

AI-Enabled Smart Service Booking and Technician Management System

Mrs. D. Revathy ¹, S. Kumanan ²

¹ Assistant Professor, Department of Computer Application, SRM Valliammai Engineering college, Anna University, Chennai, Tamil Nadu, India

² PG Student, Department of Computer Application, SRM Valliammai Engineering college, Anna University, Chennai, Tamil Nadu, India

Abstract—The AI-enabled smart service booking and technician management system is a web application designed to facilitate the interaction of customers who need home services with skilled technicians who are capable of providing such services in an efficient manner. The application is designed to make the process of service booking and management easier and more efficient for all stakeholders involved using an integrated platform. Customers will be able to search for available services such as plumbing, electricians, and other services, schedule appointments, track technicians, and provide feedback after the completion of the services. The application will also provide technicians with a platform where they will be able to receive and manage services, update their availability, share their location, and track their earnings. The application will also be managed by administrators who will be responsible for managing all aspects of the application, including accepting technicians, managing services, tracking bookings, handling customer complaints, and tracking analytical data using analytical tools. The application will be developed using modern web development technologies such as React and Vite for the front-end and Node.js and Express for the back-end to ensure high-performance and scalable application development. The application will also use MongoDB as the database management tool.

Index Terms—Smart Service Management, Service Booking System, Web Application, React, Node.js, MongoDB, Real-time Tracking, Socket.io, REST API, JWT Authentication, AI Chatbot, Service Marketplace.

I. INTRODUCTION

Traditionally, people rely on their local connections to access services like plumbing services, electrical repair services, or appliance maintenance services. These approaches have led to issues of delays, lack of

transparency, and difficulties in accessing skilled labor. With the development of web technologies and the use of the internet through mobile devices, the need to have a system that can efficiently connect customers to service providers is on the rise.

The AI Enabled Smart Service Booking and Technician Management System is proposed to solve the issues of accessing services. The system will provide a web-based system where customers can access various services. Customers will be able to access different categories of services.

The system has three main users: customers, technicians, and administrators. The customers can make bookings and track their services. On the other hand, the technicians can manage the requests and update their status. Finally, the administrators can track the entire system, manage the technicians, as well as the complaints. The system uses React with Vite for the frontend, Node.js with Express for the backend, and MongoDB for the management of the database. There is also the incorporation of the AI chatbot to offer assistance to the users.

Generally, the system offers accessibility to the services, improves communication between the users, as well as a transparent service management system.

II. LITERATURE REVIEW

Research has been conducted regarding service management, service booking, and smart service delivery using digital technologies. This research has emphasized the importance of technology in simplifying service requests, enhancing the level of communication between the customer and the service

provider, and ensuring the efficient delivery of services.

A Smart Residential Services Platform was proposed by Shubham Dhanawade, Vaibhav Gond, and Akshay Madane (2025). This research was conducted based on the development of an online platform where users of residential apartments can seek different services at their homes. This research has emphasized the importance of technology in ensuring the efficient delivery of services. A centralized online platform can enhance the level of coordination among the users of the service and the service provider, ensuring timely delivery of the service.

A research study conducted by Yuan Wang and Qian Zhao (2024), at the International Conference on Education, Knowledge, and Information Management, proposed a Smart Service Management System. This research emphasized the importance of smart technology in ensuring the efficient delivery of service. In addition, An Online Service Management System (2022) emphasized the importance of online service management systems. In this system, users can make online requests for services while administrators can monitor and manage the requests through a centralized system. This demonstrates how automation and online communication can improve the speed and transparency of service management.

In the same vein, a Web-Based Graphic Service Request System for Apartment Facility Management (2023) was developed to improve the efficiency of service request management within apartment facilities. In the system, users can make online requests for services while administrators can manage the requests.

Moreover, a research review was published in an MDPI journal that emphasized the concept of IT Service Management (ITSM). In the review, the importance of modern digital technology was emphasized as a means to improve the quality of services provided to customers.

However, the existing service management systems do not offer advanced features such as the use of real-time technician tracking, chatbot technology, and analytics. The proposed Smart Service Management System is designed to address the existing issues by incorporating features such as real-time tracking, chatbot technology, and service management.

