# A Mobile Based Garbage Collection System


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***Abstract*** **One important way to solve the problems with conventional waste management techniques is the development of mobile-based garbage pickup systems. The goal of this research is to improve garbage collection procedures' efficacy and efficiency by examining the design and execution of such a system. This project intends to suggest an innovative solution that uses mobile technology to speed waste collection, disposal, and recycling. It will do this by thoroughly reviewing relevant literature and analyzing current systems. A smartphone application with functions like real-time tracking, scheduling, and user feedback mechanisms is developed as part of the process. The results show that the suggested approach is feasible and has the potential to improve waste management practices, decrease environmental contamination, and optimize garbage disposal operations. In order to further improve the usability and functionality of mobile-based waste collecting systems, new study areas are identified and the consequences of the findings are highlighted in the discussion.**



***Keywords*****—waste management, mobile applications, and sustainability are all mobile-based, garbage disposal.**


## I. INTRODUCTION

Every day, Sri Lanka produces 7000 metric tons of solid trash, of which the Western Province produces over 60%. A typical person produces 1 - 0.4 kilogram of garbage every day on average [1]. Approximately 50% of the garbage produced is gathered, as reported by the garbage Management Authority and the Central Environmental Authority. In recent years, Sri Lanka has faced significant challenges in managing its municipal solid waste, leading to environmental pollution and public health issues. Main challenges in waste management in Sri Lanka are waste classification, waste disposal and waste recycle. Traditional waste management practices have proven inadequate, often resulting in overflowing landfills and inefficient collection processes. To address these challenges, there is a pressing need for innovative solutions that leverage technology to improve waste management practices.

Traditional waste management methods' inherent inefficiencies present a number of difficulties, including: Ineffective Collection Routes-Set collection routes typically lead to inefficient vehicle use and needless trip distances, which increase fuel consumption and emissions from vehicles. Missed Pickups-Inaccurate or out-of-date information on collection times and routes may lead to missed pickups, which may put residents' health at risk.

Absence of methods for homeowners to offer feedback or report problems with waste collection is a common problem in traditional waste management systems, which causes breakdowns in communication and interruptions in service.

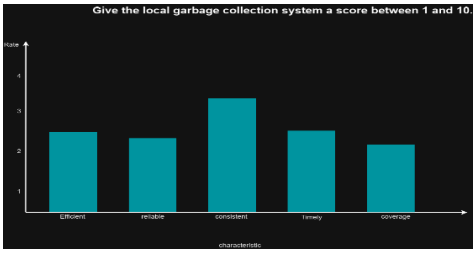


*Figure 1Rate the current garbage collection system in your area out of 10*

The creation and execution of a garbage collection system that is mobile in nature bears significant consequences for waste management agencies as well as

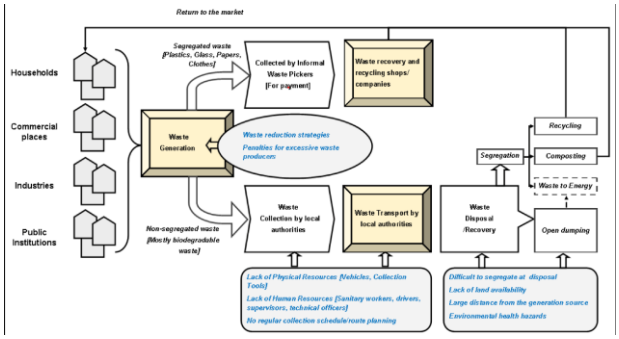


*Figure 2 An integrated research framework for identifying MSWM practices and challenges in the coastal cities of Sri Lanka.*

