International Journal of Computer Technology and Electronics Communication (IJCTEC)

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 3, May- June 2026 ||

DOI: 10.15680/IJCTECE.2026.0903007

CRM Integration with Macro and Ticketing System

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Publication History: Received: 03.04.2026; Revised: 04.05.2026; Accepted: 06.05.2026; Published: 10.05.2026.

ABSTRACT: The proposed system is a cloud-based Customer Relationship Management (CRM) platform integrated with an advanced ticket management system designed to overcome the limitations of traditional support processes. Conventional methods such as email-based or manual tracking often result in scattered data, delayed responses, lack of transparency, and inefficient issue resolution. To address these challenges, the system provides a centralized and scalable full-stack solution for managing customer queries, support tickets, and communication workflows. All customer interactions and ticket details are stored in a unified database, ensuring consistency, easy accessibility, and real-time updates across the system. The platform automates essential processes such as ticket creation, assignment, prioritization, and status tracking, significantly improving response time and operational efficiency. Role-based dashboards enable administrators, agents, and customers to access relevant features securely, ensuring proper workflow management and data privacy. A built-in feedback mechanism allows customers to confirm or reject ticket closure requests, enhancing transparency and service quality. Additionally, real-time analytics and reporting features provide insights into ticket volumes, resolution times, and agent performance, supporting better decision-making and continuous improvement. The system is developed using a modern full-stack architecture, where the frontend is built with HTML, CSS, and JavaScript to provide a responsive and user-friendly interface. The backend is implemented using Node.js and Express.js, handling business logic, authentication, and API services. Data is stored in a structured database such as MySQL or MongoDB, ensuring data integrity and scalability. Security features like JWT-based authentication, validation, and error handling mechanisms ensure reliable and secure system operations. By replacing manual processes with automation, centralized data management, and real-time communication, the proposed system enhances productivity, reduces human errors, and improves overall customer satisfaction. This solution demonstrates how modern web technologies can streamline customer support operations and deliver efficient, transparent, and reliable service management.

KEYWORDS: Customer Relationship Management (CRM), Ticket Management System, Helpdesk Automation, Role-Based Access Control, Real-Time Analytics, Full Stack Web Application, JWT Authentication, Customer Support System

I. INTRODUCTION

Organizations rely heavily on web-based applications to manage customer interactions and business processes efficiently. Customer Relationship Management (CRM) systems have become essential tools for handling customer data, communication, and support services. With the increasing demand for scalable, interactive, and real-time applications, CRM systems are now commonly developed using full-stack development technologies, which combine both frontend and backend components into a single integrated solution. Full-stack development refers to the development of both the client-side (frontend) and server-side (backend) of an application, along with database management and system integration. In a CRM system, the frontend provides an interactive user interface that allows users such as administrators, support staff, and managers to access and manage customer information easily. The backend handles business logic, authentication, data processing, and communication with the database. Together, full-stack development enables the creation of a complete, dynamic, and responsive CRM application. Traditional CRM systems often suffer from limitations such as poor user experience, lack of flexibility, and difficulty in customization. By using full-stack development, these limitations can be addressed effectively. Modern frontend technologies enable responsive dashboards, real-time updates, and user-friendly interfaces, while backend technologies ensure secure data handling, efficient processing, and seamless integration with databases and external services. This approach improves system performance, maintainability, and scalability. A CRM system developed using full-stack architecture centralizes

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customer data such as personal details, communication history, service requests, and feedback into a single database.

II. LITERATURE SURVEY

The study of existing customer support and ticket management systems reveals that modern organizations rely heavily on digital platforms to manage customer queries efficiently and systematically. Traditional support systems initially depended on manual processes such as emails and phone calls, which often led to delays, lack of tracking, and poor customer satisfaction. With the advancement of technology, helpdesk and ticketing systems were introduced to automate the process of issue tracking, assignment, and resolution. Many existing systems incorporate features such as role-based access control, where administrators, agents, and customers have different levels of access, ensuring security and proper workflow management. These systems also provide ticket lifecycle management, including statuses like open, in-progress, resolved, and closed, which helps in monitoring and maintaining accountability.

Furthermore, communication plays a crucial role in support systems, and most modern platforms include comment sections, notifications, and real-time updates to keep users informed. Despite these advancements, several studies and practical observations indicate that some systems lack transparency during the ticket closure process. In many cases, tickets are closed by agents without proper confirmation from the customer, which can lead to dissatisfaction and unresolved issues. To address this gap, recent research emphasizes the need for integrating customer feedback mechanisms directly into the workflow, allowing users to accept or reject ticket closure requests and provide remarks.
Additionally, reporting and analytics modules have become an essential part of support systems, enabling administrators to track performance metrics such as response time, resolution rate, and agent efficiency. These insights help organizations identify bottlenecks and improve service quality. However, not all systems provide comprehensive dashboards or user-friendly visualizations, which limits their effectiveness in decision-making.

Based on the analysis of these existing systems, it is evident that while many platforms successfully address ticket management and communication, there is still a need for a more user-centric approach that prioritizes customer satisfaction and transparency. The proposed system aims to overcome these limitations by incorporating secure user management, efficient ticket handling, real-time communication, feedback-driven ticket closure, and detailed reporting dashboards. This integrated approach ensures improved reliability, accountability, and overall user experience in the support process.

