

Electronic Waste Management System App

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Abstract: The growing volume of Electronic waste (E-waste) requires proper solutions in the form of effective disposal because it is a major environmental concern. EWMS operates as an Android app to enhance e-waste collection and disposal operations. The users are more engaged through the systematic waste management system that technology integration offers as well as operational productivity is enhanced. The EWMS features three key roles: Admin, User, and Employee. Through full system authority the administrator maintains complete control while handling user demands and assigning duties to workers to guide the entire waste disposal operations. The centralized management system operates toward efficient operations and tracks e-waste disposal methods properly. Users with electronic waste disposal needs should use the User role in the system. The system enables users through registration and login to both submit requests for collection and maintain status tracking plus historical request access. The transparent system keeps users up to date about proper e-waste disposal methods which leads them toward adopting sustainable electronic waste habits. Through the application users can get assigned requests to pick up and finish collection orders and track their ongoing progress. The system is based on MySQL database storage to function in conjunction with Kotlin backend development for XML user interface design that creates a robust system with security functionality and scalability feature. EWMS encourages sustainability of operations in conjunction with environmental protection since its organized system provides excellent user experience.

Keywords: E-waste management, EWMS (Electronic Waste Management System), Android application, waste disposal, MySQL database, Kotlin, XML UI design, sustainability, automation, User experience.

I. INTRODUCTION

The surge in consumer electronics and the growth of the electronics industry have made the disposal of electronic waste (E-waste) management an environmental challenge. The irresponsible dumping of E-waste poses serious dangers to the environment such as toxic chemicals spilling, soil and water contamination, and posing health threats to people, animals, and nature. Waste disbursement is currently poorly organized, managed, and done without clear access to information. To solve these problems, the Electronic Waste Management System was developed as a mobile application for Android aimed at systematically and effectively enabling e-waste collection, tracking, and disposal. The system eliminates the technological gap between users, employees, and administrators by providing digital solutions for better collaboration. This application supports responsible disbursement of electronic waste, lessens damage to the environment and encourages sustainable practices of managing waste.

II. EXISTING WORK

The current manual handling of E-waste disposal raises the demand for an automated system. The amount of work that is currently being assigned manually is difficult for any single person to manage efficiently and reliably. The current system is mostly reliant on physical interaction and paper! Retrieval from an individual's home to a municipal facility requires the increase of labor-intensive phone calls, emails or person-to-person contacts to initiate a service request. The E-waste removal process is started when a community member calls a municipal office to request it and a staff person gets out a paper log book and bears the responsibility of writing down the service request information. Further, the drawback to the current manual handling of E-waste collection companies or the service provider delivering E-waste to the city scoring residents. The lack of automated process delivers delays, mismanagement of the object and user history.

The fundamental issue with this process is that there is no centralized digital platform for recording and managing e-waste information. Without a database, reviewing requests for disposal in the past, trends in collection of waste, and frequency of disposal are nearly impossible. Additionally, resources for collection and recycling are inefficient because neither process is data-driven. Another weakness of the process is that there is no tracking and notification in real-time. Users do not know what is happening to collection requests for the waste they have generated, which can be very hard on the user.

Employees are also challenged with collecting the waste because there is little coordination and upkeep as it requires a lot of text messages, Facebook and Voicemail communications among multiple stakeholders. One of the major features missing in the current system is having a simple and formal user registration process. Those looking to rid of their e-waste have to go through a cumbersome process of requesting to dispose e-waste, which discourages them from participating. Also, it is difficult to find a disposal record or find a nearby e-waste disposal facility due to the unorganized disposal search system. Electronic applications will make it easier to establish a centralized database, automatic reminders, and real-time tracking, a better system in general for e-waste management.

