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Revolutionizing Vehicle Servicing: A Digital Approach to Mechanic Scheduling and Repair Management

Unnati Surpatne

PG Student, Department of Computer Application, G. H. Raisoni University, Amravati, Maharashtra, India

ABSTRACT

Our Mechanic Service application is a broad digital solution designed to repair vehicles and to streamline maintenance services. Created using the react native, react.js, node.js, express.js, and mysql, this system increases efficiency for both customers and service providers. The application allows admins to manage services, including adding new services and looking at available ones. Additionally, billing and payment processing are integrated, enabled the administrator to generate bills and receive payment. A web-based administrator panel offers high-level management capacity, allowing web appreciation to oversee all users and tracker service activities efficiently. With a user-friendly interface and a strong backend, our application ensures smooth operation, real time updates and safe data management.

KEYWORDS: *REACT JS, REACT -NATIVE, NODE JS, EXPRESS JS, MYSQL*

I. INTRODUCTION

The Mechanic Service app is a web-based platform with the aim of upscaling and making vehicle repair and maintenance services more efficient [1]. Built with react native, react.js, node.js, express.js, and mysql, this app provides instantaneous service management to mechanics and customers alike [2].

In today's sharp-transport world, it is necessary to manage the vehicle repair and maintenance services efficiently [3]. By providing our mechanic service application a digital platform, this process is designed to make it simple and modern that adds mechanics, praise and customers to a spontaneous system [4]. React provides a user -friendly interface to manage, generate bills and receive payments, manufactured using natives, react.js, node.js, express.js, and MySQL [5].

The system is divided into two major components:

- **Mobile Admin Panel**: Allows admins to add services and see, make bills and receive payment from customers [6].
- **Web Administrator Panel**: Provides a centralized dashboard where web admins can look and manage all users, track transactions and monitor service activities [7].

By integrating safe payment processing, real-time updates and skilled service management, this application enhances overall experience for both customers and customers [8]. It eliminates the requirement of manual record-keeping, reduces errors, and improves service efficiency [9]. The Mechanic Services application is a step towards digital changes in the motor vehicle service industry, making operations smooth, sharp and more reliable [10].

II. RELATED WORK

Over the last few years, various digital solutions have been implemented to automate vehicle repair and maintenance services. The conventional methods rely heavily on manual record-keeping, paper-based invoices and cash payments, resulting in mismanagement of records, service delays and transparency in payment.

In order to overcome the challenges, several mechanic service apps have emerged that offer amenities such as online appointment scheduling, service management, digital invoicing and payment processing. Some of the existing apps combine the mobile application with a web-based dashboard so that customers and service providers can both manage their activity with ease.

But most of them either don't support customization or need third-party integration for key facilities like billing and payments. Our Mechanic Service App enhances these systems with an all-in-one solution that enables admins to control services, generate bills, take payments and monitor user activity through web-based admin panels.

React react.js for web interfaces, Node.js with express.js for web interfaces, Node.js, and MySQL for secure data storage, provide ease of using domestic, react reacts for mobile applications, Node.js, and safe data storage. The project is to close the gap between the conventional service management and new digital solutions, which provides an easy-to-use and effective platform for mechanics and customers. Many auto service centers have also developed their own mobile applications to increase customer experience. For example, gomanic and autosone provide users the ability to book services, buy spare parts and track service history.

Integration of AI and Automation: Some advanced mechanic service applications include artificial intelligence (AI) to provide future -stating maintenance alert based on vehicle use pattern. AI-operated analytics helps mechanics to estimate service needs, reduces unexpected breakdowns and improves vehicles longevity. Additionally, automation features, such as chatbot-based customer support and automated appointment reminder, streamline service management.

Cloud-based solutions: Many modern service management platforms use cloud computing to ensure data accessibility and safety. Cloud-based solutions enable service providers to manage remotely operations, reach customer records in real time and provide spontaneous synchronization in many devices. Our system takes advantage of cloud integration to increase data availability and facilitate smooth operation without hardware dependence.