III. PROBLEM STATEMENT

Traditional Ayurvedic clinics, especially those offering Panchakarma therapies, primarily rely on manual and paper-based systems for managing patient records, therapy schedules, and prescriptions. This approach leads to several challenges such as inefficient data handling, difficulty in retrieving patient history, appointment scheduling conflicts, and increased chances of human errors. Managing multiple therapy sessions for different patients becomes complex due to the lack of a centralized system, resulting in delays and miscommunication between therapists and patients. Additionally, there is no proper mechanism to securely store and access patient data, which raises concerns about data loss and confidentiality. The absence of role-based access control makes it difficult to differentiate responsibilities among admin, therapists, and patients. Furthermore, manual tracking of treatment progress and prescriptions is time-consuming and often inaccurate.Hence, there is a need for a reliable, efficient, and scalable digital system that can automate patient management, therapy scheduling, and data handling while ensuring security, accuracy, and ease of use. The proposed AyurSutra system aims to address these issues by providing a web-based platform that streamlines clinical operations and improves overall healthcare service delivery.

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IV. RESEARCH METHODOLOGY

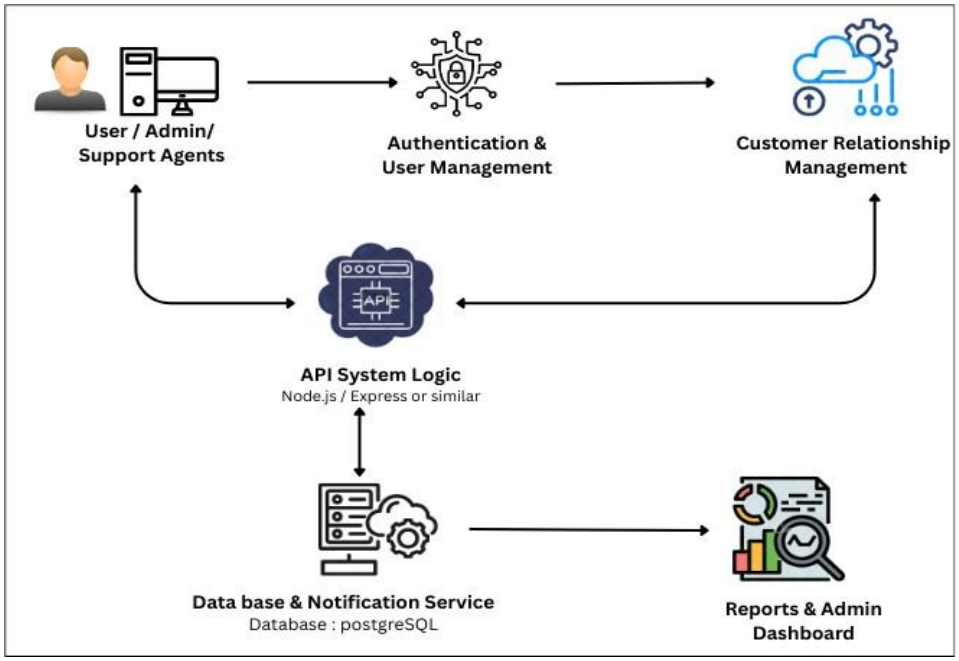

Figure1. System Architecture

The CRM Ticketing Management System architecture is designed to manage customer interactions and support requests efficiently using a full stack development approach. The system provides a user-friendly interface developed using HTML, CSS, JavaScript, and React.js, which allows users to create support tickets, view customer information, and track ticket status easily. The frontend communicates with the Node.js backend server, which handles the core application logic, user authentication, ticket processing, and communication between different modules such as authentication management, customer relationship management, ticket management, and reporting services.All application data, including customer details, ticket information, user roles, and system records, are securely stored in a PostgreSQL database

1. User Management Module

This module manages the registration and authentication of users such as Admin, Agent, and Customer. It ensures secure login with proper role-based access control. Admin can create and manage user accounts, while customers and agents can access only their permitted features. It maintains user details and activity records. Password security and session management are also handled here. This module ensures that each user interacts with the system based on their role. It forms the foundation for system security and accessibility.

2. Ticket Management Module

This module allows customers to raise support tickets for their issues or queries. Each ticket is assigned a unique ID and can be tracked throughout its lifecycle. Agents and admins can view, assign, update, and resolve tickets. The system maintains ticket status such as open, in-progress, and closed. It ensures proper handling and prioritization of issues. Customers can view only their assigned tickets. This module improves issue tracking and resolution efficiency.

3. Communication & Feedback Module

This module enables communication between customers and support agents through comments or messages. Users can provide additional details or updates related to a ticket. When a ticket is marked for closure, a request is sent to the customer for confirmation. Customers can accept or reject the closure with remarks. This ensures transparency and customer satisfaction. Feedback collected helps improve service quality. It also maintains a history of interactions for future reference.

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4. Reporting & Dashboard Module

This module provides a visual overview of system activities and performance. It displays key metrics like total tickets, resolved cases, pending issues, and agent performance. Admins can monitor trends and identify bottlenecks. Graphs and dashboards help in better decision-making. It improves overall system efficiency by providing actionable insights. Reports can be generated for analysis and record-keeping. This module supports continuous improvement of the support system.

