

WERECLAIM: A MERN Stack Solution to Enhance the Online Resale Market

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ABSTRACT

Since the days of trading, used items have been widely used and recently, the marketing of these secondhand goods has received increased attention. Shopping ethically or acting ethically as a consumer has grown in popularity along with the rise in demand for used goods. People now prefer doing business online over the conventional means of satisfying their wants due to the huge advancement of technology. Furthermore, given that there are many who are unemployed and wish to earn money online, this kind of platform for buying and selling old goods is timely to address those needs as well. Making a platform for used goods sales and purchases appears to be an excellent idea in the age of digitization and WERECLAIM was designed to address several issues of purchasing and selling goods in the secondhand market. The purpose of this study is to investigate the major trends of used items buying and selling platforms and to emphasize the contribution of WERECLAIM to the modern used goods, buyers, and sellers. We have identified the major issues and the current needs of a used items trading system and came up with the system WERECLAIM which fulfills the demand of a used items trading platform.

Keywords-- E-Commerce, Online, Buying and Selling, MERN, GitHub

I. INTRODUCTION

E-comm, sometimes known as EC for short (E-commerce), is a term used to describe transactions involving the purchase and selling of goods, products, and services over the Internet [1]. This web-based application called WERECLAIM is a platform for used goods to be sold for a higher price. This application makes use of the MERN stack of technology.

The market for used items has gradually increased due to the emergence of new trading formats, current consumers' purchasing habits, social media, the Internet, and environmental concerns. This gradual expansion of the

second-hand goods industry, particularly in the last 40 years, when the buying of these products became worth billions of dollars occurrence on a global scale. According to [2] Second-hand clothes, footwear, and accessory sales are predicted to rise from 24 billion USD in 2018 to 51 billion USD in 2023. (ThredUP, 2018). In the third quarter of 2018, the global market for used cars hit 10.2 billion units (Edmunds, 2018), continuing to be greater than the market for brand-new vehicles (Hristova, 2018). The global market for pre-owned or used furniture is estimated to be worth 29.3 billion USD in 2017 and is expected to continue expanding at a 6.4% annual pace until 2025. (Research Nester, 2017). According to Persistence Market Research (2018), the global trend in the sale of used mobile phones has grown to 19 billion USD in 2017 and is expected to reach 44 billion in 2026.

Here, we've utilized the fundamental features of an e-commerce web application, including registration, sign-in, dashboards, and the display of store categories and products [3]. Building a web application with a payment gateway and product items. Implement administrative features for the website, including user administration, store management, statistics, and report generation.

The seller is able to upload and maintain their products directly on the website here. Additionally, the shop may provide a link to its own website (if any). Customers can easily look for urgent products from the stores in their area. Customers can speak with the store owner directly based on the search results to learn more about the items they are interested in.

When discussing other current systems of selling used products, it has been observed that the user interfaces (UIs) are not very good or suitable to the topic, and some consumers have left negative reviews due to being tricked or the seller's poor communication skills making customers unhappy with their purchases. Most websites only allow you to remove an added product; you cannot change its details making it challenging for the seller. And also, some systems lack a method for sorting prices or a search tool,

which makes it challenging for users to navigate around the application. Moreover, most applications do not permit sellers to generate reports based on the things they have added to the system or users to make reports based on their purchases.

By taking into account these drawbacks of existing apps, WERECLAIM offers attractive user interfaces, supports the use of a digital payment gateway, a help line for users to contact if the appropriate seller is not responding, and a third-party delivery service which will contribute to a rise in client satisfaction. In addition to being able to generate a report on the things they have uploaded, sellers will have the opportunity to modify the details of items that have already been put to the system. The ability to filter products by lowest or highest price, and the ability to search for specific products using their names would be one of the topmost priorities in this application. Additionally, it offers a feature for keeping user data like profiles and a history of goods searched while allowing customers to create reports on their orders.

