different device types and screen sizes
    - Implement accessibility features for inclusive user experience
  - 7. Ensure System Security and Data Protection**
    - Implement secure authentication with role-based access control
    - Create robust data encryption and protection mechanisms
    - Design secure password recovery and two-factor authentication options
  - 8. Enable Data-Driven Decision Making (Ngai)**
    - Develop comprehensive analytics dashboards for performance monitoring
    - Implement data visualization tools for trend analysis
    - Create customizable reporting capabilities for different stakeholders

### 2.3.2 Technical Objectives

- 1. Build a Scalable and Maintainable System Architecture (Richards)**
  - Implement modular design using the MERN stack
  - Ensure system can handle growing user base and data volume
  - Create well-documented code with consistent coding standards
- 2. Achieve High Performance and Reliability**
  - Optimize database queries and API endpoints for fast response times
  - Implement caching mechanisms to reduce server load
  - Ensure system availability with minimal downtime
- 3. Enable System Integration Capabilities**
  - Design RESTful APIs for third-party integrations
  - Implement webhook functionality for event-driven integration
  - Create integration with Google services for calendar and meeting functionality
- 4. Ensure Cross-Browser and Cross-Device Compatibility**
  - Test and validate system functionality across major browsers
  - Ensure consistent user experience across desktop and mobile devices
  - Implement progressive enhancement for varied device capabilities

By achieving these objectives, the CRM system will deliver substantial value to both the organizations that implement it and their customers, creating a win-win scenario that enhances customer relationships while improving operational efficiency and business outcomes.

## **2.4 SCOPE**

The scope of the CRM system project defines the boundaries of what the system will and will not include, ensuring clear expectations and focused development efforts. The scope encompasses functional components, technical implementations, and user interaction capabilities.

### **2.4.1 In Scope**

#### **1. Landing Website**

- Hero section showcasing the CRM system's value proposition
- Features section highlighting key capabilities
- Solutions section addressing different business needs
- Testimonials section displaying customer feedback
- Contact form with email notification functionality
- User authentication (login and signup)
- Role-based registration (admin or user)
- Password recovery with email OTP verification
- "Remember me" functionality for persistent sessions

#### **2. Admin Dashboard**

- Overview dashboard with key metrics (revenue, active customers, sales, active deals)
- Recent activity feed showing system events
- Task management with CRUD operations and status tracking
- Customer segmentation visualization
- Calendar integration with Google Calendar
- Sales overview with performance metrics
- Lead management with CRUD operations, status filtering, search, and export capabilities

- Customer management with CRUD operations and search functionality
- Sales tracking with CRUD operations, search, and filtering
- Appointment scheduling with CRUD operations, search, filtering, and Google Meet integration
- Marketing campaign management for email and SMS
- Audience segmentation for targeted marketing
- Customer support ticket management with priority settings
- Support chat functionality for direct communication with users
- Real-time notifications for system events
- Dark mode toggle for user preference
- Profile management with editable personal details
- Security settings including password change and 2FA
- Notification

#### **2.4.2 Out of Scope:**

- Integration with third-party CRM systems
- Mobile application development
- Advanced analytics and AI-powered insights
- Payment gateway integration
- Custom API development for external systems integration
- Multilingual support
- Customer loyalty program management

## **2.5 TECHNOLOGY AND LITERATURE REVIEW**

### **2.5.1 Technology Stack**

The project utilizes the MERN stack, which stands for MongoDB, Express.js, React.js, and Node.js. This modern technology stack was chosen for its flexibility, scalability, and efficiency in building full-stack web applications.

#### **1. MongoDB (MongoDB, n.d.)**

- NoSQL database used for storing application data
- Document-oriented storage providing flexible schema design

- Efficient for handling large volumes of unstructured data
- Horizontal scaling capabilities for future growth

## 2. Express.js

- Minimalist web application framework for Node.js
- Handles HTTP requests and responses
- Provides routing mechanisms for API endpoints
- Middleware support for request processing

## 3. React.js

- Front-end JavaScript library for building user interfaces
- Component-based architecture for reusable UI elements
- Virtual DOM for efficient rendering and updates
- Robust ecosystem with extensive community support

## 4. Node.js

- Server-side JavaScript runtime environment
- Event-driven, non-blocking I/O model for efficient operations
- NPM (Node Package Manager) for dependency management
- Scalable for handling concurrent connections

## 5. Additional Technologies: (GitHub, n.d.) (Twilio, n.d.) (Nodemailer, n.d.)

- Git Version control system for code management and collaboration
- JSON Web Tokens (JWT): For secure authentication and authorization
- Axios: Promise-based HTTP client for API requests
- Socket.io: For real-time bidirectional communication in chat features
- Mongoose: Object modeling tool for MongoDB
- Redux: State management library for React applications
- Chart.js: For creating interactive data visualizations
- Nodemailer: For sending emails from the application
- Bcrypt: For password hashing and security

### 2.5.2 Literature Review

#### 1. Customer Relationship Management Systems: (Buttle) (Gartner)

CRM systems have evolved significantly from simple contact management tools to comprehensive platforms that integrate various business functions. According to



research by Gartner (2023), effective CRM implementation can increase sales by up to 29% and sales productivity by up to 34%. The modern CRM landscape emphasizes omnichannel experiences, AI integration, and self-service capabilities.

## **2. MERN Stack for Enterprise Applications:**

The MERN stack has gained significant popularity for enterprise application development due to its JavaScript-based approach across the entire technology stack. According to the Stack Overflow Developer Survey 2023, React.js continues to be the most loved web framework, with MongoDB ranking high among databases for web applications.

## **3. Real-time Communication in Business Applications:**

Real-time communication features, like the chat functionality implemented in this project, have become essential components of modern business applications. Studies by McKinsey (2022) indicate that businesses with integrated communication channels experience 23% higher customer satisfaction rates and 15% increased revenue compared to those without such capabilities.

## **4. User Experience Design in Enterprise Systems:**

Enterprise UX design has shifted toward more consumer-like experiences. Implementation of features like dark mode and responsive design, as included in this CRM system, aligns with current UX trends. According to a Nielsen Norman Group study, good UX design can improve user productivity by up to 25% in enterprise applications.

## **CHAPTER 3**

### **SYSTEM ANALYSIS**

### 3.1 STUDY OF CURRENT SYSTEM

During the internship, I analysed the existing customer relationship management processes at Tech Elecon. The current system employed a combination of spreadsheets, email communications, and basic task management tools:

- Customer data was stored in multiple Excel spreadsheets, often duplicated across departments
- Lead tracking was manual with inconsistent follow-up procedures
- Sales pipeline visibility was limited with no centralized view
- Customer support inquiries were handled via email with no formal tracking system
- Task management was performed using personal to-do lists or basic tools
- Marketing campaigns were planned and executed using separate tools
- Reports were generated manually by combining data from various sources

This fragmented approach resulted in numerous inefficiencies and communication gaps between departments.

### 3.2 PROBLEM AND WEAKNESSES OF CURRENT SYSTEM

The analysis revealed several critical weaknesses in the existing system:

1. **Data Fragmentation:** Customer information was scattered across multiple spreadsheets and systems, leading to inconsistencies and duplications.
2. **Lack of Visibility:** No centralized dashboard to view business metrics or customer interactions.
3. **Manual Processes:** Extensive manual data entry increased the risk of errors and consumed significant time.
4. **Poor Communication:** Limited tools for coordination between sales, marketing, and support teams.
5. **Inefficient Follow-ups:** No automated reminders for follow-ups with leads or customers.
6. **Limited Reporting:** Generating reports required manually compiling data from various sources.
7. **No Customer History:** Difficulty tracking the history of interactions with customers.

8. **Unreliable Task Management:** Tasks were often missed or delayed due to lack of proper tracking.
9. **Security Concerns:** Spreadsheets shared via email posed data security risks.
10. **Scalability Issues:** The manual system couldn't efficiently handle growing customer numbers.

### **3.3 REQUIREMENTS OF NEW SYSTEM**

Based on the identified problems, the following requirements were established for the new CRM system: (Salesforce, n.d.)

#### **3.3.1 Functional Requirements:**

##### **1. User Authentication and Authorization:**

- Secure login with email/password
- Role-based access control (admin and user)
- Password reset functionality
- Two-factor authentication option

##### **2. Lead Management:**

- Create, read, update, and delete leads
- Lead status tracking (new, contacted, qualified, etc.)
- Filter and search functionality
- Export leads data to Excel

##### **3. Customer Management:**

- Comprehensive customer profiles
- Interaction history tracking
- Customer segmentation
- Integration with sales data

##### **4. Sales Management:**

- Sales pipeline visualization
- Deal tracking and management
- Sales forecasting
- Performance metrics

##### **5. Task Management:**

- Create and assign tasks

- Set due dates and priorities
- Status tracking
- Filtering based on status

#### **6. Appointment Scheduling:**

- Calendar integration with Google Calendar
- Meeting scheduling
- Automated email notifications
- Video meeting link generation

#### **7. Marketing Campaigns:**

- Email campaign creation and management
- SMS campaign management
- Audience segmentation
- Campaign performance tracking

#### **8. Customer Support:**

- Ticket creation and tracking
- Priority assignment
- Real-time chat between users and support
- Resource attachment to tickets

#### **9. Reporting and Analytics:**

- Sales performance dashboards
- Customer acquisition metrics
- Support ticket analytics
- Custom report generation

#### **10. Data Management:**

- Data import/export functionality
- Backup and restore options
- Data retention policies

### **3.3.2 Non-Functional Requirements:**

#### **1. Performance:**

- Page load time under 3 seconds
- Support for concurrent users

- Responsive under various load conditions
- 2. **Security:**
  - Encrypted data storage and transmission
  - Protection against common web vulnerabilities
  - Regular security audits
  - Compliance with data protection regulations
- 3. **Usability:**
  - Intuitive and user-friendly interface
  - Responsive design for various screen sizes
  - Dark mode support
  - Consistent UI elements
- 4. **Reliability:**
  - System availability of 99.9%
  - Data backup and recovery mechanisms
  - Error handling and logging
- 5. **Scalability:**
  - Support for growing user base
  - Ability to handle increasing data volumes
  - Modular architecture for future expansion

### **3.4 SYSTEM FEASIBILITY**

#### **3.4.1 Does the system contribute to the overall objectives of the organization?**

The proposed CRM system aligns perfectly with Tech Elecon's objectives by:

- Enhancing customer relationship management, which is central to their business model
- Improving operational efficiency through automation and centralization
- Providing better insights for data-driven decision making
- Supporting the company's growth by creating scalable customer management processes
- Improving collaboration between departments, which is essential for delivering integrated IT solutions

### **3.4.2 Can the system be implemented using the current technology and within the given cost and schedule constraints?**

The system is technically feasible for the following reasons:

- The MERN stack (MongoDB, Express.js, React.js, Node.js) is well-established and proven for similar applications
- All required technologies are open source, reducing licensing costs
- The development team has the necessary expertise in these technologies
- Cloud infrastructure can be leveraged for deployment, minimizing hardware costs
- The modular design allows for incremental development within the schedule constraints

### **3.4.3 Can the system be integrated with other systems which are already in place?**

The CRM system is designed for seamless integration with existing systems:

- Google Calendar API integration for appointment scheduling
- Email service integration for notifications and marketing campaigns
- Potential for future integration with accounting and ERP systems via APIs
- Export functionality to common formats like Excel for data interchange
- Authentication can be extended to support Single Sign-On with existing systems

## **3.5 PROPOSED SYSTEM WORKFLOWS**

### **User Authentication and Registration:**

1. User visits landing page
2. User selects sign-up option
3. User chooses role (admin or user)
4. User provides registration details
5. System validates information
6. System creates user account
7. User receives confirmation email
8. User logs in with credentials
9. System redirects to appropriate dashboard based on role
10. Lead Management Process:

11. Admin creates a new lead with contact information
12. System assigns a unique ID to the lead
13. Admin categorizes lead and assigns status
14. System schedules follow-up tasks
15. Sales team updates lead status as they progress
16. System notifies relevant team members of status changes
17. Lead converts to customer or is marked as lost
18. Analytics update based on lead conversion rates

#### **Customer Support Workflow:**

1. User creates support ticket from dashboard
2. System assigns ticket ID and priority
3. Admin receives notification of new ticket
4. Admin reviews and updates ticket status
5. Admin and user communicate via integrated chat
6. Admin attaches relevant resources to ticket
7. User receives notifications on ticket updates
8. Admin resolves ticket and marks as closed
9. User can provide feedback on support quality

#### **Sales Management Process:**

1. Admin creates sales record with customer details
2. System links sales to customer profile
3. Admin updates sales status and value
4. System generates sales forecasts based on pipeline
5. Admin schedules follow-up appointments
6. System sends meeting invitations to customers
7. Sales team updates outcomes of meetings
8. System generates reports on sales performance



