



TRASHIFY-WASTE MANAGEMENT APPLICATION

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ABSTRACT:

Waste management has turned into a matter of significant challenge to the environment. The rapid increase in waste production every year has made the issue more concerning. To address this issue in modern technological world we need an unique solution, Trashify a smart recyclable waste management application developed using flutter with firebase as the backend supporting system. The application enables user to upload the image of their recyclable waste like plastic, e-waste etc. Users can upload images of recyclable waste along with details such as quantity and residential address through the application. After submission, the request becomes visible on the user dashboard for administrative review. Once the admin verifies and approves the request, reward points are credited to the user's account as an incentive for participating in recycling activities. Now comes the administration, the administration team will further share this info with the NGOs and other recycling units for the physical collection of waste from users residence. Basically this whole process bridges the gap between the organization and households and promotes sustainability. Trashify not only help people to participate in recycling process but also give them a feeling of satisfaction for being concern about environment. Apart from these features this type of projects also helps the government to frame their policies by demonstrating the consensus among people toward environment.

Keywords: Modern Technologies, Sustainability, Recycling, Flutter, Firebase.

INTRODUCTION:

Rapid growth in urbanization and population has highly increased the generation of waste globally and this creates major threat to environment. Unorganized waste management operations and improper disposal of recyclable waste also raise concerns about public health and environment. Today in fast growing global economy and modern technologies people of urban area are generation more recyclable waste then rural because of high consumption, and in this fast forward life most people have no time to dispose their waste properly. Improper waste management raises issues like pollution, landfill overflow, and harm animal. Traditional waste collection system mostly lack proper segregation and public involvement and thus makes it difficult for NGOs and recycling unit to recycle waste properly.

India generates millions of tones of waste every year which makes recycling more difficult and chaotic. Less than half of the generated waste gets processed by recycling and the rest remains affecting the environment. A major chunk of waste comes from urban area which shows high consumption rates in these areas but less attentive towards the environment. India being one of the largest market in the world generates a lot of organic and inorganic waste which needs an eco-sensitive solution, a system chain that works 24/7 for waste managing traditional waste collection and management shows good results but modern problems needs modern solutions.

With increasing use of mobile phone digital platforms have gained importance, people often use them for their entertainment, fame, and also as source of income. For those who are concerned for environment digital platforms are the most effective way of mobilizing masses for recycling waste. Smart waste management applications can simplify the chaotic process of managing waste and ensures that the waste goes to the right place such systems or innovations motivate masses and make them more conscious for recycling waste and supporting environment sustainability.

Trashify is a mobile based application platform that enable users to recycle the waste in the efficiently. The user is enabled to enter the details of waste like image, quantity, address and the user also receive points when the request is approved by the administrator. The waste collected from the users residence is further disposed properly by recycling units.

This project aims at developing a modern system of waste management common to all and easily manageable and act as a bridge between the household and recycling units. This common system of garbage management will eventually make the society more technological driven.

