

AutoXchange: Decentralized Website for Car Reselling

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Abstract— When it comes to the car buying and selling market it is constantly developing and increasing at a fast rate. However, the traditional car market system is very centralized, has high transaction costs, less transparency, and lacks proper management of physical records. These parameters play a very important role when it comes to buying or selling. But these flaws in traditional systems can be removed using blockchain technology. Blockchain provides high security, and more transparency, and reduces the cost required for the intermediaries in the process. This paper proposes a decentralized system AutoXchange which helps users to buy or resell their cars without any complications like fraud or mismanagement. The system provides security and transparency between the parties. AutoXchange provides features like vehicle registration, making a vehicle for sale, or in case of a buyer sending a request to the owner as an interest in buying his car, also provides a secure platform to perform transactions of money. As this system is decentralized the intermediary cost are also removed.

Index Terms— Blockchain, Smart contracts, Car-reselling, Peer-to-Peer.

I. INTRODUCTION

In recent years, traditional car systems have faced many challenges ranging from high costs, lack of transparency, fraud, and loss of vehicle or transaction records. But the emergence of blockchain provides an opportunity to overcome these challenges and as well make the car market more secure, trustworthy, and efficient. Blockchain technology provides a secure and transparent way of storing data, and transferring data making it an ideal solution for industries with demand for high securities and trust. The security that the blockchain provides is achieved by its decentralized nature which means that data is stored in a network location rather than a single particular location. This way of data storage makes it difficult for hackers to manipulate or steal data as they will have to deal with various nodes.

The transparency provided by blockchain makes it possible for all the parties to see the same information in real-time and this in turn increases trust and reduces fraud. By leveraging the transparency and security of blockchain AutoXchange provides a platform for the direct transaction and removes the need for intermediaries. This also helps make the platform more trustworthy, efficient, and an effective solution for car reselling.

II. RELATED WORK

The paper [1] proposes a blockchain-based car-sharing platform to increase the transparency and security of car-sharing transactions. The paper provides an overview of the features of blockchain and its benefits in car-sharing. The authors also describe the system architecture, blockchain network, smart contracts, and mobile applications to book or access cars. It also discusses the system evaluation and testing for security, efficiency, and user

satisfaction. In the end, the paper also highlights some of the key challenges and opportunities associated with the system.

The paper [2] proposes an approach to a trustworthy and secure product-service system for vehicles using blockchain. The authors also mention the lack of traditional methods like the lack of transparency and accountability. They have proposed a system where the customers can interact with the service provider and access the services related to the vehicles. They also collect data for analysis of vehicle usage which can help improve the services. The authors also provide a detailed explanation of the work and the integration with different technologies like AI and IoT. They have also discussed the system benefits such as increased customer trust, improved service quality, and the creation of new models for businesses.

The paper [3] discusses how we can make potential use of blockchain technology for vehicles. The paper provides an overview of the Internet of Vehicles and its challenges as well as the benefits of using blockchain for IoV. The paper also describes the challenges and limitations of implementing blockchain for IoV such as scalability and security concerns. The authors also discuss the several applications of blockchain in IoV like communication, data management, and identity management and these can be used to improve security, data integrity, and transparency. In the end, the paper discusses some limitations and future research for IoV in Blockchain.

The paper [4] proposes a blockchain-based system called the Vehichain for storing vehicle records. The authors tell how the traditional system can be inefficient and prone to errors and blockchain can help resolve them. The paper provides an overview of the system architecture which is the network, web-based interface, and mobile applications. The Vehichain system can be used to store and manage vehicle records such as ownership documents, service history, and accident reports. They present a case study to demonstrate the feasibility and effectiveness of Vehichain. They describe the implementation of the system as well as how the real-time data was used for testing and the results showed that Vehichain can be a viable solution.

The paper [5] proposes a blockchain framework for tracking the life of vehicles such as manufacturing, sale, maintenance, and eventual disposal. To track the movement and history of vehicles they incorporate a secure identification mechanism for vehicles. They also describe the architecture, components, and functionalities of the system. They have also evaluated the security and performance of the system which is effective to track the life of vehicles. They have used cloud-based storage for distributed storage.