### **3.6 FEATURES OF NEW SYSTEM / PROPOSED SYSTEM**

#### **1. Centralized Customer Data Management:**

- Single source of truth for all customer information
- Comprehensive view of customer interactions
- Elimination of data duplication and inconsistencies

#### **2. Intuitive and Modern User Interface:**

- Clean, user-friendly design
- Responsive layout for all devices
- Dark mode support for reduced eye strain
- Customizable dashboard views

#### **3. Integrated Communication Channels:**

- In-app messaging between users and support
- Email notifications for important events
- SMS capabilities for urgent communications
- Google Meet integration for virtual meetings

#### **4. Comprehensive Reporting Dashboard:**

- Real-time business metrics
- Interactive charts and graphs
- Customizable report generation
- Export functionality for presentations

#### **5. Automated Workflow Management:**

- Task creation and assignment
- Due date tracking and reminders
- Status updates and notifications
- Priority-based task organization

#### **6. Marketing Campaign Management:**

- Email campaign creation and scheduling
- SMS campaign management
- Audience segmentation and targeting
- Performance tracking and analytics

#### **7. Robust Search and Filter Capabilities:**

- Advanced search across all entities

- Multi-criteria filtering
- Saved search preferences
- Quick access to frequently used filters

#### **8. Data Security and Compliance:**

- Role-based access control
- Two-factor authentication
- Encrypted data storage
- Detailed audit logging

#### **9. Calendar Integration:**

- Syncing with Google Calendar
- Appointment scheduling
- Automated reminders
- Conflict detection

#### **10. Customer Segmentation and Analysis:**

- Behavioural segmentation
- Value-based segmentation
- Engagement scoring
- Customer lifetime value calculations

### **3.7 MAIN MODULES, PROCESSES, AND TECHNIQUES OF THE PROPOSED CRM SYSTEM**

#### **Core Modules**

- **Authentication:** User registration, login/logout, password management, two-factor authentication.
- **Lead Management:** Lead capture, qualification, status tracking, conversion to customers.
- **Customer Management:** Profile management, interaction history, segmentation, relationship tracking.
- **Sales Management:** Deal tracking, pipeline visualization, revenue forecasting, performance metrics.
- **Task Management:** Task creation, assignment, due dates, status, and priority tracking.

- **Appointment Scheduling:** Calendar integration, meeting scheduling, reminders, video conferencing links.
- **Marketing Campaigns:** Campaign creation, audience management, email/SMS templates, analytics.
- **Customer Support:** Ticket management, real-time chat, resource attachment, resolution tracking.
- **Notifications:** Email, in-app, SMS alerts, custom preferences.
- **Reporting & Analytics:** Dashboard metrics, custom reports, data visualization, export options.
- **Settings & Profile:** User profile, system preferences, security, data management.

### Primary Processes

- Lead capture and qualification
- Customer relationship management
- Sales pipeline tracking
- Task allocation and monitoring
- Support ticket resolution
- Marketing campaign execution
- Appointment scheduling and follow-up
- Performance analysis and reporting

### Key Techniques

- RESTful API architecture
- JWT-based authentication
- Real-time communication (Socket.io)
- Responsive design (CSS frameworks)
- State management (Redux)
- Data visualization (Chart.js)
- Form validation and error handling
- Database indexing for performance

## 3.8 SOFTWARE AND METHODOLOGY

### Software Selection

#### 1. Frontend Framework: React.js

Justification: Component-based architecture, virtual DOM for performance, and extensive community support.

#### 2. Backend Platform: Node.js with Express.js

Justification: Unified JavaScript stack, event-driven architecture for concurrent connections.

#### 3. Database: MongoDB

Justification: Flexible schema for evolving data, document-oriented storage aligning with application needs.

#### 4. State Management: Redux

Justification: Predictable state management, robust debugging tools.

#### 5. Authentication: JWT (JSON Web Tokens)

Justification: Stateless, secure authentication reducing server load.

#### 6. Real-time Communication: Socket.io

Justification: Bidirectional communication for chat, with fallback for older browsers.

#### 7. UI Framework: Material-UI

Justification: Comprehensive components, consistent design language.

#### 8. API Testing: Postman

Justification: Robust API testing with automated test scripts.

#### 9. Version Control: Git with GitHub

Justification: Distributed version control, collaboration, and CI/CD integration.

### Methodology

#### 1. Development Methodology: Iterative Waterfall

Justification: Combines structured phases (requirements, design, implementation, testing, deployment) with iterative cycles for flexibility, allowing refinement of requirements and feedback incorporation while maintaining clear milestones.

#### 2. API Design: RESTful architecture

Justification: Standardized, stateless interface for scalability and ease of integration.

#### 3. Testing Approach: Unit, integration, and end-to-end testing

Justification: Ensures comprehensive coverage across application layers.

## **CHAPTER 4**

### **SYSTEM DESIGN**

## 4.1 SYSTEM DESIGN & METHODOLOGY

The CRM system follows a modular, microservices-inspired architecture that separates concerns while maintaining cohesion between related components. The architecture is Separation of Concerns: Clear division between frontend and backend components

1. **Component Reusability:** Common UI components and services shared across the application
2. **Scalability:** Independent scaling of different services
3. **Maintainability:** Modular design for easier updates and bug fixes
4. **Security:** Authentication and authorization at multiple levels

### System Architecture Diagram:

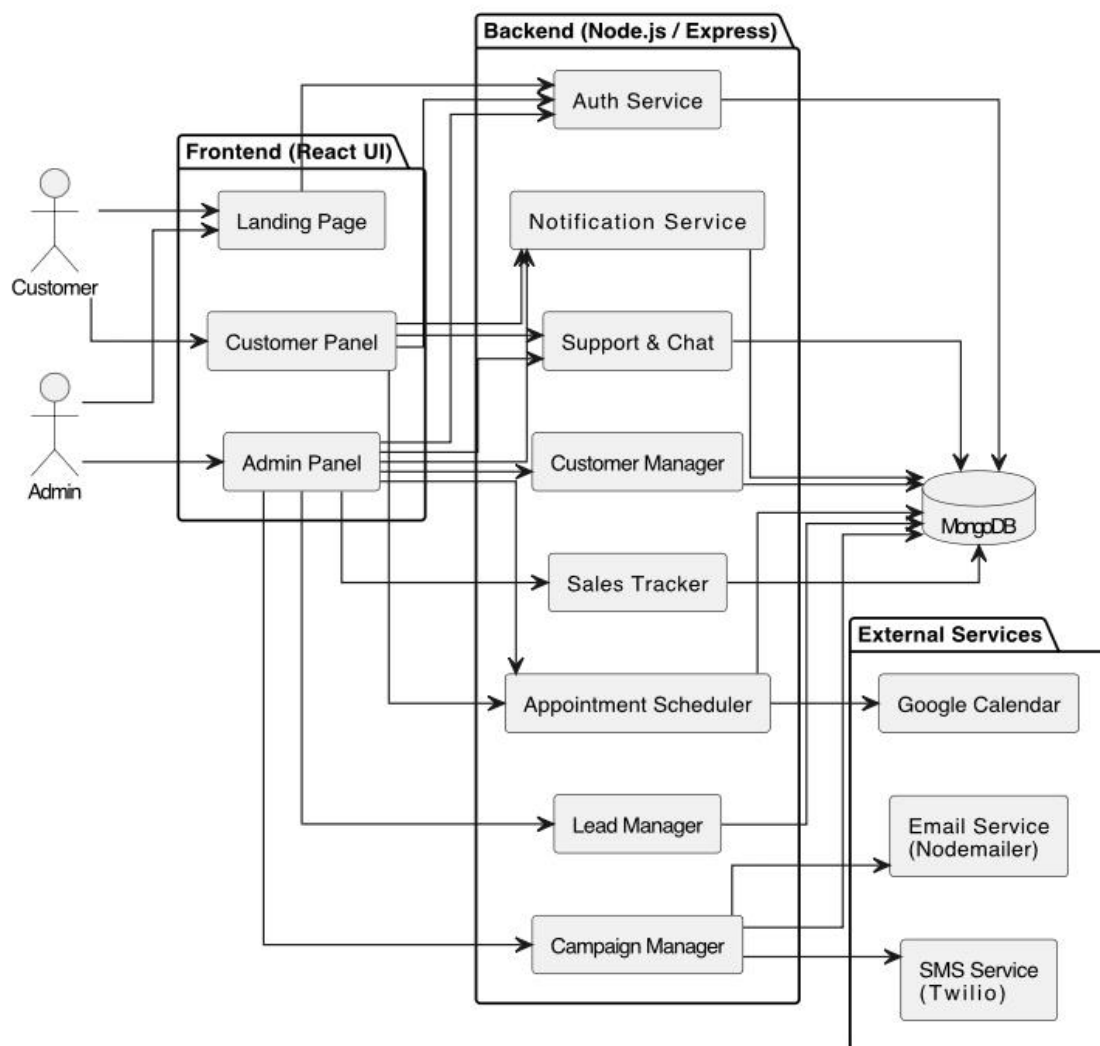


Figure 1 : System Architecture

### Frontend Architecture: (Richards)

- Component-based structure using React
- Centralized state management with Redux
- Route-based code splitting for performance
- Responsive design using CSS frameworks
- Reusable UI component library

### Backend Architecture:

- RESTful API endpoints using Express.js
- Authentication middleware for security
- Service-oriented design for business logic
- MongoDB data access layer
- WebSocket integration for real-time features

## 4.2 DATABASE DESIGN

Table 2: User

Field	Data Type	Null	Keys
name	String	No	
email	String	No	Primary key
password	String	No	
resettoken	String	Yes	Index
is2FAEnable	Boolean	Yes	
otp	String	Yes	
otpExpires	Date	Yes	
bio	String	Yes	
DOB	Date	Yes	
phone	String	Yes	
address	String	Yes	
organization	String	Yes	
occupation	String	Yes	
skills	Array	Yes	
photo	String	Yes	
isAdmin	Boolean	Yes	
verified	Boolean	Yes	
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 3: Task

Field	Data Type	Null	Keys
title	String	No	
dueDate	Date	No	Index
priority	String	No	Index
company	String	No	
completed	Boolean	Yes	
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 4: Support

Field	Data Type	Null	Keys
subject	String	No	Primary Key
description	String	No	
status	String	No	
priority	String	No	
userId	ObjectId	No	Foreign Key
userName	String	Yes	
relatedResource	Array	Yes	
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 5: Sales

Field	Data Type	Null	Keys
customer	String	No	Primary Key
amount	String	No	
status	String	No	
customerId	ObjectId	Yes	Foreign Key
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 6: notification

Field	Data Type	Null	Keys
ticketId	ObjectId	No	Foreign Key
senderId	ObjectId	No	Foreign Key
senderRole	String	No	
message	String	No	
timestamp	Date	No	Index

Table 7: message

Field	Data Type	Null	Keys
ticketId	ObjectId	No	Foreign Key
senderId	ObjectId	No	Foreign Key
senderRole	String	No	
message	String	No	
timestamp	Date	No	Index



Table 8: Leads

Field	Data Type	Null	Keys
name	String	No	
contactInfo	Object	No	
status	String	No	
customerId	ObjectId	Yes	Foreign Key
amount	Number	Yes	
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 9: Feedback

Field	Data Type	Null	Keys
name	String	No	
email	String	No	Primary Key
rating	Number	No	
message	String	No	
occupation	String	Yes	
organization	String	Yes	
userId	ObjectId	No	Foreign Key
img	String	Yes	
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 10: Customer

Field	Data Type	Null	Keys
name	String	No	
email	String	No	Unique
phone	String	No	
amount	Number	No	
segmentat	String	No	
status	String	No	
leadstatus	String	No	
leadId	ObjectId	Yes	Foreign Key
createdAt	Date	No	Index
updatedAt	Date	No	Index

Table 11: Campaign

Field	Data Type	Null	Keys
title	String	No	Foreign Key
campaignType	String	No	Primary Key
subject	String	Yes	
body	String	Yes	
message	String	Yes	
recipients	Array	No	
schedule	String	No	
emailPost	Object	Yes	
createdAt	Date	No	Index
updatedAt	Date	No	Index

## 4.3 INPUT/OUTPUT AND INTERFACE DESIGN

### 4.3.1 State Transition Diagram

The CRM system implements several state transitions across its modules. Key state transitions are illustrated below:

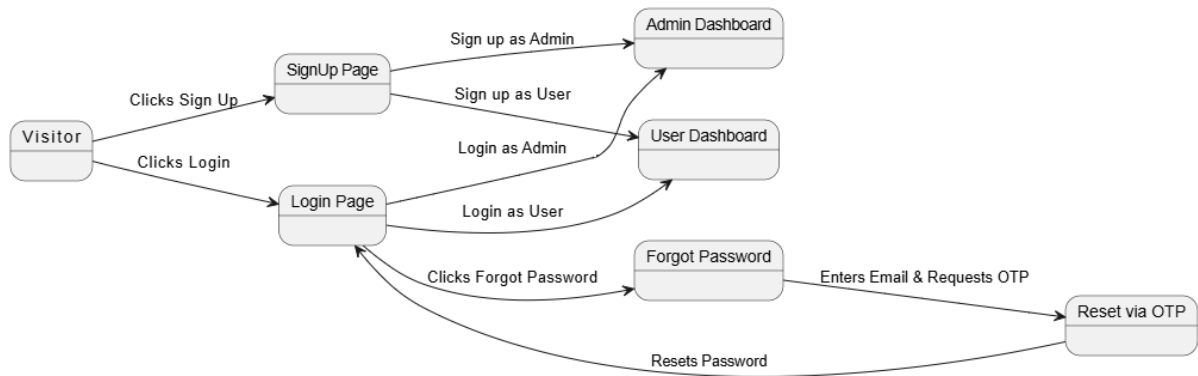


Figure 2 : State Diagram for Landing page

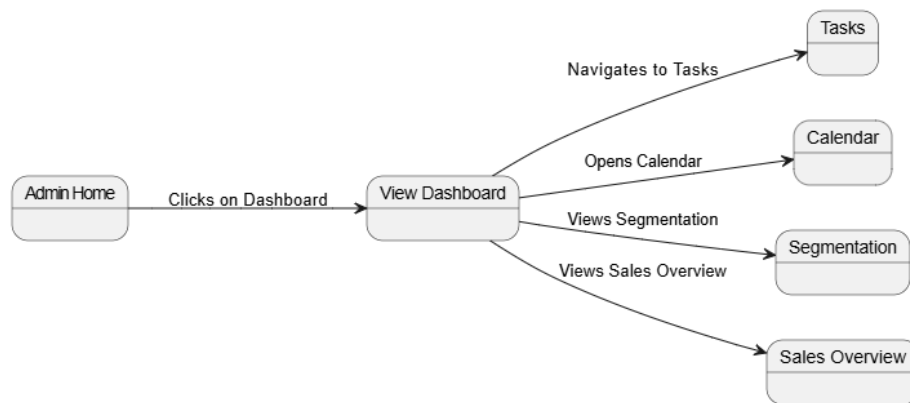


Figure 3 : State Diagram for Admin Dashboard



Figure 4 : State Diagram for Appointments

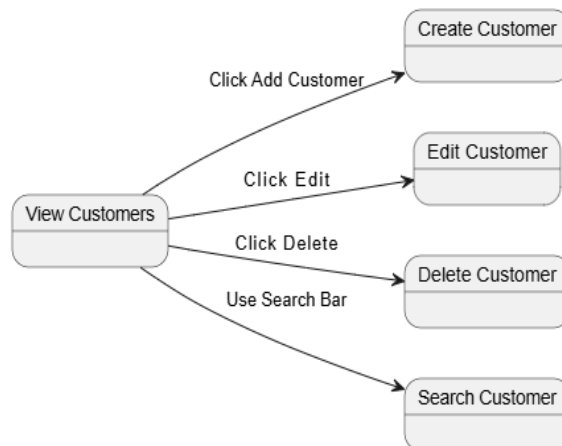


Figure 5 : Customer module

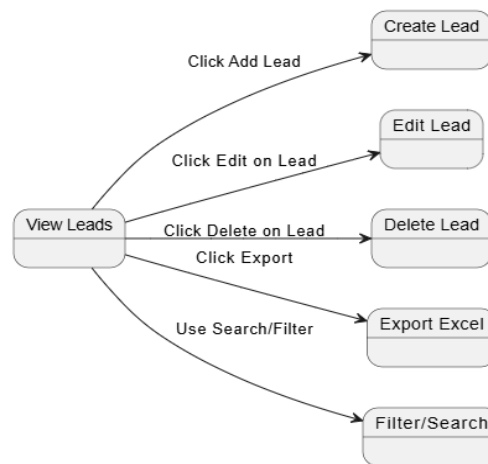


Figure 6 : Leads module

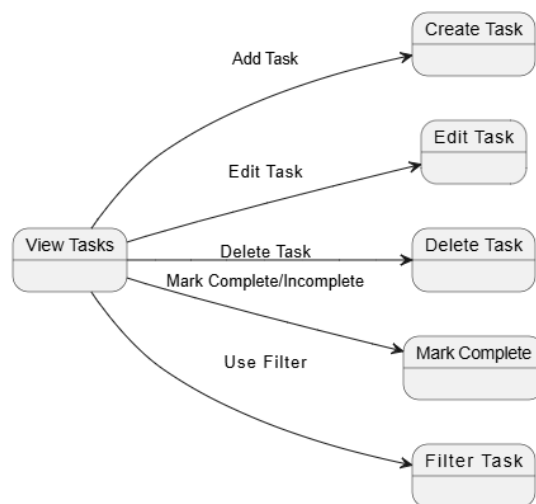


Figure 7 : Task Management module

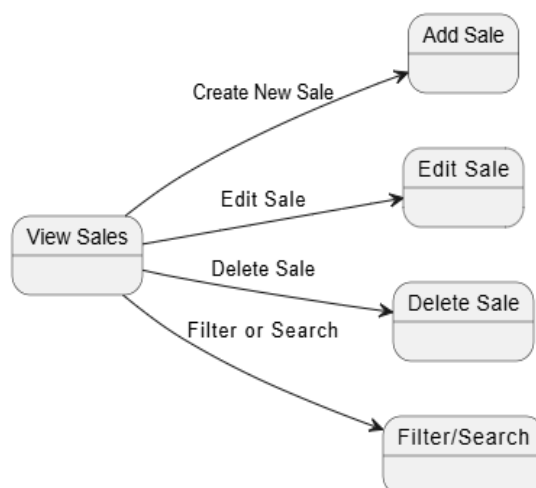


Figure 8 : Sales module

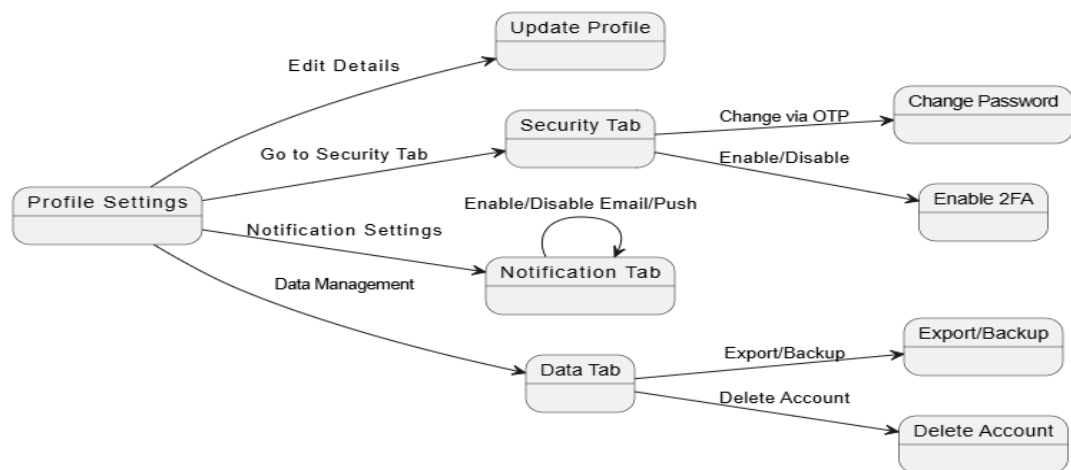


Figure 9 : Profile & Setting module

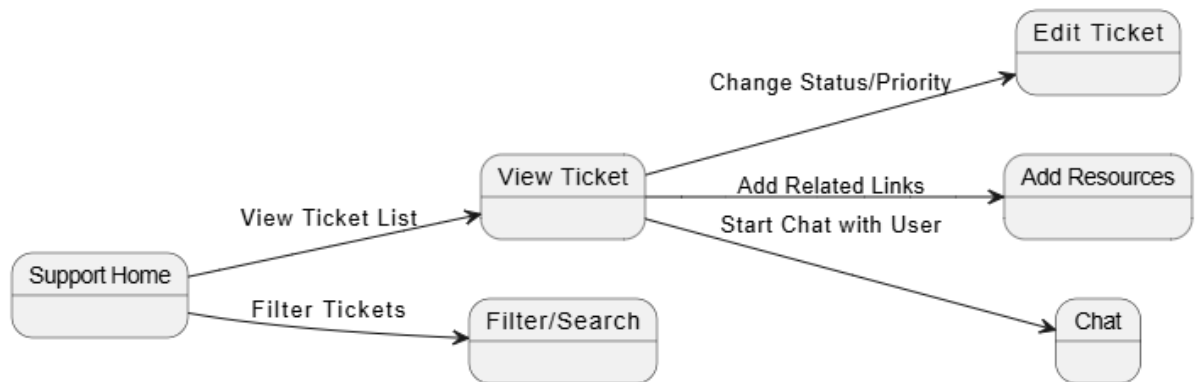


Figure 10 : Customer support module

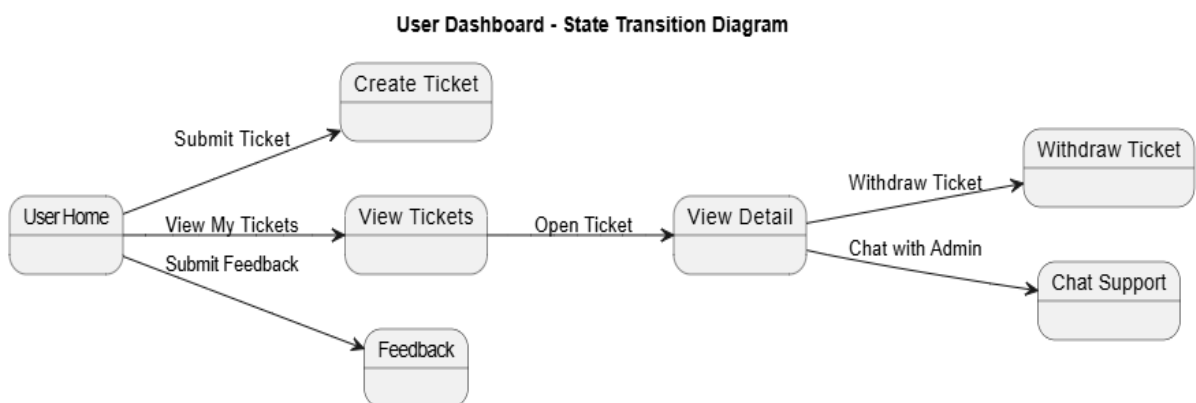


Figure 11 : User Dashboard

### 4.3.2 Samples of Forms, Reports and Interface

The CRM system features multiple interfaces designed for optimal user experience and functionality:

#### **Landing Website Interface:**

- Hero section highlighting key CRM benefits
- Features section showcasing system capabilities
- Solutions section targeting different business needs
- Testimonials section displaying customer feedback
- Contact form with validation and email notification

#### **Admin Dashboard Interface:**

- Dashboard with data visualization and metrics
- Lead management interface with filtering and search capabilities
- Customer management interface with detailed profiles
- Sales tracking interface with pipeline visualization
- Task management interface with priority indicators
- Appointment scheduling interface with calendar integration
- Marketing campaign management interface
- Customer support interface with ticketing system

#### **User Dashboard Interface:**

- Ticket creation and tracking interface
- Support chat interface
- Feedback submission form

### 4.3.3 Access Control/Mechanism/Security

The CRM system implements a comprehensive security model:

#### **1. Authentication Mechanisms:**

- Email/password-based authentication
- OTP verification for password reset
- Remember me functionality
- Optional two-factor authentication

#### **2. Authorization Levels:**

- Admin role with full system access
- User role with restricted access to personal tickets and profile

#### **3. Data Protection:**

- Encrypted password storage
- Session management with timeouts
- Data backup and restore capabilities