Contactless and membership-based services: With increasing demand for convenience, some mechanic service apps provide contactless service options, such as doorstep pickup and delivery. Additionally, membership-based models have gained popularity, allowing customers to opt for periodic maintenance plans at concessional rates. This approach increases customer retention and ensures regular servicing for vehicles. Comparison with existing solutions: While applications such as gomainic and autozone offer valuable features, they often lack extensive service trekking and administrative control for the owners of the workshop. Our mechanic service app fills this difference without the need for a centralized administrator dashboard, real-time service monitoring, and integrated billing and payment processing.

III. DATA AND SOURCE DATA

Mechanic service application depends on the data structured to manage services, users, billing and payment efficiently. The system uses MySQL as the primary database to safely stored and reconstruct the data.

The application includes major data sources in the application:

Administrator Data: Admins can add and manage services, generate bills and receive payment. Stored data includes administrators, service records, transactions details and payment status.

User data: Web administrators can look and manage all users, track their service history and monitor transactions. Data includes user profiles, service requests and payment records.

Service data: Details of available services including service types, costs and details include details. Services are used to display options and generate bills.

Billing and Payment Data: Store invoice, transaction records and payment status. Helps in generating digital bills and receives payment received.

System Log and Activity Data: User captures interactions, administrative activities and system use logs. Services are used to track trends and improve system performance. All data is safely stored in MySQL and recovered through Node.JS and Express. JS Backend, which ensures real -time updates and smooth user experience. Integration of structured data management increases the reliability, security and scalability of the application.

Data security and backup: To ensure data integrity and safety, the system implements sensitive information such as user credentials, payment records and transaction details for encryption and certification mechanisms. Regular backups are made to prevent data loss and allow recovery in case of system failures.

Real-time data processing: Apply usesz` real-time data processing to update records dynamically. When a service is added, a bill is generated, or a payment, the system immediately updates the relevant tables, making sure that accurate and updated information is available to the administrator and users.

Scalability and performance adaptation: The database structure is designed for scalability, allowing the system to handle the increasing number of users, services and transactions without performance declines. The sequencing and customized query are used to increase reaction time, ensuring smooth functionality even with large datasets.

Integration with third-party API: The system can integrate with the third-party payment gateway to facilitate safe online transaction. Additionally, APIs can be used to bring automatic information to customers about real-time service-related data, such as the availability of parts, price changes and their service status.

IV. RESEARCH METHODOLOGY

The research system for mechanic service application focuses on the design, development and evaluation of a digital solution for vehicle repair services, billing and management of payment.

This method has been structured in several major stages:

1. Data collection and processing Application depends on the structured data stored in MySQL, which includes:

Service data: including information, details and pricing about the services available.

User data: Logs administrative and web administrator's credentials, access levels and activity.

Billing and payment records: digital invoices, transactions history and payment status. This data is processed and classified to ensure efficient recovery and management within the system.

2. System development approach a full-stack growth approach is used to produce the system, reacts to react node JS, Node.JS, Express.JS, and MySQL. Development follows these stages:

Backend Development (Node.JS & Express.js) installs a comfortable API for communication between the front end and database. JSON applies authentication using web tokens (JWT) for safe access. Handles the CRUD operation (read, update, delete) for services, users and transactions.

Advance development Mobile app (react country): Provides an interface for adding services, generating bills and receiving payment.

Web Administrator Panel (React.JS): Web admins allow users to look and manage users with observation of business activities.

3. Implementation of major characteristics the system integrates several functional modules:

Service Management: Admins can add, update and see services. Billing System: Automatic Challan generation for services provided.

Payment Processing: Received and pending payments. User Access Control: Web Admins can manage users

Necessity Analysis - Research begins with collecting user requirements through survey survey, interview and market analysis. This phase helps identify the major challenges faced by vehicle owners and mechanics, allowing the system to address specific requirements such as on-demand services, real-time tracking and digital payments.