The paper [6] proposes a novel public blockchain-based system for reporting the history of used motor vehicles called the Carchain. The system uses blockchain to store the entire history of vehicles that includes maintenance, repairs, accidents, and ownership changes, in an immutable and transparent manner. Carchain also has an identity identification mechanism that helps prevent fraud such as odometer tampering and false reporting. This paper also provides a detailed description of the system architecture, data model, and consensus mechanism. They have also evaluated the system in terms of security and results show that Carchain is an effective and secure solution.

The paper [7] proposes a blockchain-based system for car registration which can eliminate issues with the traditional method. The traditional approach is centralized, which can lead to fraud. The authors suggest that storing registration data of vehicles on a decentralized platform can help reduce fraud and also delete intermediaries. The authors have also provided a detailed solution to the system's working which includes automated smart contracts, and the creation of a unique identifier for each car. They have also discussed the potential benefits and challenges of the system. Overall, the paper presents a good solution using blockchain to revolutionize the car registration process.

The Paper [8], is about a survey that is done on existing research work on blockchain applications. The authors examine the potential for cross-industry collaborations and the need for standardized protocols to ensure interoperability and scalability. The authors successfully identified challenges and potential scenarios of blockchain applications in data-driven networks (DDN). Authors had researched challenges in Future DDN like Privacy, Security, and Authentication.

In paper [9], This paper describes the history and evolution of cryptocurrencies and then talks about how blockchain works. The authors have also discussed the integration of blockchain technology with other fields such as AI and IoT. Overall, the paper provides a comprehensive overview of blockchain and cryptocurrencies. They conclude that Blockchain and Bitcoin are correlated to each other.

In paper [10], The authors start by discussing the evolution of blockchain technology from its roots in Bitcoin. The authors review research on the use of blockchain technology in finance, supply chain management, healthcare, and government, highlighting the benefits and challenges in each sector. The authors examine the different models of blockchain governance, such as on-chain and off-chain governance, and their implications for network security and scalability. The authors highlight the need for cross-disciplinary collaboration to fully realize the potential of this technology while acknowledging the challenges that need to be addressed.

In paper [11], Conducted a survey for Web 3.0 and explored DWeb. Authors have done a survey on how Decentralized Storage works. The authors examine research on the advantages and disadvantages of cryptocurrencies. This paper talks about decentralization in blockchain technology. Also, in this paper authors have mentioned Ethereum smart contract. The authors examine research on the benefits of dApps, such as increased security, reduced intermediaries, and potential for peer-to-peer interaction

In this paper [12], the Authors have used Blockchain Tech. for storing data on used cars. They have stored data on damaged parts and other essential things in mobile apps. They have integrated blockchain with the app and API dev. to trace car data. In this study, the Authors found problems in such trading mode and explored a BCT-based solution to tackle this challenge. The App of authors provides users with all data of the vehicle up-to-date without any third person which makes trading much simpler.

In this paper [13], the Authors have studied the consensus protocol of blockchain and used private blockchain for storing records of users' cars and have restricted access to authority for working. Authors have created a system which is totally transparent to all users of websites through their private blockchain. They have successfully implemented this web app with their local startups.

In this paper [14], the Authors have created a platform for the marketplace of second-hand things and they have implemented it through Blockchain and Smart Contracts. They have tested the system in a simulated environment. Authors have added one new feature in this that is verification process which differs from other normal platforms and blockchain decentralized nature makes it more secure and trustworthy.

In this paper [15], the Authors created a blockchain platform with local companies and industries via Ethereum mainnet to track data of cars produced in the company. They considered parameters like manufacturing date, produced date, etc, and deployed to the eth blockchain mainnet. The proposed system performed well in local areas which helped companies to develop trust with customers. The Authors have also found some limitations such as trustworthy data collection and research of the scalability of the application.