This paper covers the following areas. Related work section includes how the proposed system deviates from similar existing systems including comparisons and similarities. The Methodology part mainly covers the used tools and technologies. Additionally, that section includes the main backend functionalities. The most important section of the paper is written under the proposed system section. It includes the overall functions of the system and how different people interconnect with the system. Discussion section discusses the expected results of the proposed system. In addition, that section describes how the system will be tested in order to have a successful final product. Finally, the conclusion section concludes all the written areas within the scope of the system.

II. RELATED WORK

As WERECLAIM is a platform for buying and selling, we included several concepts from already-existing systems into our system. Product reviews are remarks and ratings for items made by customers who have already bought the product. Like other current strategies used by eBay, etsy etc. For secondhand marketing, in order to give consumers additional information about the things they are interested in and to boost their trust and confidence, we also will post product reviews on the listings.

The payment information of customers is safe. Because of WERECLAIMS' secure payment methods, the buyer's payment information is never given to the seller. Like in other systems, WERECLAIM will appear on the card statements.

The Money Back Guarantee and any other guarantees provided by your payment method may apply to eligible transactions at all times. There is no additional cost

for coverage, it is automatic, and it covers your purchase price.

Credit, debit, and gift cards, Apple Pay, Google Pay, PayPal, and PayPal Credit will be accepted forms of payment such as in eBay, etsy etc.

The technology stack used for the development process of the proposed system is MERN stack. Typically, an e-commerce web application has two types of users, which are admin and user. Admins are responsible for some specific management tasks such as creating, updating and removing the products and users from the database as well as managing user orders. A user is able to browse and read product's information displayed in the application. He can also add the product to the shopping cart and perform the shipping process for that product. By interviewing and researching some normal customers and business owners, the development team figured out what different types of users want from the application, and what features they think are necessary for an e-commerce web application. Based on that, a list of user stories is shown below to illustrate some of the required functionalities for such an application: [4]

- As a user, user wants to create an account
- As a user, user wants to update the profile
- As a user, user wants to surf through all the products
- As a user, the user wants to see product information such as category, price, name, review, picture, etc.
- As a user, user wants to add many products to the shopping cart and is able to view the cart
- As a user, user wants to delete products from the cart
- As a user, user wants to modify the quantity of products inside the cart
- As a user, user wants to pay for the products in the cart and complete shipping process
- As an admin, admin wants to add products and user details to the database
- As an admin, admin wants to remove users from the database
- As an admin, admin wants to update user information.

In the proposed system users refer to buyers, sellers and admins. Some basic functionalities are further modified to reach the user requirements.

III. METHODOLOGY

MERN stack is the proposed technology stack which is a free and open-source JavaScript software stack for building dynamic web sites and web applications. MERN stands for MongoDB, Express JS, React JS, Node JS, after the four key technologies that make up the stack. This technology stack includes a three – tier architecture (front end, back end, database) which is constructed entirely using JavaScript and JSON.

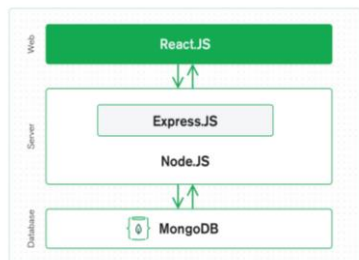


Figure 1: MERN Stack Architecture

MongoDB is a cross platform, document-based database system which uses JSON like documents to store data. Thousands of individuals use the popular NoSQL database MongoDB, which is open source and free to use. It is written in one of the current programming languages that is most widely used. Furthermore, MongoDB is a cross-platform database that uses the ideas of collections and documents to deliver high performance and high availability. [3]

Express JS is a minimal and flexible Node JS web application framework that provides a robust set of features for web and mobile applications. [5]

The top tier of the MERN stack is React.js, the analytical JavaScript framework for creating dynamic client-side applications in HTML. React lets you build up complex interfaces through simple components, connect them to data on your back-end server, and render them as HTML. React.js offers some benefits over other earlier frameworks, including a quicker learning curve, support and future development initiatives from the company (Facebook), and great documentation that has helped it become an accessible and practical service framework [6]

Node JS is an open-source, cross-platform, back-end runtime environment that runs on a JavaScript engine. According to [6] The matching handle is set up to execute when I/O performance happens, and the retrieval function leaves the event once the I/O function is finished. Currently, some I/O operations are being performed away from the server event line. Because NodeJS handles I/O tasks modestly and avoids interfering with any documentation, the event loop is free to respond to other requests.

