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Abstract

the buying and selling of second-hand products have gained significant traction due to their economic, social, and environmental benefits. This project aims to develop a comprehensive website that serves as a dynamic platform for advertising ads for buying and selling second-hand products, catering to the growing demand for sustainable consumption and circular economy practices. The website will be designed with a user-centric approach, prioritizing user experience and convenience in creating, managing, and browsing ads.

The website will feature a user-friendly interface that allows individuals to create and customize their ads, including uploading product images, specifying pricing and contact details, and managing their ads' visibility. Advanced search and filter functionalities will be incorporated, enabling users to easily discover products based on various criteria such as category, location, price range, and condition. Moreover, the website will provide a secure and trustworthy environment, with user authentication to ensure the integrity of user accounts and prevent fraudulent activities.

To enhance user engagement and facilitate communication between buyers and sellers, the website will include interactive features such as direct messaging, product reviews, and ratings. Additionally, the website will incorporate a dispute resolution mechanism to address any conflicts that may arise during the buying and selling process, ensuring a fair and transparent transaction experience.

Table of contents

1.Introduction

In today's world, the buying and selling of second-hand products have gained significant popularity due to their economic, social, and environmental benefits. With increasing awareness of sustainable consumption and circular economy practices, there is a growing demand for online platforms that facilitate the buying and selling of second-hand products. This project aims to develop a comprehensive website that serves as a dynamic platform for advertising ads for buying and selling second-hand products, catering to the needs of individuals interested in sustainable and cost-effective consumption.

The website will provide a user-friendly interface that allows individuals to create, customize, and manage their ads with ease. Advanced search and filter functionalities will enable users to easily discover products based on various criteria such as category, location, price range, and condition. The website will prioritize user experience, ensuring a seamless and enjoyable browsing and transaction process for buyers and sellers alike.

The environmental impact of producing new products and the growing awareness of reducing waste and promoting circular economy practices make the buying and selling of second-hand products an attractive option for many consumers. By providing a platform that promotes the reuse and repurposing of products, the website aims to contribute to sustainable consumption practices and reduce the overall environmental footprint.

Moreover, the website will create a sense of community among users interested in buying and selling second-hand products, fostering a culture of sharing, and promoting a collaborative and inclusive consumption model. The website will also provide a secure and trustworthy environment, with user authentication and a dispute resolution mechanism to ensure a safe and transparent transaction experience for all users.

The success of the project will be evaluated based on user satisfaction, engagement, and the volume of transactions facilitated through the website. The website's potential impact will be measured in terms of promoting sustainable consumption practices, reducing waste, and fostering a sense of community among users. Overall, the website aspires to become a reliable and user-friendly platform that empowers individuals to participate in the circular economy and contribute to a more sustainable future.

2.Related Work

In order to achieve our goal we looked for comparable applications and websites in order to be inspired. To determine whether the market for these types of applications is worthwhile ,we found application and website that provides the necessary information:

Craigslist: Craigslist is a popular online platform that allows users to post classified ads for various categories, including buying and selling second-hand items. [1]

eBay: eBay is an e-commerce platform that facilitates online auctions and fixed-price sales. While it encompasses both new and used products.[2]

Facebook Marketplace: Facebook Marketplace is a feature integrated into the Facebook social media platform that enables users to buy and sell items within their local community. [3]

Letgo: Letgo is a mobile application designed specifically for buying and selling second-hand products. It allows users to list items quickly, browse through local

listings, and communicate with potential buyers or sellers through an in-app chat feature. [4]

3.Background

The concept of buying and selling second-hand products has been around for centuries, with people looking for ways to acquire or dispose of used items that are still in good condition. In recent years, with the rise of e-commerce and online marketplaces, buying and selling second-hand products has become more convenient and accessible through dedicated websites and platforms.

The idea behind the project website is to create a platform that connects buyers and sellers of second-hand products in an online marketplace. The website aims to provide a user-friendly interface where individuals can easily post ads for the items they want to sell, and potential buyers can browse and search for items they are interested in purchasing.

The website may feature various categories such as electronics, furniture, clothing, vehicles, and more, allowing users to post and browse ads for a wide range of second-hand products. The website may also provide features such as messaging between buyers and sellers, a rating and review system, and secure payment options to facilitate safe and successful transactions.

The goal of the project website is to provide a convenient and reliable platform for buying and selling second-hand products, promoting sustainability by encouraging the reuse and recycling of items, and providing individuals with an opportunity to save money or earn some extra income by buying and selling pre-owned goods.

The project website may also have a mission to promote environmentally-friendly practices by reducing waste and promoting the circular economy, as well as fostering a sense of community by connecting individuals who share similar interests in buying and selling second-hand products.

The website may also aim to cater to a specific target audience, such as local communities, specific geographic regions, or niche markets, depending on the project's scope and objectives.

1)Market Demand: The project website is likely developed in response to the growing demand for second-hand products. As people become more environmentally conscious and seek ways to reduce their ecological footprint, buying and selling pre-owned items has gained popularity as a sustainable and cost-effective option. The website aims to tap into this market demand by providing a platform for individuals to easily buy and sell second-hand products.

2)Convenience and Accessibility: The website aims to provide a convenient and accessible platform for individuals to buy and sell second-hand products online. It may offer features such as easy ad posting, search filters, and messaging capabilities to facilitate smooth communication between buyers and sellers. The website may also offer a user-friendly interface that makes it easy for individuals of all ages and technical abilities to navigate and use the platform.

3)Wide Range of Categories: The website may cater to a diverse range of products, such as electronics, furniture, clothing, vehicles, sports equipment, and more. This allows users to post and browse ads for a wide variety of second-hand items, making the platform versatile and appealing to a broad audience.

4)Trust and Safety: The website may prioritize trust and safety in transactions by implementing measures such as a rating and review system for buyers and sellers, verifying user profiles, and providing secure payment options. This helps build trust among users and reduces the risk of fraudulent transactions, creating a safe environment for buying and selling second-hand products.

5)Sustainability and Circular Economy: The website may have a mission to promote sustainability and the circular economy by encouraging the reuse and recycling of items. By facilitating the buying and selling of second-hand products, the website aims to reduce waste, extend the lifespan of items, and promote sustainable consumption practices.

6)Community Engagement: The website may aim to foster a sense of community among users who share similar interests in buying and selling second-hand products. It may offer features such as forums, groups, or social media integration to facilitate interactions and connections among users. This promotes community engagement and creates a supportive environment for individuals interested in second-hand commerce.

3.1 Technologies that we will use:[5]

3.1.1 Building a Secure Full Stack Web Application, Implementing Protection Measures and Best Practices, Full Stack Web Development:

3.1.1.1 Front-end :

For front-end development, using React is a good choice. React allows to build interactive and dynamic user interfaces efficiently. primarily using HTML, CSS, and JavaScript along with React to create the front-end components and handle user interactions, These include code editors like Visual Studio Code, build tools like webpack or Parcel for bundling and optimizing code, package managers like npm or yarn for managing dependencies, and browser developer tools for debugging and testing.

3.1.1.2 Back-end :

For the back-end development : Node.js with Express: Node.js, a JavaScript runtime, can be used for server-client-side development. Express is a popular web application framework for Node.js, providing a simple and flexible way to handle HTTP requests, routing, and data manipulation on the server side. Using Node.js with Express allows you to have a JavaScript-based full-stack solution.

Additionally, for the client-server communication, using HTTP/HTTPS and RESTful APIs (or GraphQL) to send requests from the client-side to the server-side and receive responses.

3.1.1.3 Testing:

Unit testing: Jest is a popular testing framework that works well with React. It provides a simple and efficient way to write unit tests for React components.