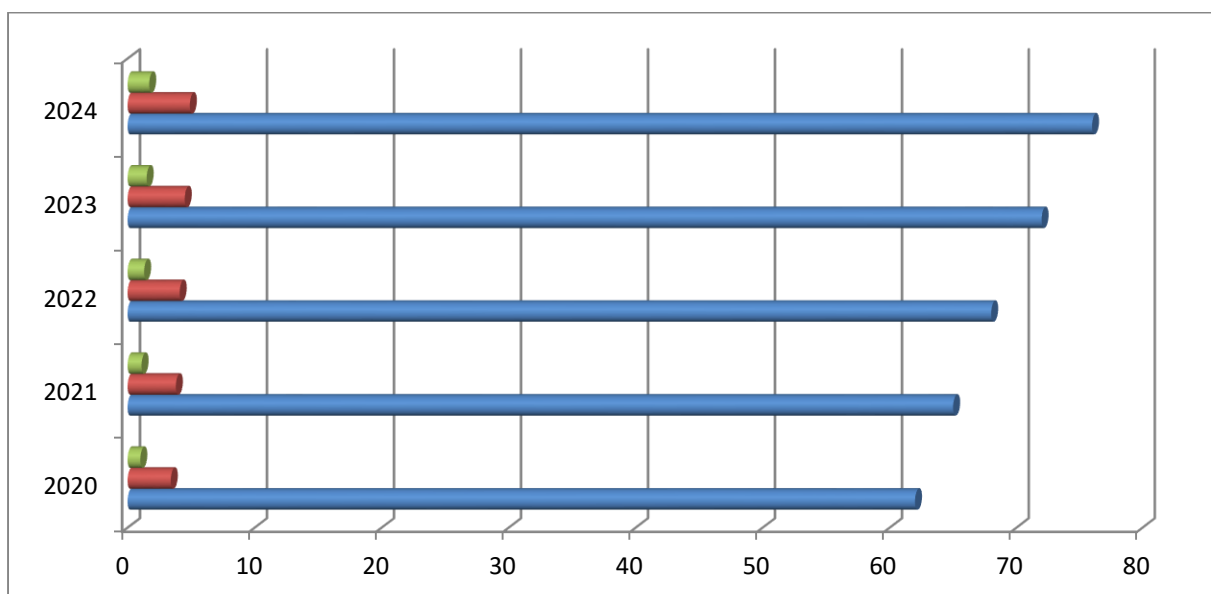


Figure 1: Types of waste produced (2020-2024)

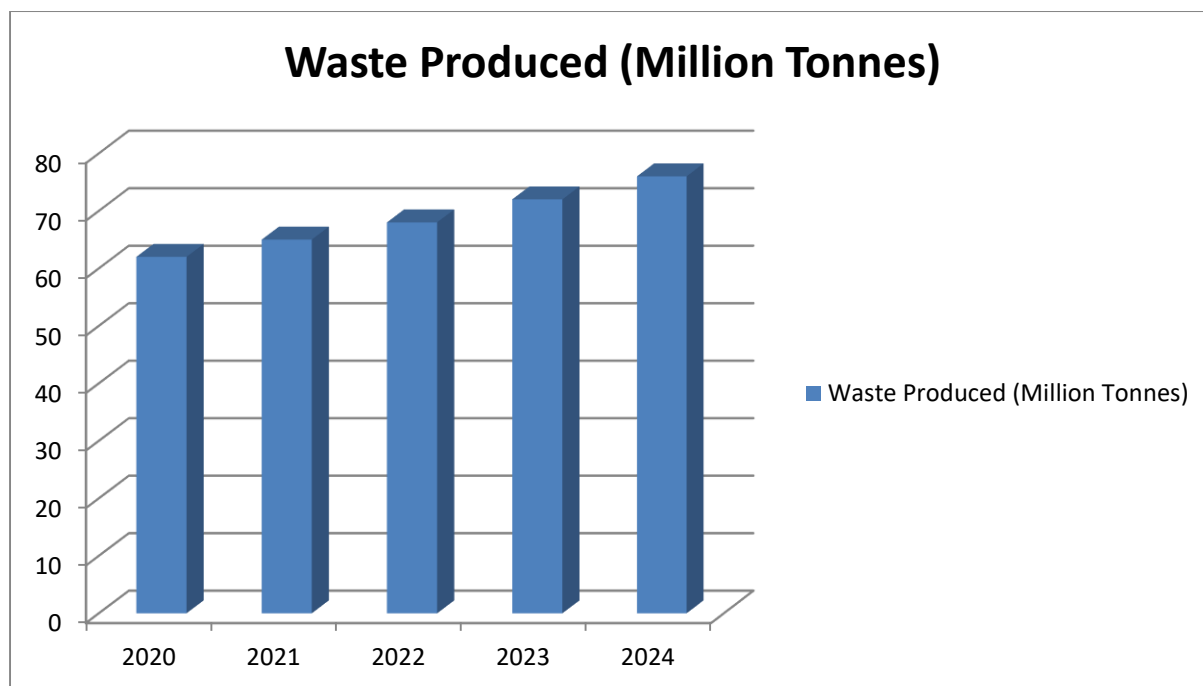


Figure 2: Waste produced (2020-2024)

PROBLEM STATEMENT:

The rapid growth of population, urbanization, and industrial activities has significantly increased the volume of waste generated on a daily basis. A considerable portion of this trash is recyclable however, incorrect separation, inadequate recycling system, and inefficient collection systems restricts effective waste management. Traditional waste disposal methods mainly focus on collecting and dumping rather than encouraging Eco-friendly recycling practices, resulting in environmental pollution, overflowing landfills, and resource depletion.