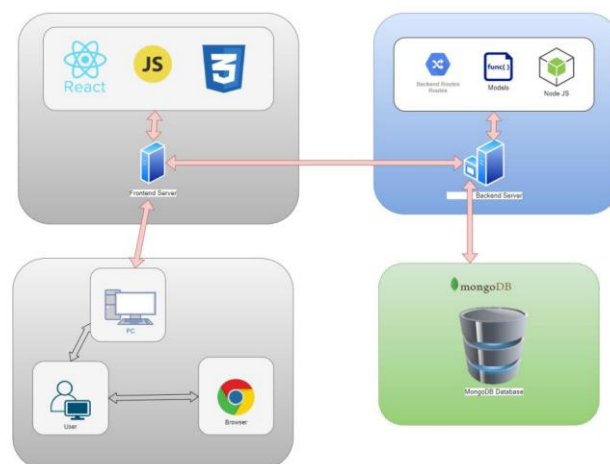


Figure 2: System Architecture Diagram

Figure 2 depicts the overall architecture of the proposed system. A separate backend server will be implemented using Node JS and React JS. RESTful web APIs will be used to communicate with the frontend server, which will consist with React JS. Frontend and Backend servers will be decoupled from each other and will be able to host in different environments to increase the modularity and compatibility of the system. MongoDB connection will be provided to the backend server and MongoDB cloud services will be used since it can be accessed from anywhere using the web services. Frontend server will render the content (User interfaces) in the end user web browser without any additional workload on the computer CPU. A web browser and an internet connection are the only requirements for the end users to access the system.

In the backend server implementation, a proper code base and industry standard folder structure will be maintained. Separate model files will be created for all the models, and it will increase the ability of modifying the code easily. Also, separate controller files which contains all the backend services and functions will be included in a separate folder. Routes file will be in a separate folder to decouple the routes from the controllers.

The database connection should be ideally a single object. Singleton pattern will be used to ensures that only a single object of the database is created and for each subsequent creation of the database, the existing object will be returned.

Json Web Tokens (JWT) will be used to handle user authentication and session management. When a user logs in to the system, a session token will be created in the frontend and stored in the local storage of the browser based on the user role. Also, some functions can be called by only authorized users. Therefore, the appropriate token should be passed through the request header.

A secure payment gateway will be implemented with the capability of using debit/credit cards. Also, PayPal

capability will be added to the payment gateway since it is widely used in most of the e-commerce platforms. A third-party payment process will be used to validate the credit/debit card details with the respective banks and secure validations will be implemented.

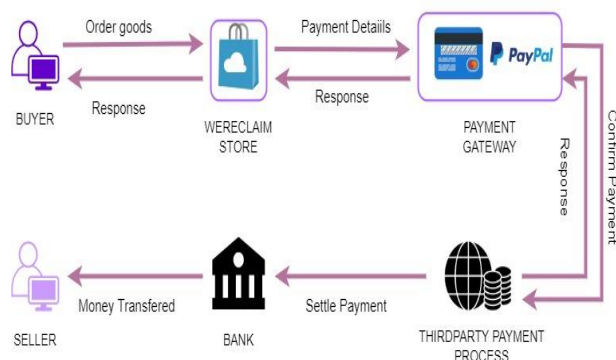


Figure 3: Payment Gateway

Third party delivery services such as FedEx, UPS and DHL will be used to deliver the purchased items since they are efficient and widely used in the industry. System will be directly communicating with the delivery services to share details such as the delivery addresses and contact details.