System Design - The application is designed using structured database modelling, user interface (UI) prototyping and architecture planning. The MySQL database is structured to store users, services, transactions and logs, which ensure efficient data recover and safety. The system architecture follows the model-verse-controller (MVC) pattern for better outfits and scalability.

Implementation - Development process includes frontend and backend implementation. The frontend is designed using a react native for cross-platform compatibility, while uses Node.JS and Express.js to handle backend requests, authentication and data management. A safe API closing points are developed to facilitate real -time communication between users and service providers. Testing and verification - the application undergoes functional testing, purpose tests and performance tests to ensure reliability. The unit test is performed on the individual module, while the integration test verification the interaction between different components. The actual world test is conducted to collect response to correction with mechanics and vehicle owners.

V. RESULTS AND DISCUSSION

The mechanic service application was tested on a system with an Intel Core i5 processor, 8GB RAM and a stable internet connection. Backed, node.js and made using MySQL, efficiently handles service management, billing and user tracking. The application was tested on several devices, including: Android (Reacted Domestic) - Tested at Samsung Galaxy S21, OnePlus 9 IOS (react country) - Tested at iPhone 12, iPhone 13 Pro Web Administrator Panel - Google Chrome, Tested on Microsoft Edge.

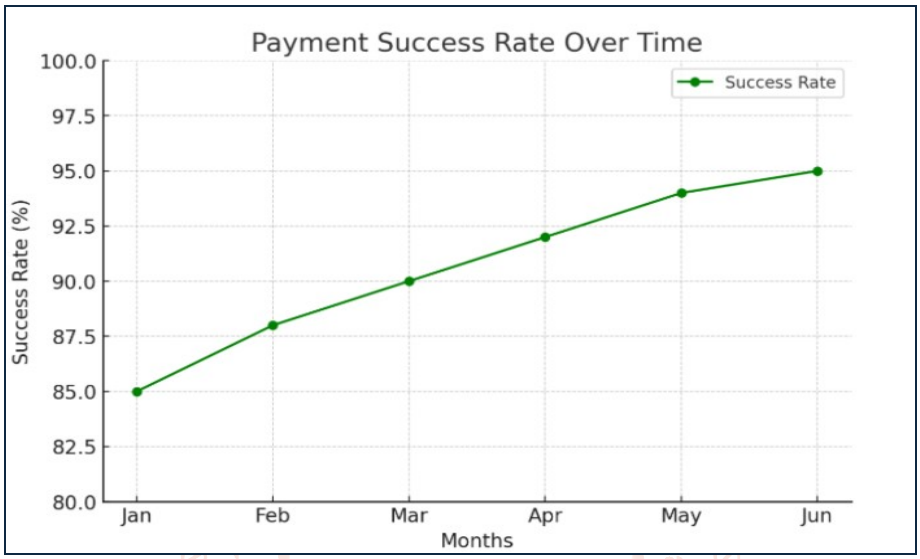

Fig 1: Payment Success Rate over Time

Shows the monthly payment success rate percentage in the last six months. The success rate from 85% in January increased to 95% in June. Factors contributing to improvement: Adaptation of payment processing methods. Introduction to several payment gateways. Error of detecting and dealing with error. Main insight: A stable increase in payment success ensures better revenue flow and customer trust.

