

# AI-Based Second-Hand Car Buying and Selling System

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**Abstract**— In India, the competition between pre-owned cars and new cars has reached its peak. All these pre-owned cars are generally termed as “Certified Used Cars”, as they are provided warranty and certified quality from the car dealers. Different car manufacturers have entered the pre-owned car business with different goals and marketing strategies. This study aims to understand customer preferences in organized and unorganized markets when buying pre-owned cars, to identify the key factors that influence their purchase decisions, and to analyze the pre-owned car market in India.

This study also looks at the structure of the pre-owned car market and the key players involved in the supply chain. It attempts to understand the experiences of Indian businessmen in the used vehicle market.

This project focuses on building a web platform for buying, selling, and exchanging second-hand cars. The system gives users easy navigation, detailed car listings, and clear communication between buyers and sellers. It includes features like search and filters, comparison tools, and a secure process for submitting car listings. The backend handles data efficiently, while AI-powered features provide personalized recommendations, automatic content moderation, and smart search. The platform is designed to be easy to use, mobile-friendly, and scalable, helping connect buyers and sellers of used cars.

**Index Terms**— Artificial Intelligence (AI), Second-Hand Car Market, Used Car Marketplace, Recommendation System, Intelligent Search, Fraud Detection, Data Analytics, Car Price Prediction, Digital Marketplace, User Behavior Analysis, Secure Authentication.

## I. INTRODUCTION

The used car market has existed in India for many years. However, it has struggled to grow because of risks like no warranty, lack of certification, and poor organization. In the last four years, major car manufacturers have entered the pre-owned car business in a big way.[1]

These platforms provide clear and complete information to customers about pre-owned cars, offering a better buying experience. The global market for pre-owned cars reached approximately 15 billion units by the end of 2019, and it continued to grow, especially during the pandemic.

In India, Maharashtra had the largest share of the pre-owned car market. Lower prices and easy availability made it a fast-growing industry. Fig. 1 shows the growth of the used car market in India.[2] To serve customers better, major companies and dealers such as Cars24, OLX Autos, and Quikr play an important role. Buying a pre-owned car is a transaction built on trust between dealers and customers.

The results show that information about the real condition of the car is the most important factor influencing customers when purchasing second-hand cars, price is the second most influencing factor, vehicle model and brand are the third and the fourth respectively, after-sales service ranks the least as most influencing factor [3]

The pre-owned car market is growing rapidly, driven by the demand for affordable and reliable vehicles. Traditional ways of buying and selling used cars often take too long, involve little trust, and offer limited information. To solve these problems, this project builds a web application for managing second-hand car transactions.

The platform makes it easy for buyers and sellers to connect. It provides detailed car listings, direct communication, and a simple approval process for new posts. It uses modern technology to stay scalable and includes AI features for smarter search, better recommendations, and improved security. This system aims to make the second-hand car market more convenient and reliable for everyone.

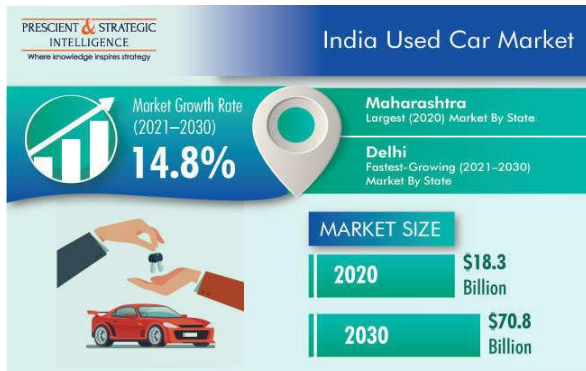


Fig. 1. The growth of the used car market in India

## II. LITERATURE REVIEW

[1] Devavrat Purohit (1992), "Exploring the Relationship Between the Markets for New and Used Durable Goods: The Case of Automobiles. Marketing Science" vol.11 issue (2):154-167

Explored the relationship between primary markets for new cars and secondary markets for used cars and found that the depreciation of used cars is influenced strongly by the types of changes in the new model cars.

[2] Giriprakash. K (2005), "Used Market Expected to Outpace New Car Market", The Hindu Business Line, Vol 12, No13.

Opined that entrepreneurs have a huge oppor [tunity in the pre-owned (used) car market, which, for the first time, is expected to outpace the new car market in the coming years. Giriprakash highlighted that the pre-owned (used) car market in India was poised for significant expansion, potentially outpacing the new car segment for the first time. He observed that entrepreneurs had a huge opportunity to capitalize on this emerging trend

The article portrays Giriprakash as recognizing the shift in consumer preference—where affordability, access to organized pre-owned car showrooms, warranties, and certified inspection services made used cars increasingly attractive to buyers. This suggested a strategic opening for businesses to enter the sector, providing structured and reliable services to match rising consumer expectations

[3] Duvan, B.S. & Aykac, D.S.O., "Used Car Remarketing," International Conference on Social Sciences (ICSS) 2009, September 10-13, 2009, İzmir, Turkey.