In this paper [16], the Authors proposed a used-car deposit platform based on blockchain. The platform enables buyers to place a deposit in escrow that will only be released to the seller after the car has been inspected. They have used private blockchains and smart contracts for logic and transactions. The information on the car is stored on the blockchain, which cannot be changed, providing buyers with accurate information about the car they intend to purchase. The system also focuses on sellers to provide accurate and detailed information about the cars they are selling, making it easier for buyers.

In this paper [17], the Authors have used Both private and public blockchain networks for implementation. They have used MetaMask, Truffle, and Ganache for Public blockchain and Hyperledger for implementation. They followed some steps during development like Data Analysis, Smart Contract, Hyperledger Fabric, Puppet, and contract Deployment. The use of public and private blockchain networks allows for secure and transparent data sharing between different parties in the supply chain. The Use of both types of blockchain for different purposes was the most interesting part of the authors' structure.

In this paper [18], the Authors have integrated agile development principles with blockchain technology. They have created web applications with MERN stack and deployed them on the internet. It has a two-step verification process for checking authority and as it is in the case of vehicle insurance and with the integration of Agile this application performed well among other applications.

In this paper [19], they Conducted a survey to collect data on the challenges facing the current vehicle registration system in Bangladesh and the potential benefits of adopting blockchain technology. Discussed various information related to the car that should be stored on the blockchain. Adoption of blockchain technology can lead to benefits such as increased efficiency, reduced corruption, and improved transparency also cost savings by reducing the need for intermediaries and reducing the time required for the registration process.

In this paper [20], Authors of this study used the IBM Blockchain network. The National Transport Authority, the manufacturer, the vehicle dealer, the insurance company, the bank, and the registrar are all involved. By automating the payment of fees and insurance, the smart contract system also lessens the need for middlemen like banks and insurance firms.

In this paper [21], They have employed the Corda blockchain in this system. It is a private or permissioned network. At the moment of creation, they are storing the data related to the driver's licence. System cuts down on the amount of time needed to obtain a driver's permit and register a vehicle. Because the node that initiates the transaction must disseminate it to all other nodes in the network, not every node in the network receives it as in other frameworks.

In the paper [22], they discussed the various challenges involved in the car resale market and discussed some solutions that can be implemented using blockchain. In the sale or purchase of used automobiles, the manual entry

in the log book or third-party institution involvement is insecure and expensive. Using Blockchain technology, appropriate tracing and tracking of transaction history can be generated.

In the paper [23], In order to gather data from a car data port and store the results on a blockchain, the suggested solution includes connecting an IoT module to the car data port. The Rinkeby Test Network was utilised. Car information is gathered using an OpenXC monitor. The information was downloaded to the local system and kept on the phone. By immediately uploading the data to the cloud server, we can significantly increase the process' security.

In the paper [24], Authors have suggested secure digital product memory records in this article that span the supply chain lifecycle from raw material sources and manufacturing to upkeep and recycling. The method will assist suppliers and manufacturers in defending their brands against bogus goods.

III. SYSTEM ARCHITECTURE

The website will have four types of users, each with their own role and privileges. The first type of user is the super admin, who will be identified by the MetaMask address used to deploy the smart contract. The super admin's role is to manage the website and add other admins, who will be district-wise RTO offices. The super admin will have full control over the website, including the ability to modify the smart contract, manage user roles, and access all user data.

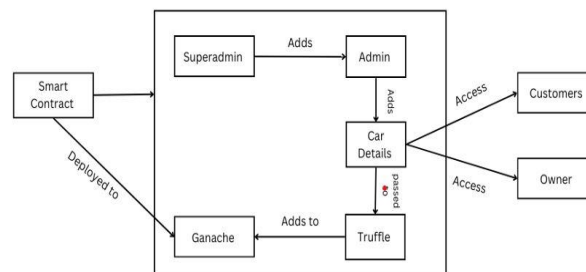


Figure. 1: System Architecture

The second type of user is the admin, who will be identified by their MetaMask address. The admin's role is to add details about cars and their owners. The admin will have access only to the car registrations in their district and will not be able to modify other district's data.