III. PROBLEM STATEMENT

In most urban areas, accessing reliable service technicians for home services such as plumbing, electrical repairs, appliance maintenance, and other home services can prove to be challenging. For instance, customers usually rely on local contacts, phone calls, or unreliable service providers, which may prove to be frustrating. In most cases, there is usually no system for scheduling services, keeping track of the availability of service technicians, or keeping track of the progress of the service delivery. Service technicians also experience challenges in accessing customers effectively. For instance, most service technicians rely on manual communication methods, which prove to be challenging in organizing service bookings, keeping track of schedules, and keeping records of service delivery and earnings.

The existing system of service management lacks real-time tracking, secure communication, and smart support facilities. The customer is unable to track the arrival of the technician, get instant replies to their queries, or book the services through a single platform. There is a need to design a smart digital platform that helps the customer and the technician interact efficiently, book the services easily, track the technicians in real time, communicate securely, and manage the services effectively.

The proposed AI Enabled Smart Service Booking and Technician Management System will help solve the problems associated with the existing system by providing a centralized web-based platform for the efficient management of services, improving the services' accessibility, and increasing transparency in the system.

IV. OBJECTIVE

The overall objective of the AI-Enabled Smart Service Booking and Technician Management System is to develop an efficient platform for the booking of service technicians for the purpose of service management. The objectives of the system are as follows:

To develop an online service booking platform for the purpose of booking home service technicians, including plumbers, electricians, and maintenance service providers. To develop an efficient service management system in which the customer would be

able to track the service technician in real time using the map tracking option. To develop the system with the option of Role-Based Access Control for Customers, Service Technicians, and Administrators for efficient system operations.

To develop the system with the option of secure authentication using JWT Authentication and password encryption. To design and implement an AI-based chatbot for user assistance with basic queries, services, and platform navigation. To enhance the transparency of services and user experience with tools such as service reviews, ratings, booking history, and analytics tools. To design and implement a responsive and scalable web application using technologies such as React, Node.js, and MongoDB. The goals and objectives of the application are to design a smart, efficient, and user-friendly service management system with improved communication and efficiency in service delivery for customers and technicians.

V. SYSTEM ARCHITECTURE

Smart Service Management System has a three-tier system architecture that comprises the presentation layer, the application layer, and the database layer. This ensures that communication between the users and the services provided by the system and the database occurs in the most efficient manner possible.

5.1.1 Presentation Layer (Frontend)

Presentation layer handles the interaction between the user and the system interface. The Smart Service Management System uses React and Vite to build the system interface as a fast and responsive web interface.

Presentation layer offers the following services:

Customer Dashboard: It allows customers to book services, track technicians, make payments, raise complaints, and provide feedback.

Technician Dashboard: It allows the technicians to take up jobs, update the service status, track earnings, and view the ratings provided by customers.

Admin Dashboard: It allows the administrator to track user activities, technicians, services provided, bookings made, complaints raised, and analytics for the system. Frontend interacts with the backend through RESTful API.

5.1.2 Application Layer (Backend)

The application layer is responsible for handling the system's business logic and data processing. This layer is implemented using Node.js and Express.js.

The application layer performs the following functions:

User authentication and authorization using JSON Web Token.

- Handling service booking requests.
- Assigning technicians and handling jobs.
- Processing payments and generating invoices.
- Handling complaints and feedback.
- Admin management operations.

Real-time communication, including technician location tracking and real-time communication, is achieved through Socket.io.

5.1.3 Database Layer

The database layer is responsible for handling data storage and management in the system. The system uses MongoDB to store and manage its data.

The database contains the following main collections:

- Users (customers and technicians).
- Services.
- Bookings.
- Payments.
- Complaints.
- Ratings and feedback.

The system uses MongoDB to store data in a flexible document format and to retrieve data quickly.

5.1.4 External Components

The system incorporates additional components to add functionality to the system:

- Leaflet – This is used to display the technician's live location.
- AI Chatbot – This is used to add value to the system, including automated customer, technician, and admin chatbot services.

5.2 EXISTING SYSTEM

In the existing model of service management, the customer mostly uses conventional means of communication, such as phone calls or manual contact through service agencies, to get the services of a technician for home services like plumbing, electrical work, or repairs. The conventional means of communication between the customer and the service provider is unorganized, which results in a delay in the provision of the service. The customer is unaware of

the availability of the technician, the quality of the service, and the time taken by the technician to reach the customer location. There is also a lack of proper tracking of the service provider once the customer has booked the service.