Following are some other tools that will be taken as an assistance for the betterment of the system. Git and GitHub will be used as the hosting platform for version controlling and collaboration.

"bcrypt", [7] a password hashing function will be used to hash passwords within the system to increase security of the system. By encrypting sensitive data such as passwords, we can reduce the risk of being attacked by malicious attackers.

Jest will be used to write unit test cases in the backend and frontend codebase. Jest is a JavaScript testing framework designed to ensure that your code has no errors. By using a framework such as Jest, we can achieve higher levels of correctness in the code, and it will save a lot of time to developers for the development work.

Redux is a predictable state container [8]. Redux enables you to create applications that operate consistently across client, server, and native contexts and are easy to test. Applications have to maintain more state as they get more complicated. State changes are predictable because of redux [8].

Axios is meant to the handling of HTTP requests and responses [9]. It provides numerous methods for submitting requests, including GET, POST, PUT/PATCH,

and DELETE. According to [9] installation can be done by -- npm install ---save axios.

Bootstrap is a free front-end framework for quicker and simpler web development. For creating a responsive and mobile-friendly website, it is the most well-liked HTML, CSS, and JavaScript framework. Downloading and using it are both completely free [10]. As stated by [10] Why choose bootstrap? Because it supports several browsers, is simple to use, prioritizes mobile devices, has a responsive design, and is open source.

Microsoft azure boards will be used as the project management software for the development process by the software development team, as it provides interactive and customizable tools. It provides a rich set of capabilities including native support for Agile, Scrum, and Kanban processes. Azure boards have components like work items, backlogs, Boards, queries, sprints details. Those components help us to track the tasks, bugs, and features within the software project.

Selenium will be used for the testing automation purpose. It is an open-source tool that automates web browsers. Selenium works through API commands, such as GET and POST, and will function based on the Selenium script requests it gets. The requests then get sent to the HTTP server of the browser driver, as well as the browsers through HTTP. Selenium framework speeds up the test execution process and improves testing performance as a whole. SonarQube will be used to analyze the code quality of the project implemented. It analyzes the source code and provides reports based on the code quality.

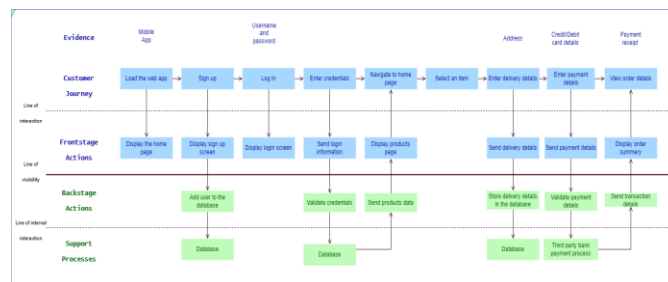
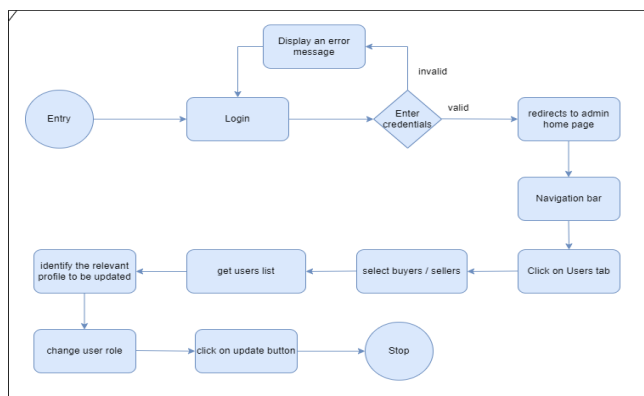


Figure 4: System Blueprint

Figure 4 represents the blueprint of some the processes in the system. Customer journey section depicts the actions which will be performed by end users and frontage actions are the functions which will be performed by the frontend of the system.

Backstage actions will be performed fully automated by the backend server and some support processes such as mongo DB database processes and third-party payment processes will also be there.

