DriveGo - Blockchain Based Peer To Peer Ride Sharing

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***Abstract*—Blockchain technology has the potential to disrupt many industries, and the ride-sharing industry has no exception. In a traditional ride-sharing platform, the company acts as a middleman between riders and drivers, taking a percentage of each ride as a fee. This model has been successful for companies like Uber and Lyft, but it has also been criticized for its high fees and lack of transparency. The platform would be powered by smart contracts, which are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. They are capable of automatically enforcing the rules and regulations specified in the contract, without the need for intermediaries. In a ride-sharing application, smart contracts can be used to automate the payment process between drivers and passengers. Using smart contracts, the ride-sharing platform can facilitate the interaction between riders and drivers without the need for a central authority.In addition to reducing fees, a blockchain-based ride-sharing platform can also increase security and privacy for both riders and drivers. All transactions on the platform would be recorded on the blockchain, which is a decentralized and secure ledger.Another benefit of this platform is greater transparency.A peer-to-peer ride-sharing platform based on blockchain technology has the potential to disrupt the traditional ride-sharing industry by offering reduced fees, increased security and privacy, and greater transparency.**

***Index Terms*—Decentralized Autonomous Organizations, Distributed Denial of Service, Ethereum Virtual Machine, Interplanetary File System, Ride-sharing services, Blockchain, Smart Contracts**

I. Introduction

The domain area of blockchain technology to create a decentralized, peer-to-peer platform for connecting riders and drivers. In this domain area, blockchain technology is used to facilitate transactions between riders and drivers in a secure, transparent, and decentralized manner. Blockchain technology has the potential to revolutionize the ride-sharing industry by offering a decentralized, secure, and transparent platform for facilitating interactions between riders and drivers. A blockchain-based peer-to-peer ride-sharing platform would operate without a central authority, relying instead on smart contracts and the decentralized nature of blockchain technology to facilitate rides and payments.One of the main advantages of a blockchain-based ride-sharing platform is the potential for reduced fees. Traditional ride-sharing platforms, such as Uber and Lyft, act as intermediaries between riders and drivers, taking a percentage of each ride as a fee.

A blockchain-based platform, on the other hand, could operate with significantly lower fees by eliminating the need for a central organization. Smart contracts can be used to facilitate rides and payments directly between riders and drivers, reducing the need for a central authority to process transactions.In addition to reduced fees, a blockchain-based ride-sharing platform can also offer increased security and privacy for both riders and drivers. All transactions on the platform would be recorded on the blockchain, which is a decentralized and secure ledger. This means that sensitive personal and financial information would not be stored in a central database, which could be vulnerable to hacking.Another benefit of a blockchain-based ride-sharing platform is greater transparency. All transactions on the platform would be recorded on the blockchain, which is a public ledger. This means that the platform would be transparent, with all transactions and fees being visible to all users. This level of transparency can help to build trust between riders and drivers, as it allows both parties to see exactly how much they are paying and receiving.
A peer-to-peer ride-sharing platform based on blockchain technology has the potential to disrupt the traditional ride-sharing industry by offering reduced fees, increased security and privacy, and greater transparency. Such a platform could

provide a more attractive alternative to traditional ride-sharing platforms for both riders and drivers.

II. Objective and Scope

The main objective of a blockchain-based peer-to-peer ride-sharing platform is to provide a decentralized, secure, and transparent alternative to traditional ride-sharing platforms such as Uber and Lyft. By leveraging the capabilities of blockchain technology, the platform aims to offer a number of benefits to both riders and drivers, including reduced fees, increased security and privacy, and greater transparency.One of the key advantages of a blockchain-based ride-sharing platform is the potential for reduced fees. Traditional ride-sharing platforms act as intermediaries between riders and drivers, facilitating the connection between the two parties and taking a percentage of each ride as a fee. This model has been successful for ride-sharing companies, but it has also been criticized for its high fees. A blockchain-based platform, on the other hand, could operate with significantly lower fees by eliminating the need for a central organization. Smart contracts can be used to facilitate rides and payments directly between riders and drivers, reducing the need for a central authority to process transactions.

