A person putting a plastic bottle into a recycling bin

Description automatically generated

**Table of Contents**

[1. Introduction 3](#_Toc159861411)

[1.1 Key Features / Components 3](#_Toc159861412)

[1.2 Initial Hypotheses 4](#_Toc159861413)

[1.3 Assumptions 4](#_Toc159861414)

[1.4 Potential Benefits 4](#_Toc159861415)

[1. Proposed Research Methodology 5](#_Toc159861416)

[2.1 Background Research 5](#_Toc159861417)

[2.2 Uniqueness of the project 6](#_Toc159861418)

[2.3 Data collection method-user surveys/questionnaires 6](#_Toc159861419)

[2.4 Technologies 6](#_Toc159861420)

[3. Project Planning & Timeline 7](#_Toc159861421)

[3.1 Timeline 7](#_Toc159861422)

[3.2 Team Contribution 8](#_Toc159861423)

[4. Implemented Features till Mid Term 8](#_Toc159861424)

[4.2 Assumptions 8](#_Toc159861425)

[4.3 Research and Comparison 8](#_Toc159861426)

[4.4 Change in Milestone / Timeline 8](#_Toc159861427)

[4.5 Challenges Faced 9](#_Toc159861428)

[5. Features with Details 10](#_Toc159861429)

[5.1 Implemented Features 10](#_Toc159861430)

[5.2 Details of the Implemented Features 10](#_Toc159861431)

[6. How to run the project 24](#_Toc159861432)

[7. Acknowledgement 25](#_Toc159861433)

[8. References 25](#_Toc159861434)

1. **Introduction**

In the modern era of technological advancements and rapid societal growth, we are constantly facing the challenge of increasing waste volumes, leading to improper disposal practices that contribute to air pollution and other environmental concerns. Addressing this critical issue, ScrapAway introduces an online platform designed for the efficient door-to-door collection of various types of waste, including plastics, metals, electronics, organics, furniture, and hazardous materials.

ScrapAway's innovative solution enables users to responsibly dispose of their waste without leaving the comfort of their homes, thereby reducing the need for travel, and significantly contributing to environmental sustainability. In today's fast-paced lifestyle, where proper waste management is often overlooked due to busy schedules and inconvenient pickup arrangements, ScrapAway offers a timely and effective response.

Our platform distinguishes itself through its variety of robust features, catering to both waste disposers and collectors. Sellers benefit from features like an intuitive Dashboard for managing pickups and bookings, Easy Waste Listing for different waste types, convenient Scheduled Pickups, and Pricing Estimates to gauge disposal costs. The platform also includes comprehensive Waste Categories for a broad range of disposals. On the collector side, ScrapAway offers functionalities such as Booking Management, allowing waste collectors to efficiently manage their pickup bookings, Route Optimization tools for planning effective collection routes, and Income Tracking features to monitor earnings from completed pickups.

In addition to these core functionalities, ScrapAway enhances user engagement with educational and interactive features. This includes Recycling Tips, Community News, engaging Recycling Challenges, and Real-Time Alerts for an informed and connected user experience.

ScrapAway will be specifically designed to be user-friendly and adaptable, meeting diverse waste disposal needs. Our platform simplifies waste management while contributing to global environmental preservation efforts. By revolutionizing waste disposal methods, we are committed to aligning with sustainability and ecological responsibility.

## **Key Features / Components**

**Seller Features:**

1. **Dashboard:** View and manage pickups / bookings.
2. **Easy Waste Listing:** Sellers can list different types of waste.
3. **Scheduled Pickups:** Choose convenient pickup times and locations.
4. **Pricing Estimates:** Get cost estimates for different waste types.

**Collector / Buyer Features:**

1. **Booking Management:** Collectors can view, accept, or reject pickup bookings.
2. **Route Optimization:** Tools to plan efficient collection routes.
3. **Income Tracking:** Monitor earnings from completed pickups.