**Figure 5: Admin User Flow**

IV. PROPOSED SYSTEM

As mentioned above WERECLAIM will be a used items buying and selling enabled online platform. Main functionalities are related with buying and selling operations. Here, there are 3 main personas associated with the system. They are buyers, sellers, and admins. Buyers have a separate login while sellers and admins have another login option. When registering to the system those people should give necessary details and create an account. Separate user accounts will be created according to the users and specific privileges will also be given. As an example, only the sellers will have the capability to add items to the application and buyers will not be able to add items to the system.

**Figure 6: Use Case Diagram**

The figure 6 use case diagram represents the key functionalities of the system wherein these tasks are assigned to the buyer, seller, and system administrator.

Here, when an admin logs into the system, he can navigate to the side menu and see the functions related to

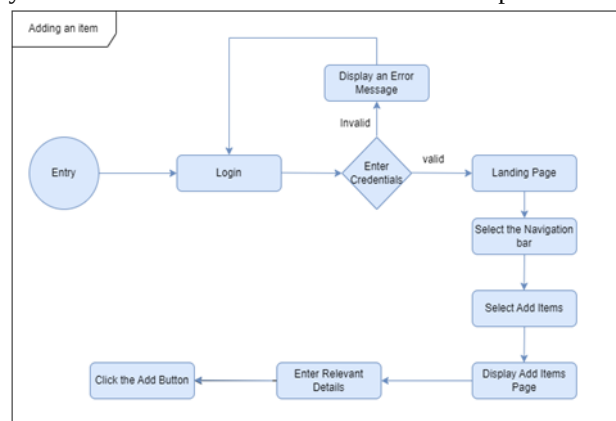
him. An admin user will be able to do special set of functions such as he/she will be able to view a list of users with their public data such as the name, email address and the contact information. However, admins will not be able to view sensitive data such as passwords, credit/debit card details of the users and sensitive data will be encrypted and stored within the database.

Also, the admins will have the capability to monitor any malicious users which could cause security threats. If found, admins can restrict the access of those users to the system or permanently ban from the system. Also, the admin users will have the functionality to see the system usage reports such as how many users logged into the system within a given time period, how many orders were placed within a day. By using that information, they will be able to take decisions to improve the system in the future.

Admin users will be able to see the order statuses of the sellers since some sellers get delayed handling orders and it could cause the user experience to lower. In those scenarios admins can take necessary actions to handle those situations such as refunding the buyers and cancel those specific orders.

The sellers of the system can log into the system using their credentials and navigate to the home page. After that they have an option to add products to the system. Here, a seller can add an image and provide details regarding the item and can add that item to the system. Sellers can view a list of added items and can update the needed details from time to time. They can delete the products at any instance also.

A list of products also can be generated via the system which includes the details about added products.

**Figure 7: Sellers User Flow**

There's a wide diversity among the buyers of the system. Anyone can create a buyer account and can access the buying function. Buyers can browse through the system and find out the necessary items. They can search for the needed items too. When a buyer finds the item, he

can view all the details about that item after clicking on the image. Details include price, category, used time period. After that he can access the add to cart option. Then the product is added to the cart.

The cart function is enabled with the addition of an item to it. A buyer can add one or more items to the cart. Those items are displayed in the cart and the buyer can select the quantity at that moment. After adding items, the checkout option is enabled. With that, the buyer is redirected to an interface where he has to fill shipping details. After completing that a buyer can place an order.

Likewise, an item can be purchased from the system.

The system enables a feature to view the orders. Here, there is a list of orders done by a particular buyer, so a buyer can view the details of a particular order which he placed. There are details about the shipping process and the item information. This option makes the system more user friendly as it sorts the orders by buyer. System administration also has the access to view the orders placed. So, admins can get a clear idea about the usage of the system for that functionality.