[2]This shows an integrated research framework to identify Municipal Solid Waste Management (MSWM) practices and challenges in the coastal cities of Sri Lanka. This framework was used to identify key problems in each step of MSWM from waste generation, waste collection, waste transport, to, finally, waste disposal/recovery (highlighted in italics in blue in each stage).
Mobile-based technologies might potentially reduce vehicle emissions, improve waste collection operations' efficiency, and optimize collection routes.
Minimize Environmental Impact: Mobile-based systems help reduce the effects of climate change and promote environmental sustainability by reducing the environmental impact of waste collecting activities.
Enhance Public Health: Effective garbage collection and disposal reduces the risk of public health concerns connected with ineffective waste management methods and helps stop the spread of diseases.
Improve Resource Efficiency: Mobile-based technologies help the shift to a circular economy by encouraging recycling and resource recovery, which lowers the use of finite resources.
Improved Quality of Life: Cleaner, healthier cities make for happier, more prosperous communities. This is made possible by dependable and effective waste collection services

These are the main aims of this research: to examine the body of research on mobile technology and waste collection systems that is already available.to evaluate the benefits and weaknesses of current systems and find areas in need of development.to put out a fresh idea for the planning and execution of a garbage collecting system that is mobile in nature.to create a working mobile application prototype with essential features including route optimization, real-time tracking, and user feedback systems.to assess the suggested system's viability and efficacy by field testing and user input.to talk about the results' implications and pinpoint areas that could use more research and development in the area of mobile-based waste management systems.

The rest of the paper is organized as follows:
A thorough analysis of relevant research and literature on mobile-based waste collecting systems is given in Section2.The study methodology, including the creation of the suggested system, is covered in Section 3. The efficacy and viability of the suggested system are shown in Section 4 with the results of user input and field testing. The consequences of the results are covered in Section 5, along with potential directions for further study and advancement.
Finally, Section 6 provides a summary of the study's main findings along with some closing thoughts.

## II. LITERATURE REVIEW

The Particularly in areas like Sri Lanka, efficient waste collection and management are essential to maintaining clean and secure urban settings. Even though the Internet of Things (IoT) and other cutting-edge technologies have been the subject of numerous studies, it's important to take into account other options that would be more appropriate for locations with less IoT infrastructure. This review of the literature focuses on studies that use notification systems, GPS monitoring devices, and chatbot artificial intelligence to improve trash management procedures.
AI chatbots have become a useful tool for enhancing engagement and communication across a range of industries, including waste management. Chatbot AI facilitates communication between residents and garbage disposal authorities by offering an easy-to-use interface for reporting difficulties, scheduling pickups, and accessing information. Because of its ability to comprehend natural language, it can handle user questions effectively, improving user experience in general and encouraging more people to participate in waste management programs.

Additionally, improved route optimization and operational efficiency are made possible by integrating GPS tracking devices into waste collection procedures. [2] [3] [4]Authorities can improve routes based on variables like traffic conditions and proximity to collection places by tracking the real-time position of collection trucks. This contributes to cleaner communities and less of an impact on the environment by lowering fuel consumption and operating expenses while also guaranteeing prompt waste collection services.

Notification systems are also essential for informing locals about garbage pickup operations. Users can receive automated reminders on scheduled collection times, delays, and other relevant details through SMS,

email, or mobile applications. By establishing transparency and trust between the community and the government, this proactive approach to communication promotes environmental sustainability and encourages adherence to waste disposal standards.
The use of chatbot AI [5], GPS tracking systems, and notification systems offers a feasible alternative for areas like Sri Lanka, even if the research now in publication often focuses on IoT-based solutions. Waste management organizations may increase the effectiveness, accessibility, and openness of their rubbish collection services by utilizing these technologies, which will ultimately help to create more sustainable and healthy urban environments. To develop more specialized and efficient waste management techniques, future studies should examine how well these systems work in Sri Lanka's particular socioeconomic and infrastructure setting.

## III. METHODOLOGY

The Flutter framework was used in the development of the garbage collecting app's frontend. Flutter makes it possible to create cross-platform apps with a single codebase, making it easy to develop for both iOS and Android. Its architecture based on widgets makes it easier to create visually beautiful and engaging user interfaces. Visual Studio Code and Android Studio were the main integrated development environments (IDEs) used for coding, debugging, and testing the application during the development process.