**Other Features:**

1. **Recycling Tips:** Learn about recycling and waste management.
2. **Community News:** Read success stories and environmental news.
3. **Recycling Challenges:** Solve riddles/puzzles to learn about recycling.
4. **Real-Time Alerts:** Get notifications and digital receipts.
5. **Partnerships:** Information on recycling partnerships.

## **Initial Hypotheses**

1. The website will create income opportunities for garbage collectors.
2. A user-friendly website will lead to higher participation in proper waste disposal practices.
3. Streamlined online booking will decrease illegal dumping of large items.
4. Enhanced convenience and affordability will boost resident satisfaction in waste disposal.
5. The platform will raise awareness about the importance of responsible waste management.

## **Assumptions**

1. There is a significant demand among residents for disposing of items not covered by city services.
2. Garbage collectors are willing and able to handle the increased and varied workload.
3. Users are inclined to use a website for waste disposal scheduling and services.

## **Potential Benefits**

**For Sellers:** Reduces the hassle and environmental impact of disposing of large waste items, offering a cost-effective solution.

**For Collectors:** Generates additional income and provides a more organized system for waste collection, enhancing efficiency.

# **Proposed Research Methodology**

## **Background Research**

1. **Existing Problem:**

The topic we've selected addresses the challenges associated with solid waste management. Recent data of survey indicates that many Canadian residents struggle with significant waste disposal issues, particularly during the winter. The key difficulties include:

* **Challenges in Disposing of Solid Waste:** This includes the difficulty in disposing of large items such as broken electronics, furniture, tiles, and scrap materials, which are often not accepted by local municipal waste management services.
* **Limitations on Garbage Item Disposal:** Residents face restrictions on the number of items they can dispose of, with a current limit of six items per household per year for corporation pickup trucks. This poses a problem for those needing to dispose of more items.
* **Issues with Missed Garbage Collection Schedules:** When residents are unavailable at home and miss the scheduled pickups by city council garbage collectors, they are left with limited options. They must either store the garbage for another week or opt for expensive private pickup services.

To address these issues, we are developing a website for residents. This platform not only facilitates scheduling waste collection at a time that suits the user but also offers a cost-effective alternative to the fees charged by the city of Surrey. It presents a win-win situation: residents can easily discard items that the city's service doesn't accommodate, while garbage collectors have an opportunity to generate significant income.

Our research will delve into the needs and challenges faced by both waste disposers (sellers) and waste collectors, ensuring our platform effectively addresses the requirements of both groups.

1. **Similar websites:**

<https://my.surrey.ca/largeitems/terms>

<https://vancouver.ca/home-property-development/garbage-and-recycling-collection-schedules.aspx>

<https://city.langley.bc.ca/city-services/engineering-parks-operations/garbage-green-bin-recycling>

1. **Research papers:**

<https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3808542&download=yes>

<https://www.researchgate.net/publication/235217579_Development_of_A_Web_based_GIS_Waste_Disposal_Management_System_for_Nigeria>

## **Uniqueness of the project**

The uniqueness of the website lies in the solutions it provides to the residents as there is no such website available for them that can provide them with a pickup option of all kinds of solid waste that too in adverse weathers such as winters.

**Competitive Prices and validation:** The ability for users to check and compare prices for waste disposal is a pivotal factor. This feature enables users to make informed decisions, ensuring they get the best possible value for their waste disposal needs.

**Flexible scheduling of Door Pickups:** Offering scheduled door pickups provides users with the flexibility to choose a time that suits their needs. This feature allows users to cater to the busy schedules who may not have the time to visit waste disposal centers and they throw the cans, plastic, electronic in the bin.

**Location preferences:** Allowing users to choose their preferred location for waste pickups doesn’t matter if their location is in the city or outskirts.

## **Data collection method-user surveys/questionnaires**

Our research into waste disposal challenges has involved two key methods: analyzing research papers and websites and engaging in interviews and surveys with people who have encountered waste disposal issues. We've paid special attention to the struggles faced during severe weather, when waste assistance services are often rare.