One of the key obstacles in current waste supervision systems is the lack of direct communication and cooperation between households, administrators, and reprocessing organizations. Many individuals are motivated to recycle their waste but often shorts proper guidance, convenient collection systems, or motivations to actively participate. Also, the absence of digital platforms for improved waste submission and verification makes the recycling process less available and inefficient.

These restrictions highlight the urgent need for a smart, tech-based waste handling solution that simplifies recyclable waste collection while supporting public involvement. A system that integrates easy to use waste reporting, administrative verification, reward mechanisms, and cooperation with NGOs or recycling units can considerably improve recycling efficiency and motivate sustainable practices.

OBJECTIVE:

The key objective of this project is to design an effective mobile-based waste management system that eases the process of recyclable waste collection and supports sustainable environmental methods through digital innovation.

The particular objectives of the project are as follows:

- To design and develop a simple mobile application that enables users to upload recyclable waste details, including images, quantity, and address information.
- To create an executive system for verifying user submissions and handling waste collection requests properly.
- To motivate public involvement in recycling activities through a motivation-based points system.
- To develop better connection between users, supervisors, NGOs, and recycling units for proper waste collection and elimination.
- To reduce improper waste elimination practices by supporting systematic recycling methods.
- To contribute to environmental sustainability by improving recycling availability and increasing responsible waste management understanding.

LITERATURE REVIEW:

Usual waste handling systems mainly depend on physical collection, transfer, and processing techniques, which often lack correct separation and reuse productivity. These systems target mainly on waste removal rather than long-term resource utilization, leading to environmental damage, waste accumulation, and ineffective use of reusable materials. As waste generation continues to rise globally, conventional waste management practices face increasing problems in handling rising waste generation properly.

Latest developments in smart waste handling have developed technology-based methods such as smart-enabled waste bins, intelligent systems, mobile apps, and active supervision systems. These systems enhance waste collection effectiveness through mechanization, path optimization, and better interaction between participants. studies shows that combining mobile platforms and cloud systems can greatly improve user participation, waste segregation, and recycling operations methods.

Many advanced recycling app and other digital platforms have introduced the reward based system to motivate the user participation in eco-friendly system. Reward systems such as points or other psychological tricks helps increase user participation in this novel system. These type of systems increase public involvement and performs the latent function of mobilizing the crowd for waste management.

Therefore, there is a high need for an integrated and user-friendly digital platform for environment. The system should combine recyclable trash reporting, admin control, reward system, and connection with recycling units. Trashify manages these things by a practical approach. The application eases the recycling process and make users more conscious about environment.

The Government of INDIA has launched many initiatives to improve the waste management system and to promote environment sustainability. One of the major step taken by government of India is the Swatch Bharat Mission, introduced in the year 2014. The program helped a lot to waste management and focuses on sanitation, waste collection, and proper disposal of collected waste. It motivated a mass for environment conservation and to adopt cleaner waste management methods.

Along with Swatch Bharat Mission, the Smart City Mission also encourages a lot to the users and make people aware of the use of technology. This initiative support smart and effective waste management system to improve efficiency and sustainability. Many cities have been developed through this initiatives and many are in progress. Improve recycling framework have also been deployed to optimize trash collection and removal.

The Ministry of environment, Forest and Climate Change introduced the solid waste management rules, 2016 to improve the waste management processes. These rules provides strong guidelines for waste segregation, collection, transportation, and processing. The rules focus on dividing the biodegradable, recyclable, and dangerous waste at the source only. This helps increase the efficiency and also reduce the risk of viral etc.