Microsoft's stable and adaptable.NET framework was chosen for the backend development of the application to manage the data processing and business logic. Utilizing the capabilities of.NET, we established strong APIs and services to handle user authentication, data storage, and front-end-to-backend database connectivity. This guaranteed effective data interchange and seamless interaction across the application.

[6] [7]The open-source relational database management system MySQL was used to store and manage the data for the application. For storing user profiles, pickup schedules, and waste collection records, MySQL offered a dependable and scalable solution. We ensured quick data retrieval and manipulation through effective database design and optimization, which improved the application's overall responsiveness and performance.
Development frameworks, like Visual Studio Code and Android Studio, are essential resources for developers, offering a smooth development experience when writing and debugging code.

[8]An AI chatbot functions as a dynamic interface in the context of a garbage collection system app, enabling smooth communication between users and the waste management system. The chatbot uses artificial intelligence and natural language processing to understand consumer inquiries about special collection requests, bin locations, and garbage disposal dates. In addition to giving users real-time updates on collection statuses and answering any questions or issues they may have; it may effectively assist users in arranging pickups. Additionally, the chatbot may provide tailored advice on recycling choices, eco-friendly disposal techniques, and trash segregation policies, enabling users to make decisions that protect the environment.

The chatbot may adjust to users' preferences and communication styles through this iterative learning process, which eventually results in accurate and timely responses. The AI chatbot facilitates a more sustainable approach to waste disposal in communities, automates waste management procedures, [9] and improves user engagement by smoothly integrating into the garbage pickup system app. The chatbot is able to optimize garbage pickup operations and encourage environmental stewardship among users by providing intelligent support and instruction.

GPS monitoring capability in an app for a garbage pickup system is essential for streamlining waste management procedures. The software uses GPS technology to track a garbage truck's location in real time, [10]giving drivers the ability to effectively plan routes and keep an eye on their movements. With the help of this tool, waste collection staff may move between areas with ease, reducing down on travel time and increasing the number of pickups they can accomplish each day. Users also gain from being able to track the pickup truck as it approaches, which helps them to get ready for garbage disposal and guarantees on-time pickups. All things considered, GPS tracking increases energy savings, operational effectiveness, and user satisfaction with the garbage collection system app.


*Figure 3 Technologies*

Users receive timely notifications from the notification system about upcoming pickups, scheduling modifications because of holidays or unanticipated events, and reminders for properly sorting waste. By ensuring that users are notified and ready for garbage collection activities, these notifications lower the possibility of missed pickups and encourage effective waste management techniques. Additionally, by keeping customers updated about service interruptions or delays, the notification system promotes proactive involvement by letting them modify their plans and avoid

inconvenience.

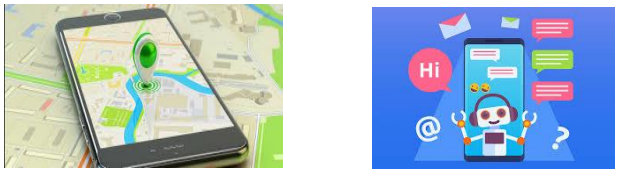


*Figure 4 Special Features*

Evaluating case studies in various urban environments to see how the application affects garbage collection procedure optimization, pollution reduction, and general cleanliness could be an experimental validation of the programme' s efficacy. To assess the application's effectiveness and pinpoint areas for development, analysts can also examine user input and performance indicators including reaction time, user satisfaction ratings, and system uptime.

## IV. PROPOSED SYSTEM

The utilization mainly use of Flutter for the front end but React.js use to the admin functions implementing, .NET for the back end, and MySQL for database administration in the creation of the garbage collection application created a strong basis for a smooth and effective user experience. The ability to create visually attractive interfaces was made possible by Flutter's cross-platform capabilities, and the integration of robust backend features made possible by.NET ensured seamless data processing and interaction. MySQL offered a dependable data storage option, which improved the overall functionality and responsiveness of the application. With the help of Visual Studio Code and Android Studio, developers could create applications that were optimized for waste management more quickly and with greater quality thanks to the availability of strong tools.

