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Transforming the Rental Market with Smart and Sustainable Solutions

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Abstract

Rent Bazar is an intuitive Flutter-based application that facilitates the renting of goods and services by connecting individuals who need items with those willing to rent out their possessions. The app provides a seamless platform where users can browse, search, and rent various products, including furniture, electronics, vehicles, real estate, and more. Additionally, Rent Bazar allows users to list their items for rent, maximizing the utility of their unused belongings. With secure payment options, a user-friendly interface, and location-based search features, Rent Bazar simplifies the process of renting, making it convenient, cost-effective, and environmentally sustainable. By promoting the reuse of goods, Rent Bazar fosters a community-driven sharing economy, reducing waste and encouraging efficient resource utilization.

Introduction

The rental market, encompassing housing, vehicles, goods, and services, is undergoing a significant transformation driven by technological advancements and evolving societal priorities. Traditional rental models often involve cumbersome processes, limited transparency, and inefficiencies that impact both renters and landlords [1]. Furthermore, the environmental impact of traditional consumption patterns, including the production and disposal of goods, is increasingly concerning. This research explores the potential of smart and sustainable solutions to revolutionize the rental market, addressing its existing challenges and promoting a more

equitable and environmentally responsible approach [2].

The rise of the sharing economy and the proliferation of online platforms have already begun to disrupt traditional rental practices. However, opportunities remain to leverage emerging technologies, such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain, to create more efficient, transparent, and sustainable rental ecosystems. This includes developing innovative solutions for areas such as:

- Improved matching algorithms: AI-powered systems can optimize the matching of renters and landlords based on diverse criteria, leading to better outcomes for both parties.
- Enhanced

security and trust: Blockchain technology can enhance security and transparency in rental agreements, reducing fraud and disputes.

Streamlined processes: Smart contracts and automated systems can streamline administrative tasks, reducing paperwork and improving efficiency. Sustainable consumption: Promoting the rental of underutilized assets contributes to a circular economy, reducing waste and environmental impact [3].

This paper will examine the current state of the rental market, identifying key challenges and opportunities. We will then analyze existing and emerging technologies that can contribute to the development of smart and sustainable rental solutions. Finally, we will discuss the potential societal, economic, and environmental benefits of these solutions, along with the challenges and considerations for their successful implementation. The goal is to provide a comprehensive overview of how technology can be harnessed to create a more efficient, equitable, and environmentally responsible rental market for the future [4].

Literature survey

The literature survey provides a comprehensive overview of existing theories and research related to online rental systems, highlighting the need for clarity and understanding in this domain. Several studies have focused on different aspects of online rental applications, including housing, cars, and various items, showcasing the diversity of this research area.

[1] Online Rental Housing System presents a dedicated platform for renting houses, focusing on user convenience and efficiency in the rental process.

The system utilizes a web-based interface for user interaction, along with a database management system to handle property listings and user data.

The application stands out by providing a streamlined process that connects property owners directly with tenants, minimizing the need for intermediaries and enhancing user experience through a simplified interface. This direct interaction fosters transparency and trust in the rental process.

[2] This research introduces a car rental application designed to facilitate the renting of vehicles with a focus on user-friendliness.

The application employs HTML, CSS, and JavaScript for the frontend, while PHP is used for backend development, ensuring a responsive and interactive user experience. The application's unique feature is its efficient

booking system that simplifies the rental process, allowing users to quickly find and reserve cars. The emphasis on a user-friendly interface enhances customer satisfaction and engagement.

[3] This paper discusses an online rental system that encompasses a wide range of rental items, including cars, bikes, and furniture. The system is built using frameworks like Laravel and Django for backend development, with MySQL as the database management system, ensuring robust performance and scalability. Its comprehensive approach to various rental categories makes it a versatile platform, catering to diverse user needs. The integration of multiple item types under one platform enhances convenience for users looking for various rental options.

[4] The literature highlights limitations in existing platforms like Housing.com and 99acres, which often rely on offline documentation and intermediaries.

While specific technologies for these platforms are not detailed, they typically involve traditional web technologies without full automation.

The proposed systems aim to reduce dependency on intermediaries, offering a more transparent and efficient rental process through digital agreements and online payments. This focus on automation and user empowerment is a significant advancement over existing solutions.