DISADVANTAGES

- **Lack of Tracking and Notifications:** Because the program is purely paper-based, users are not notified of realtime updates for e-waste collection requests. This may make users uncertain whether their waste will be collected or delayed, or lost.
- **Manual Record-Keeping Errors:** Keeping records of the e-waste records paper-based results in more chances of data mismanagement, duplication and loss. This creates obstacles like inaccuracy for tracking past requests and difficulties generating reports to improve e-waste management.
- **Delayed Response Time:** Manual scheduling leads to delayed collections and improper resource allocation. A lack of structure in the system leads to processing requests for waste pick up with delay and increases the waiting time.
- **Inadequate Accessibility:** Users must either visit pickup centers in real-time, or make phone calls to request a waste pickup. Getting to the pickup is logistically difficult and takes a long time, especially for customers who cannot make it to the site during working hours.
- **Inefficient Communication:** There is low coordination between recycling centers or customers and waste collectors. There is no formal communication or notice for customers, which leads to missed pickups, increased delays, etc.

III. PROPOSED WORK

The E-Waste Management System proposed here represents a radical departure from existing practices for collecting and disposing of electronic waste by employing modern tools to streamline and enhance the process in a manner that optimizes efficiency and transparency and is respectful of environmental sustainability. An important component of the system is a real-time system that facilitates communication between users, employees, and administrators. Notifications to users are personalized using the system and will include alerts about scheduled pickups, collection updates, and urgent disposal drives.

With the system established, the proactive engagement will be robust with respect to responsible e-waste disposal, and a spirit of timely collection and processing achieved throughout the process. The current e-waste management system is a paper-based process that operates using manual methods and human interactions. People requesting waste management services call or visit the waste management services in person for the request of e-waste pickup. Only after a human will record and assign a job to an employee will the process move forward. This introduces inefficiencies and delays throughout the process.

The system involves three key roles:

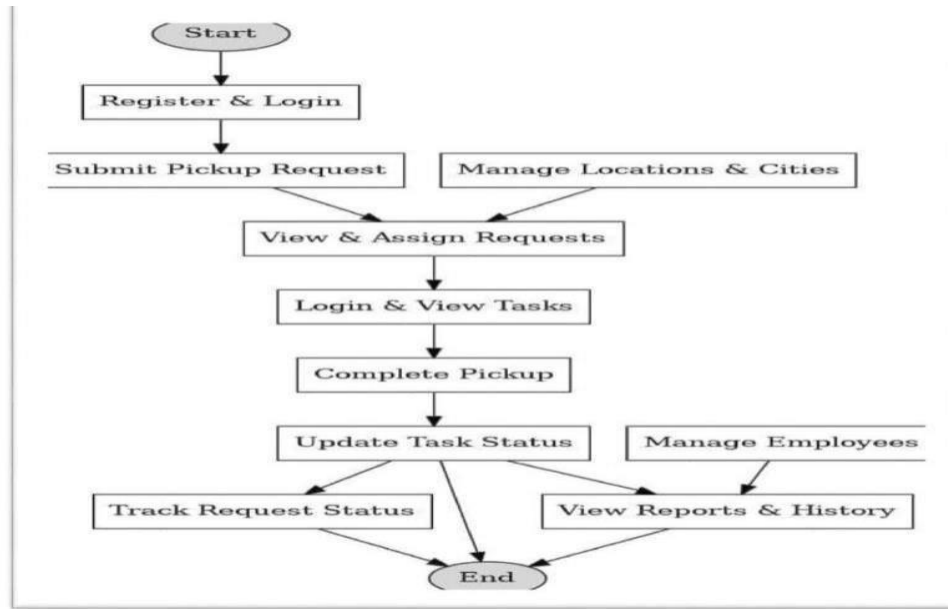
- There are three different groups: Admins, Users and Employees, and there is no way for them to work from a central digitized communication and tracking system.
- Admins oversee the waste collection work, but they are reliant on manual logs and paper documentation, which complicates matters when tracking and managing requests.
- Users submit requests to have their electronic waste collected by offline methods, such as a phone call or paper based requests, and they are given no way to track the status of their request.
- Employees receive their assignment information verbally or in written communication, which creates a situation that is prone to communication errors, possibly missing records or delays.
- However, combined with an easy to learn user experience and a serious commitment to data security and compliance, the suggested technology can allow users, employees, and admins to easily collaborate to enhance responsible electronic waste disposal. The system creates trust among its stakeholders for waste disposal in a cleaner and sustainable community as it creates real-time tracking information, automated scheduling, and communications.