In addition to reducing fees, a blockchain-based ride-sharing platform can also increase security and privacy for both riders and drivers. All transactions on the platform would be recorded on the blockchain, which is a decentralized and secure ledger. This means that sensitive personal and financial information would not be stored in a central database, which could be vulnerable to hacking.Another benefit of a blockchain-based ride-sharing platform is greater transparency. All transactions on the platform would be recorded on the blockchain, which is a public ledger. This means that the platform would be transparent, with all transactions and fees being visible to all users. This level of transparency can help to build trust between riders and drivers, as it allows both parties to see exactly how much they are paying and receiving.

Overall, the main objective of a blockchain-based peer-to-peer ride-sharing platform is to provide a decentralized, secure, and transparent alternative to traditional ride-sharing platforms. By offering reduced fees, increased security and privacy, and greater transparency, the platform aims to provide a more attractive option for both riders and drivers.

III. Literature Survey

A. Blockchain Enabled Peer To Peer Ride Sharing

The use of blockchain technology in the ride-sharing industry is a relatively new concept, and as such, there is a limited amount of published literature on the subject. However, a number of studies and articles have explored the potential benefits and challenges of using blockchain technology in the ride-sharing industry. The journal "Transportation Research Part A: Policy and Practice" analyzed the potential of using blockchain technology in the ride-sharing industry and identified several benefits. The study found that a blockchain-based ride-sharing platform could reduce transaction fees, increase security and privacy, and offer greater transparency compared to traditional ride-sharing platforms. The study also highlighted the potential for blockchain technology to enable the development of new business models in the ride-sharing industry, such as the use of smart contracts to facilitate the exchange of services between riders and drivers. The journal "Transportation Research Part C: Emerging Technologies" examined the use of blockchain technology in the sharing economy, including ride-sharing. The study found that blockchain technology has the potential to enable the development of decentralized platforms that can operate without a central authority, reducing the need for intermediaries and associated fees. The study also identified a number of challenges to the adoption of blockchain technology in the ride-sharing industry, including regulatory hurdles and the need for standardized protocols. Several articles have also explored the potential of using blockchain technology in the ride-sharing industry. An article published in Forbes argued that blockchain technology could enable the development of more transparent and secure ride-sharing platforms, potentially leading to increased trust between riders and drivers. Another article published in Venture Beat argued that blockchain technology could enable the creation of decentralized ride-sharing platforms that could operate without the need for a central authority.[1]

B. Block V: A Blockchain Enabled Peer-Peer Ride Sharing Service

Ride sharing is a centralized trust based system where users trust the service providers for the ride set up, tracking, cancellation, fare calculation etc. Any malicious activity in the centralized server based system or driver or rider destroys the fairness involved in the ride and causes inconvenience to the parties. After the completion of the ride, the drivers are rated by the riders. There are possibilities that, a malicious rider can claim the refund with a fake complain and give the driver poor rating. Current system is not capable of deciding the correctness of the objections raised by either parties and provides a biased outcome of each objections as per the centralized company's marketing strategies[2].

A blockchain enabled solution to ensure the fairness of the ride. The creation, completion, dissatisfaction or abortion of any ride will be written in the blockchain ledger, hence will be available to all participants in the peer to peer network. Simultaneously ensures the fairness in maintenance of the inbuilt reputation system. They have implemented a prototype in Ethereum private network and KOVAN test network and the analysis is included . The main advantages are Enhanced security, Transaction transparency, Network data security. And it maintain the transparency in the ride and overall system stable with respect to the increasing number of participants.

C. Enhancing Blockchain-Based Ride-Sharing Services Using IPFS

Ride-sharing services (RSSs) using centralization methods experience various challenges like single point-of-failure, privacy violation, lack of security, and distributed denial

of services (DDoS) attack, etc. So, blockchain-based RSSs mitigate such problems through decentralization. Relying on the blockchain only leads to problems such as increase in application response time, chain size, and a high computational cost due to the increase in data storage in blockchain and thus increase the service costs to end users. Additionally, the blockchain lacks to scalability of data because of the inability to store large-sized data and accommodate the grows of ride-sharing data. To overcome these problems, a novel decentralized ride-sharing system that exploits blockchain and Interplanetary File System (IPFS) is proposed. The goal of the proposed system is to move all ride-sharing data outside the blockchain and replacing it with a small hash[3].
The blockchain manages the application state and users. In addition, it automates processes through smart contracts. While the IPFS stores data for blockchain in immutable and integral way. Wherefore, the proposed ride-sharing system integrates IPFS with blockchain for RSSs to retain the provided assurance by the blockchain and provide efficient service to end users. Experimental results proved the applicability and efficiency of RSS based on blockchain and IPFS which provides efficient storage of ride-sharing data, immutable history, and generally better efficiency in a decentralized manner. The advantages are make transactions secure and trustworthy. Ensure rideshare data security and privacy from data hackers.