## 4.4 DATA FLOW DIAGRAM

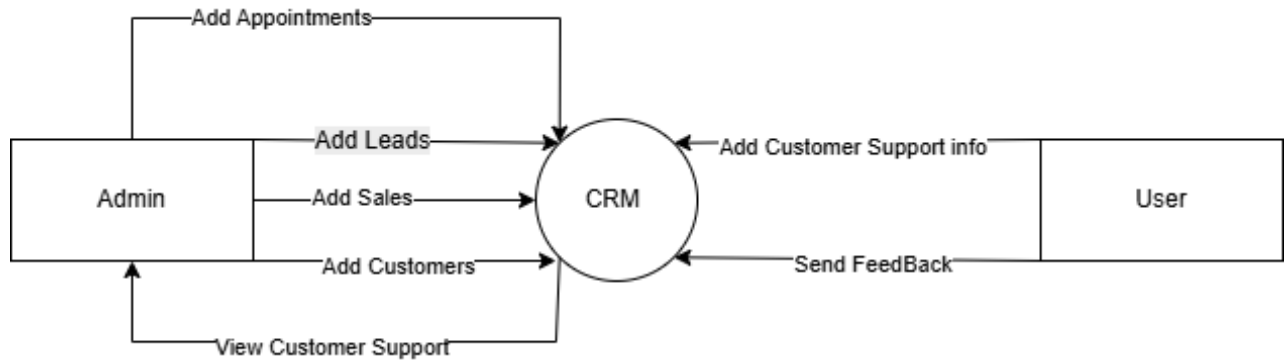


Figure 12: DFD Level 0

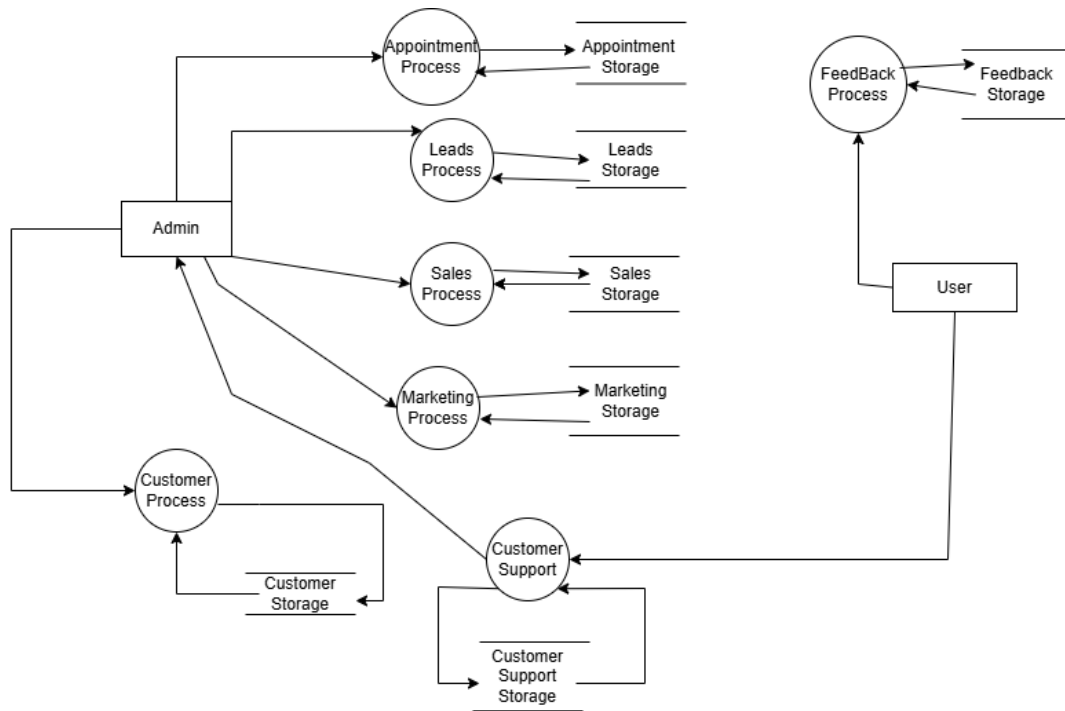


Figure 13: DFD Level 1

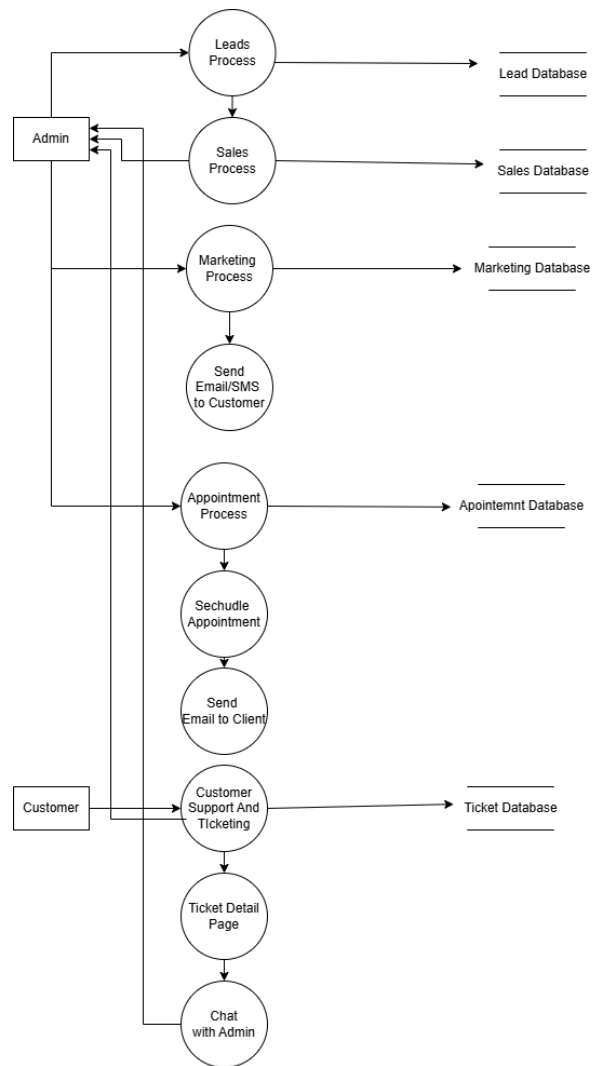


Figure 14: DFD Level 2



## 4.5 ER DIAGRAM

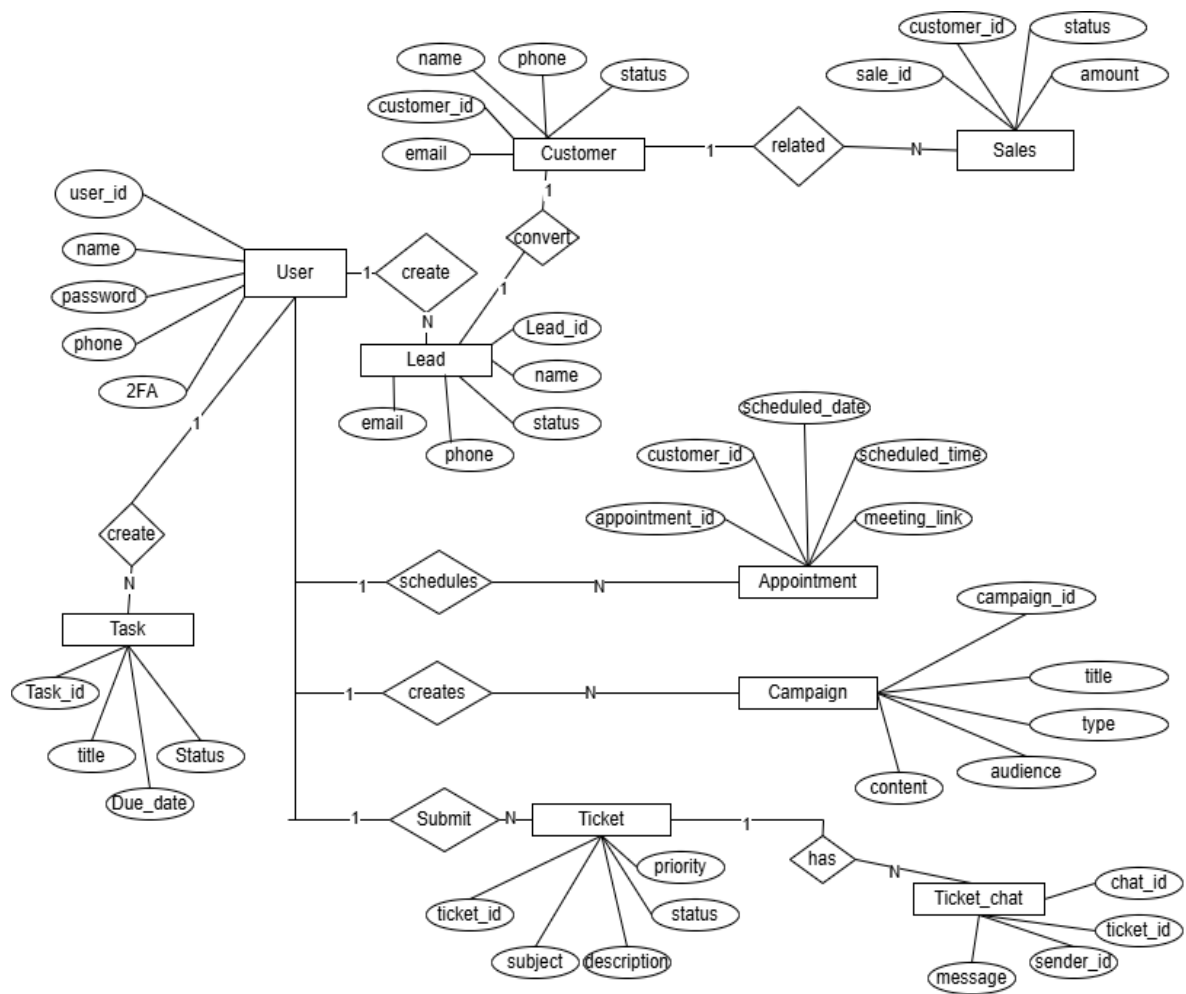


Figure 15: ER Diagram

## 4.5 SEQUENCE DIAGRAM

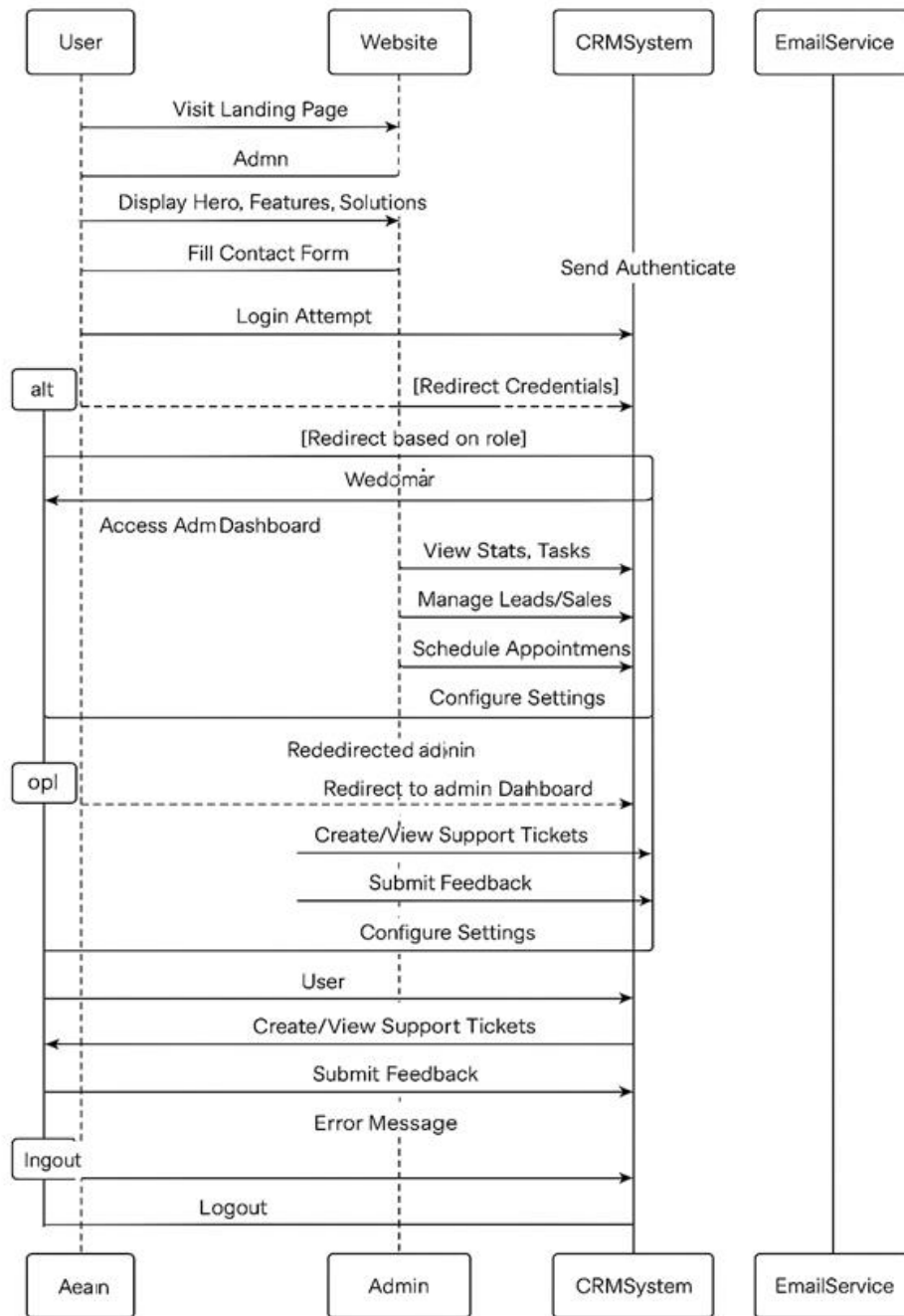


Figure 16 : Sequence Diagram

## **CHAPTER 5**

### **IMPLEMENTATION**

## 5.1 IMPLEMENTATION PLATFORM/ENVIRONMENT

The CRM system was implemented using the MERN stack:

- **Frontend:** React.js with Material UI components for responsive design
- **Backend:** Node.js with Express.js framework
- **Database:** MongoDB for flexible document storage
- **Authentication:** JWT (JSON Web Tokens) for secure authentication
- **Version Control:** Git for collaborative development
- **External APIs:** Google Calendar API for appointment scheduling

**Development tools:**

- Visual Studio Code for coding
- Postman for API testing
- MongoDB Compass for database management
- GitHub for version control repository

## 5.2 MODULES SPECIFICATION(S)

**Authentication Module:**

- JWT-based authentication system
- Password hashing using bcrypt
- Email verification using nodemailer
- OTP generation and validation logic

**User Management Module:**

- User registration with role assignment
- Profile management with image upload
- Password reset functionality
- Two-factor authentication integration

**Lead Management Module:**

- CRUD operations for leads
- Status tracking (New, Contacted, Qualified, Converted)
- Assignment to sales representatives
- Filtering and searching capabilities
- Excel export functionality

**Customer Management Module:**

- Customer profiling with contact details
- Purchase history tracking
- Interaction logging

- Integration with sales module

#### **Sales Module:**

- Deal tracking with pipeline visualization
- Revenue forecasting
- Sales analytics with graphical representation
- CRUD operations for sales opportunities

#### **Task Management Module:**

- Task creation with priority settings
- Assignment to team members
- Due date tracking
- Completion status monitoring

#### **Appointment Module:**

- Google Calendar integration
- Meeting link generation
- Email notifications
- Schedule visualization

#### **Marketing Module:**

- Email campaign creation
- SMS campaign management
- Audience segmentation
- Performance analytics

#### **Customer Support Module:**

- Ticket creation and management
- Priority-based routing
- Real-time chat functionality
- Resource attachment capability

#### **Notification System:**

- Real-time notifications using Socket.io
- Email notifications for critical events
- In-app notification center

#### **Data Management Module:**

- Export functionality for reports
- Backup and restore capabilities
- Data retention policy implementation

## 5.3 CHALLENGES FACED DURING IMPLEMENTATION

While building the CRM system, several technical and practical challenges emerged. Overcoming these issues helped improve system quality and build practical problem-solving skills.

### 1. Real-time Features with Socket.IO

- **Challenge:** Managing multiple real-time socket events (notifications, chat) caused unexpected overlaps and memory usage issues.
- **Solution:** Created separate namespaces and used middleware to authenticate users and handle events more efficiently.

### 2. Google Calendar Integration

- **Challenge:** Handling OAuth 2.0 tokens and managing multiple user calendars created complexity in appointment scheduling.
- **Solution:** Created a middleware service to manage token refresh, and mapped CRM users to their Google accounts securely.

### 3. Large Dataset Handling

- **Challenge:** Admin dashboards lagged with large volumes of lead and sales data.
- **Solution:** Implemented pagination, query indexing in MongoDB, and optimized aggregation pipelines.

### 4. Dynamic Form Handling

- **Challenge:** Implementing reusable form components for lead, customer, and campaign modules while maintaining validation rules.
- **Solution:** Created modular Formik-based forms with Yup schemas, allowing easy extension and validation per use case.

### 5. Socket Reconnection on Refresh

- **Challenge:** Real-time socket communication broke when users refreshed the page, losing notifications or chat sync.
- **Solution:** Integrated a SocketContext to persist and reinitialize the connection on every route change using JWT tokens.

## 5.4 CODE QUALITY AND BEST PRACTICES FOLLOWED

Maintaining clean, maintainable code was a key focus throughout the CRM project to ensure scalability, readability, and long-term maintainability.

### 1. Folder Structure and Modularity

- Followed a feature-based folder structure separating concerns into auth/, sales/, support/, etc.
- Reusable utility functions and API services were abstracted to improve code reusability.

### 2. Code Standards

- Used ESLint and Prettier for consistent formatting.

- Applied DRY (Don't Repeat Yourself) principles and separated business logic from route handlers.
- Component naming followed PascalCase, while functions used camelCase convention.

### 3. Version Control

- Maintained a structured Git workflow with feature branches, pull requests, and descriptive commit messages.
- Used .gitignore to exclude sensitive and unnecessary files (e.g., .env, node\_modules, build/).

### 4. Error Handling and Logging

- Centralized error handler in Express for consistent error responses.
- Client-side error boundaries and toast alerts ensured smooth user feedback without crashes.

### 5. Security Best Practices

- Sanitized user input to prevent injection attacks.
- Enforced rate limiting and CORS policies.
- Secured API routes using role-based middleware.

By adopting these best practices, the development team ensured high-quality code that can be easily maintained and extended in future versions of the CRM.