ALGORITHM

Step 1: Input Definition

Let each ticket $T_i$have attributes:

- Priority $P_i \in \{1,2,3\}$(Low=1, Medium=2, High=3)
- Severity $S_i \in [1,5]$
- Waiting Time W_i(in hours)
- Customer Impact $C_i \in [1,5]$

Step 2: Priority Score Calculation

$$\text{Score}(T_i) = w_1 P_i + w_2 S_i + w_3 W_i + w_4 C_i$$

Where $w_1, w_2, w_3, w_4$are weights such that

$$w_1 + w_2 + w_3 + w_4 = 1$$

Step 3: Ticket Ranking

Sort all tickets in descending order based on $\text{Score}(T_i)$.
Higher score → Higher priority.

Step 4: Agent Load Calculation

Let each agent $A_j$have current workload:

$$\text{Load}(A_j) = \sum_{k=1}^{n} \text{ActiveTicket } s_k$$

Step 5: Optimal Assignment Function

Assign ticket $T_i$to agent $A_j$such that:

$$A_j = \arg\min \text{Load}(A_j)$$

This ensures load balancing among agents.

Step 6: Status Transition Model

Each ticket follows a finite state model:

$$\text{Open} \rightarrow \text{Assigned} \rightarrow \text{InProgress} \rightarrow \text{Resolved} \rightarrow \text{Closed}$$

If rejected:

$$\text{Resolved} \rightarrow \text{Reopened}$$

Step 7: Response Time Optimization

Average response time:

$$RT_{avg} = \frac{\sum_{i=1}^{n} R\,T_i}{n}$$

System aims to minimize RT_{avg}.**Step 8: Feedback Score Calculation**

After closure, customer gives rating $R_i \in [1,5]$:

$$\text{Satisfaction} = \frac{\sum_{i=1}^{n} R_i}{n}$$

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Step 9: Output

- Optimized ticket assignment
- Reduced response time
- Improved customer satisfaction

EXISTING SYSTEM

In the existing system, customer relationship data and support ticket handling are managed using disconnected systems or manual methods such as emails, spreadsheets, and standalone tools. Customer information is stored in different locations, leading to data duplication, inconsistency, and frequent data loss. Support teams often lack access to complete customer interaction history, making it difficult to understand issues fully and provide accurate solutions. Ticket creation and tracking are mostly manual, which increases response time and results in missed or unresolved issues. There is no proper mechanism to prioritize tickets based on urgency, causing critical customer problems to be delayed. Communication between customers and support teams is inconsistent, as updates are not automatically shared. Management has limited visibility into support performance due to the absence of real-time reports and analytics, making it difficult to monitor service quality and customer satisfaction. Overall, the existing system is inefficient, time consuming, error- prone, and unable to support the growing demands of modern customer-centric organizations.

PROPOSED SYSTEM

The proposed system introduces a centralized Customer Relationship Management (CRM) platform integrated with ticketing management to overcome the limitations of the existing system. All customer information and support tickets are stored in a single unified system, ensuring data consistency and easy accessibility. The system automates ticket creation, assignment, tracking, and prioritization, enabling faster and more efficient issue resolution. Support teams gain complete visibility into customer history, allowing them to provide personalized and timely support. Additionally, the system provides real-time reports and analytics, helping management monitor performance, improve decision-making, and enhance customer satisfaction. The system shall offer intuitive dashboards and reports that provide visibility into ticket volumes, resolution times, agent performance, and overall service quality, helping management analyse efficiency and customer satisfaction. The user interface shall be responsive and user- friendly, allowing easy navigation between CRM, ticketing, and reporting sections, which will improve productivity and reduce training efforts.