Moreover, payment processing and service records are usually handled manually, which sometimes leads to a lack of accuracy. In addition, complaint management is usually poor, making it hard for administrators or service providers to keep track of the quality of services. Because of these limitations, the traditional system of service management is not only inefficient but also not transparent, thus lacking features such as real-time communication, which is available in modern digital platforms.

5.3 PROPOSED SYSTEM

The concept of the AI-Enabled Smart Service Booking and Technician Management System aims to provide a platform where customers can easily access skilled technicians for home services such as plumbing, electrical work, and home maintenance. This system will provide a simple and user-friendly web application that customers can use to browse services and track the arrival time of the technicians.

This system will also provide technicians with the ability to manage service requests, update their availability, and share their locations for effective service delivery. This system will be built using React with Vite for a fast frontend, Node.js and Express.js for backend operations, and MongoDB for storing data. The location of the technicians is tracked in real time using Socket.IO, which enables the customer to view the movement of the technician through an interactive map using Leaflet.js. The system also offers secure authentication using JSON Web Token, which offers secure login and information protection for the user.

Moreover, the system is augmented with the incorporation of an AI-based chatbot that helps the user in responding to their queries, helps the user in choosing the service, and helps the user in efficient booking. The system also offers the administrator the ability to manage the services, approvals for the technicians, bookings, complaints, and analytics through the dashboard.

The final output clearly states the proposed system offers a smart, efficient, and scalable solution for the efficient management of the home services operation,

which enhances the overall customer experience, technician experience, and the overall management of the system.

5.4 SYSTEM DESIGN

The Smart Service Management system uses a client-server model, where the frontend and backend work together to provide effective service management. The frontend is built with React and Vite, which create a fast and interactive user interface. The backend uses Node.js and Express, offering strong server-side support. The database is built on MongoDB, storing user information, services, bookings, reviews, and complaints. There are three user roles in the system: Customer, Technician, and Administrator. Customers can book services, track technicians, and give feedback. Technicians can accept requests, update service details, and share their live location. The Administrator manages the system, including services, technicians, bookings, and analytics.

The system uses REST APIs to enable communication between the frontend and backend. JWT provides secure authentication and authorization. Socket.io allows for real-time tracking of the technician's location. Leaflet is used to display the technician's location on the map. Zustand manages state at the frontend level.

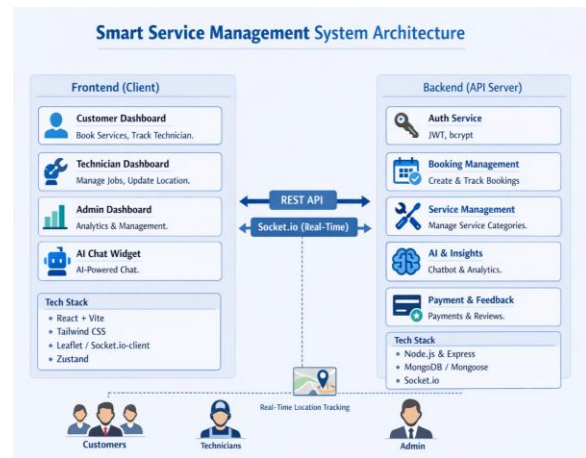


FIG 1.1 SYSTEM DESIGN

VI. API IMPLEMENTATION

The Smart Service Management application utilizes the RESTful API to allow the application's frontend and the backend server to communicate. The application's API is developed using Node.js and Express. The API allows the application to perform

various tasks such as user authentication, managing services, booking services, payment processing, and managing user feedback.

6.1 Authentication APIs

Authentication APIs are utilized for managing users' registration, login, and password reset.

POST /api/auth/register: The API allows users to register as customers, technicians, or admins.

POST /api/auth/login: The API allows users to log in and obtain a JSON web token.

6.2 User APIs

These APIs are utilized for managing users' profiles and listing technicians.

GET /api/users/profile: The API fetches the profile of the current logged-in user.

PUT /api/users/profile: The API allows users to edit their profile.

GET /api/users/technicians: The API fetches a list of technicians.

6.3 Service API

Service API handles service categories on the platform.