GUI testing: Cypress and React Testing Library are popular choices for GUI testing in React applications. They allow you to simulate user interactions and test the behavior of the application.

Back-End testing: cause using in Back-End the Node.js and Express.js for the back-end side, using the tools like Mocha, Chai, and Supertest for writing tests for code. Mocha, Chai, and Supertest are all popular testing frameworks and libraries in the JavaScript ecosystem, commonly used for testing Node.js applications.

3.1.2 Setting up a Client-Server Architecture:

A client-server architecture involves two main components: the client, which is the front-end part of your application running in the user's browser, and the server, which is responsible for handling requests, processing data, and serving responses.

The client is typically built using JavaScript. In our case, using React for the front end, write client-side code in JavaScript using React components to create a dynamic and interactive user interface.

The server is responsible for processing incoming requests from the client, interacting with the database, and returning the appropriate response. set up the server using Node.js, a JavaScript runtime, along with a web application framework like Express.js. Express.js simplifies the process of building web applications by providing a set of tools and utilities for handling routes, middleware, and request/response handling.

3.1.2.1Communication between the client and server:

To establish communication between the client and server, using HTTP (Hypertext Transfer Protocol), where the client sends requests to specific endpoints (URLs) on the server, and the server processes those requests and sends back responses.

The communication between the client and server in a client-server architecture involves the exchange of data and requests between the two components. Here's an overview of how the communication typically occurs:

Client-Side Request: The client, which is the front-end part of the application running in the user's browser, initiates a request to the server. This can happen when the user interacts with the user interface, such as submitting a form, clicking a button.

Sending the Request: The client sends an HTTP request to the server using the appropriate method, such as GET, POST, PUT, or DELETE. The request contains information such as the URL, headers, and optional payload data.

Server-Side Processing: The server, running on the back-end, receives the request and processes it. This involves interpreting the request, handling the requested action or resource, and performing any necessary business logic or data manipulation.

Data Processing and Storage: The server may interact with databases, external APIs, or other resources to retrieve or update data as required by the request. It performs the necessary operations and prepares the response.

Generating the Response: Once the server has processed the request and obtained the required data or performed the necessary actions, it generates an HTTP response. The response includes a status code, headers, and a response body that contains the requested data or an acknowledgment of the action taken.

Sending the Response: The server sends the response back to the client as an HTTP response. The client receives the response and can process the data or perform any necessary actions based on the information provided.

Client-Side Handling: Upon receiving the response, the client processes the data or performs the appropriate actions based on the response. This can include updating the user interface, displaying relevant information, or triggering further interactions.

Continuous Interaction: The communication between the client and server can involve multiple requests and responses, forming a continuous interaction loop. The client can initiate subsequent requests based on user interactions or other events, and the server responds accordingly.

HTTP (Hypertext Transfer Protocol) is commonly used for communication between the client and server. It is a standardized protocol that defines how requests and responses are formatted and transmitted.

3.1.3 Data Base:

Choosing a Database: a good choice for the database is PostgreSQL. It is a powerful and widely-used open-source relational database management system. PostgreSQL offers excellent performance, scalability, and reliability, making it suitable for handling the data related to buying and selling second-hand products.

3.1.4 Protection:

Protecting Site: Here are key algorithms and techniques to consider for protecting site:

3.1.5 Input validation:

Implement proper input validation on both the client and server sides to prevent common security vulnerabilities like SQL injection and cross-site scripting (XSS).

3.1.5.1 SQL Injection:

SQL injection is a technique where an attacker exploits vulnerabilities in a web application's input validation mechanisms to manipulate the application's database. Typically, web applications use databases to store and retrieve data. When input from users is not properly validated or sanitized, an attacker can inject malicious SQL statements into the application's input fields. If these statements are executed by the application's database, it can lead to unauthorized access, data manipulation, or even complete compromise of the database.

For example, consider a login form where users enter their username and password. If the application does not validate or sanitize the input properly, an attacker could enter a malicious SQL statement in the username field that could allow them to bypass the login mechanism and gain unauthorized access to the system.

To prevent SQL injection, input validation and parameterized queries (also known as prepared statements) should be used. Input validation ensures that user input adheres to the expected format, while parameterized queries separate the SQL code from the user input, preventing the injection of malicious code.

3.1.5.2 Cross-Site Scripting (XSS):

Cross-Site Scripting (XSS) is a vulnerability that occurs when an application fails to properly validate or sanitize user-supplied input and outputs it directly onto a web page without encoding or escaping. Attackers can exploit this vulnerability by injecting malicious scripts, usually written in JavaScript, into web pages viewed by other users. When unsuspecting users view the affected pages, the malicious scripts are executed in their browsers, allowing attackers to steal sensitive information, perform actions on behalf of the user, or spread malware.

For example, suppose a website allows users to submit comments or messages that are displayed on a public forum. If the website fails to validate or sanitize the input, an attacker can inject a script that steals users' cookies or performs other malicious actions when other users view the comments.

To prevent XSS attacks, input validation should be performed to ensure that user input is properly encoded or sanitized before being displayed on web pages. Output encoding techniques, such as HTML entity encoding or using security libraries, can be applied to ensure that user input is treated as data rather than executable code.

3.1.6 Authentication and authorization:

Use secure authentication mechanisms such as JSON Web Tokens (JWT) to verify the identity of users and control their access to various parts of the website.

Authentication and authorization are two important concepts in web application security. Let me explain each of them and how JSON Web Tokens (JWT) can be used for secure authentication.

3.1.6.1 Authentication:

Authentication is the process of verifying the identity of a user or entity accessing a system or resource. In the context of web applications, it involves validating the credentials provided by a user (such as username and password) to ensure they are who they claim to be.

Secure authentication mechanisms, like JSON Web Tokens (JWT), are used to authenticate users. JWT is an open standard that defines a compact and self-contained way to transmit information securely between parties as a JSON object. It consists of three parts: a header, a payload, and a signature.

When a user successfully logs in, the server generates a JWT and sends it back to the client. The client then includes this token in subsequent requests to the server. The server can verify the authenticity and integrity of the token using the included signature, ensuring that the user is authenticated.

JWT authentication has several advantages, including:

Statelessness: Since JWTs contain all the necessary information, the server doesn't need to store session data. This makes it easier to scale and distribute authentication across multiple servers.

Cross-domain compatibility: JWTs can be sent as HTTP headers, allowing authentication across different domains or microservices.

Payload customization: The payload of a JWT can contain additional information about the user, such as roles or permissions, which can be useful for authorization purposes.

3.1.6.2 Authorization:

Authorization comes into play after authentication and involves determining what actions or resources a user is allowed to access. Once the server verifies the identity of a user through authentication, it needs to enforce access control rules to ensure that the user has the necessary permissions to perform certain actions or access specific parts of the website or application.

Authorization mechanisms can be implemented using various techniques, such as role-based access control (RBAC) or attribute-based access control (ABAC). RBAC defines user roles and assigns permissions to those roles, while ABAC evaluates access based on attributes associated with the user, resource, and environment.

By combining authentication and authorization, a web application can ensure that only authenticated users with the appropriate privileges can access and perform actions on different parts of the website or application.

Secure authentication mechanisms like JSON Web Tokens (JWT) provide a means to verify the identity of users in web applications. This authentication is then used in conjunction with authorization mechanisms to control and enforce access to various parts of the website based on the user's authenticated identity and assigned privileges.

3.1.7 Hashing and encryption:

Safely store user passwords by hashing them using a strong cryptographic algorithm like Bcrypt. Encrypt sensitive data when storing or transmitting it.