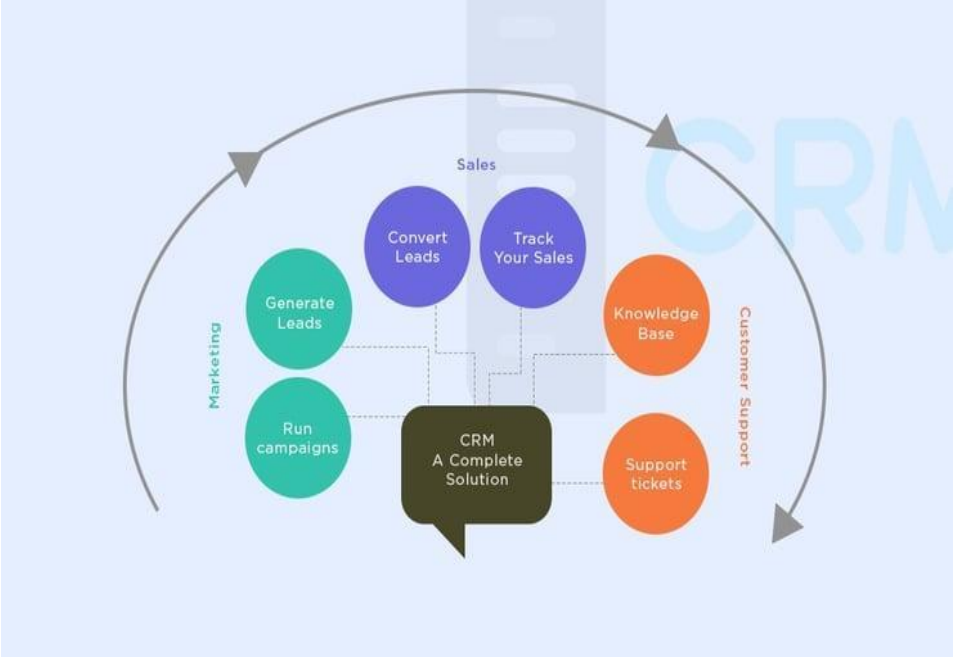

Figure1. Proposed system

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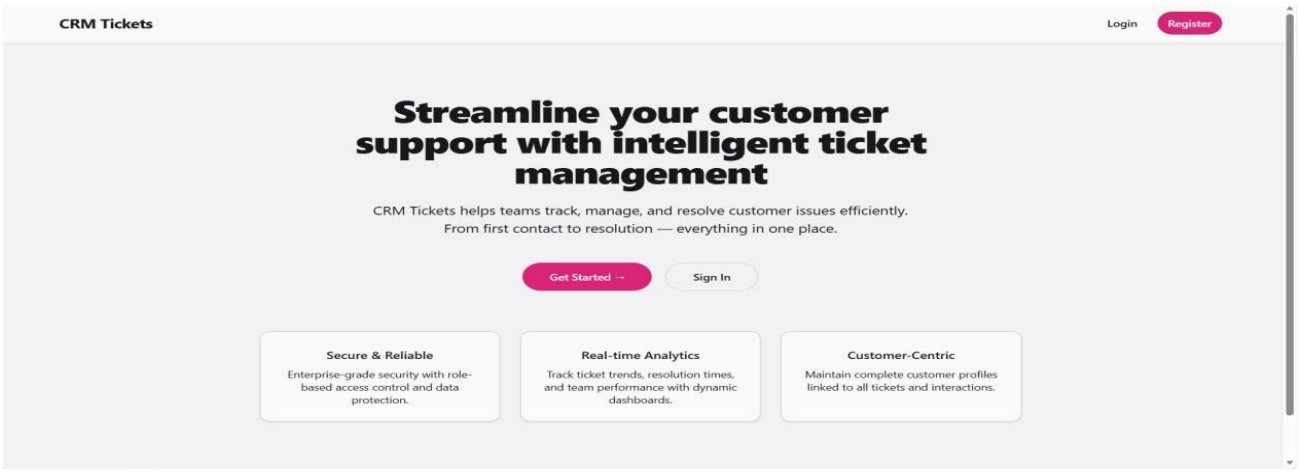
V. RESULTS

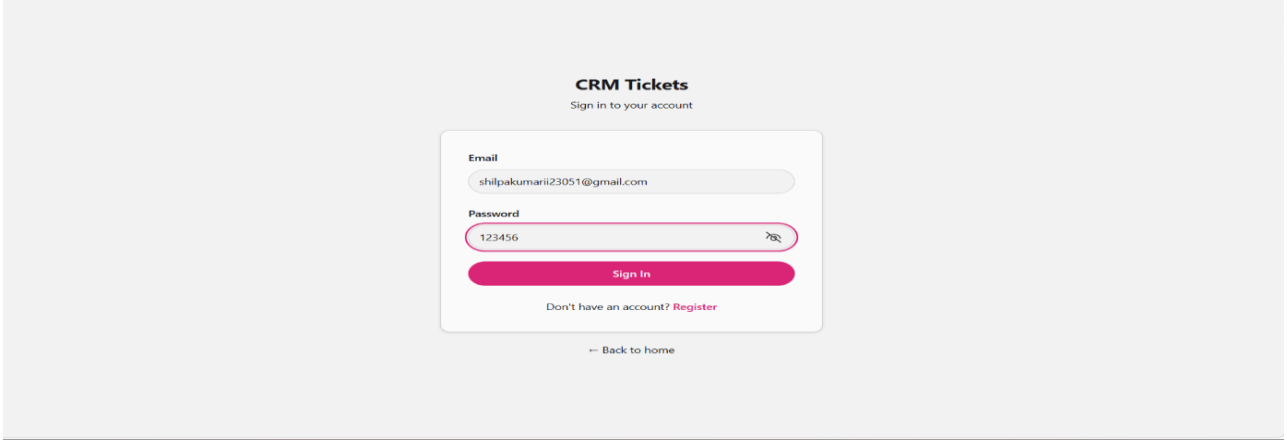
The AyurSutra system was successfully developed and implemented to manage Panchakarma patient records and therapy scheduling in a digital environment. The system was tested under various scenarios to evaluate its functionality, usability, and performance. All modules including user authentication, patient management, therapy scheduling, and prescription handling worked effectively without major errors. The integration between frontend, backend, and database was smooth, ensuring efficient data flow and system stability.

The implementation of the system significantly reduced the time required for managing patient records and scheduling therapy sessions compared to the traditional manual approach. Tasks such as appointment booking, data retrieval, and report generation were completed quickly with minimal effort. The system also eliminated common issues such as duplicate entries, misplaced records, and scheduling conflicts, thereby improving overall efficiency.