Investigated the used car business, particularly in the US, Europe and Turkey, and highlighted that the dealers and manufacturers with successful used car operations make strategic investments in technology to improve customer experiences and build trust that forms the basis of their ability to compete with lower priced independent dealers and private sellers.

[4] Pablo A. Muñoz Gallego Eva Lahuerta Otero, Universidad de Salamanca, "STRATEGIC BEHAVIOUR AND PERFORMANCE OF INTERNET USE BY SECOND-HAND SPANISH CAR DEALERS."

has revealed some very interesting data about the sector. Among buyers, 66.4% turn to the second-hand car market as a first option and consider price to be its main advantage (87.5%), followed by the guarantee (4.61%). 62.7% of buyers in this market acquired the vehicle they were initially looking for, although 14.7% of respondents still maintain that one cannot be sure of the condition the vehicle is in when buying it.

[5] A Study on Consumer Behavior Towards Preowned Cars in India (November 2016) , Dr. Shiva Shankar, Volume 11, Issues 05.

Explores how Indian consumers decide when buying cars, focusing on factors like brand, safety, comfort, fuel efficiency, and quality. This research article examines consumer preferences, purchasing patterns, decision-making factors, and satisfaction levels associated with buying preowned cars in India. The study provides insights into market trends, behavioral influences, and the challenges faced by buyers and sellers in the used vehicle market. It contributes to better understanding consumer behavior in the Indian automotive sector, which is crucial for marketers, dealers, and policymakers.

[6] International Journal of Research Publication and Reviews (May 2025), Vinit Tyagi, Mohd Fazal Khan, Rehman Khan, Volume 06, Issues 05.

Describes digital systems replacing traditional car buying/selling, emphasizing trust, accuracy, and modules like listing, search, and admin management.

[7] International Journal of Research Publication and Reviews (March 2025) Praveen Kumar, Divya, Volume 06, Issues 03.

AI-powered online car marketplaces automate listings,

pricing, search, and fraud checks, making buying and selling used cars faster, safer, and easier

### III. METHODOLOGY

The methodology adopted for this research follows a structured, systematic, and technology-driven approach to design, develop, and evaluate an intelligent online platform for buying and selling second-hand cars. The process integrates modern web technologies, artificial intelligence (AI), and user-centric design principles to ensure transparency, efficiency, and security across the platform.

#### 3.1 Research Design

This study uses a combined descriptive and experimental research design:

Descriptive to understand user needs, existing system limitations, and market trends.

Experimental to design, implement, and test AI-based features such as recommendations, search optimization, and fraud detection.

The system was developed using an iterative development model, enabling continuous refinement based on testing and feedback.

#### 3.2 Requirement Analysis

Requirement analysis was conducted through:

Literature review of existing research on used-car markets and AI platforms. Comparative analysis of existing applications such as OLX Autos, Cars24, and CarDekho.

Stakeholder discussions and user surveys to identify expectations, pain points, and functional needs.

Outputs of this phase include: Functional requirements (e.g., listing, search, authentication) non-functional requirements (e.g., security, scalability) System constraints (technology stack, database structure)

#### 3.3 System Architecture Design

A modular and scalable architecture was designed consisting of:

Front-end Layer (React.js + Shadcn UI) for user interaction.

Back-end Layer (Node.js APIs + Prisma) for business logic.

Database Layer (Supabase/PostgreSQL) for structured storage.

AI Layer for recommendation, intelligent search, and moderation.

Authentication Layer (Clerk Auth) for secure login and user verification.

Communication Layer (WhatsApp Business API) for safe buyer–seller messaging.

The architecture follows client–server model, REST-based communication, and component-based UI design.

#### 3.4 Data Modeling and Dataset Preparation

Data modeling included defining structured tables for: User profiles, Car listings, Car images, Activity logs, AI interaction data.

Datasets for AI components were prepared from: Public car specification datasets, Price trend datasets, Sample user interaction patterns, manually curated training data for moderation

Data cleaning steps included handling missing values, normalization, and feature extraction.

#### 3.5 AI Model Development

Three AI components were implemented:

1. Recommendation Engine Uses content-based and behavior-based filtering.
2. Inputs: User searches, interactions, preferred brands, price ranges.
3. Outputs: Personalized car suggestions.

2. AI-Based Search Optimization Query correction (spell-check, auto-complete). Similarity matching using NLP techniques. Ranking algorithm based on relevance, popularity, and price range.

3. Automated Moderation & Fraud Detection Identifies incomplete, suspicious, or duplicate listings

Flags potential fraud based on behavior patterns. Uses a lightweight classification model trained on listing quality.