These real-world experiences, combined with the academic information we gathered, have been invaluable in shaping our understanding of the problem. They have particularly highlighted the gaps in current waste management systems and the need for more accessible and efficient solutions. Based on these insights, we have been working on developing a comprehensive application specifically designed to simplify and streamline waste management processes. This app aims to address the unique challenges identified through our research, making waste disposal more manageable for individuals, especially during challenging weather conditions.

## **Technologies**

We are designing a full-Stack application using **MERN STACK**.

1. **Methodology:** We will use Agile methodology for flexible, iterative development of our app.
2. **Operating System:** Windows.
3. **Front end:** We will use React to develop the User Interface of our website.
4. **Backend:** Server-side activities will be managed by Nodejs, which provides scalability and real-time capabilities.
5. **Database:** MongoDB, a versatile NoSQL database for storing and retrieving data.
6. **API:** Writing Api using Nodejs.
7. **Responsiveness:** Our website will provide consistent user experience across all devices and browsers.

# **Project Planning & Timeline**

## **Timeline**

|  |  |  |
| --- | --- | --- |
| **Deadlines** | **Phase** | **Description** |
| Jan 1 - Jan 14 | Requirement Gathering and Analysis | This phase involves studying various research papers and understanding the user needs to find the problem statement.   1. **Milestone:** Completion of Technical Feasibility Analysis. 2. **Deliverables:** Detailed project Plan, and research findings. |
| Jan 17 - Jan 22 | Designing Prototype | During this phase a rough prototype design will be created.   1. **Deliverables**: Rough estimation of the number of pages and a draft user interface. |
| Jan 29 - Feb 10 | Front End Development | 1. During this development phase responsive UI will be designed using React, Bootstrap and CSS. 2. **Milestone:** Completion of UI of Homepage of our app. |
| Feb 11 | Testing First Set | |
| Feb 12 – Feb 21 | Backend Development | During this phase database connectivity is set up with the front end and Api will be written using NodeJS.   1. **Milestone:** Successful completion of database connectivity and validation of user information |
| Feb 22 | Testing Second Set | |
| Feb 23 - Mar 15 | Coding Final Set | 1. Integrate all the functionalities. 2. **Deliverables:** Fully functional website with database connectivity. |
| Mar 20 - Mar 25 | Quality Assurance and Testing | 1. Quality Assurance and Testing activities will ensure all modules are working smoothly. 2. **Milestone:** Successful completion of quality assurance. 3. **Deliverables:** QA reports and bug fixes. |
| 26 Mar - Apr 6 | Presentation and Report | 1. This final phase includes preparing for the project presentation and compiling the report. 2. **Milestone:** Successful project presentation. 3. **Deliverables:** Report and project presentation materials. |

## **Team Contribution**

**Sabiya Sabiya (Group Member #1)**

Her role will be centered on the seller side of the platform. Her primary responsibility includes enhancing the user experience and integrating the database for effective waste listing and scheduling. She will primarily focus on refining the database aspects of the project.

**Laiba Ayyaz (Group Member #2)**

Her focus will be on the collector side of our application more. She will be dedicated to optimizing the UI/UX, ensuring it is user-friendly and efficient for route planning and booking management.

# **Implemented Features till Mid Term**

The latest update on the ScrapAway project shows progress in making the website better for users and garbage collectors. Now, users can easily sign up, log in, and manage their accounts securely. They can also choose when and where they want their garbage picked up and list different kinds of waste they want to dispose of. Plus, the team used modern technology to build the website, making sure it works well on all devices and keeps user information safe. They've also added helpful features like a dashboard for users, a guide on sorting waste, and ways to track garbage collection orders. This work makes it easier for people to manage their waste and helps the environment.