ADVANTAGES

- **User-Friendly Interface:** This system has an interface that is clean and organized, allowing a user, employee, or admin to view all features without confusion.
- **Efficient Tracking and Monitoring:** Allow users to track their e-waste pickup requests while on pickup and allow admin/employees to monitor assigned requests and fulfilled requests for the sake of transparency.
- **Seamless Communication:** The system promotes good communication between users, employees, and admins, thus facilitating the confirmation of received requests followed by faster follow-up communication in the entire waste management process.
- **Environmentally Sustainable:** The system promotes environmental sustainability; in that it makes the collection and proper disposal of e-waste easy, hence ensuring accountability in recycling processes while reducing the pollution of electronic waste towards a greener environment.
- **Secure Data Management:** By using MySQL to store data with high levels of efficacy for all collection records and transaction data, you will ensure the security and integrity of the user's e-waste information.
- **Automated Documentation:** In the initial request for collection, the system automatically documents each and every e-waste pickup by not only eliminating paperwork but providing an easy access to collection data for review.

- Cost-Effective Operations: By maximizing pickup routing and reducing the need for human involvement, the system reduces fuel, labor, and overall operational costs.
- Compliance with Regulations: The system assists with regulatory compliance of properly tracking e-waste management, maintaining proper records, and enforcing standardized collection and disposal processes.

Design:



The flowchart provides step-by-step instructions to perform pickup request management tasks in an organized manner. The user interface begins by requiring registration and system login to provide two options: pickup request submission and location and city management functions. After request display the system assigns tasks that leads users to log their work and complete pickups. The completion of work triggers an automatic status update that allows users to view staff management together with request tracking as well as report generation and historical information. The system generates a concluding state which indicates a structured process to execute efficient pickup management.

IV. EXPERIMENTAL RESULT

The E-Waste Management System enhanced the process efficiency of e-waste disposal processes considerably. The users were also facilitated by the online system since they could place pickup order and monitor request status online. The real-time tracking system coupled with automated notifications minimized user confusion by providing realtime item status details. Workers spent less time performing manual coordination duties after the system implementation so they could dedicate themselves to collection and disposal activities. The data centralized in the system made record maintenance more efficient thus improving tracking of collections and resource distribution processes. The E-Waste Management System established a modernized workflow addressing original operational issues to develop efficient waste management procedures for staff and end-users. The automated system demonstrated its capability to advance e-waste management procedures through automated processes that both decreased human involvement and reduced errors and enhanced organizational productivity.

Admin Actions:

- The login process allows an administrator to handle user and employee accounts by assigning roles and access permissions.
- The administrative personnel receive incoming request assignments which they distribute to workers.
- The admin checks current collection operations by using real-time tracking systems.
- At the end of administration tasks, the user logs out of the

system. **User Actions:**

- Users should log in with their account before submitting a pickup request which consists of waste type and quantity information as well as preferred pick-up time.
- After submitting the request, the user will obtain automated messages about their request progression.
- Users access real-time location monitoring for their assigned employee while they perform the collection on the same day.
- Users can check past disposal request records after finishing work with the system.
- Users should log out from the system right after they check request progress or send in fresh

requests. **Employee Actions:**

- The system displays assigned pickup requests containing details about location and scheduled time as well as e-waste type to the employee upon login.
- The employee travels to the requested site while simultaneously updating the progress in the system.
- After collecting the waste, the employee records its details which are automatically updated within the system.
- The system provides historical data which the employee can utilize for analyzing collection trends to enhance route planning.
- After finishing work the employee conducts a logout procedure.

The administrator maintains full control over the system management by handling user and employee accounts while setting permissions for their roles. The system enables staff members to process pick-up requests for e-waste which results in employee assignments and real-time tracking of collection work. The admin system produces operational reports from collection data which help improve operational efficiency. When administrative responsibilities have been finished the administrator follows protocol for system logout procedures.