The role-based access control mechanism ensured secure and controlled access to the system. Admin, therapist, and patient roles were clearly defined, and each user could only access relevant features. This improved data security and maintained confidentiality of patient information. The use of MongoDB Atlas provided efficient data storage and faster retrieval, even when handling multiple records simultaneously.

The user interface was found to be simple, responsive, and easy to use. Users were able to navigate through different modules without difficulty. The dashboard provided clear and organized information, enabling users to monitor appointments, patient records, and therapy progress effectively. Feedback from users indicated that the system improved their workflow and reduced manual workload. Overall, the AyurSutra system demonstrated reliable performance, improved accuracy, and enhanced healthcare management capabilities. The system successfully addressed the limitations of manual methods and provided a scalable solution for Ayurvedic clinics. It can be further enhanced with advanced features such as mobile application support AI-based recommendations, and cloud deployment for wider accessibility.





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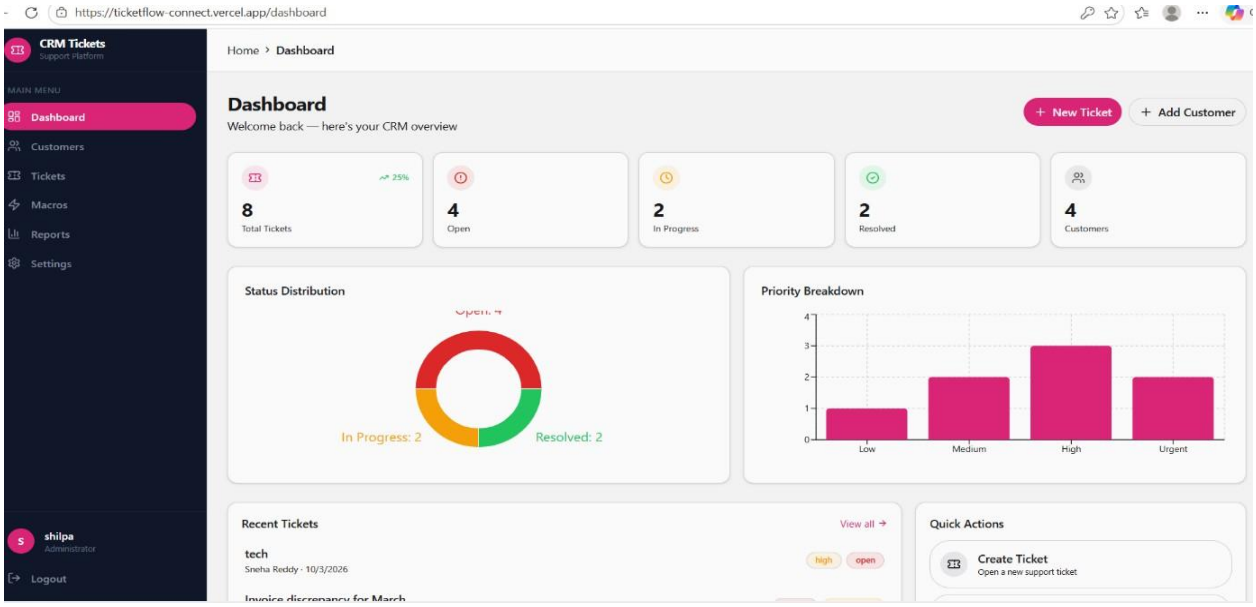