Bcrypt is a widely recommended cryptographic algorithm for password hashing. It incorporates a salt (random data) and multiple iterations of the hashing process, making it computationally expensive and slowing down potential attacks like brute-forcing or rainbow table attacks. Bcrypt ensures that even if an attacker gains access to the hashed passwords, it would be extremely difficult to reverse-engineer the original passwords.

3.1.8 Rate limiting and throttling:

Implement measures to limit the number of requests per minute or hour from a single IP address to prevent abuse or attacks like DDoS.

Rate limiting and throttling are techniques used to control and limit the number of requests made by a client to a server within a specific time frame. Let's break down these concepts:

3.1.8.1 Rate Limiting:

Rate limiting sets a predefined threshold on the number of requests that a client (usually identified by their IP address) can make within a given time period, such as requests per minute or requests per hour. The purpose of rate limiting is to prevent abuse, protect server resources, and ensure fair usage for all clients. When a client exceeds the allowed limit, the server can respond with an error or take appropriate actions, such as temporarily blocking further requests from that client.

3.1.8.2 Throttling:

Throttling is a similar concept to rate limiting but focuses on limiting the rate at which requests are processed or served by the server. It aims to control the server's load and prevent it from being overwhelmed by a sudden influx of requests. Throttling can be implemented by introducing delays between responses or by prioritizing certain requests over others.

3.1.8.3 The key benefits of rate limiting and throttling include:

Preventing Abuse: By limiting the number of requests per client, rate limiting helps protect against malicious activities such as DDoS (Distributed Denial of Service) attacks, where an attacker overwhelms the server with a flood of requests, causing service disruptions.

Protecting Server Resources: By setting limits, rate limiting and throttling ensure that server resources, such as CPU, memory, and bandwidth, are not monopolized by a single client or a small number of clients. This helps maintain stability and availability for all users.

Maintaining Quality of Service: By controlling the rate of requests, rate limiting and throttling prevent degradation in performance and response times for all users. It ensures a fair and consistent experience for everyone accessing the server or application.

Mitigating Security Risks: Rate limiting can also help mitigate certain security risks, such as brute force attacks, where an attacker attempts to guess passwords by trying multiple combinations. By limiting the number of login attempts within a given time frame, rate limiting can help protect against such attacks.

Implementation of rate limiting and throttling depends on the server infrastructure and the technology . It can be done at different layers, including network-level, load balancer, reverse proxy, or within the application code itself. Various frameworks and libraries provide rate limiting and throttling mechanisms that can be integrated into the project.

By implementing rate limiting and throttling measures, can ensure the stability, security, and fair usage of website or API by preventing abuse, protecting server resources, and maintaining quality of service for all users.

Regular security updates: Stay up to date with security patches and updates for your server, frameworks, and libraries to protect against known vulnerabilities.

3.1.9 Protection Personal Information:

Information: Personal data like names, addresses, contact numbers, and email addresses. Algorithm: For sensitive personal information, encryption algorithms AES (Advanced Encryption Standard) used. AES is a symmetric encryption algorithm widely adopted for its strong security. It requires a secret encryption key to encrypt the data, ensuring confidentiality.

When sensitive data is submitted from a client-side form or API request, handle the encryption on the server-side before storing it in database with AES. This ensures that the sensitive data is protected while at rest.

When we need to retrieve and use the sensitive data, decrypt with AES it on the server-side using the same encryption AES key.

Apply the decryption process using the chosen encryption library to obtain the original sensitive data.

3.1.10 Payment:

Payment Algorithm: Implementing a payment algorithm involves integrating with a payment gateway. payment gateways include PayPal, Stripe, and Braintree. Here's a general outline of the payment process.

Set up an account with a payment gateway provider. Integrate the payment gateway's API into the website's server-side code to handle payment requests and responses.

3.1.11 HTTPS: Securing Data Transmission and Protecting User Privacy:

HTTPS encrypts the data transmitted over HTTP, rather than specifically encrypting the HTTP protocol itself. In other words, HTTPS secures the content and information being sent using the HTTP protocol.

Encrypting HTTP communication between the server and client is highly recommended for ensuring the confidentiality and integrity of data transmitted over the network. By encrypting HTTP, you can prevent unauthorized access, eavesdropping, and tampering of sensitive information.

The standard and widely adopted way to encrypt HTTP traffic is by using HTTPS (HTTP Secure), which is the secure version of HTTP. HTTPS employs SSL/TLS (Secure Sockets Layer/Transport Layer Security) protocols to encrypt the data exchanged between the server and client.

When you access a website using HTTPS, the communication between your web browser (the client) and the web server is encrypted using SSL/TLS protocols. This encryption ensures that the data exchanged between the client and server remains confidential and cannot be easily intercepted or understood by unauthorized parties.

how HTTPS works:

Encryption Layer: SSL/TLS protocols establish an encrypted communication channel between the client and the server. This layer sits on top of the HTTP protocol.

Data Encryption: The data transmitted over this secure channel, including the HTTP requests and responses, is encrypted using symmetric encryption algorithms like AES. This encryption ensures that the content cannot be read by anyone without the proper decryption key.

Authentication: SSL/TLS also provides authentication and integrity verification. The server presents its digital certificate, which contains its public key, to the client. The client verifies the certificate's authenticity and uses the public key to establish a secure connection. This process ensures that the client is communicating with the intended server and prevents impersonation or tampering.

By encrypting the data exchanged over the HTTP protocol, HTTPS protects the privacy and integrity of the content, including any sensitive information such as login credentials, personal details, or financial data.

It's important to note that when using HTTPS, the communication channel is encrypted, but the web server still processes the HTTP requests and responds with HTTP responses. The difference is that the data within these requests and responses is encrypted and secure from eavesdropping or tampering.

HTTPS provides a layer of encryption on top of the HTTP protocol, ensuring that the data transmitted between the client and server remains confidential and protected.

It's important to note that using HTTPS not only protects sensitive user data but also helps establish trust with your users, as they see the padlock symbol and "https://" in the browser's address bar, indicating a secure connection.

While HTTPS provides transport-level security, JWT provides a means for implementing secure authentication and authorization within an application. The use of JWT is independent of whether or not HTTPS is employed.

3.1.12 chat:

3.1.12.1 Chat Algorithm:

Implementing a chat feature requires a real-time communication system. using technology WebSockets to enable real-time messaging between buyers and sellers.

WebSockets is a communication protocol that provides full-duplex communication channels over a single TCP (Transmission Control Protocol) connection. Unlike traditional HTTP requests, which follow a request-response model, WebSockets enable ongoing, two-way communication between a client (typically a web browser) and a server.

Low Overhead: WebSockets have lower overhead compared to HTTP requests, as they eliminate the need for the repetitive request-response cycle. The WebSocket connection remains open, reducing the need for establishing new connections for each communication.

3.1.13 Essential APIs for Seamless Integration in Web Applications:

3.1.13.1 The meaning of API:

API stands for Application Programming Interface. It provides protocols and specifications that allow us to develop and integrate a web application. With the help of APIs, we can establish communication and data exchange between different applications or products. APIs act as a contract between our website and other services, facilitating seamless integration. By utilizing public APIs, we can easily connect with hardware or software components and leverage cloud-native app development to enhance our infrastructure.

3.1.13.2 Payment Gateway API:

To handle payments for buying and selling products, can integrate with payment gateway APIs such as PayPal API, Stripe API, or Braintree API. These APIs provide secure payment processing, transaction management, and handling features.

3.1.13.3 Geolocation API:

provide location-based services or display relevant results based on user location, you can integrate geolocation APIs like Google Maps Geocoding API or OpenStreetMap Nominatim API. These APIs enable to retrieve and process location data.