D. SmartCon: A Blockchain-Based Framework for Smart Contracts and Transaction Management

A smart contract is known to be useful for automating business processes triggered by specific events caused by IoT sensors, data feeds, or other applications. A blockchain-based smart contract management system is an innovative technology that is foreseen to automate future business-to-business (B2B) processes. Blockchain is well-known to play a central role in business process re-engineering by optimizing business workflow operations, especially in multi-party arrangements. The paper presents a multi-organizational smart contract management system in which a user can create, deploy, and execute smart contracts. It is a unified architecture supporting DAO (Decentralized Autonomous Organizations) and organizational level blockchain-based smart contract execution. There are two types of separate blockchains utilized in the proposed framework, i.e., SBlockchain and TBlockchain. SBlockchain is used to store smart contracts, whereas all the data generated by the smart contracts is stored inside the TBlockchain[4].

As a decentralized and distributed ledger, blockchain is already revolutionizing the world with its secure by design data storage mechanism in which transactions are registered with a hash called an immutable cryptographic signature. It has developed a novel transaction/data storage system that is more transparent, safe, allows business with untrustworthy parties, and reduces fraud. It suggests that if one block of the chain is altered, it would be automatically evident that the blockchain had been corrupted. If hackers wanted to attack a blockchain system, it will have to modify every block in the chain through the network's distributed iterations.

The Decentralised Autonomous Organization (DAO) working through smart contracts, is one of the most incredible ideas to apply blockchain technology effectively. By encoding its financial transactions and laws on a blockchain, it eliminates the need for a central governing body. A smart contract is an auto-executable code executed when certain pre-defined conditions are met. The terms of an agreement are turned into auto-executable lines of code to implement the automated execution of contract terms between untrustworthy parties. Smart contracts are used to automate business-to-business (B2B) activities and can be triggered by IoT computers, data streams, or other programs that create particular occurrences.

E. Secure Ride-Sharing Services Based on a Consortium Blockchain

Due to poor traffic conditions and the high costs of traveling by private cars, ride sharing has become a popular means to trip. In view of the security threats and centralization existing in the current ride-sharing service, It propose a secure ride-sharing scheme based on a consortium blockchain, which can guarantee the security, confidentiality, and privacy of data interaction via attribute-based proxy re-encryption algorithm. First, the passenger presets the access structure and encrypts the data using attribute-based encryption. The ciphertext is then sent to the roadside unit (RSU), which broadcasts the carpooling request to the driver[5].

After receiving the request, the driver sends the itinerary attribute to RSU, which performs carpool matching according to received ciphertext and itinerary attributes, then the ciphertext is re-encrypted and sent to the matched driver. Second, the master node uses an improved Delegated Proof-of-Stake (DPoS) consensus to verify the carpool record, which is stored on the blockchain after the verification is successful. In case of disputes, block data can be utilized for traceability. Third, drivers and passengers use the credibility mechanism to score each other after ride sharing. In addition, trusted authority can reveal the real identity of malicious users. Finally, IT conduct a security analysis and performance evaluation for proposed scheme. The results manifest that the scheme not only meets the security and privacy requirements of ride-sharing services but also effectively resists potential security risks. Therefore, the scheme is feasible, efficient, and suitable for ride-sharing services.

F. Smart Contracts for supply chain applicable to Smart Cities daily operations

In Smart Cities, an era of technology and on- demand offerings, being able to have a signed contract in the least amount of time possible can significantly benefit business operations. This focuses on the Document of Understanding (DOU) contract oriented to supply chain operations, which forms the basis for the relationship between a consumer

service and the provider of that service. The sign off of this process is currently too long; opening an opportunity to apply Blockchain as a solution. It uses local resources, applying design thinking and agile practices to create a local Blockchain Ledger. Consequently, a proof of concept Blockchain demo, which holds the complete detailed history of the agreement, with immutable transactions and transparency, adding security and privacy of the participant's information. The innovative contribution is the application of Blockchain to the business activities, improving business operations, and giving us a real-time view of all the information. As a result, when combining the work methods with the latest technology, this have all-around improvements in business operations. Now with a successful trial run of the application,it can confidently apply smart contracts in day to day activities in a Smart City; it can be replicated in other areas that manage sensitive information and financial reports[6].