India has also introduced the Plastic Waste Management Rules to regulate the plastic pollution. These rules or guidelines focus on extended produces responsibility(ERP), recycling targets, and limits single use plastic.

Despite these governmental initiatives, many challenges still influence the waste management system. Problems such as less public participation, poor waste segregation, and limited digital accessibility exists. Technology based systems like Trashify can support these initiatives through east to use digital platforms.

METHODOLOGY:

The TRASHIFY is a smart application based platform for recycling waste. It connects the users, admin, and recycling units together through a digital structure. The application is designed using Flutter as the user interface tool and Firebase as the data managing service. Firebase is used as the backend system for verification and storage. The system also provides live database management for effective data managing.

The process begins with the user page where the users log in to the application. Users then upload the details of waste to be recycled , including image, users address, waste quantity. The uploaded data is safely saved to the firebase cloud system. This data is further accessed for the admin verification and review. The system maintains secure and organized handling of user submission.

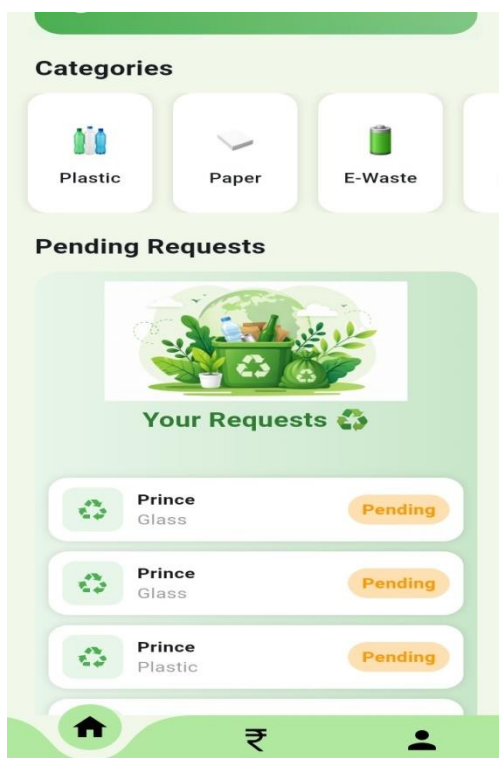


Figure 3: Home page

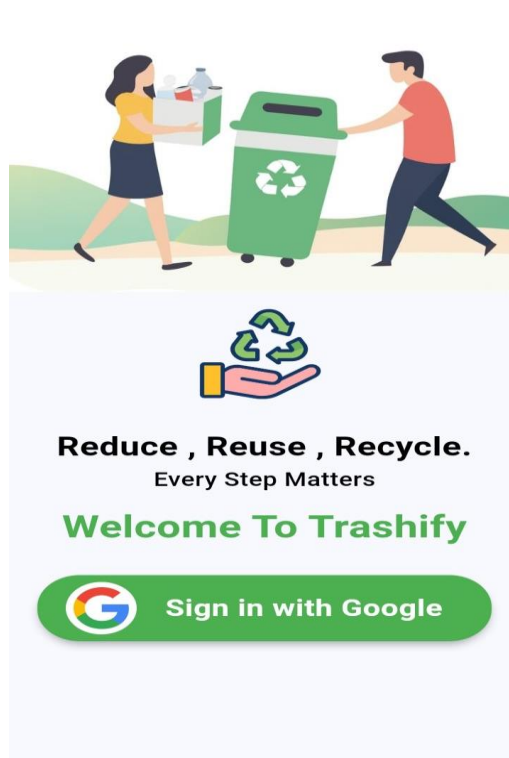


Figure4: Log in page

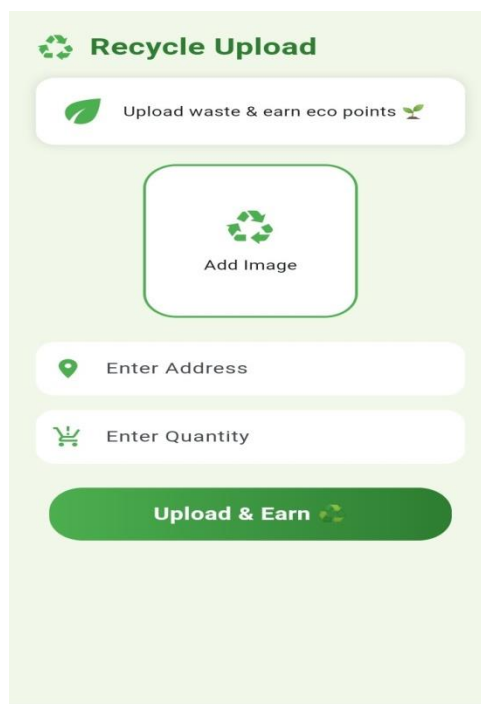


Figure5: Upload page

In the admin side module, the admin access the uploaded request data through a dashboard. They verify trash details and approve or reject request based on their authenticity. Approved request reward the users for their participation and user gets point which he can see in the points dashboard. The reward system motivated the user for further activities.

After approval, the admin team connects with the NGO's or other recycling units for the collection of waste. These units collect the trash from the users residence. The collected waste then is transferred to the recycling workplace where it is processed. The workflow ensures smooth communication among all participants.

The overall system combine the user directly to the admin and then to the recycling units. It also includes admin handling and coordination with recycling firms. By using this mobile technology and cloud system, Trashify improves user participation..

TOOLS & TECHNOLOGY:

The building of Trashify uses advanced mobile app tools to maintain effective functioning, system expansion, and public availability. The main UI framework used is Flutter, an free-source UI software development kit built by Google. Flutter allows multi-platform application development, allowing the system to function properly on Android devices while providing a interactive and easy to use interface. Its computer-based architecture supports adjustable design and better user experience.

For data management services, Firebase is used as the main cloud platform. Firebase verification handles safe account creation and login processes, maintaining data security and user confirmation. Cloud Firestore serves as the live database for storing user information, waste upload records, reward points, and management data. Firebase Storage is used for securely storing submitted waste images, enabling quick access and handling of user-uploaded waste recycling information.