## **Assumptions**

Initial assumptions highlighted the demand for an intuitive platform for waste disposal and the readiness of garbage collectors to engage with a digital solution. Over time, these assumptions have been validated and expanded upon, revealing a deeper understanding of user requirements and the logistical intricacies of waste collection. The project's evolution reflects a responsive approach, where assumptions are continually tested and refined through development and user interaction.

## **Research and Comparison**

Comparative research has played a pivotal role in guiding the project's trajectory. By analyzing existing waste management solutions and integrating user feedback, the ScrapAway initiative has identified unique opportunities for innovation. This research has not only informed the development of distinctive features but also highlighted the importance of user experience design in encouraging sustainable waste disposal practices.

## **Change in Milestone / Timeline**

For tracking and visualizing the progress and tasks of the "ScrapAway" project, the JIRA scrum board is being utilized. This tool effectively outlines each sprint's objectives and achievements, providing a clear overview of the project's development stages.

The project "ScrapAway" is structured around two primary module sets, with the first set focusing on the User modules now successfully completed. An elaboration on the timeline and efforts invested in this phase includes the design of the User module's UI, which took approximately 20 hours. The backend, involving API development with Node.js, was accomplished in 10 hours. The integration of the UI with the MongoDB database required a more substantial effort of 30 hours, ensuring a seamless connection between the frontend and backend. Additionally, the first set underwent thorough testing for 20 hours to verify that all user-side functionalities operate correctly, with a strong emphasis on authentication and error handling mechanisms. This rigorous process ensures that the user experience is both intuitive and secure, reflecting the team's commitment to quality and efficiency.

A screenshot of a computer

Description automatically generated

## **Challenges Faced**

Initially, we began the project by storing passwords directly into the database. However, after conducting further research by reading various documents and watching videos, we realized that this approach posed significant security risks. Storing passwords in plaintext form is highly insecure, as it leaves sensitive user data vulnerable to unauthorized access in the event of a data breach.

Subsequently, we delved deeper into industry best practices and explored more secure alternatives. Through our research, we learned about the concept of token-based authentication, which offers a robust solution to password storage concerns. Instead of directly storing passwords, this approach involves hashing the passwords before storing them to the database. If the hashes match, a token is generated and returned to the Client.

This transition to token-based authentication not only enhances the security of user credentials but also aligns with industry standards and best practices. By implementing this approach, we can better safeguard user data and mitigate the risk of security breaches.

In addition to that, when we began developing the profile component, we encountered challenges with passing the username in the URL, which we realized was not the optimal approach after consulting various React documentation resources. Consequently, we embarked on learning how to effectively pass data from one component to another. Through collaborative Zoom meetings, we collectively explored different approaches until we decided on a secure solution. This solution involved setting the username variable in local storage and subsequently fetching the username using the getParam argument.

# **Features with Details**

## **Implemented Features**

* Login and sign-up authentication
* Dashboard
* Trash collection form.
* Drop down nav bar.
* Profile screen.
* Track order screen.
* Logout

## **Details of the Implemented Features**

1. **Login / Sign-Up**

The ScrapAway project incorporates a sophisticated authentication mechanism to enhance user experience and security. Upon registration, users can create a new account or log into an existing one. The system employs bcrypt for password hashing, ensuring that passwords are securely stored in the database. During the login process, the system compares the hashed passwords. If they match, a JSON Web Token (JWT) is generated and stored locally, facilitating a secure and efficient login process. This token plays a crucial role in providing a personalized user experience by retaining user details for subsequent sessions.

The backend architecture, powered by MongoDB, efficiently manages user data. It verifies login credentials against the stored information, granting access to the main dashboard upon successful authentication. In instances of login failure, due to reasons such as incorrect password input or attempts to access a non-existent account, the system promptly displays relevant error messages to guide users.

Furthermore, we have designed specific APIs to streamline the registration, login, and user detail retrieval processes. These APIs not only simplify user interaction with the platform but also ensure that data handling and authentication are both secure and user centric. This approach underscores the project's commitment to creating a seamless and secure environment for managing waste disposal services.