The suggested system has the ability to user to inform the garbage collecting company, that they want to dispose garbage. For that user can enter the pickup location and the garbage type. Then buy clicking find my garbage truck user can send the garbage type and the location.

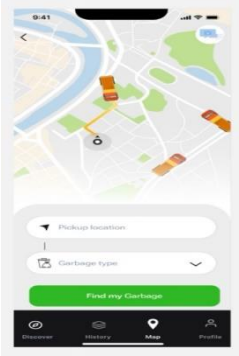


*Figure 5 Enter pickup and garbage type Page*

If it is the day of collection of the respective type of garbage, the system tracks the truck and view it to the user, where the truck is and what it's route. Also, the user has the ability to see and know details about the truck and who is the driver. Here the user has the ability to cancel their order, if they think the order is not necessary.

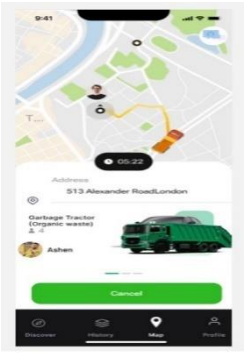


*Figure 6 View truck detail Page*

This is the page that user can have information about the dates that collecting each garbage types. There is a specific day for each type of garbage. User can get more details by clicking each day in the calendar.

*Figure 7 Pickup schedule*

Here the user can see all the services that can gain by this app. So, by clicking the necessary button related to the want service you can get the service

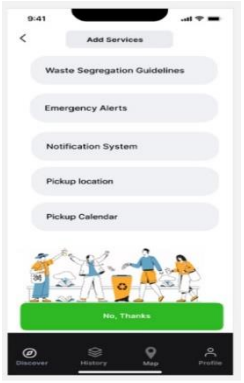


*Figure 8 Service Page*

This is the profile page of the user. Here the user can view his/her profile with the details that given when sign-up to the mobile app. User have the ability to edit the profile

details by clicking the edit button. And there is button to logout. So, if the user wants to logout with the account, user can logout buy clicking that button.

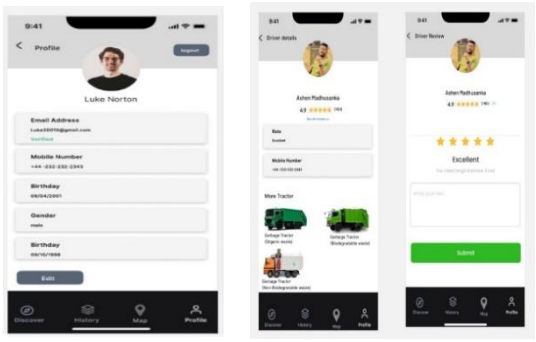

*Figure 9 Profile*

System Admin use web application to do his functions he can adding drivers, managing driver profiles tracking routs, see notification, using chatbot AI to chat with users.