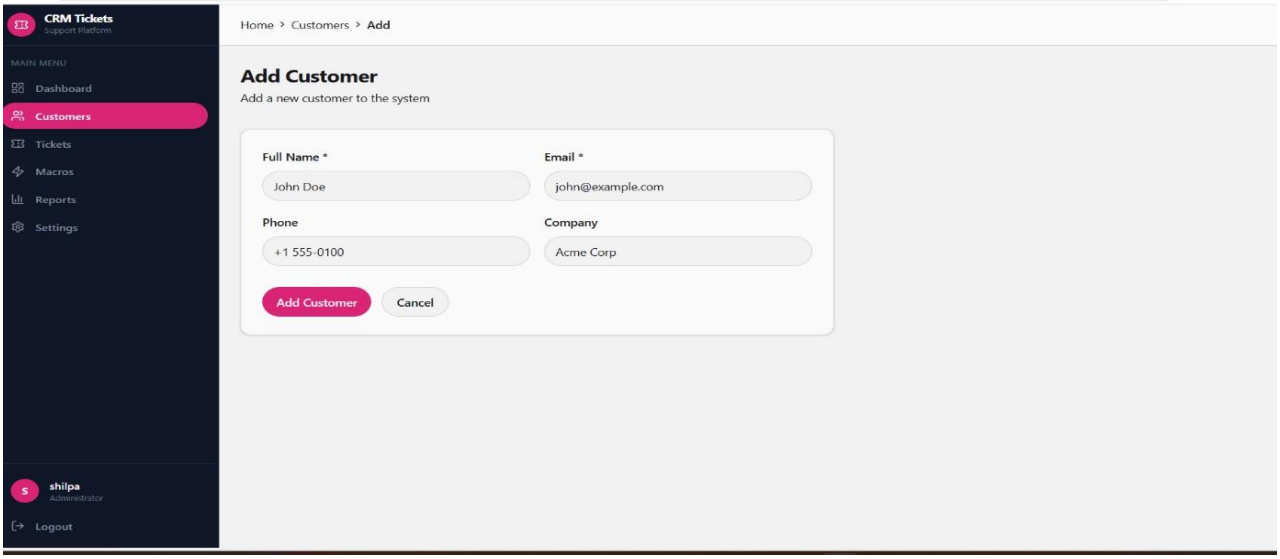

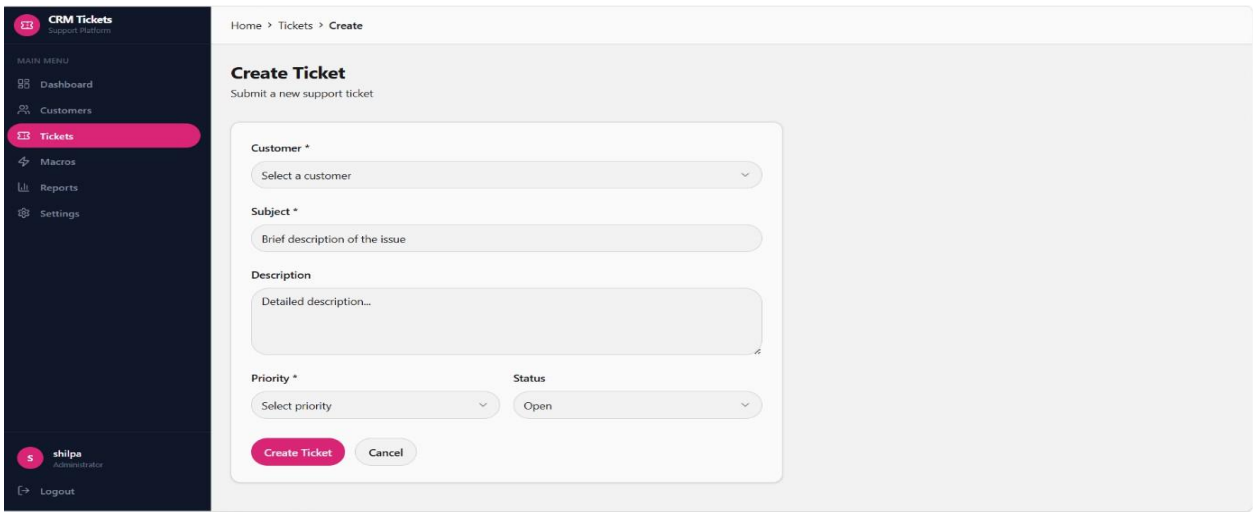

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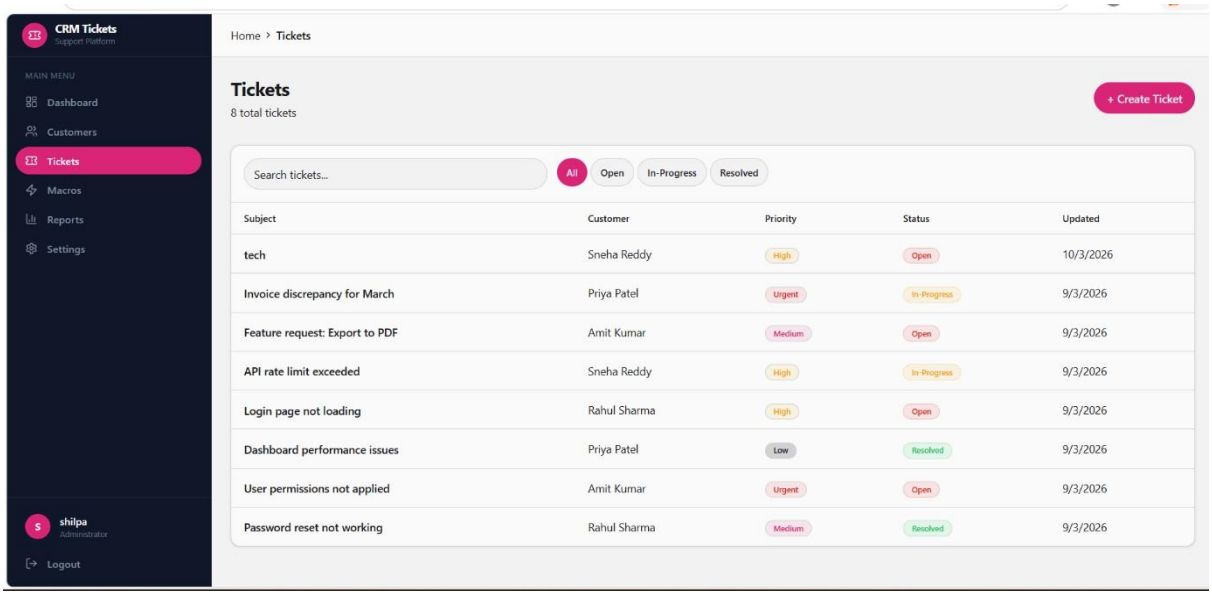