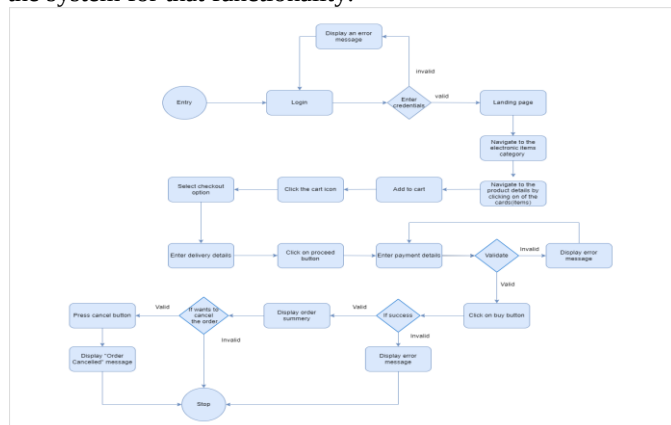


Figure 8: Buyers User Flow

As a seller, A good way to express gratitude to your client is by using a product review. As soon as they finish making the payment, the seller should provide a review for the client.

As a buyer, After the shipment is complete, customers can add reviews to the things they have purchased. Depending on the buyer's request, this may be made public or kept private. We firmly advise everyone to keep all of their feedback data open. Other WERECLAIM users are more likely to trade with you if you assist them to develop a sense of trust.

Nobody likes a negative review because it will damage the reputation of your business and impact conversion rates. When a retailer has to delete a review from their store, WERECLAIM provides two choices. Either you can ask the consumer to make a modification,

take the feedback down, or ask WERECLAIM to take it down.

The functionalities of the proposed system are finalized as mentioned above. But with the circumstances they are subjected to change with new user requirements.

V. DISCUSSION

During the implementation, we plan to execute the functions discussed in the methodology section under, backend processes. When taken as a whole this system can be expressed as a combination of separate functionalities such as a payment gateway, delivery service and some authentication processes.

JWT authentication is a token-based stateless authentication mechanism which is popularly used as a client-side-based stateless session. This can be applied to the login process of the proposed system, where there are two separate logins for admins, buyers, and sellers.

We plan to implement a payment gateway for the payment feature in the shipping process. It will be a service that goes with the delivery process. Shipping process is more important when considering the payment process. An order is placed after completing the shipping process.

As mentioned in the methodology section, selenium will be used for the testing automation process. Following steps can be used as a proper finishing.

1. Create a WebDriver instance.
2. Navigate to a webpage.
3. Locate a web element on the webpage via locators in selenium.
4. Perform one or more user actions on the element.
5. Preload the expected output/browser response to the action.
6. Run test.

By following the above procedure, the system can be tested and can guarantee that the system is properly implemented if the test is passed.

Research and development engineers can follow this paper to get ideas about reselling platforms. As future work, the team and other parties can add improvements to the system based on the areas they are engaged in. They can add new functionalities to the system and create similar systems of the proposed area. Based on the new technologies and tools, the system can be updated. Even this idea can be used for mobile platform as well. In the modern world people are more connected with mobile devices when compared with desktop applications. Therefore, it will be more useful in the future.

VI. CONCLUSION

The purpose of this study was to show that the way WERECLAIM fulfill the needs of an online used items

buying and selling platform for not only the buyers as well as the sellers who deal with used items buying and selling. Introduction was provided about the current trends and usage of used items buying and selling platforms and also addressed the issues of existing such systems. Also mentioned, to fulfill the need of a proper online used items buying and selling platform what are the things it should satisfy according to the early research about We've compared the WERECLAIM with the existing similar kind of online platforms and showed the benefits of our system over them.

To put in another way this study shows how worthy this system is over existing systems. Moreover, we've shown the usage of the tools and technologies like MERN stack, azure boards, GitHub, etc. To understand the way the system works easily this study provides certain diagrams which are included the entire functionalities and overall understanding of the system. As an extension to this system, we're planning to introduce advanced features that will become fresh features for these kinds of systems. Also, our intention is to release a mobile application of the same system so that the users can easily get the usage of this system via their mobile phones.

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