GET /api/services – Retrieves all service categories.

POST /api/services – Allows the admin to create a new service category.

PUT /api/services/:id – Updates service category information.

DELETE /api/services/:id – Deletes a service category.

6.4 Booking API

Booking API handles service requests.

POST /api/bookings – Creates a new service booking.

GET /api/bookings/:id – Retrieves booking information based on the ID.

PATCH /api/bookings/:id/status – Updates the status of the booking (Accepted, In Progress, Done).

6.5 Analytics APIs

Analytics APIs are used to provide statistical data to the administrator dashboard.

GET /api/analytics/stats – This API provides system statistics, including total users, bookings, and revenue.

6.6 AI Chat API

The AI API allows for a chatbot to assist users.

POST /api/ai/chat – This API sends user queries to the AI chatbot and retrieves responses.

All these APIs enable the system to perform basic functions, including user management, service booking, technician tracking, payment, and AI chat.

VII. SYSTEM TESTING

System testing is performed to ensure that the Smart Service Management system works correctly and all the requirements are met. It also checks that all the modules of the Smart Service Management system are working correctly, including user authentication, service booking, technician management, real-time tracking, etc. The entire process of system testing also helps to find errors, bugs, and performance issues within the system before the final deployment.

During the system testing of the Smart Service Management system, various kinds of tests are performed, including functional testing, integration testing, and user interface testing. In the functional testing of the Smart Service Management system, each feature of the system, such as registration, login, service booking, payment, etc., is checked.

The system is also subjected to security testing using JWT authentication, which ensures that only authorized users are able to access certain resources. Once all the test cases are completed, the system is ensured to be stable and reliable.

VIII. IMPLEMENTATION & RESULT

8.1 IMPLEMENTATION

In the implementation phase, the development of all the modules of the Smart Service Management System takes place. The frontend of the system is built using React along with Vite. The backend of the system is built using Node.js along with Express. The database used for the system is MongoDB. The user authentication of the system is done using JWT. The communication between the customers and the technician is enabled using Socket.io. The location of the technician is displayed using Leaflet Maps. The AI chatbot is integrated into the system. All the modules of the system, such as the customer booking module, the technician module, and the admin module, are integrated.

8.2 RESULT

After implementation, the Smart Service Management system is successfully able to provide a platform where customers can easily book services, keep track of the technicians in real time, and provide feedback after the service is completed. It also enables the technician to receive service requests, update their availability, and easily handle their service activities.

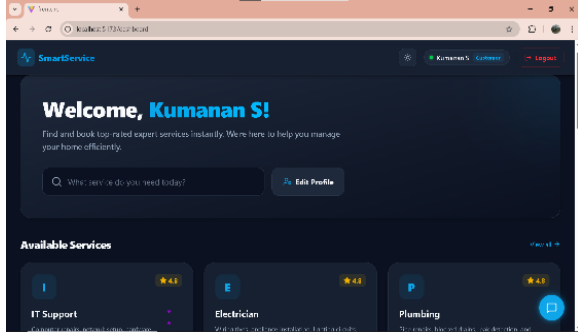


Fig 1.2 CUSTOMER DASHBOARD

The administrator is able to handle service categories, keep track of service bookings, and monitor the performance of the system through the admin dashboard. By incorporating real-time tracking and AI chatbot technology, the user experience is enhanced as it is able to provide information in real time.