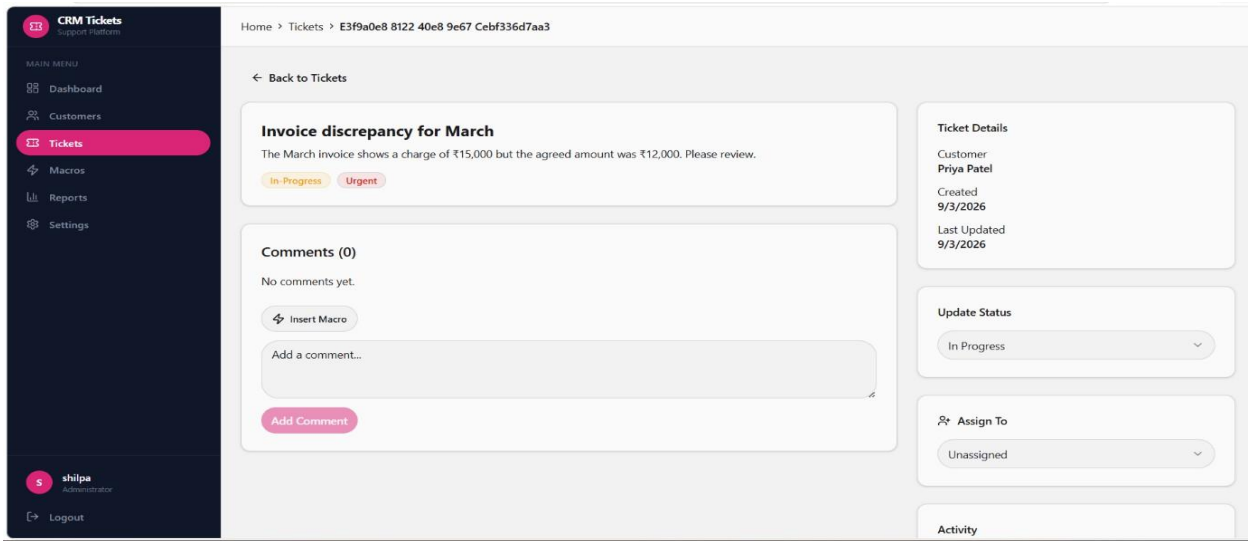

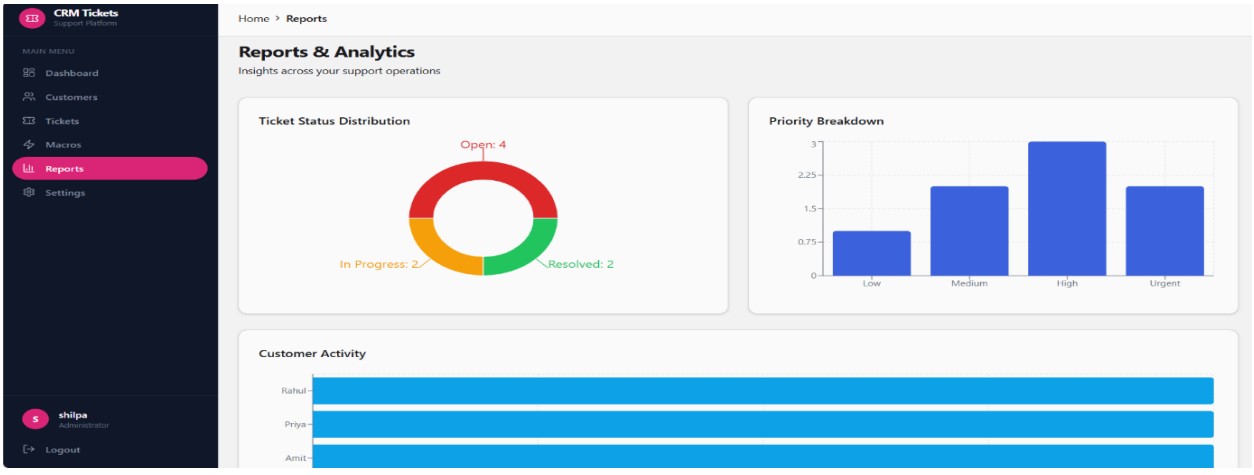

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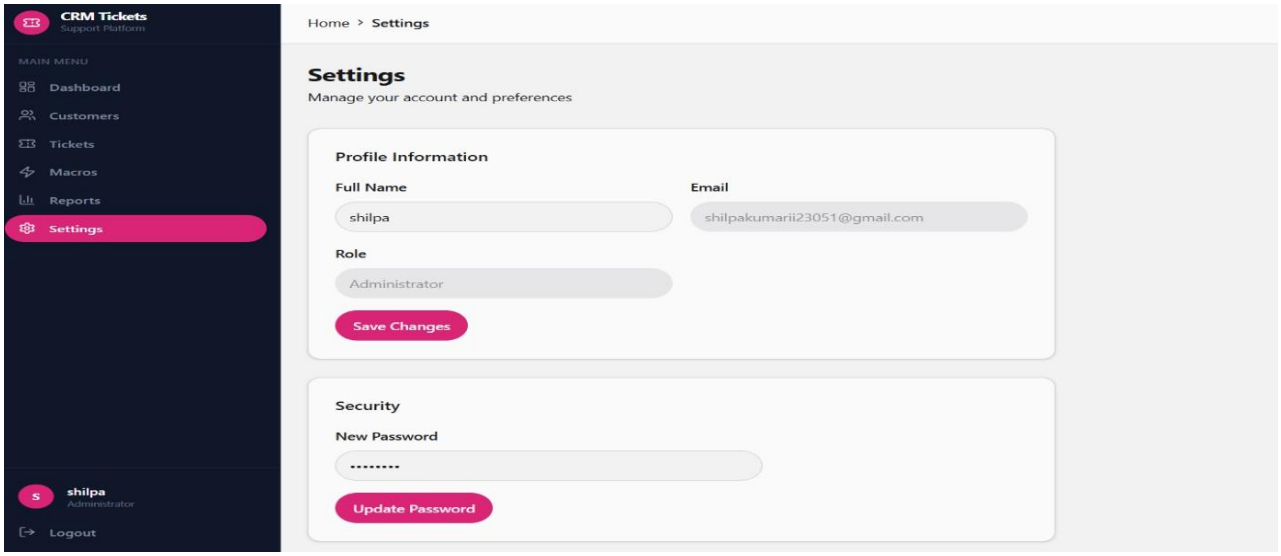