The House Rental System emphasizes digitizing and streamlining the rental process, supporting various property types. It incorporates advanced technologies such as AI for predictive analytics and blockchain for secure transactions, alongside SSL for security and payment gateways like Razorpay for seamless transactions.

The integration of AI and blockchain positions the system for future scalability and security, making it a forward-thinking solution in the rental market. This innovative approach enhances trust and efficiency in transactions, setting a new standard for rental platforms.

Existing Systems

Housing.com primarily relies on traditional offline documentation, which complicates the rental process for users. This often leads to inefficiencies and delays in transactions, making the experience cumbersome for both tenants and landlords. The lack of a streamlined digital process can deter users from fully engaging with the platform.

[1]. The platform lacks real-time communication features, hindering timely interactions between

potential renters and property owners. This limitation can result in missed opportunities for both parties, as users may not receive prompt updates on property availability or rental agreements.

Housing.com does not cater to short-term rentals or specific accommodations, such as bachelor housing. This gap in the market restricts options for users seeking diverse rental solutions, indicating a need for more versatile platforms that can accommodate various rental needs. The reliance on brokers in Housing.com adds extra costs and barriers for both property owners and tenants. This intermediary model can create friction in the rental process, making it less appealing for users who prefer direct interactions without additional fees. 99acres also suffers from a lack of digital agreement processing or e-signatures, leading to cumbersome paperwork and a lack of transparency in rental agreements. This absence of digital solutions can deter users from engaging with the platform, as they may prefer more streamlined and secure methods of handling agreements [6].

The platform often experiences overcrowding issues, resulting in a time-consuming experience for users who must sift through numerous listings without effective filtering options. This can lead to frustration and a diminished user experience, as potential renters struggle to find suitable properties. 99acres lacks comprehensive functionalities, leading to a fragmented user experience where users must navigate multiple platforms to meet their rental needs. This fragmentation can create confusion and inefficiency, highlighting the need for more integrated solutions in the rental market [6].

Traditional vehicle rental systems often rely on manual recordkeeping, which can lead to inefficiencies such as overbooking and mismanagement of vehicle availability. This reliance on outdated methods creates significant challenges in ensuring real-time availability for customers. The lack of automated processes in existing systems results in a cumbersome user experience. Customers often face difficulties in booking vehicles due to the absence of a user-friendly interface, which can deter potential renters from using the platform. Security concerns are prevalent in traditional rental systems, as they often utilize unsecured payment methods. This vulnerability can lead to fraudulent activities, undermining user trust and safety in the rental process. Existing platforms typically do not leverage modern technologies such as cloud-based infrastructure or machine learning for pricing models. This absence of innovation limits the efficiency and

scalability of the rental process, making it less competitive in the market.

Many traditional systems lack comprehensive data management solutions, which can hinder effective tracking of user interactions and transactions. This deficiency can lead to poor customer service and a lack of personalized experiences for users. The reliance on brokers in traditional vehicle rental systems adds unnecessary costs and complexity to the rental process. This intermediary model can create friction, making it less appealing for users who prefer direct interactions without additional fees. Overall, the existing vehicle rental systems face significant challenges that necessitate a modern, automated approach to enhance user experience, security, and operational efficiency [8][9].

I. Proposed Work

Many people tend to buy products only to discard them shortly afterward, resulting in excessive waste and depletion of resources. This cycle of overconsumption not only harms the environment but also leads to unnecessary expenses. As awareness of these issues increases, more individuals are looking for sustainable alternatives that encourage reuse and minimize waste. Renting items allows people to access them temporarily without the burden of ownership, which helps reduce clutter and prevents needless production. This practice extends the lifespan of products, ensuring that resources are used more efficiently. By promoting responsible consumption, renting supports a more sustainable and eco-friendly lifestyle while also being a cost-effective option for users.

Methodology

Rent Bazar is developed on a scalable and secure Flutter platform, supported by a well-architected backend infrastructure. This section offers a detailed overview of the technologies and tools used for the development, deployment, and management of the application, ensuring its reliability, performance, and security.