Attached screenshots demonstrates Signup/Login functionality and error handling scenarios.

A sign on a scrapaway

Description automatically generated with medium confidence

A login form with a black box

Description automatically generated with medium confidence

A screenshot of a computer screen

Description automatically generated

A login screen with a piece of metal

Description automatically generated

Backend code to demonstrate the signup/login API functionality using Nodejs.

A computer screen shot of a program

Description automatically generated

A screenshot of a computer program

Description automatically generated

This code snippet shows how to perform asynchronous HTTP requests to interact with the backend services, such as fetching data or submitting form data.

A computer screen shot of a program code

Description automatically generated

A computer screen shot of a program

Description automatically generated

1. **Drop down Nav Bar**

In the initial design phase, the homepage was designed which has two navigation bars to enhance user navigation and accessibility. The primary navigation bar directs users to three key sections: the homepage itself (via the ScrapAway logo), a dedicated page for the Waste Sorting Guide, and a section outlining business collaborations. Meanwhile, the secondary navigation bar offers links to the Blog, Contact, About, and Waste Collection pages, the latter of which integrates a user authentication system facilitating both login and signup options for new users. Upon entering valid email and password credentials, users are seamlessly directed to a dashboard page. This dashboard features a dropdown menu granting access to user profiles, history, order tracking, and a logout option.

A white rectangular object with black text

Description automatically generated

A screen shot of a computer screen

Description automatically generated

1. **Dashboard**

The dashboard prominently features a Trash collection form that prompts users to provide essential details such as name, contact number, address, pickup date, and the specific type of waste for collection. After users fill out and submit all their information, they see a message confirming their submission. This lets them know everything went through correctly. Also, being able to schedule pickups for whenever it works best for them makes the platform more user-friendly and convenient.

From a technical standpoint, the backend of the platform is built using a series of APIs. These are created to do two main things: keep user data safe in the database and make sure each request to the API is properly checked for security. This careful planning in building the APIs makes managing data smoother and ensures that users' interactions with the ScrapAway platform are both safe and efficient.

Users can easily list different types of waste through our platform. Whether it is household waste, industrial waste, electronic waste, or any other type of waste, users can conveniently create listings to dispose of their waste responsibly.

Below are the screenshots to show UI design of Dashboard page.

A screenshot of a computer

Description automatically generated

A screenshot of a chat

Description automatically generated

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

Form successfully submitted in database

A screenshot of a computer

Description automatically generated

API that fetches the user details to give them a personalized experience.

A screen shot of a computer program

Description automatically generated

API that saves the data in the database and sends them on track order page. (Back-end)

A computer screen shot of a program code

Description automatically generated

API that saves the data in the database and sends them on track order page. (Front-end)

**A computer screen shot of a program code

Description automatically generated**

1. **Profile page:** The profile management feature of the web application is designed for simplicity.

and security, enabling users to update their personal and account details directly from the interface. This functionality is underpinned by a combination of front-end and back-end technologies, ensuring a smooth and secure user experience.

On the front end, the part of the app users sees and use, there's a page with forms for editing personal information and changing passwords. When users first get to this page, it automatically fills in their current details. They can change any of these details and save them. The web page interacts to the backend to make these changes official. If all goes well, users see a message that their profile has been updated. If not, they get an error message.

Additionally, React's use Effect hook automatically fetches and displays the user's existing profile information upon page load, ensuring that the most current data is always presented. The architecture not only prioritizes user control and data accuracy but also emphasizes security through encrypted passwords and token-based user authentication, reflecting a holistic approach to user account management within the application.

On the backend, a specific endpoint /updateProfile is protected by authentication middleware, verifying that only logged-in users can make changes. This security measure uses JSON Web Tokens (JWT) to confirm the user's identity before proceeding with any updates. The system allows changes to key user information, such as names and email addresses, by matching the submitted details with the user's ID in the MongoDB database. Successful updates trigger a confirmation response to the user, while any discrepancies or errors result in clear, informative messages.