The third type of user is the owner of a car, who will be identified by their MetaMask address. When the owner uses the account with their address, they will be able to see all the cars registered under their name. The owner can make a car available for sale and accept requests from potential buyers. Once the owner accepts a request, the car's ownership will be transferred from the owner to the buyer, without any third-party interference. The car will be removed from the owner's property section and added to the buyer's property section.

The fourth type of user is the buyer, who will be identified by their MetaMask address. The buyer can see all the car details and request to buy a car from the owner. Once the owner accepts the request, the ownership of the car will be transferred to the buyer, without any intermediary involvement. The buyer will be able to view the car in their property section.

It is important to note that the use of blockchain technology ensures the security and immutability of all data stored on the website. The use of MetaMask addresses to identify users ensures that only authorized users can access and modify data. This decentralized approach eliminates the need for third-party intermediaries and ensures transparency and trust in the car registration process.

This project is developed using a combination of cutting-edge technologies and frameworks that were carefully chosen to ensure the efficient and secure functioning of this blockchain-based car registration and reselling website. Some of the key technologies used in our project include:

Blockchain: The backbone of our project is built on blockchain technology, which provides a decentralized and secure way of storing and managing data. The platform used for this purpose was the Ethereum blockchain, a widely-used platform for developing decentralized applications.

MetaMask: MetaMask is a popular web extension that allows users to interact with the Ethereum blockchain, making it easier for them to connect to the network, manage their digital assets, and securely sign transactions.

ReactJS is a popular JavaScript library used for building user interfaces. It was utilized to create the frontend of this website, which provides a smooth and responsive experience for users.

Truffle: Truffle is a development framework that provides a suite of tools for building and deploying smart contracts on the Ethereum blockchain. Here, Truffle is used to write, test, and deploy our smart contracts. Ganache is a personal blockchain for Ethereum development that allows developers to create a local blockchain network for testing and debugging smart contracts. It was used for local development and testing of our smart contracts.

By leveraging these technologies, we were able to create a secure, decentralized, and user-friendly car registration platform that provides greater transparency and security for car owners and buyers.

IV. RESULTS AND DISCUSSION

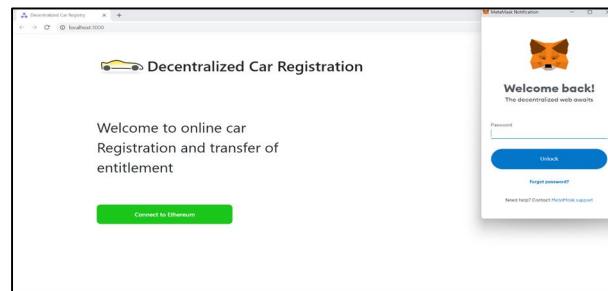


Figure 2: Home Page

In the first page of our website, users are required to connect to MetaMask to access the various features and functionalities of the website. Depending on the account address of the user, the next page that opens will vary. If the user is a super admin, they will be directed to the super admin page. If the user is an admin, they will be directed to the admin page. And if the user is a buyer or an owner, they will be directed to the user page.

This approach ensures that users are presented with a customized experience that meets their specific needs and roles. It allows for greater flexibility and usability, as each user can access the features and functionalities that are relevant to them. Additionally, by using MetaMask to authenticate users, we ensure that the website is secure and protected from unauthorized access.

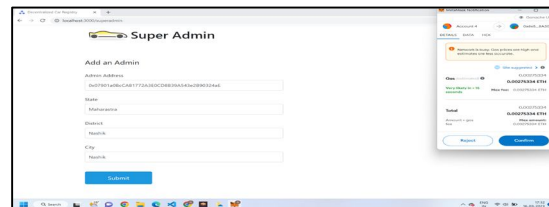


Figure 3: Super Admin dashboard

The super admin dashboard is a critical component of our blockchain-based car registration website. It can only be accessed by the account that was used for deploying the smart contract. Once the account is authenticated, the super admin can access the dashboard and can add new admins to the system.