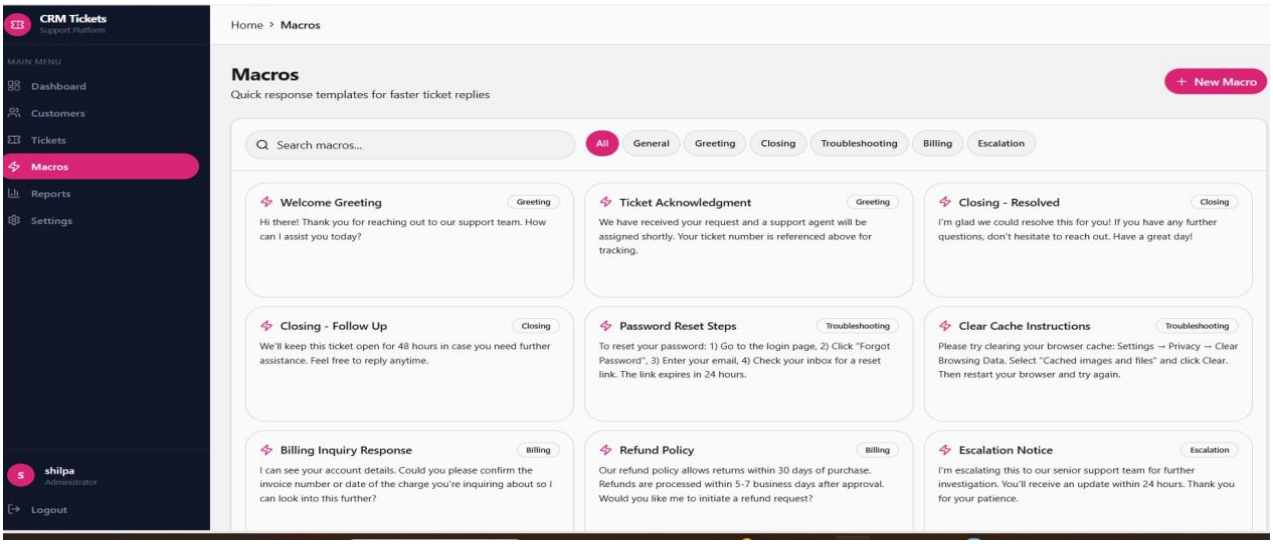

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VI. CONCLUSION AND FUTURE ENHANCEMENTS

The CRM Ticket Management System has been successfully designed and implemented to provide an efficient and organized solution for handling customer issues and service requests. The system offers a structured platform where users can easily create support tickets, and support agents can manage, track, and resolve these issues in a systematic and timely manner. The system integrates multiple modules such as Authentication & User Management, Customer Relationship Management (CRM), Ticket Management, and Reporting & Notification, which work together seamlessly to ensure smooth communication and workflow across the application. This modular approach improves coordination between users and support teams, reduces response time, and enhances overall service quality. One of the key advantages of the system is its ability to maintain accurate and consistent records of customer interactions and support activities. This helps organizations to analyze past issues, improve decision-making, and provide better customer service in the future. The system also supports real-time updates and notifications, which keep both users and support agents informed about the progress of tickets.Security is another important aspect addressed in this project. The implementation of authentication and authorization mechanisms ensures that only authorized users can access the system, thereby protecting sensitive customer data. Additionally, the use of a centralized PostgreSQL database allows efficient data storage, quick retrieval, and reliable data management. The system integrates multiple modules such as Authentication & User Management, Customer Relationship Management (CRM), Ticket Management, and Reporting & Notification, which work together seamlessly to ensure smooth communication and workflow across the application.

The proposed CRM-based ticket management system can be further enhanced by integrating advanced technologies and additional features to improve efficiency and user experience. In the future, Artificial Intelligence (AI) can be incorporated to automatically categorize and prioritize tickets based on their content, reducing manual effort and response time. A chatbot can also be added to provide instant support for common queries, enabling 24/7 customer assistance.The system can be extended with mobile application support, allowing users to access and manage tickets on the go. Integration with third-party platforms such as email, SMS, and messaging services (like WhatsApp) can improve communication and notification delivery. Advanced analytics and predictive reporting can be introduced to forecast ticket trends and agent workload, helping management make proactive decisions.

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| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 3, May- June 2026 ||

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