## 5.5 Result

### 5.5.1 Website

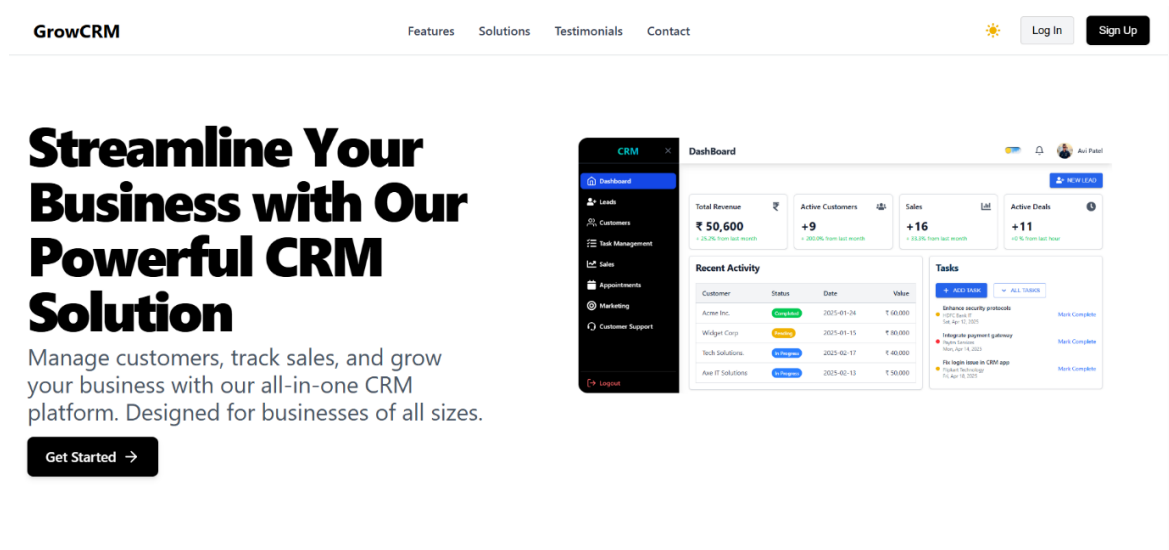


Figure 17 : Website

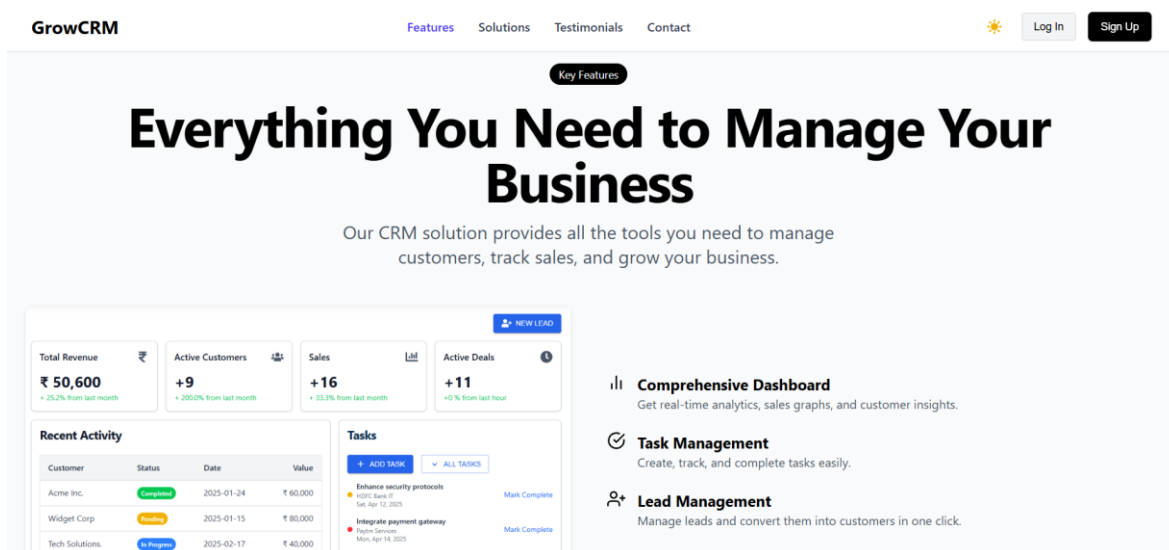


Figure 18 : Feature section

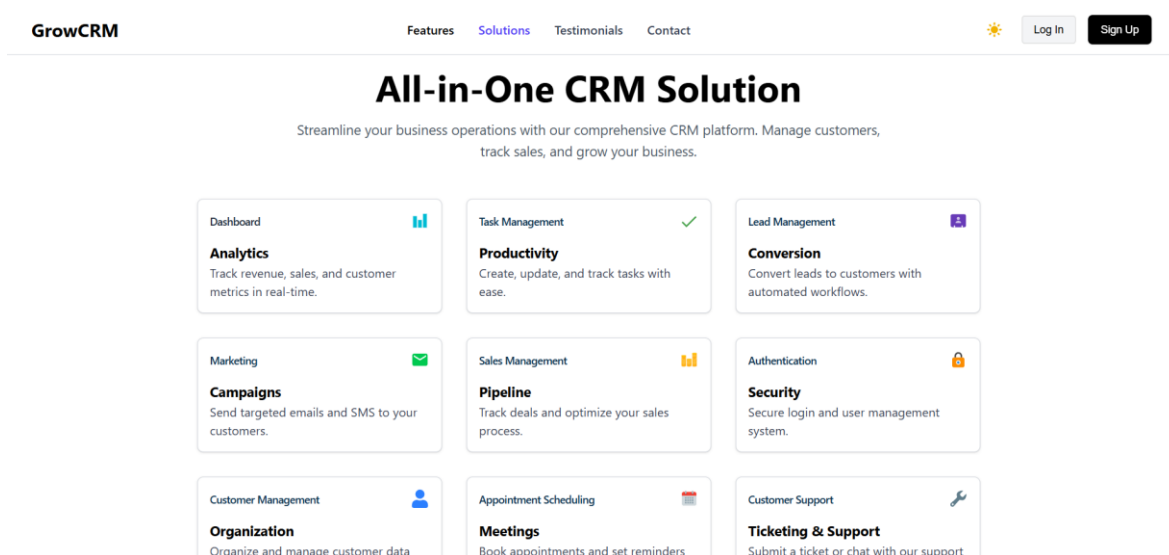


Figure 19 : Solution Section

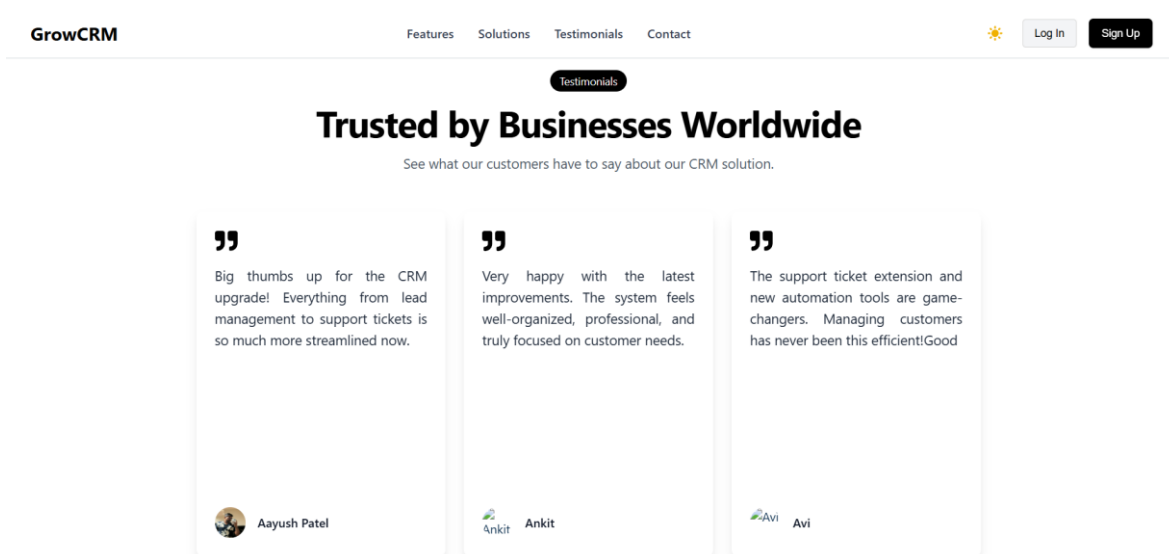
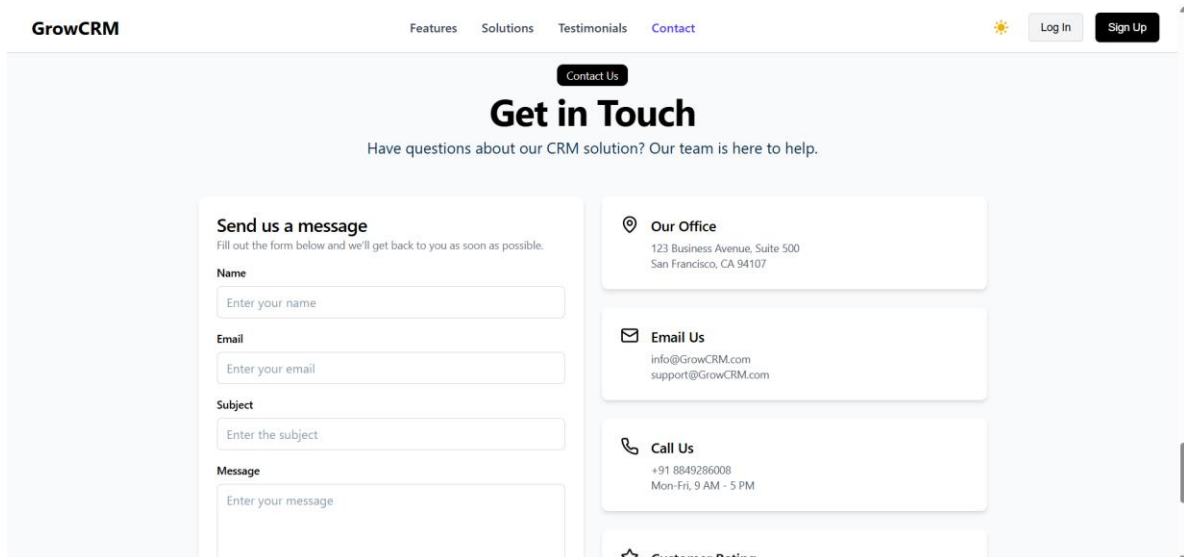


Figure 20 : Testimonials





The image shows the 'Contact Us' page of the GrowCRM website. At the top, there is a navigation bar with links for 'Features', 'Solutions', 'Testimonials', and 'Contact'. The 'Contact Us' link is highlighted. Below the navigation bar, there is a 'Contact Us' button. The main heading is 'Get in Touch', followed by the text 'Have questions about our CRM solution? Our team is here to help.' The page is divided into two columns. The left column contains a 'Send us a message' form with fields for 'Name', 'Email', 'Subject', and 'Message'. The right column contains three contact options: 'Our Office' (123 Business Avenue, Suite 500, San Francisco, CA 94107), 'Email Us' (info@GrowCRM.com, support@GrowCRM.com), and 'Call Us' (+91 8849286008, Mon-Fri, 9 AM - 5 PM). At the bottom right, there is a 'Customer Rating' section with a star icon.

GrowCRM

Features Solutions Testimonials Contact

Log In Sign Up

Contact Us

## Get in Touch

Have questions about our CRM solution? Our team is here to help.

**Send us a message**  
Fill out the form below and we'll get back to you as soon as possible.

**Name**  
Enter your name

**Email**  
Enter your email

**Subject**  
Enter the subject.

**Message**  
Enter your message

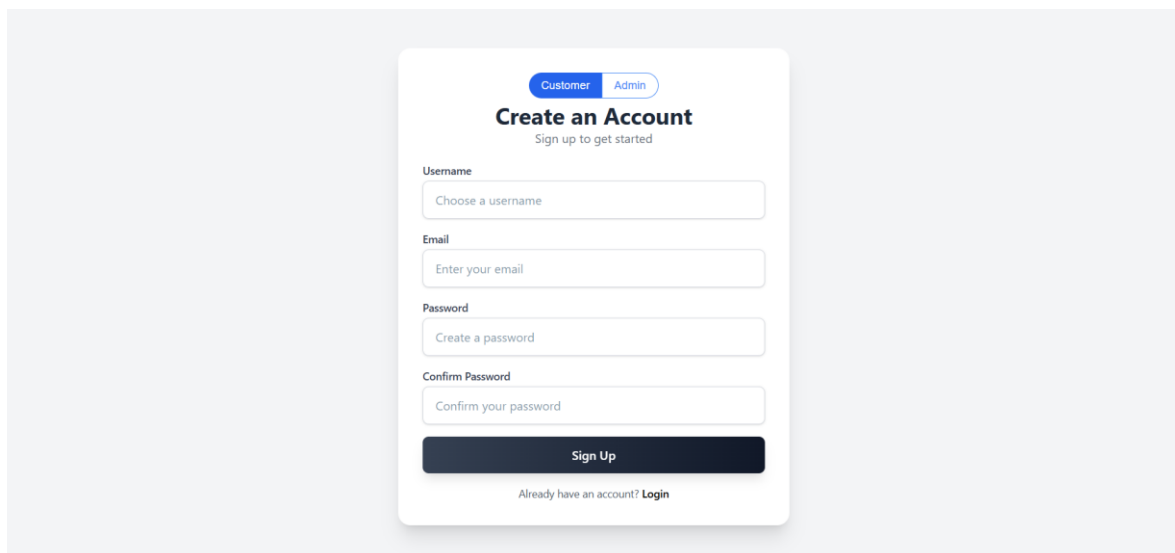
**Our Office**  
123 Business Avenue, Suite 500  
San Francisco, CA 94107

**Email Us**  
info@GrowCRM.com  
support@GrowCRM.com

**Call Us**  
+91 8849286008  
Mon-Fri, 9 AM - 5 PM

Customer Rating

Figure 21 : Contact Form



The image shows the 'Create an Account' sign-up page. At the top, there are two tabs: 'Customer' and 'Admin'. The 'Customer' tab is selected. The main heading is 'Create an Account', followed by the text 'Sign up to get started'. The form has four input fields: 'Username' (Choose a username), 'Email' (Enter your email), 'Password' (Create a password), and 'Confirm Password' (Confirm your password). Below the form is a 'Sign Up' button. At the bottom, there is a link 'Already have an account? Login'.

Customer Admin

## Create an Account

Sign up to get started

**Username**  
Choose a username

**Email**  
Enter your email

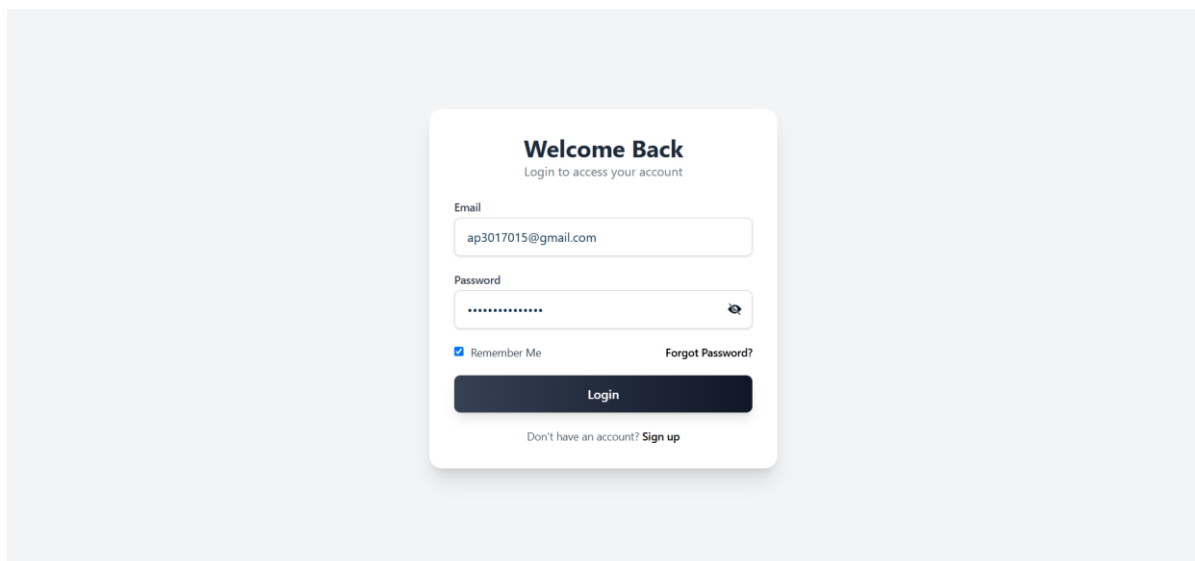
**Password**  
Create a password

**Confirm Password**  
Confirm your password

Sign Up

Already have an account? Login

Figure 22 : Sign up page for both user and admin



The image shows the 'Welcome Back' login page. The main heading is 'Welcome Back', followed by the text 'Login to access your account'. The form has two input fields: 'Email' (ap3017015@gmail.com) and 'Password' (masked with dots). Below the form is a 'Login' button. There is a 'Remember Me' checkbox and a 'Forgot Password?' link. At the bottom, there is a link 'Don't have an account? Sign up'.

## Welcome Back

Login to access your account

**Email**  
ap3017015@gmail.com

**Password**  
.....

☒ Remember Me [Forgot Password?](#)