3.1.13.4 Image Recognition API:

involves classifying or recognizing images of second-hand products, have to integrating an image recognition API like Google Cloud Vision API or Amazon Rekognition API. These APIs provide image analysis capabilities for object recognition, labeling, and content moderation.

3.1.13.5 Email Service API:

To send transactional emails, notifications, or account-related emails, can integrate with email service APIs like SendGrid API, Mailgun API, or Amazon SES API. These APIs enable you to programmatically send emails and manage email templates.

3.1.13.6 SMS Gateway API:

send SMS notifications or implement SMS-based verification, can integrate with SMS gateway APIs such as Twilio API or Nexmo API. These APIs provide the necessary functionality to send and receive SMS messages.

3.1.13.7 Social Media APIs:

To enable social sharing, login with social media accounts, or retrieve social media data, can integrate with social media APIs like Facebook API, Twitter API, or LinkedIn API. These APIs allow to interact with various social media platforms and access user-related data.

4.Expected Achievements:

1)User Engagement: Increasing the number of registered users, improving the website's user interface and user experience (UI/UX), and increasing the average time spent on the website per session. This could be achieved through features such as easy product search and browsing, clear and attractive product listings, and user-friendly messaging and negotiation functionalities.

2)Increased Traffic: Growing the website's organic and referral traffic through search engine optimization (SEO), social media marketing, and online advertising. This could be measured by tracking the number of unique visitors, page views, and the website's ranking on search engine results pages [6].

3)Expanded Product Listings: Encouraging users to post a higher volume of high-quality ads for buying and selling second-hand products. This could be achieved through promotional campaigns, incentives for users who post ads, and streamlining the ad posting process.

4)Enhanced Trust and Safety: Building trust among users by implementing safety measures such as user verification, secure payment options, and a system to report and remove fraudulent or inappropriate ads. This could result in increased user satisfaction and a higher rate of successful transactions.

5)Revenue Generation: Generating revenue through various means such as paid advertisements, premium listings, subscription plans for sellers, and transaction fees. The website's success could be measured by tracking the revenue generated and the return on investment (ROI).

6)Social Impact: Contributing to sustainability and environmental conservation efforts by promoting the concept of buying and selling second-hand products as a way to reduce waste and extend the lifespan of products. This could be measured by tracking the number of products listed and sold, and the estimated reduction in waste or carbon footprint.

7)Market Penetration: Expanding the website's reach to a wider audience by targeting specific market segments or geographic regions, and increasing the website's market share in the online marketplace for second-hand products. This could be measured by monitoring the website's performance against competitors and analyzing user demographics and geographic data.

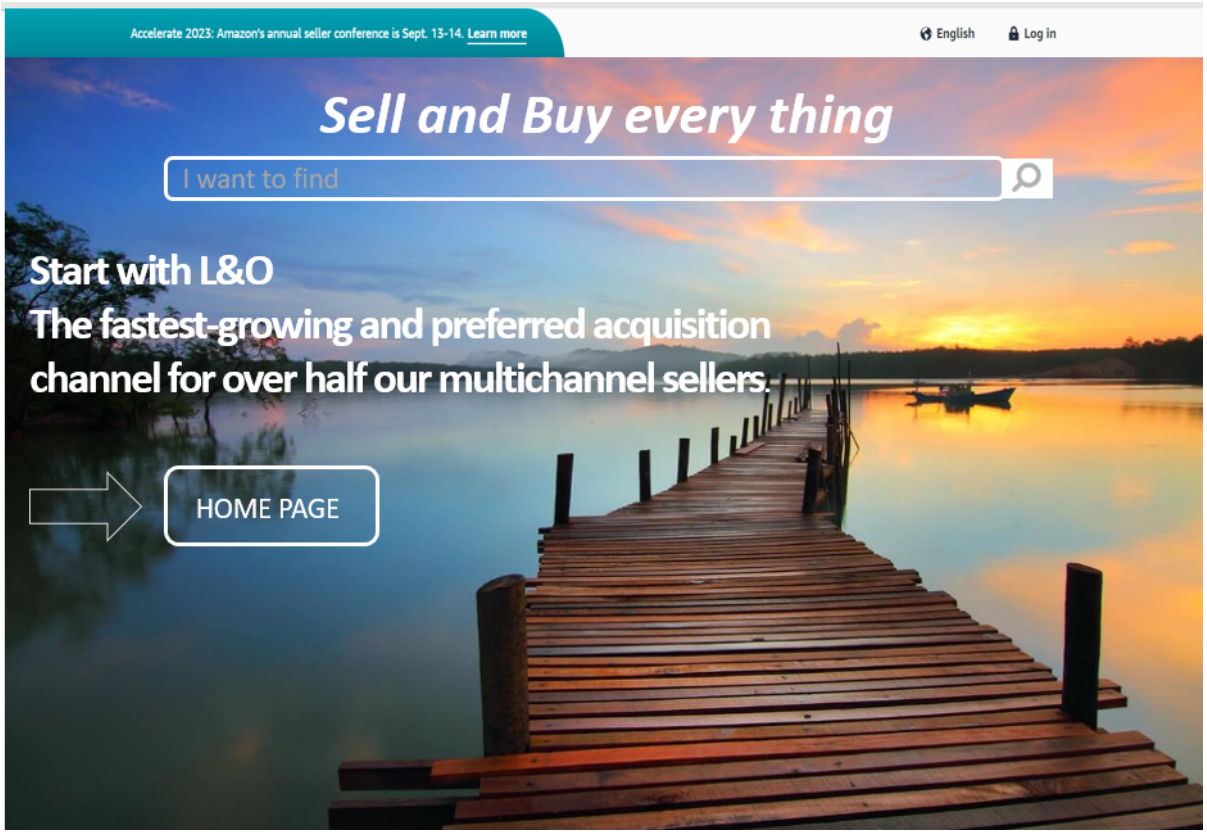
8)Positive Feedback and Reviews: Garnering positive feedback and reviews from users, both buyers and sellers, which could serve as testimonials and testimonials and endorsements for the website's credibility and reliability.

9)Repeat Business and Referrals: Encouraging repeat business from satisfied users and leveraging word-of-mouth referrals to attract new users. This could be measured by tracking repeat transactions, referral sign-ups, and customer satisfaction ratings.

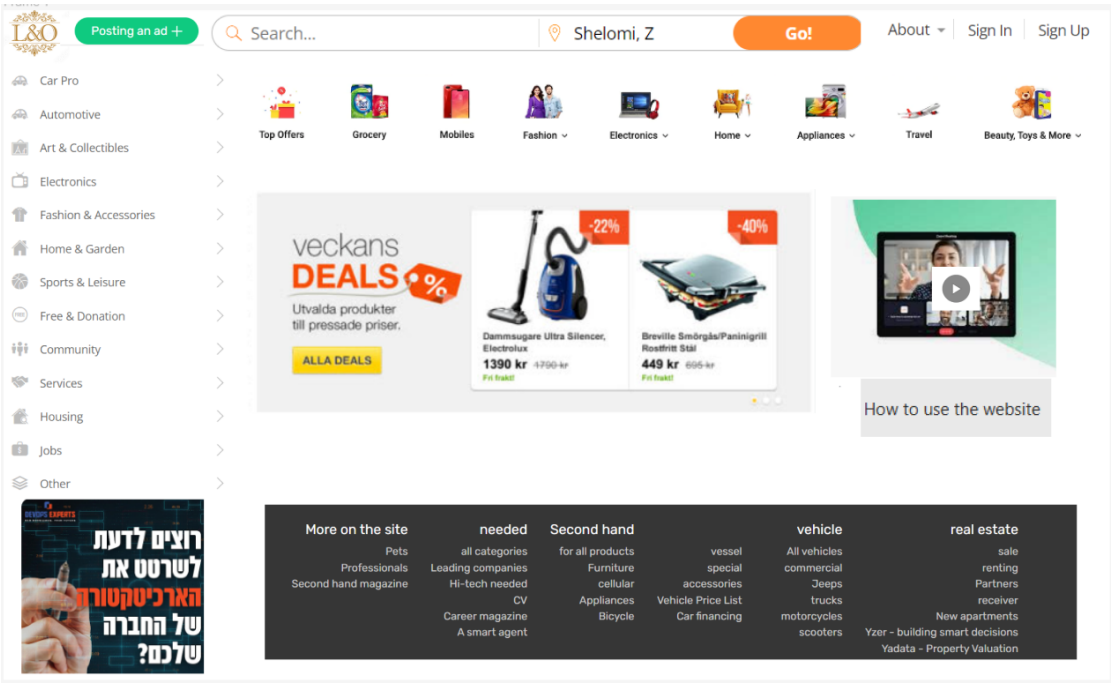
10)Continuous Improvement: Implementing regular updates and improvements to the website based on user feedback, market trends, and technological advancements to stay competitive and provide an enhanced user experience.