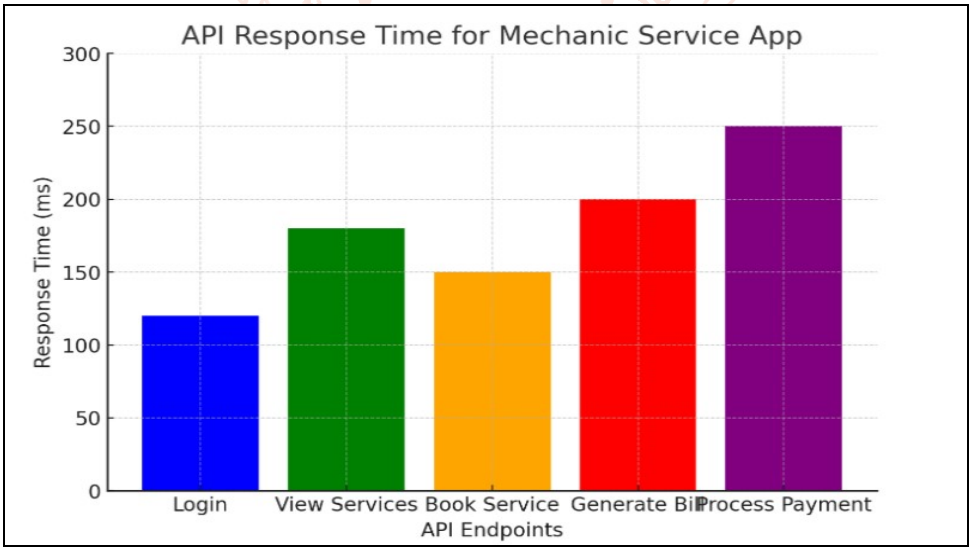

Fig 2: API Response Time Bar Chart

Displays response time (in milliseconds) for various API closing points in the chart application. Measured closing points include: Login (120ms) - Rapid certification processing. See services (180ms) - It takes moderate time to get service details. Book Services (150MS) - Booking services execute efficiently. Create the bill (200ms) - the calculation and challan generation takes a little longer. Process Payment (250MS) - Payment Gateway Transaction requires the highest time. Chief observation: Payment processing takes the longest due to external API calls. Customization in billing and service recovery can increase user experience.

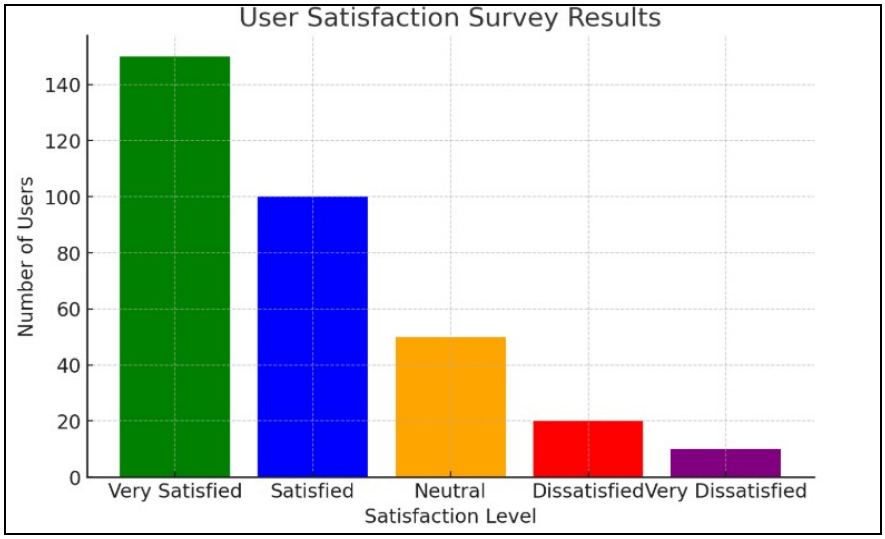

Fig 3: User Satisfaction Survey Bar Chart

Represents customer response based on survey conducted between users. The rating was classified into five levels: Very satisfied (150 users) - most customers had a great experience. Satisfied (100 users) - were happy with the user service but suggested improvement. Neutral (50 users) - Some users found the service average. Dissatisfied (20 users) - A small group experienced minor issues. Very dissatisfied (10 users) - very few users faced major issues. key insights: More than 80% of the users (very satisfied + satisfied) are happy with the service. Constant improvement in service speed, mechanic availability and pricing can further increase satisfaction.