Login

Don't have an account? Sign up

Figure 23 : Login Page

5.5.2 Admin Dashboard

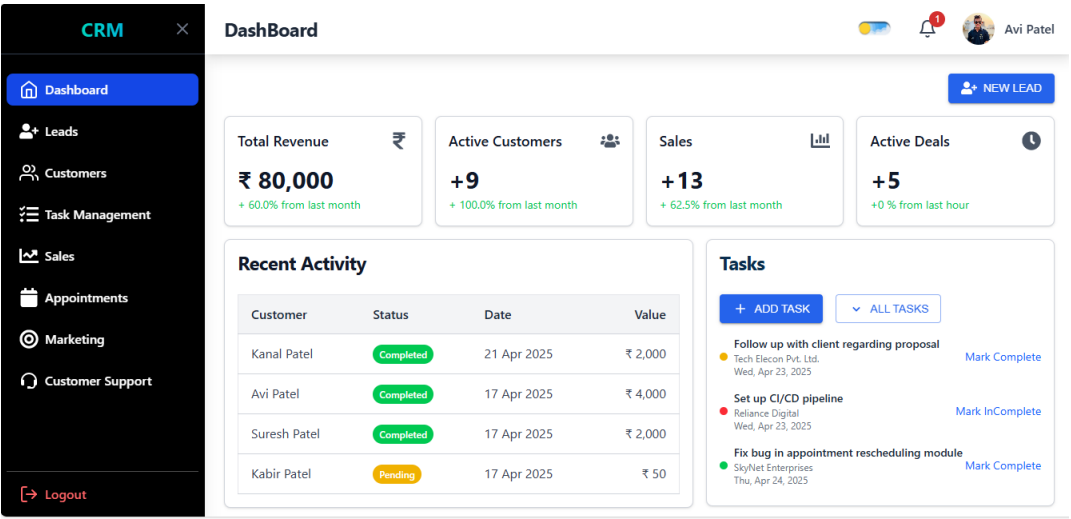


Figure 24 : Admin Dashboard Home Page

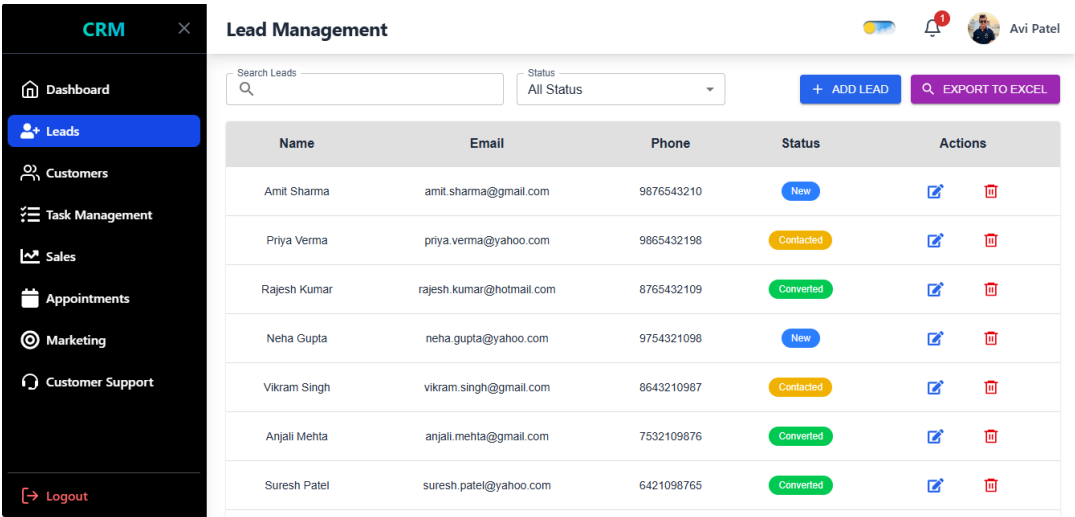


Figure 25 : Leads Page

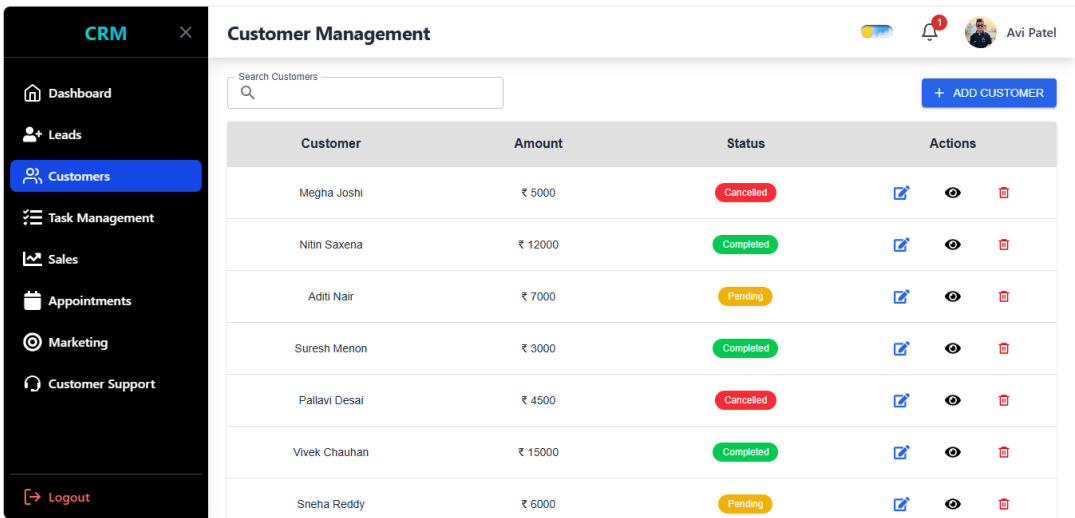


Figure 26 : Customers



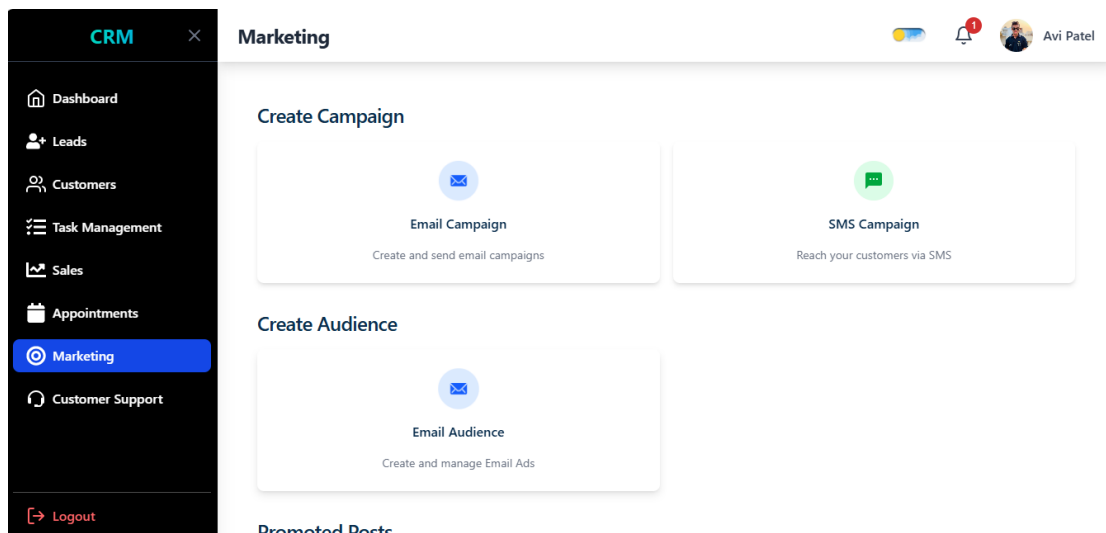


Figure 30 : Marketing & Campaigning

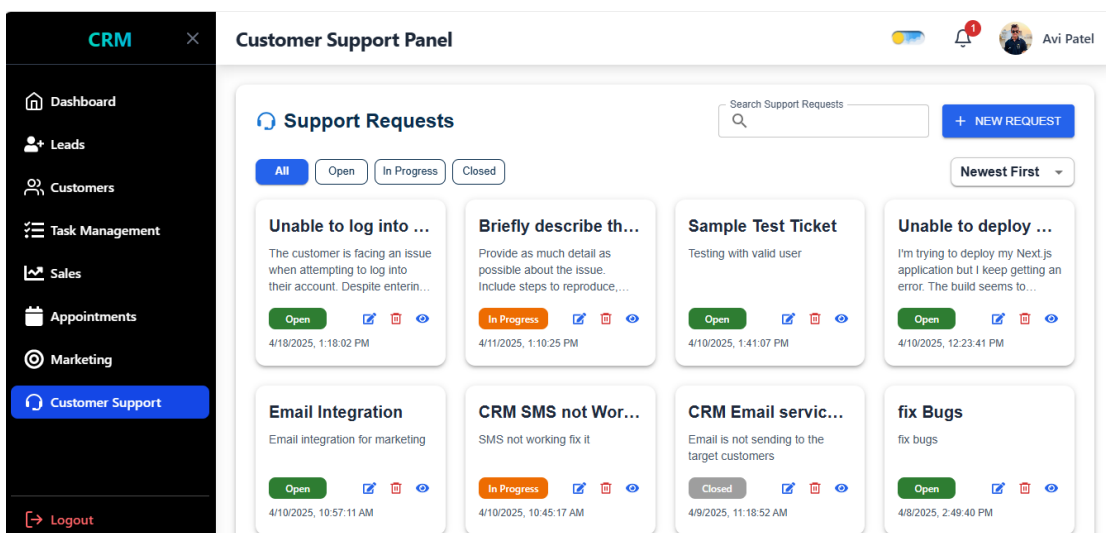


Figure 31 : Customer Support Panel

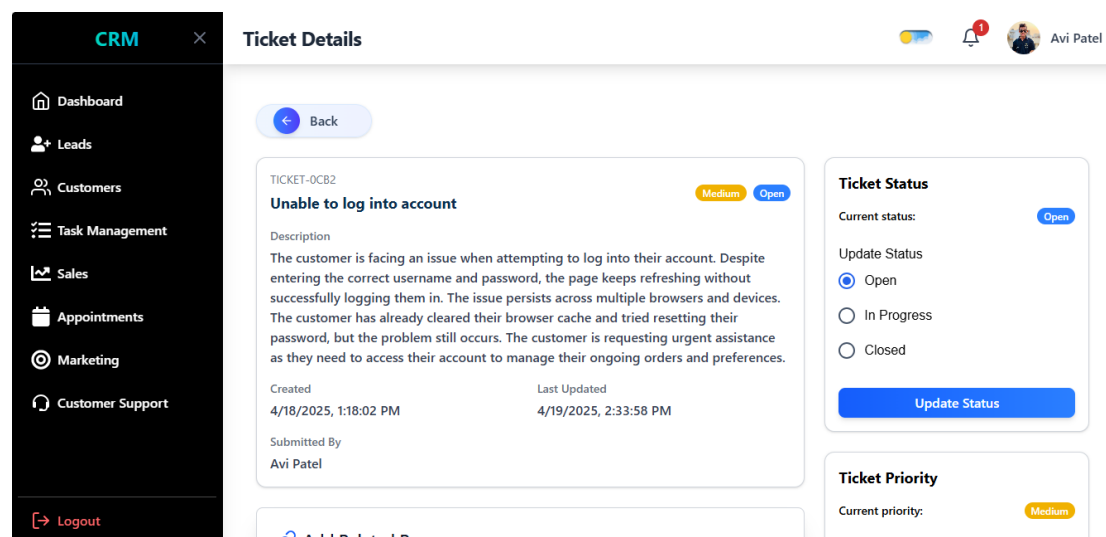


Figure 32 : Detailed Customer Support with integrated chat

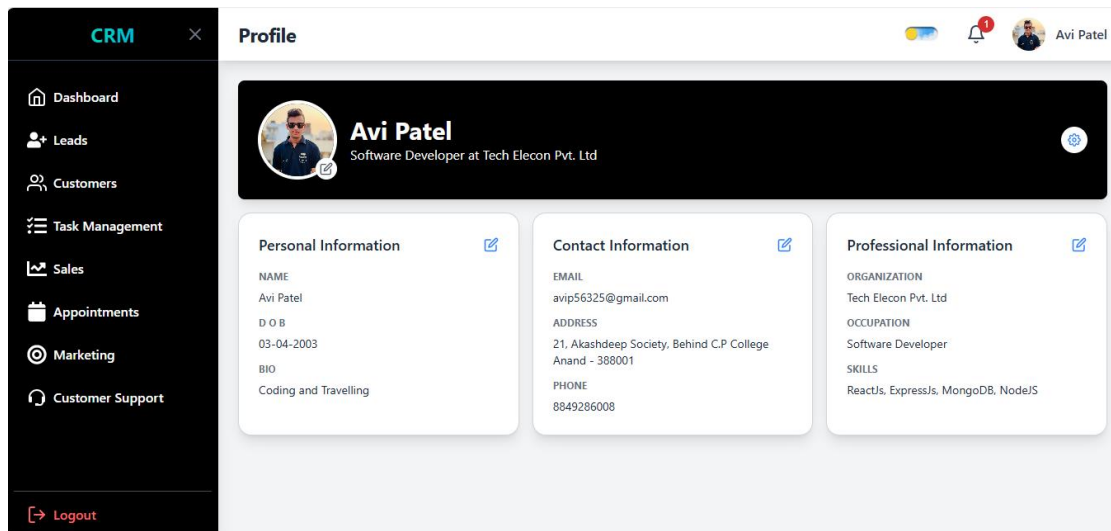


Figure 33 : Admin Profile Page

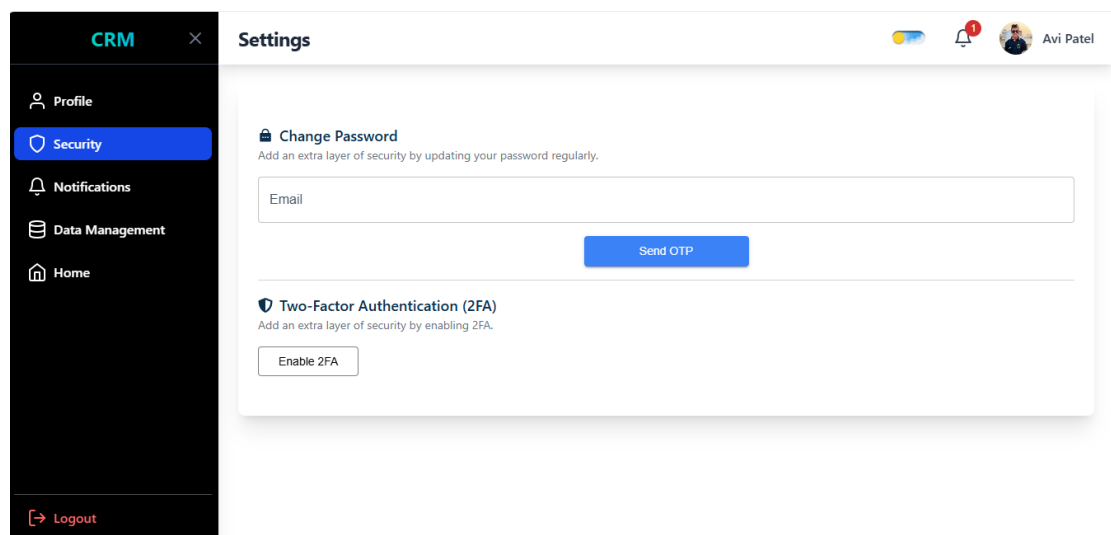


Figure 34 : Settings – Security Tab

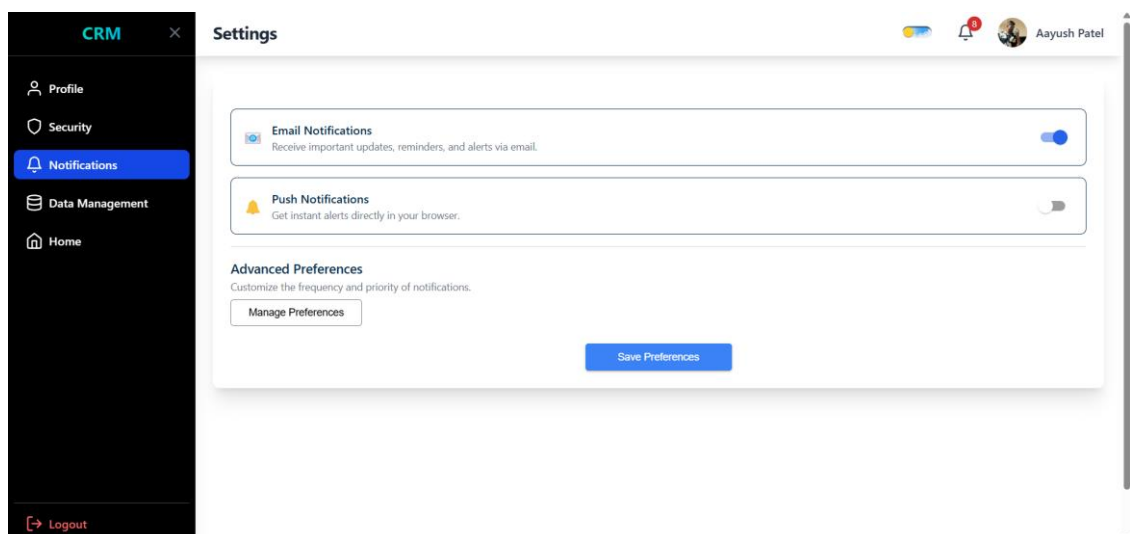


Figure 35 : Settings - Notification Tab

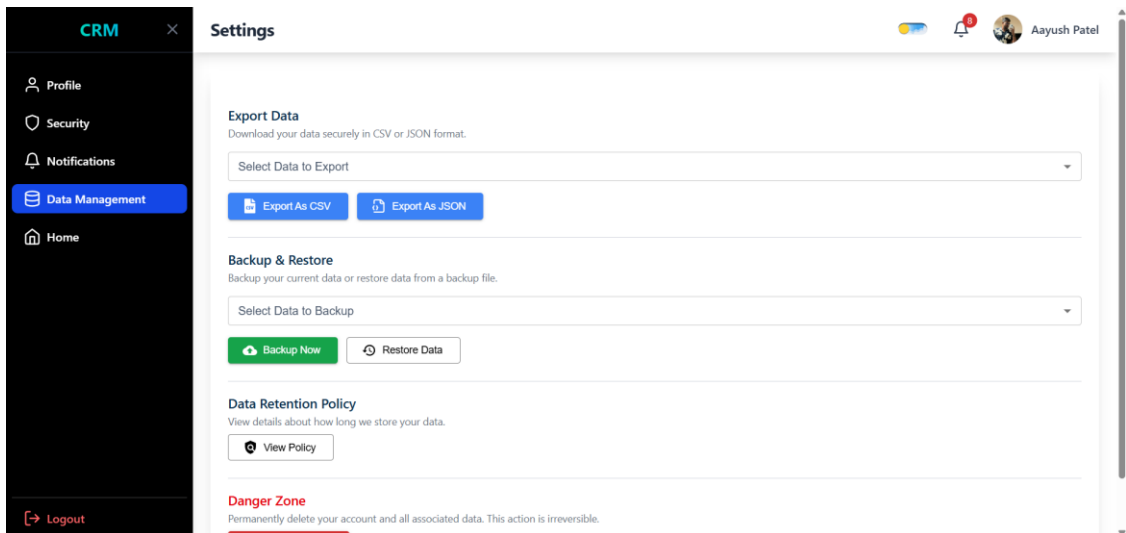


Figure 36 : Security - Data Management Tab

## 5.5.3 User Dashboard

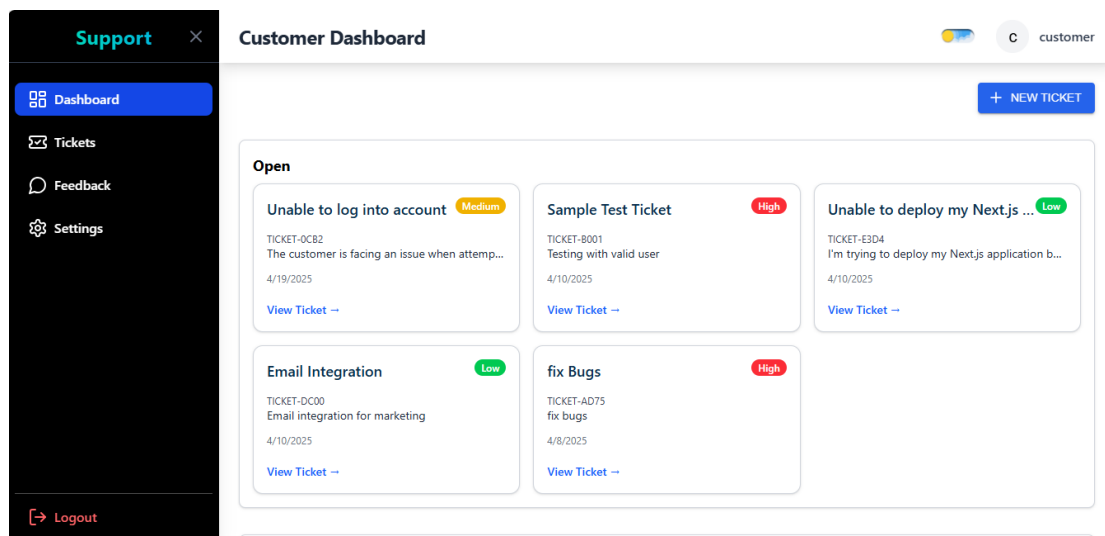


Figure 37 : User Dashboard Home Page

Support

Dashboard

Tickets

Feedback

Settings

Logout

Tickets

Search Tickets

Status

Priority

+ NEW TICKET

Ticket ID	Title	Priority	Status	Created	Updated
TICKET-0CB2	Unable to log into account	Medium	Open	4/18/2025	4/19/2025
TICKET-DB59	Briefly describe the issue you're facing.	High	In Progress	4/11/2025	4/17/2025
TICKET-B001	Sample Test Ticket	High	Open	4/10/2025	4/10/2025
TICKET-E3D4	Unable to deploy my Next.js application	Low	Open	4/10/2025	4/10/2025
TICKET-DC00	Email Integration	Low	Open	4/10/2025	4/10/2025
TICKET-7F21	CRM SMS not Working	High	In Progress	4/10/2025	4/10/2025
TICKET-CEA2	CRM Email service not working	Medium	Closed	4/9/2025	4/19/2025

Figure 38 : Tickets

Support

Dashboard

Tickets

Feedback

Settings

Logout

Customer Feedback

Share Your Feedback

Name

Your name

Email

you@example.com

Rating

Select a rating

Message

Write your feedback...

Figure 39 : Feedback

## **CHAPTER 6**

### **TESTING**



## 6.1 TESTING STRATEGY

The testing strategy for the CRM system followed a comprehensive approach:

- 1. Unit Testing**
  - Individual components tested in isolation
- 2. Integration Testing:**
  - API endpoints tested with realistic data
  - Component interactions verified
  - Database operations validated
- 3. System Testing:**
  - End-to-end workflows tested
  - Cross-browser compatibility verified
  - Mobile responsiveness checked
- 4. Performance Testing:**
  - Load testing with simulated users
  - Response time measurements
  - Database query optimization checks
- 5. Security Testing:**
  - Authentication mechanisms tested
  - Authorization controls verified
  - Input validation tested
- 6. User Acceptance Testing:**
  - Testing with actual admin and customer users
  - Feedback collection and implementation
  - Real-world scenario validation

## 6.2 TEST RESULTS AND ANALYSIS

### 6.2.1 Test Cases

Here's the formatted Test Cases table from section 7.2.1 that you can easily copy and paste:

Table 12 : Test cases

Test ID	Test Condition	Expected Output	Actual Output	Remark
AUTH-001	User login with valid credentials	Successful login and redirect to appropriate dashboard	As expected	Passed
AUTH-002	User login with invalid credentials	Error message displayed	As expected	Passed

Test ID	Test Condition	Expected Output	Actual Output	Remark
AUTH-003	Password reset functionality	OTP sent to email and password reset successful	As expected	Passed
LEAD-001	Create new lead	Lead created and visible in lead list	As expected	Passed
LEAD-002	Update lead status	Status updated and reflected in pipeline	As expected	Passed
LEAD-003	Filter leads by status	Only leads with selected status displayed	As expected	Passed
CUST-001	Customer creation	Customer profile created successfully	As expected	Passed
CUST-002	Customer search	Relevant customers displayed based on search criteria	As expected	Passed
TASK-001	Create task with priority	Task created with correct priority indicator	As expected	Passed
TASK-002	Mark task as complete	Task status updated to complete	As expected	Passed
SALE-001	Create new sales opportunity	Sale created and displayed in pipeline	As expected	Passed
SALE-002	Update sale status	Status updated and metrics recalculated	As expected	Passed
APPT-001	Schedule appointment	Appointment created and Google meeting link generated	As expected	Passed
APPT-002	Cancel appointment	Appointment status updated and notification sent	As expected	Passed
MARK-001	Create email campaign	Campaign created and ready for sending	As expected	Passed
MARK-002	Create audience segment	Audience created based on criteria	As expected	Passed