When users want e-waste pickups, they must enter information about waste types together with quantity measurements and their preferred appointment times into the system. The system automates request status updates and provides users with tracking capabilities for the selected employee who performs the collection service on the day. Users gain access to check past request records once their requests finish processing. The users finalize their work then perform a logout process for system security.

The physical e-waste collection duties belong to the staff members. The system shows employees their assigned pickup requests which include information about location details and waste type and scheduled times. Employees use the system to conduct their route and perform real-time request status updates while documenting collection records for time-sensitive system updates. Previous collection data can be examined by workers to improve their route-planning capabilities. The employees finalize their assignments through proper logout procedures.

Screens:



Fig 1: User Sign In Page

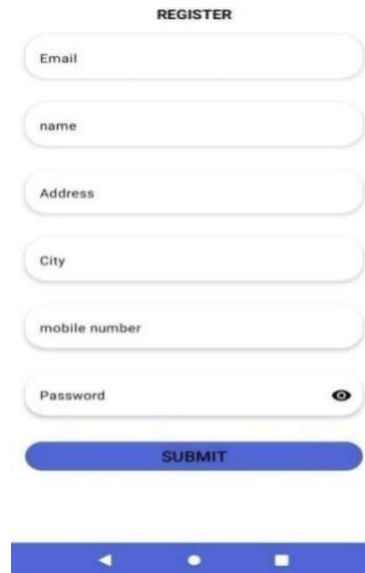


Fig 2: User Sign Up Page

The system prominently features a section for employee login, where employees can enter their ID and password to access their accounts by clicking on the "Employee Login" button. This initial screen serves as the entry point to the system, ensuring that only authorized employees can proceed further, thereby maintaining security and proper access control. The Employee Page screen is the main interface for employees after logging into the E-Waste Management System. It presents several key options.



Fig 3: Admin Dashboard

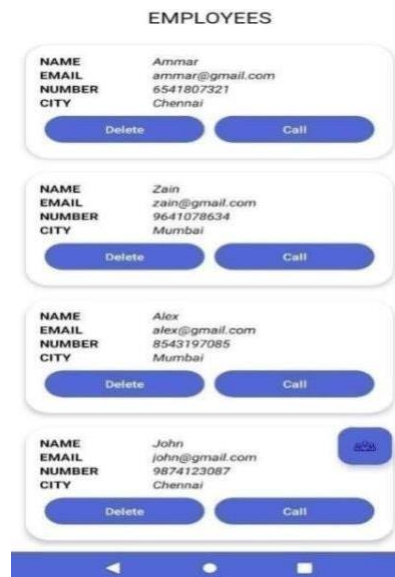


Fig 4: Admin Employees

Admin Dashboard Screen It is the initial screen that appears upon login of the admin to the E-Waste Management System. It consists of a number of major options, including employee management, management of

e-waste pickup requests, view of user data, and logout of the system. All of them are distinct buttons so that it is simple to navigate and hence the admin will have easy access control.

Employee Management Screen The screen gives the administrator a complete picture of the registered employees. All information of each employee, such as name, email, contact number, and city, is shown in card view. The admin has two important actions for each employee — "Delete" to delete the employee from the system and "Call" to call them directly. Besides, a floating action button is offered to add new employees to make employee management easier and facilitate easy coordination between administrators and employees.