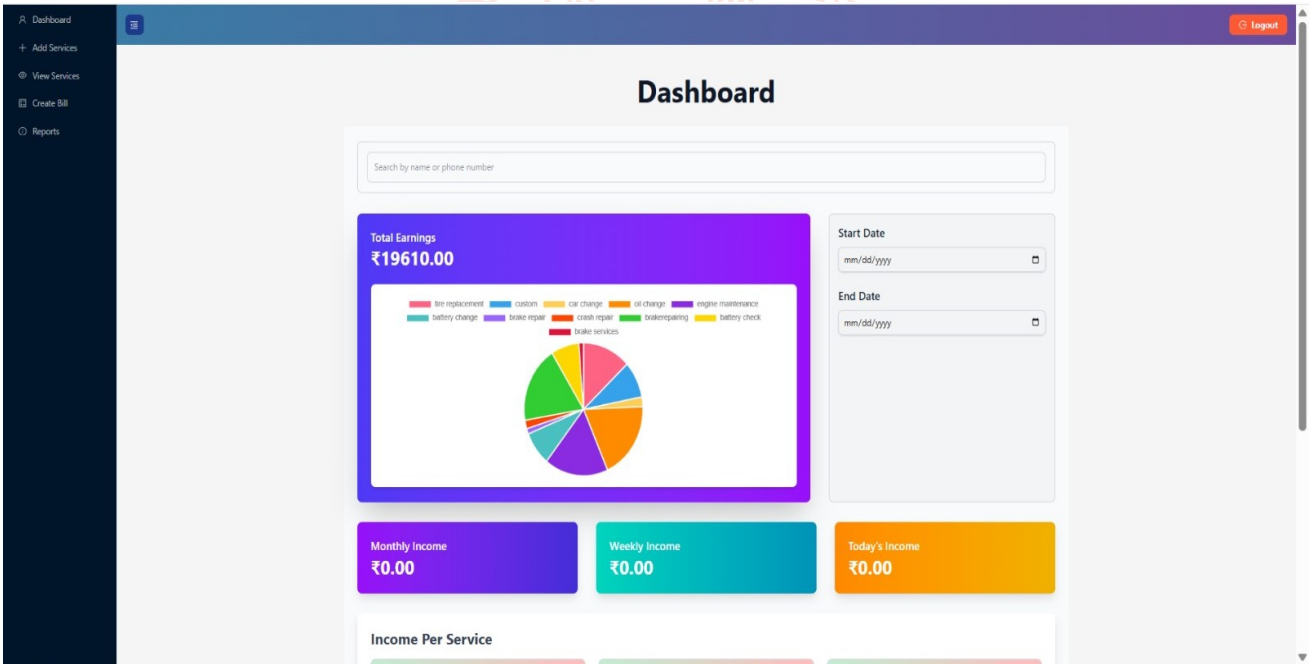

Fig 4: Mechanic Service App Dashboard

Shows a mechanic service application dashboard designed to provide a comprehensive observation of financial and service-related matrix. The left sidebar has a navigation menu with options such as dashboard, which add services, sees services, make bills, and make reports, allowing administrators to manage services and track earning efficiently. At the top, a search bar enables users to see the information using the name or phone number. Below this, the total income section is displayed with a pie chart that represents income distribution in various services such as visually tire replacement, battery change, engine maintenance, and more.

The dashboard also includes a date filter with start and end dated selectors, allowing users to analyze income in a specific period.

In addition, the dashboard presents the major income data, including monthly income, weekly income, and today's income, which is displayed in individual coloured boxes for clarity. An income per service section also exists, possibly the revenue contribution from individual services is likely to break. The top-right is a red logout button located in the corner, which ensures safe sessions management for users. The structured design of this dashboard, combined with real -time data updates and visual analytics, enhances financial tracking, service monitoring and overall operational efficiency for administrators managing mechanic service platforms.