#### 3.6 System Development Process

The system was developed using modern web development frameworks:

Front-end Development: React.js for UI components, Shadcn UI for styling, Mobile-first responsive design.

Back-end Development: Node.js for API development, Prisma ORM for database operations, Middleware for authentication and error handling

Database Implementation Supabase for secure user data and real-time updates, PostgreSQL for relational storage, Image storage using cloud buckets

Authentication & Security Clerk Auth for login and session management, Arcjet Communication

Integration WhatsApp Business API for direct buyer-seller communication

### 3.7 Testing and Validation

Multiple testing strategies were adopted:  
 Functional Testing Verified all modules: login, listing, search, filters, admin panel.  
 Integration Testing Ensured smooth communication between front-end, API, and database.  
 AI Model Validation Recommendation accuracy testing, Moderation precision/recall score, Search relevance evaluation

### 3.8 Deployment

The final system was deployed using: Vercel for front-end hosting and CI/CD pipeline.  
 Render / Supabase for backend and database hosting.

### 3.9 Ethical and Security Considerations

User data protection ensured through encryption and secure authentication. No personal information is shared publicly without consent. Fraud detection prevents misuse of platform. AI models trained on safe, verified datasets.

## 3.10 System Design

### 3.10.1 System Architecture

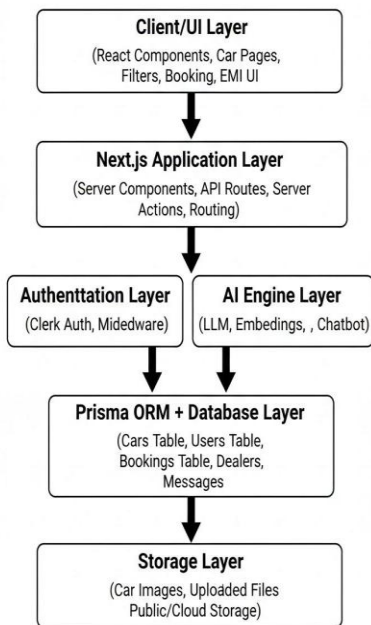


Fig.02. System Architecture.

### 3.10.2 Activity Diagram

#### Car Listing System - Book Test Drive

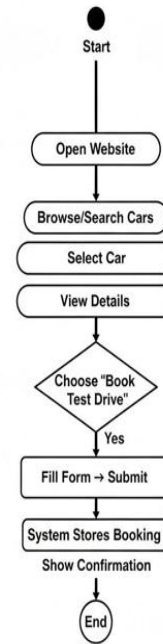


Fig 03. Activity Diagram

### 3.10.3 State Diagram

#### Car Listing System - Car State Diagram

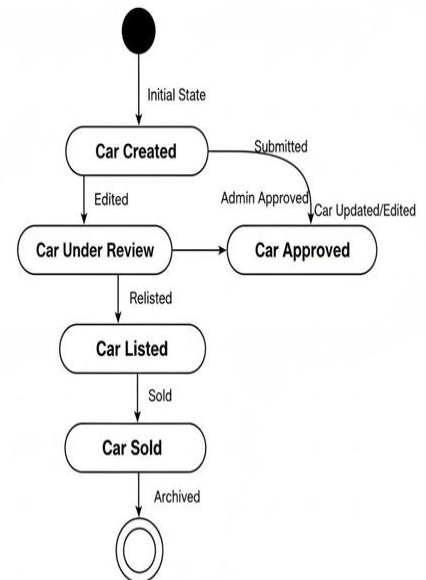


Fig 04. State Diagram

#### IV. RESULTS AND ANALYSIS

##### 4.1 UI Screens Implemented



Fig.05.Landing Page

Description: RK Motors featuring a main heading ("Find your Dream Car with RK Motors"), an AI-powered search bar for vehicle makes and model, and a section for Featured cars.



Fig.06.Smart AI Search

Description: AI-powered car search feature, allowing users to find vehicles by text input (Make, Model) or by