4.1 The main screens:

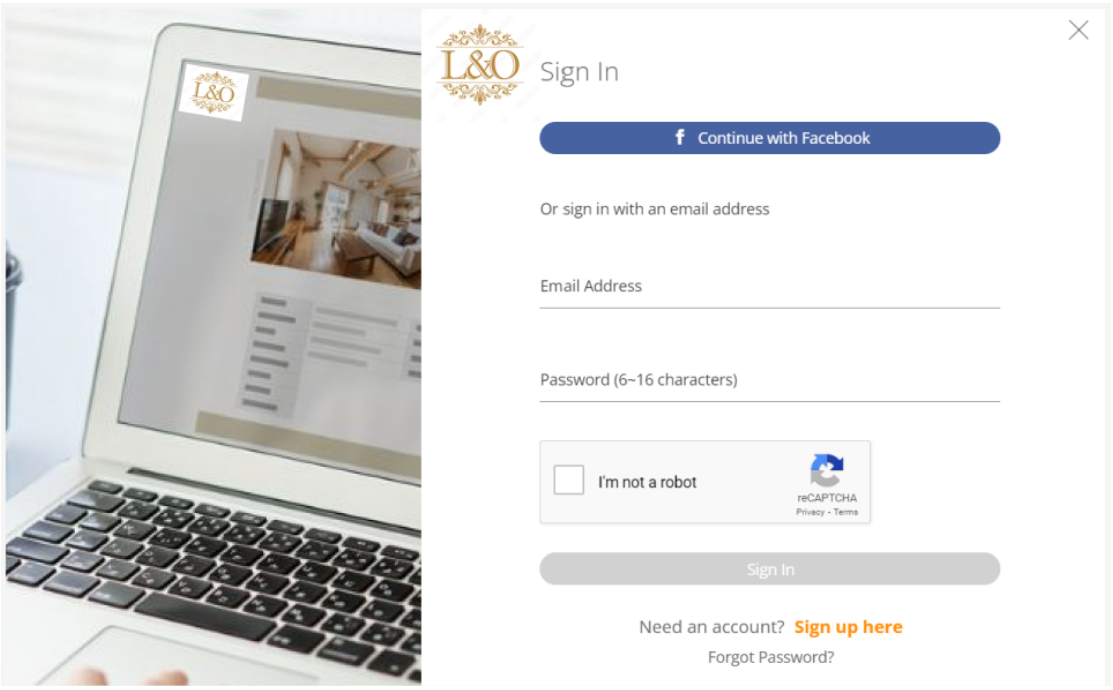
You can view the prototype screens we created in Figma :
This is the opening of our website



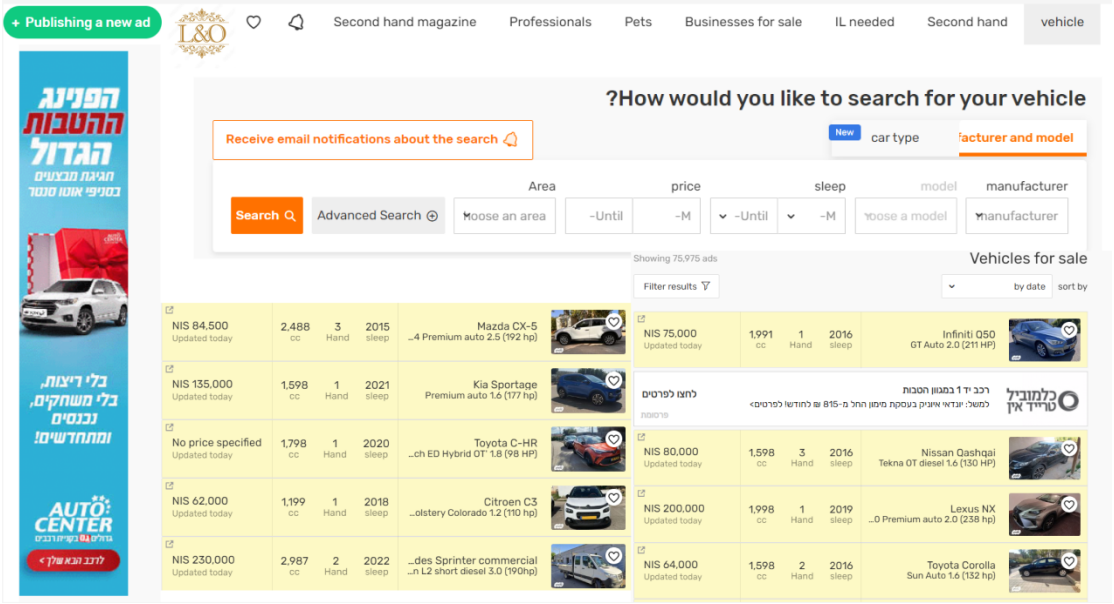
This is the main interface that appears to the user after searching for our website in the Google search engine, but he will not be able to use it until after he registers, after clicking on the word “Login” at the top of the page, and then he will pass to the registration page or sign up for the first time



This interface contains the user's login details to perform his transactions and publish the matters he intends to publish



On this interface, the site displays car products to the user after he writes that he wants to buy a specific type of car in the search engine



5. The Process

5.1 Research – Second-Hand Product Market

To broaden our understanding of the second-hand product market, we conducted in-depth research to answer the following questions:

How does the second-hand market function, and what are the common practices involved in buying and selling second-hand products? We examined the different models of second-hand transactions, such as peer-to-peer marketplaces, consignment stores, and online auction platforms. We studied the processes of listing products, negotiating prices, arranging shipping, and facilitating secure transactions.

What are the challenges and difficulties faced by individuals in the process of buying and selling second-hand products? We delved into the pain points experienced by buyers and sellers, including trust issues, verifying product authenticity, determining fair prices, dealing with unreliable or unresponsive users, and handling logistics.

Which age group and demographics have the most significant demand for a platform that facilitates the buying and selling of second-hand products? We analyzed market data and conducted surveys to identify the primary target audience for our website. This could include young adults looking for affordable options, eco-conscious consumers seeking sustainable choices, collectors interested in rare items, or budget-conscious families.

What are the existing bottlenecks or limitations in the current second-hand market, and how can our website address them? We examined common challenges such as limited reach, lack of standardized trust mechanisms, difficulty in finding specific items, and cumbersome payment and shipping processes. Based on these insights, we aimed to develop solutions that overcome these barriers and offer a seamless experience to users.