G. PETCHAIN: A BLOCKCHAIN-BASED PRIVACY ENHANCING TECHNOLOGY

The use of smart devices and sensors, enormous amounts of data are being generated continuously. The data is commonly stored in centralized cloud platforms and consumed by different services. The data is indeed a valuable resource for many service providers who provide advanced features and utilities to their subscribers. However, user data include personal and sensitive information which can be misused in many ways. There is no way for a subscriber to confirm that their service provider is compliant with data privacy regulations. The existing privacy enhancing techniques such as anonymization and differential privacy substantially reduce data usability while ensuring privacy. Therefore, it remains essential to provide a feasible solution that allows service providers to take advantage of user data while guaranteeing their privacy. In this paper, we present PETchain: a novel privacy enhancing technology using blockchain and smartcontract. In PETchain, data is stored securely in a distributed manner and processed in a user-selected trusted execution environment. Users deploy the smartcontract that allows them to decide whether and how their data can be exploited by service providers. The feasibility and performance of PETchain are presented by implementing PETchain over a consortium Ethereum blockchain[7].

H. PERFORMANCE ANALYSIS OF ETHEREUM Transactions In Private Blockchain

Ethereum, the wellknown blockchain platform, does not have any limit for block size, unlike Bitcoin. However, there are other obstacles in processing unlimited transactions per second. Ethereum blockchain code runs by different clients, and they run on different speed and present the different level of performance. The paper studies Ethereum transactions and it analyzes two most popular Ethereum clients, Geth and Parity, on a private blockchain to obtain the better understanding of the effect of different clients on Ethereum performance. The results show that the transactions are 89.8 percent on average faster in Parity client in comparison with Geth client, using the same system configuration[8].

A blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties. Each transaction in the public ledger is verified by consensus of a majority of the participants in the system. Once entered, information can never be erased. The blockchain contains a certain and verifiable record of every single transaction ever made.Blockchain is a structure composed of blocks each of which are recorded transaction. The box consists of a header and the transaction list. Title block includes a hash, hash of the previous block, the transaction. Transaction, inter alia, contains an attribute within the input link to the transaction with the previous state data. As a result of the hash is irreversible, there is no algorithm for obtaining the desired result, in addition to random search. The node sends the resulting unit is connected to other nodes that test unit. If there are no errors, then the block is considered to be added to the chain, and the next block should include a hash of it.

I. A Light Blockchain-Powered Privacy-Preserving Organization Scheme for Ride Sharing Services

Ride-sharing is a service that enables drivers to share their trips with other riders, contributing to improving traffic congestion as well as assist in reducing Carbon Dioxide (CO2) emission and fuel consumption. It has come to the forefront in recent years as a Green service in large cities. However, the majority of existing ride-sharing services rely on a central third party, which makes them subject to a single point of failure and privacy disclosure concerns by both internal and external attackers. Moreover, they are vulnerable to distributed denial of service (DDoS) and Sybil attacks due to malicious users. There is also high service fees paid to the ride-sharing service provider. In the paper, we propose to decentralize ride-sharing services based on a public Blockchain. The scheme enables drivers to propose ride-sharing services without relying on a trusted third party. To preserve location privacy, riders send cloaked ride requests to hide their exact pick-up/drop-off locations, and departure/arrival dates. Then, by using an off-line matching technique, drivers sends their offers encrypted to ensure data confidentiality. Upon receiving the ride-offers, the rider can find a ride match using some heuristics as well as the bid price included in the offer. To preserve anonymity, riders/drivers use pseudonyms that change per trip to ensure unlinkabilty. We envision the application of this technology in Green Internet of Things connected smart cities, where ride sharing services are common. Finally, implement the scheme and deploy it in a test net of Ethereum. The experimental results show the applicability of the protocol[9].