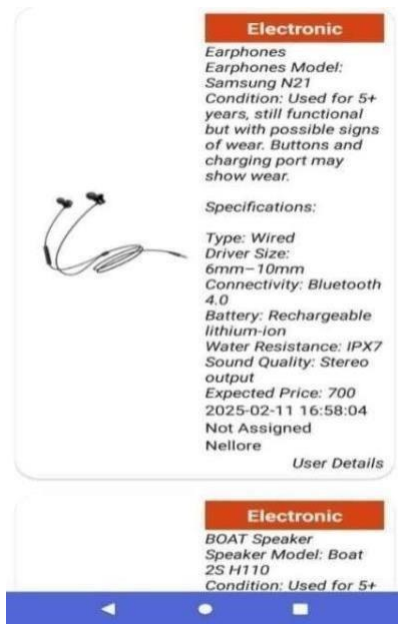


Fig 5: Admin Assign Requests

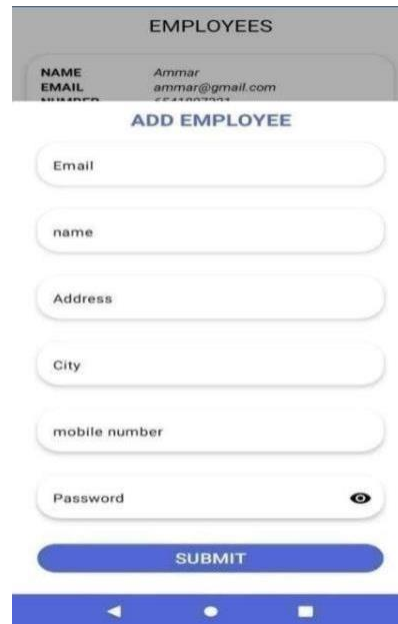


Fig 6: Admin Add Employees

Admin Assign Requests Admin Assign Requests Page offers a complete overview of electronic devices that are posted for e-waste disposal so administrators can easily manage incoming requests. Each item listing contains critical details such as the model of the product, product name, condition, and other specifics such as connectivity type, battery type, sound quality, and more. The page further indicates the expected price when listed, listing date, location, and collection status currently, to maintain full transparency in the process. A standout feature is the "User Details" button at the end of every entry, which allows administrators to easily view the profile of the user who requested it. This allows for easy communication if further information or coordination is needed. The organized format also allows the admin to look at every item in detail prior to assigning collection or disposal duties.

Add Employee Screen facilitates smooth integration of new employees into the e-waste system and introduces an organized workforce. The screen offers a straightforward form through which administrators can enter essential employee data such as email, full name, residence address, city, mobile number, and a secure password. Each field is created to record significant information to be used in identifying and communicating with employees.

Once the required details have been filled in, the "Submit" button on the bottom of the page completes the registration process and adds the employee automatically to the system. This feature is vital to effective human

resource management since it enables administrators to add to the staff when necessary, to effectively assign tasks according to the increasing needs for e-waste collection and disposal. The streamlined process not only saves time but also minimizes the risk of making mistakes, leading to a better organized and responsive process.