• **Architecture (Block Diagram) :**

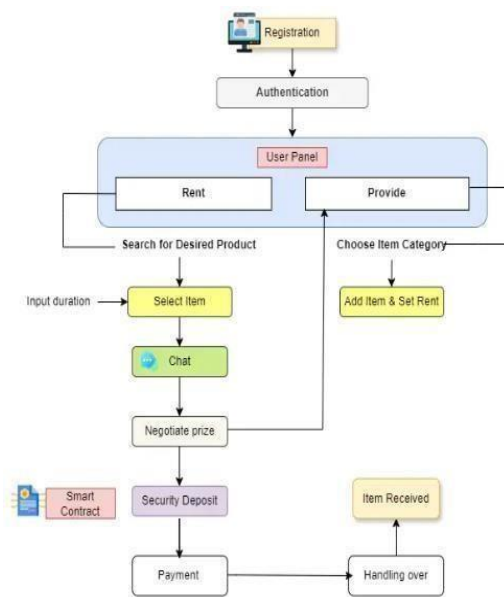


Fig 1: Architecture Diagram

• **Key Features :**

1. **Intuitive Interface :** The app provides a simple, easy-to-use interface, allowing users to browse and manage rentals effortlessly. Clear navigation ensures a seamless experience for both renters and owners.
2. **Secure Transactions :** Multiple payment gateways ensure safe and encrypted transactions. Fraud prevention measures protect users, making the platform a reliable rental marketplace.
3. **Location-Based Search :** Users can find rental items nearby using geolocation services. This feature reduces travel time and delivery costs, ensuring quick access to needed items.
4. **Effortless Listing :** Renters can upload images, add descriptions, and set rental terms with ease. The simple listing process helps owners quickly monetize unused items.
5. **Diverse Categories :** The platform supports various rental categories, including electronics, vehicles, furniture, and real estate. This wide selection caters to different rental needs.

Requirements

1. Application Development:

The development of Rent Bazar was carried out using Android Studio, the official Integrated Development Environment (IDE) for Flutter applications. By leveraging Flutter's crossplatform capabilities, the app was primarily coded in Dart, which offers a flexible

and robust mobile development experience for both Android and iOS platforms. Below are the key components involved in the development:

- 1) **Material Design :**
 - APIs and SDKs Integration :
 - Google Maps API ..
 - Firebase SDK :
 - Payment Gateway SDK :
- 2) **. Backend Infrastructure**
 - Google Firebase and Cloud Firestore:
 - Python and TensorFlow:
 - Secure Payment Integration:
- 3) **Data Security and Privacy:**
 - User Authentication and Authorization
 - End-to-End Encryption :
 - Secure Payment Processing:
 - Data Privacy Compliance:

II.

Implementation

RentBazar, an Android-based mobile application designed to facilitate peer-to-peer item rentals. The primary objective of the platform is to enable users to either rent out their unused items or borrow products for temporary use in a seamless, secure, and user-friendly manner. The application supports two core functionalities—**Rent** and **Provide**—which are accessible through a unified user panel upon successful authentication. The implementation workflow begins with user registration and authentication, followed by interaction within the user panel. Renters can search for items based on category and rental duration, while providers can list their items by defining categories and rental rates. A built-in chat feature enables real-time communication and negotiation between users. Once terms are agreed upon, the system employs smart contract mechanisms to secure the transaction, followed by a security deposit and rental payment process. Finally, the item is handed over to the renter, completing the transaction cycle.

1. **Registration :** New users register on the RentBazar platform using the mobile application.
2. **Authentication :** After registration, users are authenticated to access the platform.
3. **User Panel :** Authenticated users are directed to the user panel which has two main options:
 - Rent (for renting items)
 - Provide (for offering items on rent)

For Users Who Want to Rent Items:

4. **Search for Desired Product :** The user browses or searches for the item they want to rent.

5. Input Duration : The user specifies how long they want to rent the item.
6. Select Item : The user selects the desired item from the search results.
7. Chat : The user and provider can chat to discuss the item details.
8. Negotiate Price : Both parties can negotiate the rental price.
9. Smart Contract Generation : Once the price is finalized, a smart contract is generated to secure the transaction.
10. Security Deposit : The renter pays a refundable security deposit as per the contract terms.
11. Payment : The agreed rental amount is paid through the application.
12. Item Received : The renter receives the item.