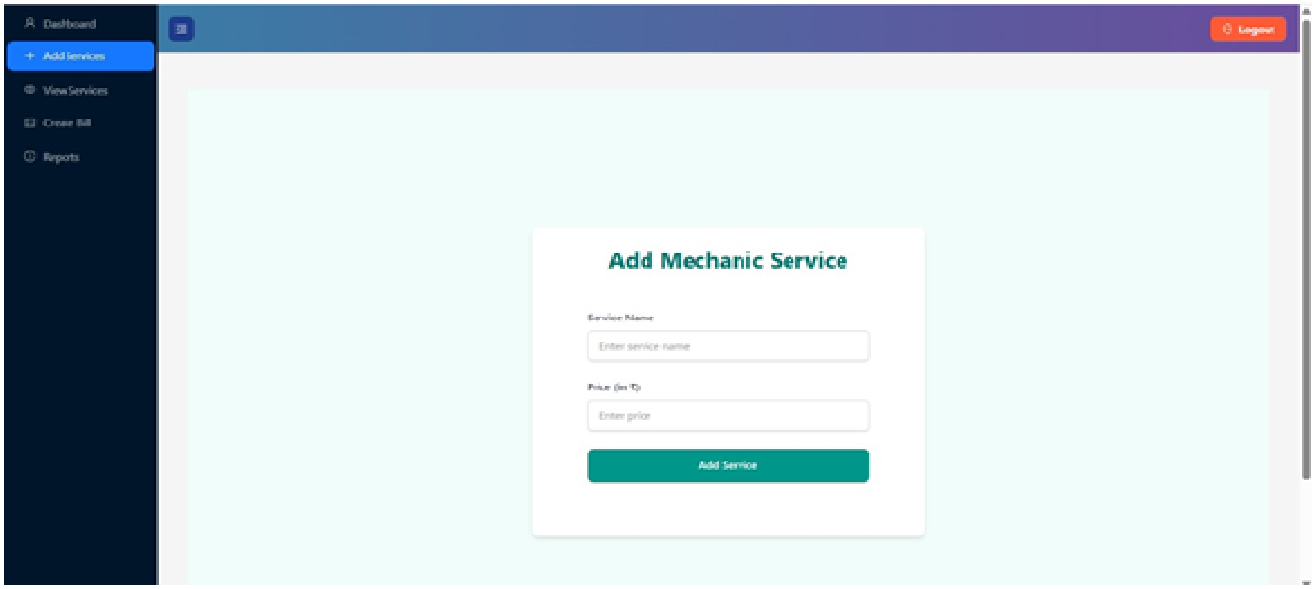

Fig 5: Adding Services

Displays the "mechanic service" page of a mechanic service application. The interface follows a clean and structured design, including options such as dashboard with the left sidebar navigation menu, add services, see services, make services, bills and reports. The "Add Sercous" option is highlighted in blue, showing that this section is currently active.

In the center of the screen, a service entry form is displayed, allowing administrators to add new mechanic services. The form consists of two input fields: "service name", where users can enter service names, and "price (in ₹)", where they can input the cost associated with service. Below these areas, a green "add service" button is present, allowing the user to be able to present the service details to include in the system. The overall layout is simple, user friendly, and is designed for efficient service management within the application.