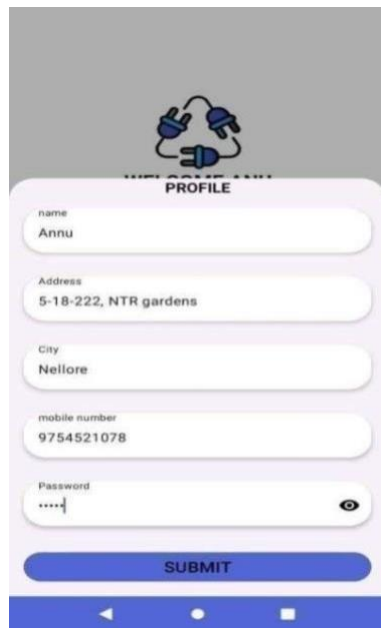


Fig 7: User Dashboard

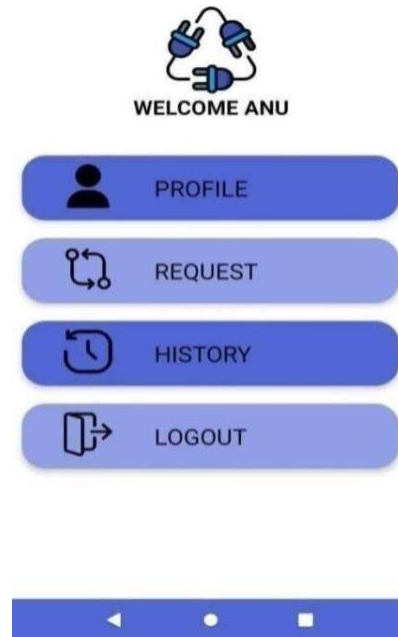


Fig 8: User Edit Profile

Dashboard of Users "Dashboard" is the name of the main screen that users see when they first log in to the E-Waste Management System. "Profile" allows you to manage your personal information, "Request" allows you to enter new e-waste pickup requests, "History" allows you to examine previous requests, and "Logout" allows you to safely log out of the system. The user interface was created with ease of use in mind, giving users direct access to the functional requirements they require.

The User Edit Profile feature allows users to view and modify their personal information. These are the fields on the form: "Name," "Address," "City," "Mobile Number," and "Password." After entering information, users can click the "Submit" button to save or modify their work. For the e-waste pickup to be coordinated successfully, users must be able to change their contact information on the page.

User Dashboard Page:

- Profile: Edit personal details.
- Request: Generate new e-waste collection requests.
- History: Track previous orders.
- Logout: Log out safely from the system.
- easy-to-use format for convenient access and quick retrieval.

User Edit Profile Page:

- View and update personal details.
- Fields: Name, Address, City, Mobile Number, and Password.

- "Submit" button to save changes.
- Ensures accurate contact information for easy coordination of e-waste collection.



Fig 9: User Request

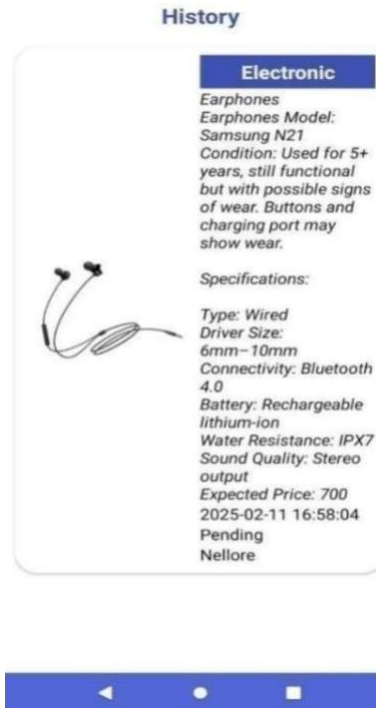


Fig 10: User History

User Request Page. User Request Page provides for the ease and convenience of requesting new e-waste collection. User has freedom to select the kind of product through a drop-down menu and submit the photo of the product to make it more clearer. There has also been the implementation of a definite description box whereby detailed descriptions such as product model, condition, and technical specification can be included by the users, thus introducing transparency and precision into judging. Also, there have been features such as price expected that grant the users convenience to input a value desired for the product, thus making the transaction user-based. The "Send" button at the page end is handy for sending so that the requests are posted into the system in real time. Simplification of process makes it handy and compels the users to take steps towards proper e-waste disposal actively.

User History Page gives users a list of all their previous e-waste pickup requests in an easy-to-access place, with a correct and easily readable history. Each request is structured with relevant information such as product category, model, condition, and key specifications. Additionally, users can see the estimated price, date submitted, and status of each item so that they know what their status of submission is. Systematic design ensures ease and simplicity in tracking requests, enhancing user experience. The feature brings transparency and accountability into the process of e-waste management to allow users to contribute actively towards environmentally friendly waste treatment. The system ensures long-term interaction through a comprehensively documented history of past actions and encourages good e-waste management culture.