J. An Systematic Study on Blockchain Transaction Databases Storage and Optimization

The peer-to-peer networks, blockchain transaction systems require each node to store a complete collection of Unspent Transaction Output (UTXO) in the in-memory transaction

database, so as to ensure new transactions can by verified independently and realize the system decentralization. However, the size of blockchain transaction database is growing rapidly, in order to meet the requirements of transaction verification and system decentralization, the nodes need to constantly expand the memory capacity to adapt to the growing database, which leads to the in-memory storage problem of transaction database. In the paper analyzes blockchain transaction databases and proposes a storage optimization scheme. The scheme uses the expiration identification method based on Least Recently Used (LRU) algorithm to separate the blockchain addresses into cold and hot zones. It can achieve storage optimization by moving special UTXOs away from the in-memory database, and it can achieve storage optimization without damaging data integrity and security. We present the theoretical analysis for the optimization method to validate the effectiveness. Designed extensive experiments show the proposed method outperforms the current mechanism for the blockchain transaction databases[10].

IV. EXISTING SOLUTIONS

These are some sources that provide an online platform for implementing a blockchain-based peer-to-peer ride-sharing platform:

1) A2B Taxi: A2B Taxi is a decentralized ride-sharing platform that uses blockchain technology to facilitate rides and payments between riders and drivers. [35] The platform allows drivers to set their own prices and retain a larger percentage of the fare compared to traditional ride-sharing platforms.
2) Arcade City: Arcade City is a decentralized ride-sharing platform that uses blockchain technology to facilitate rides and payments between riders and drivers. The platform allows drivers to set their own prices and retain a larger percentage of the fare compared to traditional ride-sharing platforms.
3) La'Zooz: La'Zooz is a decentralized ride-sharing platform that uses blockchain technology to facilitate rides and payments between riders and drivers. The platform rewards drivers with tokens for providing rides, which can be used to pay for services on the platform or traded on exchanges.
4) Chasyr: Chasyr is a decentralized ride-sharing platform that uses blockchain technology to facilitate rides and payments between riders and drivers. [37] The platform allows drivers to set their own prices and offers a loyalty program for frequent riders.

V. PROPOSED SYSTEM

A peer-to-peer ride sharing service enables customers to discover rides extemporaneously. Peer-to-peer transport services allow drivers (peers) to offer on-demand transport to those in need of a ride using their private vehicles. Peer-to- peer networks cope with a variety of hosts, for instance private cars and public transportation vehicles. These differing actions have an impact on the agreements and, as a result, the travel options. The solution provides the peers to choose a basic smart contract template initially and agree on the transaction's specifics. Individuals will no longer require a third party to complete the transaction since the Smart Contract template will ensure that either both sides of the transaction are fulfilled,or none at all.

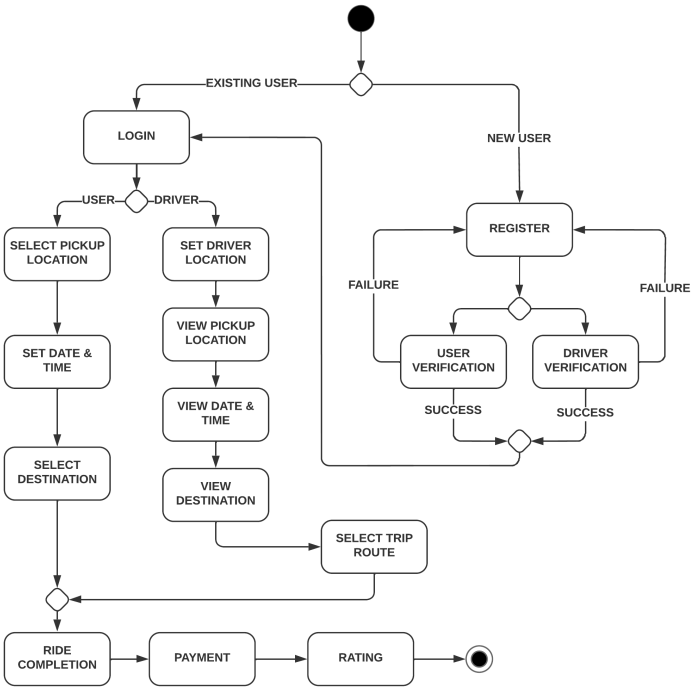

Fig. 1. Activity diagram

The system could use smart contracts to automate the execution of certain actions and processes, such as the acceptance and completion of rides, the payment of fees and fares, and the resolution of disputes.