SUPP-001	Create support ticket	Ticket created and notification sent to admin	As expected	Passed

Test ID	Test Condition	Expected Output	Actual Output	Remark
SUPP-002	Chat functionality	Messages delivered in real-time	As expected	Passed
SECU-001	Enable 2FA	2FA enabled and required for next login	As expected	Passed
DATA-001	Export data to Excel	Data exported correctly in Excel format	As expected	Passed
PERF-001	Load dashboard with 1000+ records	Dashboard loads in under 3 seconds	2.7 seconds	Passed
RESP-001	Mobile responsiveness	UI adapts correctly to mobile screen sizes	As expected	Passed

## **CHAPTER 7**

### **CONCLUSION AND DISCUSSION**

## 7.1 OVERALL ANALYSIS OF INTERNSHIP/PROJECT VIABILITIES

The CRM system developed during this internship has proven to be highly viable both technically and commercially:

### 1. Technical Viability:

- The MERN stack provided a robust and scalable foundation for the system
- Modular architecture ensures easy maintenance and future expansion
- Integration capabilities with external systems enhance functionality
- Performance metrics demonstrate system efficiency even under load

### 2. Commercial Viability:

- The system addresses key pain points in customer relationship management
- Automation of manual processes provides significant time and cost savings
- Enhanced analytics capabilities enable data-driven decision making
- Positive user feedback confirms market fit

### 3. Learning Outcomes:

- Gained practical experience in full-stack development using MERN
- Developed skills in API design and integration
- Enhanced understanding of database optimization techniques
- Improved knowledge of security best practices
- Acquired experience in iterative waterfall development methodology

## 7.2 INTERNSHIP PROGRESS REVIEW MEETING WITH INDUSTRY GUIDE

Regular progress review meetings were conducted with Mr. Satyam Raval, Deputy General Manager at Tech Elecon:

### 1. Initial Planning Meeting - February 10, 2025 (On-site)

- Project requirements and scope finalization
- Technology stack selection
- Timeline and milestone planning

### 2. Final Review - April 23, 2025 (On-site)

- Complete system demonstration
- Performance review
- Documentation verification

## 7.3 PROBLEM ENCOUNTERED AND POSSIBLE SOLUTIONS

During the development of the CRM system, several challenges were encountered:

1. **Challenge:** Real-time notification system performance issues

**Solution:** Implemented Socket.io with optimized connection pooling and message queuing to handle high volumes of notifications without performance degradation.

2. **Challenge:** Google Calendar API integration complexities

**Solution:** Created a middleware service to handle API authentication, rate limiting, and event synchronization, simplifying the integration process.

3. **Challenge:** Mobile responsiveness across diverse devices

**Solution:** Implemented responsive design using Material UI's grid system and custom breakpoints, with extensive testing on various device sizes.

## 7.4 SUMMARY OF INTERNSHIP

The internship at Tech Elecon provided an invaluable opportunity to develop a comprehensive CRM system using modern technologies. The project encompassed the complete software development life cycle from requirement analysis to deployment and testing.

Key accomplishments include:

- Development of a responsive landing website with authentication system
- Creation of feature-rich admin dashboard with comprehensive CRM capabilities
- Implementation of user dashboard for customer support interaction
- Integration with external APIs for enhanced functionality
- Robust testing and optimization for performance and security

The CRM system successfully addresses the needs of businesses to manage customer relationships effectively through its integrated modules for lead management, customer support, sales tracking, and marketing automation.

## 7.5 LIMITATION AND FUTURE ENHANCEMENT

### Current Limitations:

- Limited support for multiple languages
- Basic reporting capabilities compared to enterprise-level CRM systems
- Mobile application not yet developed
- Limited offline functionality
- Basic integration with third-party tools

### Future Enhancements:

- Mobile Application Development:
- Native mobile applications for iOS and Android
- Offline data synchronization

### Advanced Analytics:

- AI-driven customer insights

- Predictive lead scoring
- Sales forecasting models

**Enhanced Integration:**

- Integration with popular ERP systems
- Payment gateway integration
- Social media platform integration

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