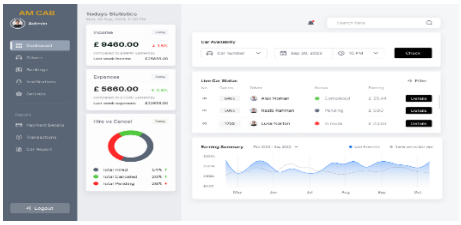

*Figure 10 Admin dashboard*

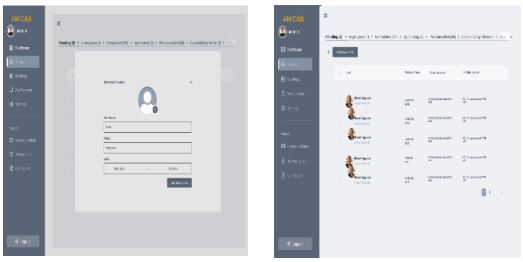

*Figure 11 Add & Manage drivers*

## V. DISCUSSION

The study's conclusions have a big impact on environmental sustainability, urban planning, and trash management strategies. The MBGCS provides a scalable and affordable answer to the problems with conventional trash collection systems by utilizing mobile technologies. Stakeholders can minimize collection times, optimize garbage collection routes, and lower fuel and carbon emissions thanks to the MBGCS's real-time monitoring and data analytics capabilities. Furthermore, the MBGCS's user-centric design empowers and engages the community, encouraging locals to participate actively in garbage disposal initiatives. It is imperative to recognize the limits of the MBGCS, such as possible privacy issues, challenges related to the digital divide, and infrastructural restrictions in settings with limited resources. Future studies ought to concentrate on resolving these issues and investigating the sustainability and scalability of mobile-based trash management strategies in various urban environments.

### *V.1 Results*

The Mobile Based Garbage collecting System (MBGCS) significantly improved operating efficiency, especially in terms of streamlining waste collecting procedures. Waste management authorities were able to optimize resource allocation and collection routes by promptly responding to garbage accumulation thanks to the real-time reporting functionalities. By doing this, waste collection efficiency was increased overall, and operating expenses related to needless travel and resource mismanagement were decreased.

Additionally, the MBGCS's high user satisfaction and engagement levels highlighted how well it promotes community involvement in garbage management. The smartphone application's easy-to-use design, combined with gamification features like incentives for regular waste reporting, encouraged locals to take an active role in maintaining their environment.

### *V.2 Testing*

The Mobile Based Garbage Collection System (MBGCS) had a thorough testing process that examined a range of user experience, functionality, and system performance issues. The assessment of the mobile application interface's accessibility and usability was mostly dependent on usability testing. The team was able to obtain important information about how user-friendly the interface was for routine tasks like reporting waste accumulation and monitoring complaint status by including representative users in testing sessions. This input was crucial in helping to improve the application's general usability and guarantee a smooth user experience.

Another essential part of the testing phase was functionality testing, which verified the accuracy and dependability of system capabilities. The team evaluated the system's performance in critical activities like data collecting, notification generation, and device synchronization under various network conditions and device compatibilities through a number of demanding test scenarios. The team was able to detect and resolve any possible problems or irregularities in the system's behavior by simulating real-world usage scenarios, which guaranteed stable and dependable performance in a variety of operational environments.

### *V.3 Additional advancements*

The practicality and effectiveness of the Mobile Based Garbage Collection System (MBGCS) were greatly enhanced by the further advances. By integrating GPS technology, collection vehicles' locations could be tracked

in real time, which improved fleet management and route planning. In order to prevent missed pickups, a notification system made sure users received timely reminders for disposing of their waste. Strategic decisions were guided by the useful insights into waste generation patterns that data analytics techniques gave. By including a feedback mechanism, community engagement was promoted by enabling users to make contributions to service enhancements. Together, these developments improved waste management techniques and encouraged environmental sustainability, strengthening the MBGCS.

## VI. CONCLUSION

In conclusion, the Mobile Based Garbage Collection System (MBGCS) shows itself to be a trailblazing remedy for the enduring problems with conventional waste management techniques. This study paper demonstrates the transformational potential of the MBGCS in revolutionizing trash collecting systems through careful design, rigorous development, and extensive testing. The waste management authorities are equipped with unparalleled insights into waste creation patterns, resource utilization trends, and operational efficiency measures by virtue of the system's extensive data analytics functionality and real-time reporting capabilities. Through the utilization of mobile technology, the MBGCS surpasses the constraints of traditional waste management systems, providing a flexible, scalable, and user-focused method for addressing the intricacies of urban trash management. Ecological durability

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Additionally, the MBGCS encourages environmental stewardship and community involvement by giving people the tools they need to take an active role in waste management initiatives. By means of its user-friendly smartphone interface, gamification features, and feedback mechanisms, the system cultivates a culture of environmental consciousness and sustainability by instilling a sense of ownership and responsibility in its users. In the pursuit of more effective, fair, and sustainable waste management solutions, the MBGCS stands as a ray of hope as the world's population continues to urbanize and environmental concerns grow.

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