Are there any non-technology-based methods for buying and selling second-hand products, and how reliable and relevant are they in today's digital world? We explored traditional methods such as classified ads, yard sales, and local flea markets to understand their relevance and effectiveness. While these methods still have their place, we acknowledged the need for a digital platform that expands the reach and convenience of buying and selling second-hand products.

What technological advancements have been made in the field of second-hand market platforms, and how successful have they been in improving the user experience? We researched the latest trends and innovations in the second-hand market industry. This included features like AI-powered product recommendations, virtual try-on capabilities, integrated payment gateways, escrow services for secure transactions, and social engagement tools. We evaluated their impact on user experience and identified the ones that align with our website's goals.

Based on our research, we held discussions and brainstorming sessions to share and consolidate our findings. We analyzed the data, market trends, and user feedback to identify the key points to focus on when developing the website.

5.1.1 Constraints and Challenges – Second-Hand Product Market:

One of the major challenges in creating this project is the realization that the second-hand product market is diverse and complex. It encompasses a wide range of product categories, buyer preferences, and regional variations. Additionally, establishing trust between buyers and sellers is crucial but can be challenging in an online environment. To address these challenges, we will focus on creating a platform that emphasizes safety, convenience, and transparency.

To mitigate the complexity, we can categorize the products into specific sections or subcategories, making it easier for users to navigate and find what they are looking for. We can also incorporate features like filters, sorting options, and keyword search to facilitate a seamless browsing experience.

To address trust issues, we can implement user verification processes, including user profiles with ratings and reviews. Encouraging buyers and sellers to provide feedback on completed transactions can help build a reliable reputation system within the

platform. Additionally, we can offer secure payment gateways or escrow services to ensure that transactions are protected.

5.1.2 Conclusions from Research – Inspiration for the Website:

Our conclusions and inspirations for the website were influenced by the findings of studies such as "Consumer Behavior in the Second-Hand Market" conducted by the Marketing Department of a renowned university. The study revealed that consumers in the second-hand market often seek lower prices, unique products, and sustainable purchasing options. It also highlighted the importance of providing detailed product descriptions, high-quality images, and user reviews to build trust and enhance the overall user experience.

Additionally, we found that successful second-hand market platforms implemented features like advanced search filters, secure payment gateways, user verification processes, and personalized recommendations based on user preferences. These insights guided us in shaping the functionality and design of our website, ensuring it meets the needs of both buyers and sellers in the second-hand product market.

5.2 Methodology and Development:

1)Agile Methodology:

I have chosen the Agile methodology for its iterative and flexible approach. By splitting the development into small components, I can easily make adjustments and adapt to changing requirements.

2)Building the Website:

I will start by developing the core structure and layout of the website using appropriate web development technologies like HTML, CSS, and JavaScript. My goal is to create a user-friendly interface that focuses on ease of navigation and intuitive design. Additionally, I will ensure that the website is responsive and compatible with different devices.

3)User Registration and Authentication:

To provide a personalized experience, I will incorporate a user registration system that allows users to create accounts. To protect their information, I will implement secure authentication mechanisms such as username/password login or even the option to sign in using social media accounts.

4)Product Listing and Search:

One of the key features of my website will be enabling sellers to create detailed listings for their second-hand products. I will include fields for essential information like product title, description, price, condition, location, and contact details. To make it easier for users to find specific products, I will implement a search functionality based on keywords, categories, and filters.

5)Messaging and Communication:

To facilitate communication between buyers and sellers, I will integrate a messaging system. This will allow users to send inquiries, negotiate prices, and arrange transactions through secure messaging channels.

6)Payment and Transactions:

To enable seamless online transactions, I will integrate a secure payment gateway. Users will have multiple payment options such as credit/debit cards or digital wallets. Implementing robust security measures will be a priority to protect users' financial information.

7)Reviews and Ratings:

Building trust and credibility will be essential, so I will include a review and rating system. This will allow buyers to provide feedback on sellers and their products. I will prominently display ratings and reviews to assist users in making informed decisions. Additionally, I will implement mechanisms to handle disputes and resolve any issues that may arise between buyers and sellers.

8)Admin Dashboard and Moderation:

To effectively manage user accounts, listings, and reported content, I will develop an admin dashboard. This will enable me to ensure compliance with website guidelines and policies. I will also have the ability to handle user disputes and take necessary actions when required.

9)Analytics and Reporting:

Implementing analytics tools will help me track website usage, user behavior, and popular product categories. By generating reports and gaining insights from the collected data, I can identify trends and make data-driven decisions to enhance the website's performance.

10)Product Videos:

To enhance the buying and selling experience, I will integrate the capability to upload and display videos for listed products. Sellers will have the option to include videos showcasing the condition, functionality, or unique features of their items. This will help potential buyers gain a better understanding of the products and make informed purchasing decisions.

11)Testing and Quality Assurance:

I will conduct rigorous testing to identify and fix any bugs or issues that may affect the user experience. Usability testing will be crucial to ensure a seamless and intuitive interface. Additionally, I will verify the website's compatibility across multiple browsers and devices.

12)Continuous Improvement and Maintenance:

Gathering user feedback and monitoring website analytics will help me identify areas for improvement. I will regularly update and enhance the website based on user needs and market trends. Providing ongoing maintenance and support will be crucial to ensure the website operates smoothly and to promptly resolve any issues.

13)Customer Support and Community Engagement:

I will offer various customer support channels to assist users with their inquiries or concerns. Encouraging community engagement through forums, blogs, or social media platforms will foster a sense of trust and collaboration among users.

6. Product

6.1 Requirements

Functional:

1	User Registration: Allow users to create accounts and provide necessary information for buying and selling second-hand products.
2	Product Listing: Enable sellers to create detailed listings for their products, including title, description, price, condition, location, and contact details.
3	Search Functionality: Implement a search feature that allows users to find specific products based on keywords, categories, or filters.

4	Messaging System: Facilitate communication between buyers and sellers through a secure messaging system.
5	Secure Payment Gateway: Integrate a secure payment gateway to enable online transactions between buyers and sellers.
6	Reviews and Ratings: Include a review and rating system for buyers to provide feedback on sellers and products.
7	User Management: Provide administrative tools to manage user accounts, listings, and reported content.
8	Analytics and Reporting: Implement analytics tools to track website usage, user behavior, and popular product categories.
9	User Authentication: Implement a secure authentication mechanism to verify the identity of users during login.
10	Advanced Search Filters: Provide advanced filtering options to allow users to refine their search based on specific criteria such as price range, location, brand, etc.
11	Wishlist/Save Listings: Allow users to save or add listings to their wishlist for future reference.
12	Multiple Listing Categories: Support a wide range of categories (e.g., electronics, clothing, furniture) to accommodate different types of products.
13	Image Uploads: Enable sellers to upload multiple images for each product listing to provide visual representation to potential buyers.
14	Geolocation Integration: Integrate geolocation services to allow users to search for products based on their current location or proximity.
15	Social Media Integration: Allow users to share listings on social media platforms to expand visibility and reach a larger audience.
16	Notifications: Send notifications to users for activities such as new messages, listing updates, or status changes.
17	Order Management: Provide a dashboard for sellers to manage orders, including tracking shipments and updating order status.
18	Privacy Settings: Allow users to control the visibility of their personal information and choose privacy preferences for their listings.
19	Ad Promotion: Offer options for sellers to promote their listings through featured placements or sponsored ads for increased visibility.
20	Reporting and Flagging: Implement a reporting system to flag inappropriate or fraudulent listings for moderation.

Non-functional:

1	Usability: Ensure the website has an intuitive and user-friendly interface for easy navigation and a positive user experience.
2	Performance: Optimize website speed and responsiveness to provide a seamless browsing experience.