For Users Who Want to Provide Items:

13. Choose Item Category : The provider selects the appropriate category for the item they wish to rent out.
14. Add Item & Set Rent : The provider lists the item and sets the rental price.
15. Handling Over : After the payment and security deposit are processed, the provider hands over the item to the renter.

Result And Discussion

The **RentBazar** mobile application was successfully developed and tested to validate its core functionalities, including user registration, authentication, item listing, item search, chat-based negotiation, and secure payment handling. The application provides a user-friendly interface and seamless navigation across modules, ensuring both renters and providers can efficiently complete transactions. During testing, the system demonstrated accurate handling of user inputs and realtime communication between parties. The smart contract and security deposit features contributed to building trust and minimizing the risk associated with item lending. Moreover, the implementation of chat functionality enabled effective negotiation, which is a key component in peer-to-peer rental systems. User feedback collected from a small group of test users indicated high satisfaction with the ease of use, clarity of workflow, and reliability of transaction processes. However, areas for improvement were identified, including the need for more advanced search filters, notification alerts, and a review or rating system for users.

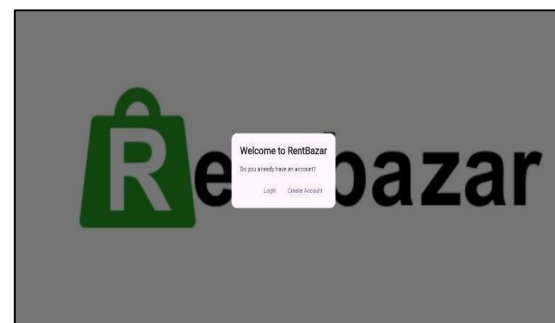
Overall, the results suggest that **RentBazar** meets its intended objectives and holds significant potential for broader deployment as a secure and convenient rental marketplace.

Future enhancements will focus on scalability, performance optimization, and integration of additional user-centric features.

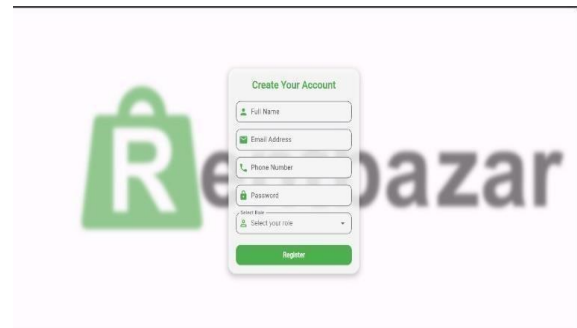
1) App icon splash



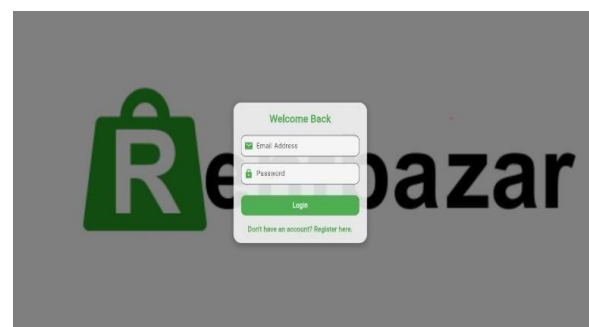
2) Option page for login and registration



3) Account Creation page/Registration page



4) Login page



Conclusion

To conclude, **Rent Bazar** offers an effective and forward thinking solution to modern rental needs by combining technology with sustainability. The application promotes the reuse of goods and services through a clean, easy-to-use mobile platform, reducing unnecessary purchases and supporting eco-friendly living. By enabling secure transactions, location-based item discovery, and a smooth user experience, the app makes renting convenient for all users. Furthermore, Rent Bazar contributes to the growth of the **sharing economy** by encouraging individuals to monetize unused items, fostering a sense of community and financial opportunity. With future plans for integrating advanced technologies like AI and blockchain, and expanding into new markets, the platform is well-equipped to evolve with changing user demands. In summary, Rent Bazar not only addresses current challenges in the rental space but also aligns with global efforts toward sustainability and digital transformation, positioning itself as a valuable player in the future of smart consumption.

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