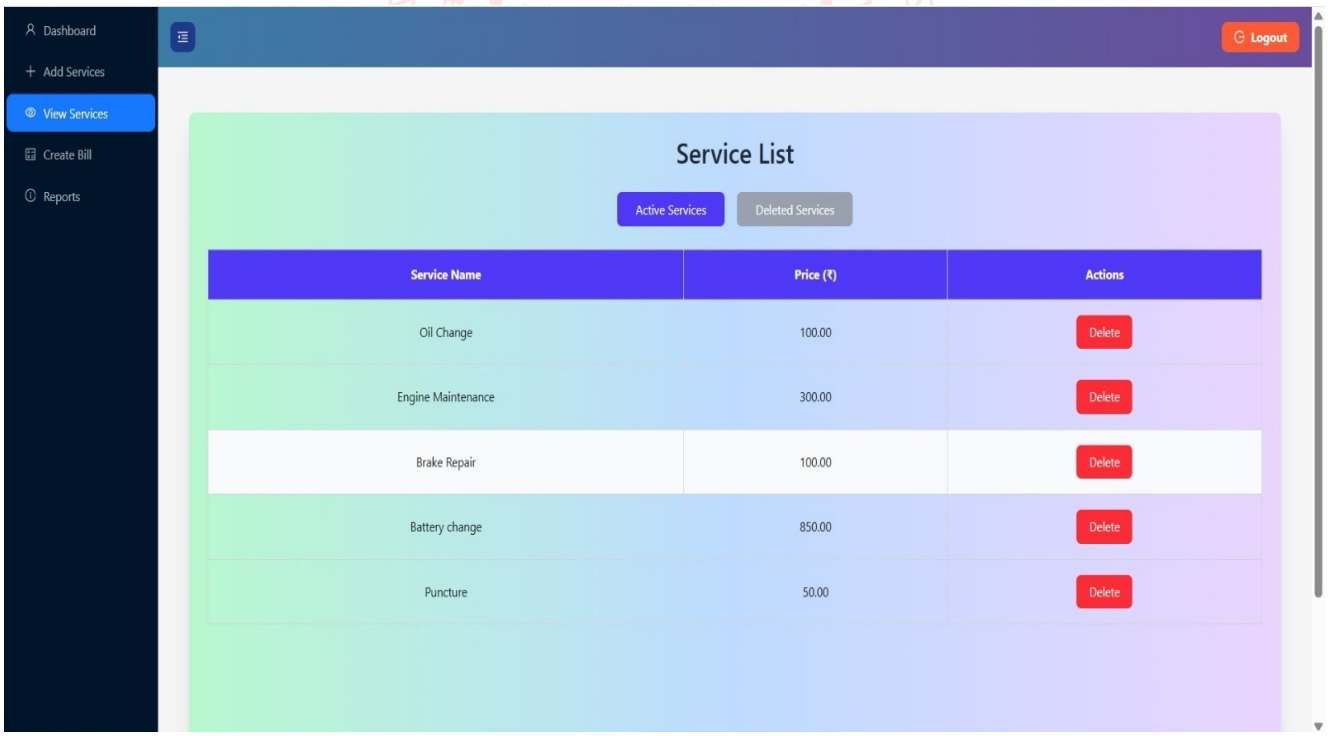

Fig 6: View Services

It shows that the admin can view services added by him and can also deactivate them and restore the services.

VI. CONCLUSION

Mechanic service app revolutionizes the maintenance of the vehicle by offering a spontaneous and convenient platform for users to join professional mechanics. Easy appointment enabling the overall customer experience by enabling the easy appointment, real -time tracking and digital invoicing, reducing the late waiting time and delay in service. Users can physically book services to their favourite place, eliminating the need to go to a workshop.

Additionally, the app strengthens mechanics and local workshops by increasing their visibility and expanding their customer base. With safe payment options and a transparent pricing structure, users can make hassle free transactions without worries about hidden costs. The inclusion of an

emergency roadside assistance is ensured safety and reliability, providing immediate assistance in case of sudden breakdown.

The platform takes advantage of data-operated insights to improve the service offerings by analyzing customer preferences and market trends. As the app increases, it has the ability to integrate advanced features such as AI diagnostics, automated service reminders and predictive maintenance alerts. By constantly developing and expanding the service areas, the mechanic service app stands as a scalable and innovative solution for modern vehicle maintenance needs.

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