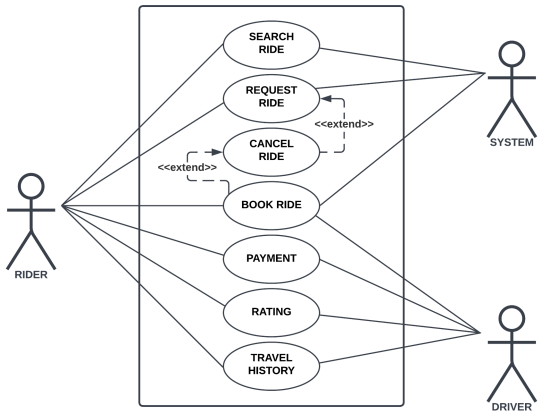

Fig. 2. Use Case Diagram

The system would need to have a mechanism for verifying the identities of users and drivers, and building a reputation

system to encourage trust and good behavior on the platform. Apart from the environmental advantages due to the decrease in number of vehicles and thus amount of fuel required, such a system also opens a whole new world of economic opportunities for car owners.

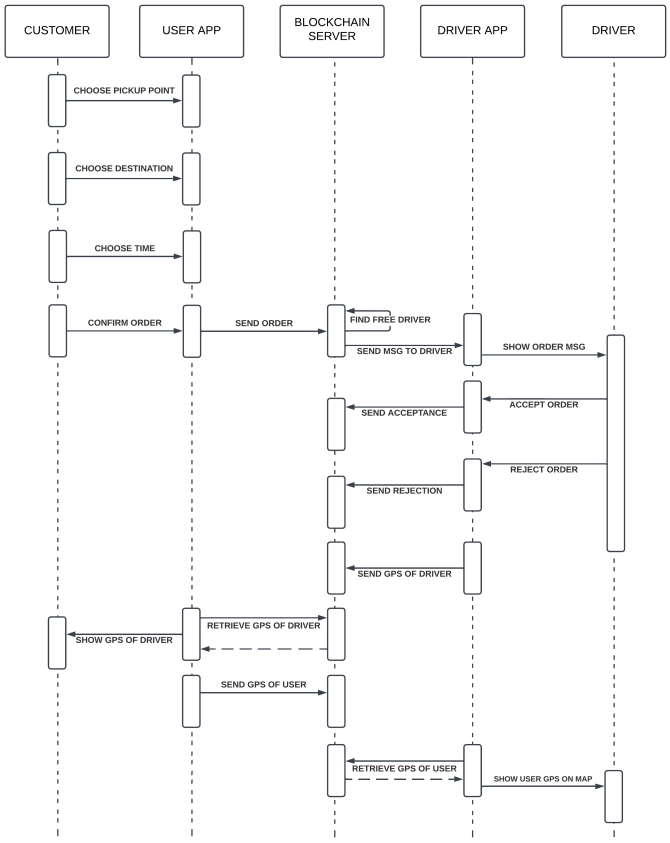

Fig. 3. Sequence Diagram

VI. Conclusion

A blockchain-based peer-to-peer ride sharing platform has the potential to revolutionize the traditional ride sharing industry by allowing users to interact directly with each other and with the platform, without the need for a central authority. This could lead to a number of benefits and changes in the industry.Another potential benefit is more options and potentially lower prices for riders. With a peer-to-peer platform, riders can choose from a wider range of vehicles and drivers, and negotiate the terms of the ride directly. This can result in a more personalized and flexible experience for riders. In addition, the competition among drivers could lead to lower prices for riders.However, there are also challenges and limitations to consider when it comes to a blockchain-based peer-to-peer ride sharing platform. One challenge is ensuring the security and integrity of the blockchain. As with any blockchain application, it is important to prevent fraud and tampering, and to ensure that the platform is resistant to cyber attacks. This requires robust security measures and protocols, as well as continuous monitoring and updates.Additionally, the adoption and use of a blockchain-based peer-to-peer ride sharing platform would depend on a number of factors, including the availability of users and drivers, the regulatory environment, and the overall user experience. In order for such a platform to succeed, it would need to attract and retain a sufficient number of users and drivers, and offer a seamless and convenient service. It would also need to comply with relevant regulations and laws, and address any concerns or objections from +policymakers and other stakeholders.The peer-to-peer ride sharing platform has the potential to bring significant changes and benefits to the ride sharing industry, but it is not without risks and challenges.

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