The user interface of user’s profile page.

A screenshot of a computer

Description automatically generated

Successfully updated first and last name

A screenshot of a computer

Description automatically generated

Mongo DB collection, user details before updation.

A computer screen shot of numbers

Description automatically generated

Mongo DB collection, user details after updation

A computer code with numbers and letters

Description automatically generated

The API that updates user details in the database.

A computer screen shot of a program code

Description automatically generated

Component that fetches and displays updated user details.

A screen shot of a computer program

Description automatically generated

1. **Track Order Screen**

The Track Order functionality provides a streamlined method for users to monitor the status of their waste collection orders directly from their profile. By selecting "track order," users are directed to a comprehensive overview of their orders, detailing the status of each, whether pending, completed, or scheduled for pickup.

The backend plays a crucial role in securing and processing these requests. It verifies the user's identity through token authentication and queries the database for the latest order information, ensuring that only legitimate users can view their order statuses.

Simultaneously, the front end delivers this information in a user-friendly manner. Upon initiating a track order request, a temporary loading indicator appears, keeping the user informed during the data retrieval process. The system then presents the order details, such as ID, status, and scheduled pickup dates, in a clear and accessible format. In instances where no orders are available for tracking, a notification is promptly displayed, keeping users fully informed about the status of their waste collection services.

A screenshot of a computer

Description automatically generated

A screen shot of a computer program

Description automatically generated

1. **Logout**

The logout functionality in the web application is designed to be straightforward and secure, ensuring users can easily exit their session. When a user decides to log out, the handle Logout function is triggered. This function performs two key actions to securely end the user's session.

It removes the user's authentication token from local storage. This token is critical for maintaining the user's session and access privileges throughout the application. By removing it, the application effectively terminates the session, ensuring no unauthorized access to the user's account after logout.

After the token is removed, the user is redirected to the login page. This redirection is an essential step, as it moves the user away from potentially sensitive information and back to the entry point of the application, ready for a new session.

A computer screen with white text

Description automatically generated

# **How to run the project**

1. Open both the ScrapAway-Frontend and ScrapAway-Backend in separate Visual Studio windows.
2. In the terminal, navigate to each project folder and run the command "npm i" to install all necessary dependencies.
3. In the backend folder, run the command "node Server" to start the backend server on port 3005.
4. In the frontend folder, run the command "npm start" to launch our website on localhost:3000.

**Git Hub Link:**

<https://github.com/sabiya-sachdeva/ScrapAway/>

# **Acknowledgement**

I would like to extend my heartfelt thanks to Douglas College for creating an educational environment that greatly encourages learning and innovation. I am especially grateful to **Professor Reza Abbasi** for his invaluable teachings in MERN full-stack development. Additionally, my gratitude goes to **Professor Nikhil Bhardwaj** and **Michael Ma** for their expert guidance in database management, which was crucial in my mastery of these complex concepts.

# **References**

1. <https://my.surrey.ca/largeitems/terms>
2. <https://vancouver.ca/home-property-development/garbage-and-recycling-collection-schedules.aspx>
3. <https://city.langley.bc.ca/city-services/engineering-parks-operations/garbage-green-bin-recycling>
4. <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3808542&download=yes>
5. <https://www.researchgate.net/publication/235217579_Development_of_A_Web_based_GIS_Waste_Disposal_Management_System_for_Nigeria>
6. <https://www.youtube.com/watch?v=6mbwJ2xhgzM&list=PLu0W_9lII9agiCUZYRsvtGTXdxkzPyItg>
7. <https://en.wikipedia.org/wiki/React_(software)>
8. <https://www.tutorialspoint.com/nodejs/nodejs_express_framework.htm>
9. <https://www.tutorialspoint.com/reactjs/index.htm>
10. <https://www.youtube.com/watch?v=YazDWUPh_xs>