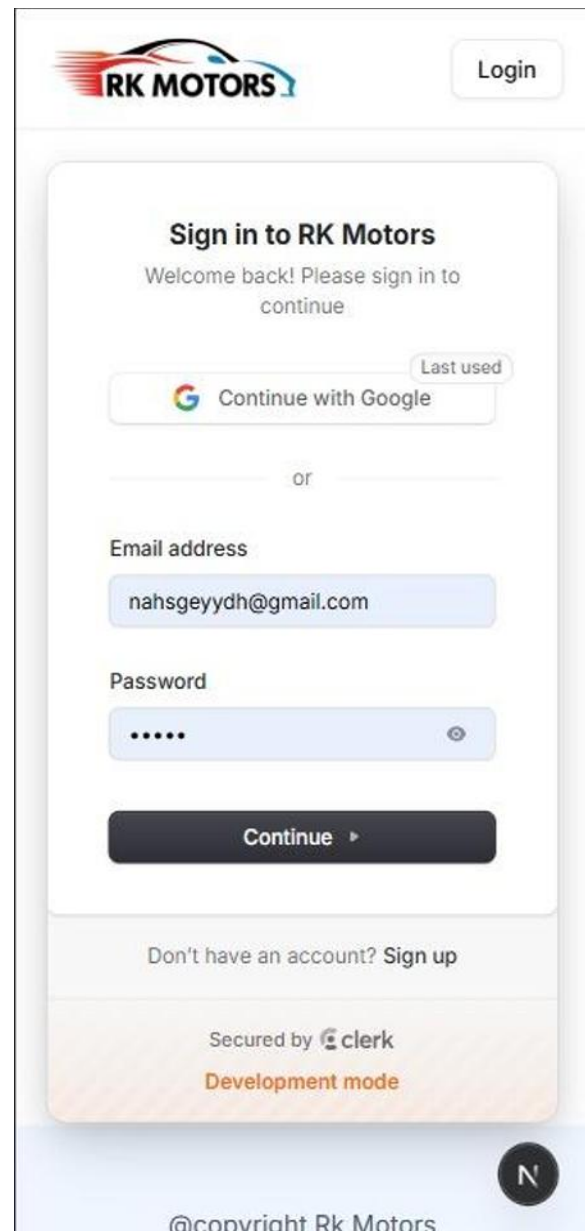


Fig.07.Login / Signup Page

Description: A Sign in to RK Motors page offering authentication via Continue with Google or through Email address and Password fields, with links to Sign up and indicating the sign-in process is Secured by Clerk.

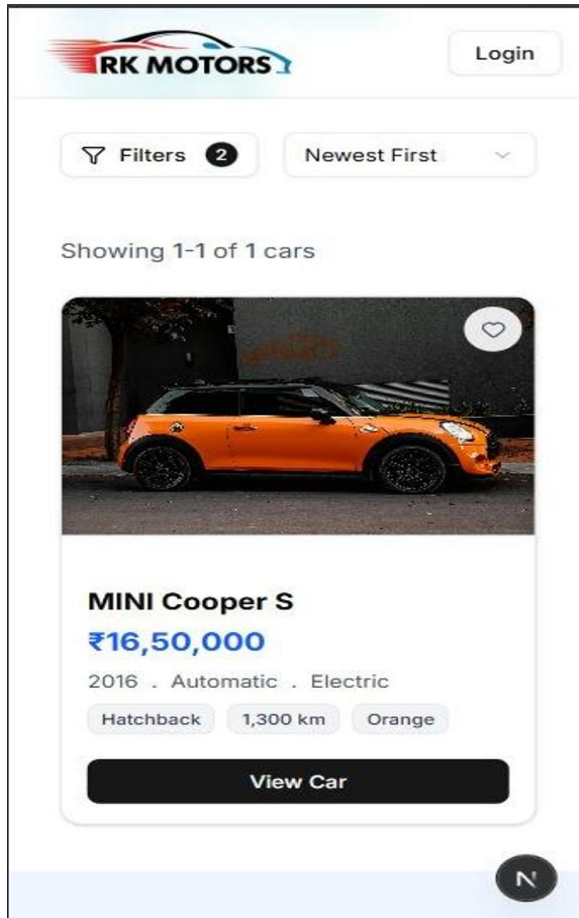


Fig.08.Car List.

Description: A car listing results page displaying a single result card, along with options to Filters and sort by Newest First.

## V. CONCLUSION

Development of the AI CAR MARKET project has successfully built the foundation needed for a modern, intelligent car marketplace. During this phase, the team worked on requirement analysis, literature review, system design, database modeling, and partial development of core modules. This work has created a strong technical base for Phase-II.

A working prototype of key features has been developed, including public pages, car listings, user login, EMI calculator, and test-drive booking. These modules show that it is possible to build a simple, user-friendly car buying and selling platform. Using Clerk for login and Prisma for database management, the system can securely handle user sessions, bookings, and inventory records.

The completion of UI screens and initial backend logic shows the project is moving forward in an organized way. The UML diagrams, WBS, Gantt chart, and system architecture confirm that the project follows a proper software engineering approach. Planning for AI features like smart search, auto-generated descriptions, and chat assistance has already begun, setting the stage for a better user experience in the next phase.

Phase-I has been completed successfully and gives a clear path for Phase-II. In the next phase, features like a full admin dashboard, AI-powered tools, better booking workflows, and full system deployment will be added. With the strong groundwork from Phase-I, the project is ready for a smooth and successful completion.

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