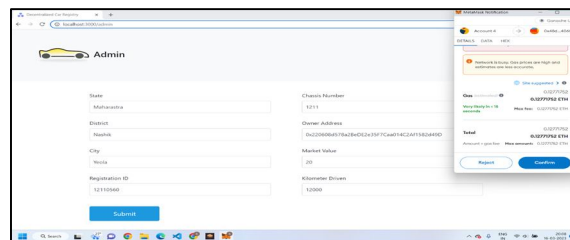


Figure 4: Admin dashboard

The admin dashboard is accessible to admins who have been added to the system by the super admin. Once logged in, the admin can access the dashboard and perform various functions, including entering all the details related to the car. While entering the details, the admin have to add owners MetaMask address because when owner logged

in to the system, they would be able to see the car details added by the admin and verify that all the details are correctly entered in the system.

To add a car to the system, the admin navigates to the "Add Car" section of the dashboard and enters the relevant details, including the name and model of the car, the year it was manufactured and any other relevant information. Additionally, the admin must enter the account address of the owner of the car, which is used to add the car to their property.

The dashboard for buyers and owners is accessible to both buyers and owners, and provides a personalized experience that allows users to manage their profiles, view their registered cars, and handle car ownership transfers. Upon logging in, users are directed to their dashboard where they can modify their profile details, including their personal information and contact details.

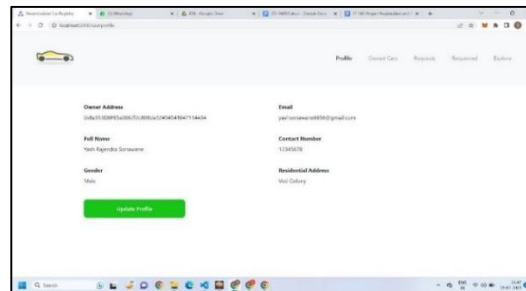


Figure 5: User page

In the property section, users can view all the cars that are registered in their name. In the requests field, they can view any pending ownership transfer requests made by other users who wish to purchase their car. If the user accepts the request, the ownership of the car is transferred to the buyer. In the requested tab, users can view any requests they have made to purchase cars owned by other users.

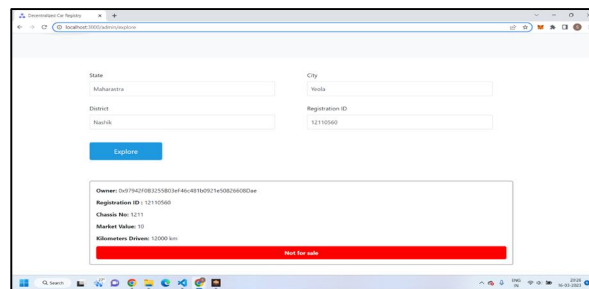


Figure 6: Explore Section

In the explore section, users can browse through the details of other cars registered on the website. If a car is available for sale, users can send a purchase request to the owner. The purchase request is then processed through the blockchain-based smart contract, ensuring a secure and transparent transaction.

V. FUTURE SCOPE

AutoXchange provides a better and more effective solution for the car resale industry but there are some areas that can help make this system more productive. There are several factors that can elevate the performance of AutoXchange like integration with more blockchain networks, expansion to other markets, implementation of AI algorithms, and integration with IoT devices.

VI. CONCLUSION

The AutoXchange platform presents a promising solution for challenges faced by the car resale industry. By using the power of blockchain AutoXchange enables buyers and sellers to have a secure, transparent, cost-effective, and efficient platform for buying and selling their cars. AutoXchange also provides a secure transaction platform between the parties. Through the development it is showcased that the use of blockchain help overcome the challenges of traditional method. We believe that AutoXchange can help change how people sell or buy cars and also increase trust, and efficiency in the marketplace.

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