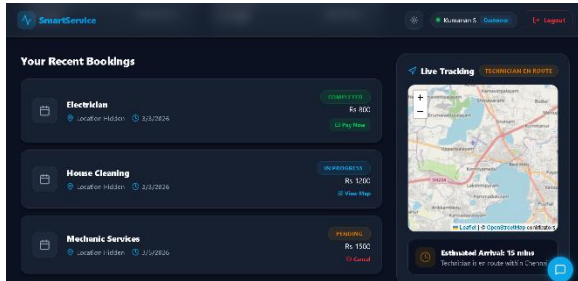


Fig 1.3 RECENT BOOKING & REAL-TIME TRACKING

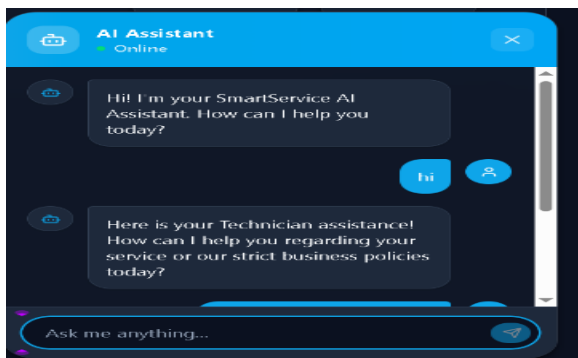


Fig 1.4 AI CHATBOT

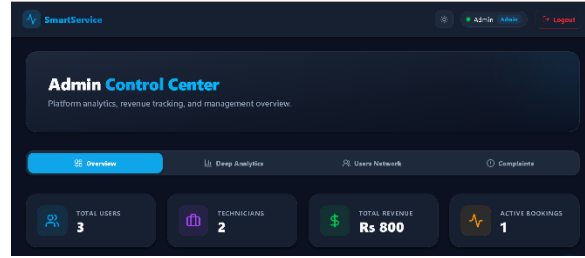


Fig 1.5 ADMIN DASHBOARD

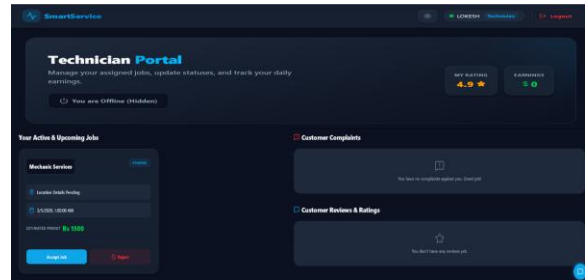


Fig 1.6 TECHNICIAN DASHBOARD

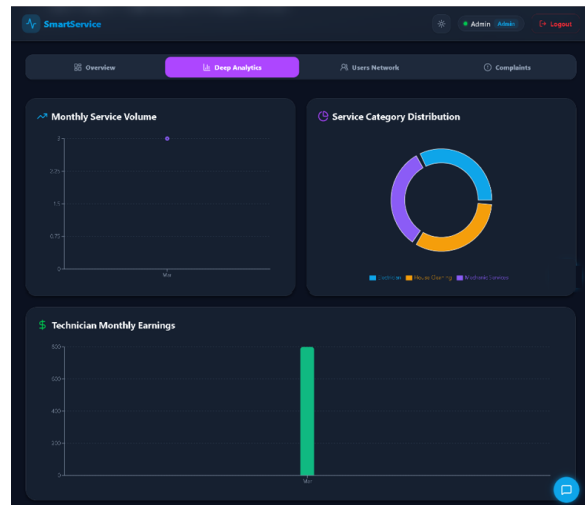


Fig 1.7 ANALYTICS

IX. CONCLUSION

The Smart Service Management system offers an efficient platform that allows customers to connect with technicians for various service requirements. Customers can book various services, manage their respective technicians, and monitor their respective service activities through a single platform. By using modern technology, including React, Node.js, Express, and MongoDB, customers can enjoy a fast, efficient, and user-friendly experience.

Real-time features, including Socket.io, are also integrated into the system, allowing customers to

enjoy location tracking through Leaflet Maps. In addition, customers can enjoy the benefits of an AI chatbot that can provide fast responses to their respective queries. Finally, the system allows administrators to manage their respective services, technicians, and bookings through the admin dashboard.

Overall, the Smart Service Management system offers a wide range of benefits, including efficiency, ease of use, and customer satisfaction. Therefore, the Smart Service Management system can be considered a successful example of how modern web technologies can be leveraged to develop a smart service management system.

X. FUTURE ENHANCEMENTS

The Smart Service Management system could also be further improved by adding some new features to increase the functionality and user experience of the system. In the future, the system could include a mobile application for Android and iOS to make it easier for users and service providers to access the system. It could also include advanced AI chatbots with natural language processing capabilities to improve the customer experience and increase the accuracy of the chatbots.

The system could also include various online payment options to make the payment process easier and more efficient for users. It could also include push notifications and SMS to improve the user experience by providing timely updates to users. Another feature that could be added to the system is the integration of machine learning algorithms to improve the user experience by providing personalized recommendations for users.

The system could also be extended to include multiple cities to make it more efficient and increase the user base of the system.

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