Fig 11: Employee Dashboard

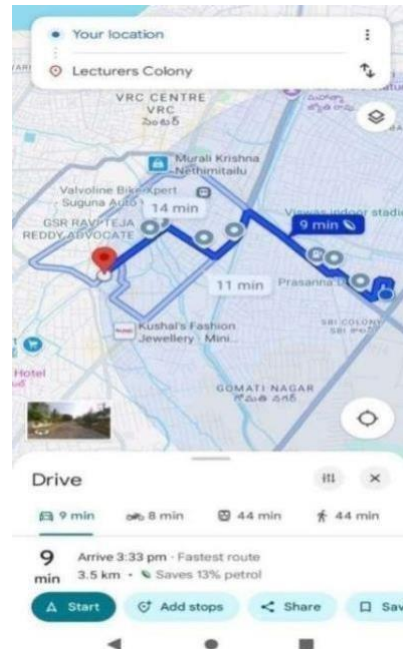


Fig 12: Employee locating user

The Employee Dashboard Page provides an overview of the electronic item listed for e-waste. This would include the product type, model, condition, and key specifications such as connectivity, battery type, and sound quality. It will also include special features, expected price, and location. Overall the dashboard page gives the user adequate knowledge of the product state and specification to make informed decisions and further actions.

Employee locating user. Page will assist users with locating the e-waste drop-off points for collection or track the user to drop point for the pickup. It will show the user starting point, destination, and multiple stops along the way, with expected travel time highlighted with alternate routes as needed. Overall it will assist members in efficiently tracking a route for e-waste collection.

Employee Dashboard Page:

- Product Type, Model, Condition, and Key Specifications (e.g., connectivity, battery type, sound quality).
- Special Features, Expected Price, and Location.
- Provides adequate knowledge of the product state to make further actions.

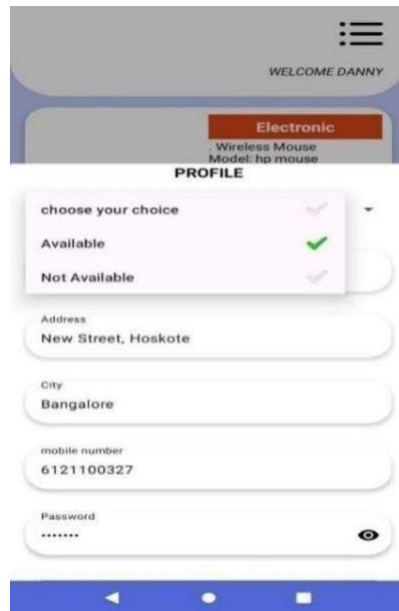


Fig 13: Employee edit profile



Fig 14: Updating Page

The Employee Edit Profile Page is used for users to update their personal information as well as their availability status. Users may select “Available” or “Not Available” from a drop down to indicate their status. The other fields they may edit are “Address”, “City” “Mobile Number”, and “Password”. All users have the ability to click “Submit” after they have changed any of their personal information ensuring that the system always has updated information, which enables improved communication and coordination.

The Updating Page is a prompt for the user that confirms they have solved a complaint. When the user selects the option to indicate a resolution has been met, a pop-up message will indicate: “Are You Sure Complaint is Solved?” and have a button for “Yes”. This feature gives the user an opportunity to double check if they are sure they want to confirm the resolution before it is finalized and helps reduce accidental confirmed resolutions to complaints, thus increasing the accuracy of complaint handling.

V. CONCLUSION

The Electronic Waste Management System (EWMS) has sparked a change in the approach to electronic waste management by streamlining and automating various processes including collecting, tracking and disposing e-waste. By embracing new technologies, EWMS is a more efficient, secure and scalable electronic waste management solution in a sustainable, efficient, and effective manner. A key advantage of EWMS is a system of technological underpinnings. The utilization of MySQL guarantees secure and scalable data storage, and assists in accurate record-keeping of e-waste transactions while ensuring accuracy of data storage. The backend is powered by Kotlin and provides good functionality. The XML-based user interface provides users the ability to engage the system without advanced technical knowledge allowing users an intuitive experience to navigate the system, submit requests, and to check status updates. A major benefit of the system is which will enable instantaneous tracking of waste collection and disposal activities. This feature promotes transparency and accountability, keeping stakeholders informed about all steps in the process. Additionally, the platform employs the seamlessly integrated authentication mechanisms to strengthen security by prohibiting unauthorized access and allowing only verified individuals to interact with the system.

VI. REFERENCES

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