3	Security: Implement robust security measures to protect user information and ensure secure transactions.
4	Compatibility: Ensure the website is compatible with different browsers, devices, and operating systems.
5	Scalability: Design the website to handle a growing number of users and product listings without compromising performance.
6	Accessibility: Ensure the website conforms to accessibility standards, making it usable for users with disabilities.
7	Reliability: Minimize downtime and ensure the website is available and functional for users at all times.
8	Maintenance and Support: Provide regular maintenance and support to address any issues or bugs that arise and ensure smooth operation of the website.
9	Mobile Responsiveness: Ensure the website is optimized for mobile devices to provide a seamless user experience on smartphones and tablets.
10	Cross-browser Compatibility: Ensure the website functions properly on popular web browsers such as Chrome, Firefox, Safari, and Edge.
11	Data Backup and Recovery: Implement regular data backups to prevent data loss and have a recovery plan in place in case of system failures.
12	Performance Monitoring: Set up monitoring tools to track website performance metrics and identify areas for optimization.
13	SEO-friendly Design: Implement search engine optimization techniques to improve the website's visibility and search engine rankings.
14	Multilingual Support: Provide language options to cater to users from different regions or offer translation services for better accessibility.
15	Load Testing: Conduct load testing to ensure the website can handle high traffic volumes and maintain performance under peak loads.
16	Compliance with Legal Requirements: Ensure compliance with relevant laws and regulations, such as data protection and consumer rights.
17	User Feedback and Ratings: Allow users to provide feedback and ratings for the website's functionality, usability, and overall experience.
18	Error Handling and Logging: Implement error handling mechanisms and maintain logs to track and troubleshoot any system errors or issues.
19	Documentation: Create comprehensive documentation to assist with future maintenance, updates, and troubleshooting.
20	Integration with External APIs: Integrate with external APIs, such as payment gateways or shipping providers, to enhance the website's functionality.

6.2 Architecture Overview :

1)User Interface (UI):

The UI is responsible for providing an interactive and intuitive interface for users to browse, search, and interact with the website. It includes components such as the homepage, search functionality, product listings, user profiles, and messaging system.

2)User Authentication and Authorization:
This component handles user registration, login, and authentication. It ensures that only authorized users can access certain features such as posting ads, managing their listings, and contacting other users.

3)Database:
The database stores all the data related to user profiles, product listings, transactions, and messages. It can utilize a relational database management system (RDBMS) such as MySQL or PostgreSQL to store structured data efficiently.

4)Ad Management:
This component manages the lifecycle of ads on the website. It includes functionalities such as creating new ads, editing existing ones, marking items as sold, and removing expired or inactive listings. The ad management system should support categorization, tagging, and filtering options for easy navigation.

5)Search and Recommendation:
To provide an efficient search experience, the website should integrate a search engine or indexing system. This allows users to search for specific products based on various criteria such as category, price range, location, and keywords. Additionally, a recommendation engine can be implemented to suggest relevant products to users based on their browsing history and preferences.

6)Payment Gateway:
Integration with a secure and reliable payment gateway is essential for facilitating transactions between buyers and sellers. It enables users to make payments securely, and may support various payment methods such as credit cards, PayPal, or digital wallets.

7)Messaging System:
A messaging system allows users to communicate with each other for inquiries, negotiations, and arranging transactions. It should provide real-time or near real-time messaging capabilities, as well as notification features to alert users about new messages or updates.

8)Security:
Security measures such as encryption, secure communication protocols (HTTPS), and input validation should be implemented to protect user data, prevent unauthorized access, and ensure the privacy and integrity of transactions.

9)Scalability and Performance:
As the website grows, it should be designed to handle increasing traffic and user activity. This can be achieved through techniques such as load balancing, caching, database optimization, and horizontal scaling of servers.

10)Analytics and Reporting:
Implementing analytics and reporting functionality allows the website administrators to gather insights about user behavior, popular products, transaction trends, and other metrics. This information can be used to improve the website's performance, user experience, and marketing strategies.

6.3 Interfaces and Simulation Flow:

6.3.1 interfaces:

1)User Registration Interface:
•Allows users to create new accounts by providing necessary details such as username, email, and password.
•Validates user input and checks for duplicate usernames or email addresses.
•Displays error messages if any validation errors occur.
•Upon successful registration, redirects users to the login interface.

2)User Login Interface:
•Provides a login form for users to enter their credentials (username/email and password).
•Authenticates user credentials against the stored user information in the database.
•Redirects authenticated users to the home interface upon successful login.
•Displays error messages for invalid credentials or account inactivity.

3)Home Interface:
•Displays a personalized homepage with recommended products, featured listings, or recently added items.
•Includes search functionality to allow users to search for specific products or browse different categories.
•Provides filters and sorting options to refine search results.
•Shows advertisements or promotional offers to attract users.

4)Product Listing Interface:
•Allows users to create listings to sell their second-hand products.
•Includes a form to enter product details such as title, description, price, and images.
•Validates the input and ensures all necessary information is provided.

•Allows users to upload images of the product and add additional details like condition, location, and contact information.
•Upon submission, stores the listing in the database and makes it available for other users to view.

5)Product Details Interface:
•Displays detailed information about a specific product, including images, description, price, location, and contact information of the seller.
•Includes a button to initiate a conversation or negotiation with the seller.
•Provides options for users to save or bookmark listings for future reference.

6)Messaging Interface:
•Allows users to communicate with each other for inquiries, negotiations, or arranging transactions.
•Provides a messaging platform where users can send and receive messages related to a specific listing.
•Sends notifications to users when they receive new messages or inquiries.

7)User Profile Interface:
•Displays user profiles with information such as username, profile picture, location, and contact details.
•Allows users to edit their profile information and update their contact details.
•Shows a history of past transactions or activities of the user.

8)Admin Dashboard Interface:
•Accessible only by administrators or moderators.
•Allows them to manage user accounts, review and moderate listings, handle reported content, and perform other administrative tasks.
•Provides tools for monitoring and analyzing website performance, user activity, and trends.

6.3.2 Simulation Flow:

6.3.2.1 Brief Flow:
•User registers an account or logs in to an existing account.
•User browses the homepage or uses the search feature to find desired products.
•User selects a product and views its details, including images and seller information.
•User communicates with the seller through messaging for inquiries or negotiation.
•User enters shipping and payment information during the checkout process.
•The website processes the payment and confirms the transaction.

•Seller and buyer receive notifications about the successful transaction.
•User can rate and leave feedback for the seller based on their experience.
•User can access their profile to manage their listings, view transaction history, and update their contact information.
•Administrators or moderators can access the admin dashboard to manage the website, monitor activities, and resolve any reported issues.

6.3.2.2Expansion Flow:

1)User Registration:
•User accesses the website and clicks on the registration link.
•User fills in the required information such as username, email, and password.
•User submits the registration form.
•The system validates the user input and checks for duplicate usernames or email addresses.
•If the registration is successful, the user is redirected to the login page.
•If there are any validation errors, appropriate error messages are displayed to the user.

2)User Login:
•User accesses the website and enters their credentials (username/email and password) in the login form.
•The system authenticates the user's credentials against the stored user information in the database.
•If the credentials are valid, the user is logged into their account and redirected to the homepage.
•If the credentials are invalid, an error message is displayed, and the user is prompted to enter valid credentials.

3)Browsing Products:
•User logs into their account and is redirected to the homepage.
•User can browse through the listings displayed on the homepage or use search filters to find specific products.
•User can click on a product listing to view detailed information about the item, including images, description, price, and seller information.