The application is created and tested using Android Studio and Visual Studio Code, which offers integrated environment for testing, coding, debugging and application implementation. Dart is used as the main programming language for designing this application.

These technologies together create a expandable, affordable, and accessible waste managing system. By combining Flutter's flexible user interface with Firebase services, Trashify gives real-time data synchronization, secure data storage, and effective communication between users, admin, and recycling units. This technical structure helps the app remain effective, user-friendly, and adjustable for further improvements..

ADVANTAGES:

- Offers a more user friendly platform for household to manage their household trash via a mobile app.
- Influence public participation through a more interesting reward based system.
- Enhances connection between the users, admin, NGO's, and recycling organizations.
- Helps improve waste segregation and recycling, and contributes to lower environmental pollution.
- Employs modern technologies like Flutter and Firebase for efficient performance and real time data management system.
- Promotes knowledge about responsible waste removal and eco-friendly activities.
- Supports high consciousness about environmental positive activities.

RESTRICTIONS:

- The system highly depends on humanized connection between admin and NGO's or recycling unit.
- It needs a more stable internet connection for the users and also on the admin side to use all the features.
- Limited automation in physical waste collection may reduce overall effectiveness.
- User involvement depends on awareness, motivation, and access to digital platforms.
- The system mainly focuses on reusable waste and does not cover all types of materials

CONCLUSION:

Trashify is a smart management system based on application technology designed to solve the problems of waste handling and segregation. The application uses Flutter for frontend development and firebase for backend services to provide and an easy to use platform for more efficient handling of trash. This type of digital platforms play an important role in improving user participation, efficient waste management, waste collection, and disposal.

This application provides few user motivating features as well, features like reward system, attractive user interface etc. the platform motivates eco-friendly environmental practices by increasing public involvement and improving accessibility to recycling services. The app also support environment protection by reducing landfill deposition and improving recycling efficiency.

Although some limitations are there such as manual connection with the NGO's and internet dependency still exists. This project highlights the strong potential of technology and presents a fabulous testimony of modern technology and make people aware of the high potential of technology and apart from all these things this system makes people more conscious for the sustainable environment.

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