4)Creating a Listing:
•User logged into their account clicks on the "Sell" or "Create Listing" button.
•User is presented with a form to enter the necessary details about the product, such as title, description, price, condition, and images.
•User fills in the required information and uploads relevant images.

•User submits the listing form.
•The system validates the input and stores the listing in the database.
•The listing becomes available for other users to view.

5)Communicating with Sellers:
•User interested in a product clicks on the "Contact Seller" or "Message" button on the product listing page.
•User is directed to a messaging interface where they can send inquiries or negotiate with the seller.
•User can type and send messages to the seller, and receive responses.
•The messaging interface keeps a record of the conversation history for reference.

6)User Profile Management:
•User can access their profile page to view and edit their account information.
•User can update their contact details, shipping address, and other profile settings.
•User can view their listing history, transaction history, and saved or bookmarked items.
•User can manage their listings, edit or delete existing listings, and mark items as sold.

7)Admin Moderation:
•Administrators or moderators can access the admin dashboard.
•They can manage user accounts, review and moderate listings, handle reported content, and perform administrative tasks.
•Admins can suspend or ban user accounts if necessary, and remove or hide inappropriate listings.
•Admins can monitor website performance, user activity, and resolve any reported issues

7.Data Analysis and Classification :

1)Data Collection:
I will collect data from various sources like user registrations, product listings, transactions, and user interactions. The collected data will be stored in a structured format in the database, ensuring its integrity and security.

2)Data Preprocessing:
I will clean the collected data by removing duplicates, handling missing values, and correcting any inconsistencies. To prepare the data for analysis, I will transform it into a suitable format, such as converting text data into numerical representations.

3)Exploratory Data Analysis (EDA):[7]
I will perform exploratory data analysis to gain insights into the collected data. By analyzing statistical measures like mean, median, and standard deviation, I will understand the distribution of product prices, user ratings, and other relevant features. Visualizing the data using charts, histograms, or scatter plots will help me identify patterns, trends, or outliers.

4)Feature Extraction and Selection:
To achieve effective classification, I will identify relevant features that can contribute to the task, such as product category, brand, condition, price, and user ratings. By applying feature extraction techniques, I will reduce dimensionality and extract meaningful information from the data. Feature selection methods like correlation analysis or feature importance will help me choose the most influential features for classification.

5)Classification Models:
Based on the nature of the problem and the available data, I will select appropriate classification algorithms. I will train classification models like logistic regression, decision trees, random forests, or support vector machines using labeled data. To assess the performance of these models, I will evaluate metrics such as accuracy, precision, recall, and F1-score. Fine-tuning the models by adjusting hyperparameters will enhance their classification performance.

6)Predictive Analytics:
I will apply the trained classification models to predict the category, condition, or other relevant attributes of new product listings. By using the predicted results, I will enhance the user experience by providing automatic categorization suggestions or recommending similar products to users.

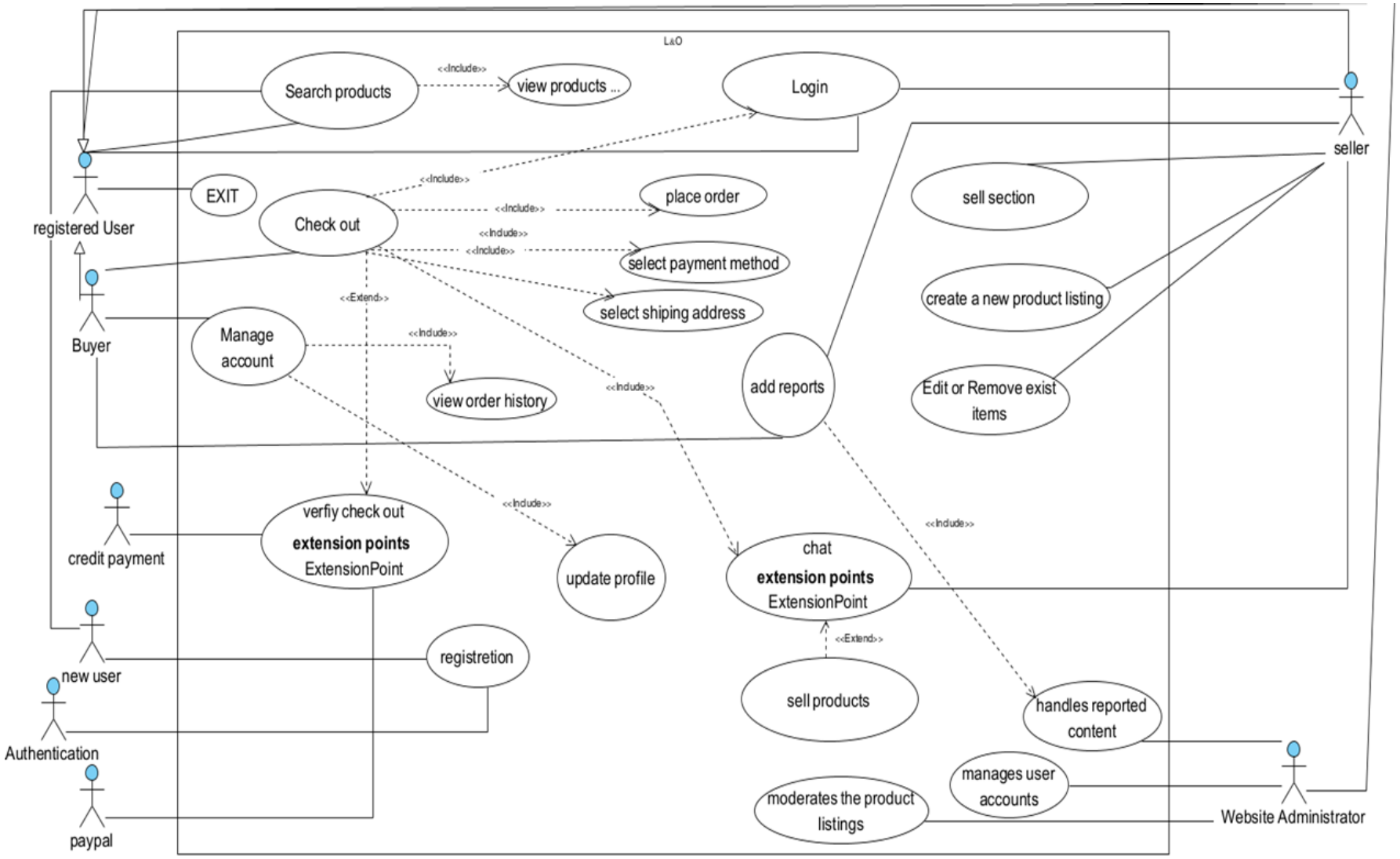
7)User Behavior Analysis:
Analyzing user behavior patterns, such as browsing history, search queries, and interactions with listings, will help me understand common user preferences, popular categories, and frequently purchased items. I will leverage this information to personalize the user experience, improve recommendation systems, and optimize marketing strategies.

8)Fraud Detection:
To ensure a safe environment for users, I will implement fraud detection algorithms. These algorithms will help identify suspicious or fraudulent activities, such as fake product listings or unauthorized transactions. By utilizing techniques like anomaly detection, pattern recognition, or machine learning algorithms, I will detect and take appropriate actions against fraudulent behavior, such as blocking fraudulent accounts, notifying users, or reporting incidents to authorities.

9)Performance Monitoring and Improvement:
I will continuously monitor the performance of the classification models and data analysis techniques. Gathering feedback from users and stakeholders will allow me to identify areas for improvement. Incorporating user feedback, updating the models, and refining the data analysis processes will enhance the accuracy and usability of the system.

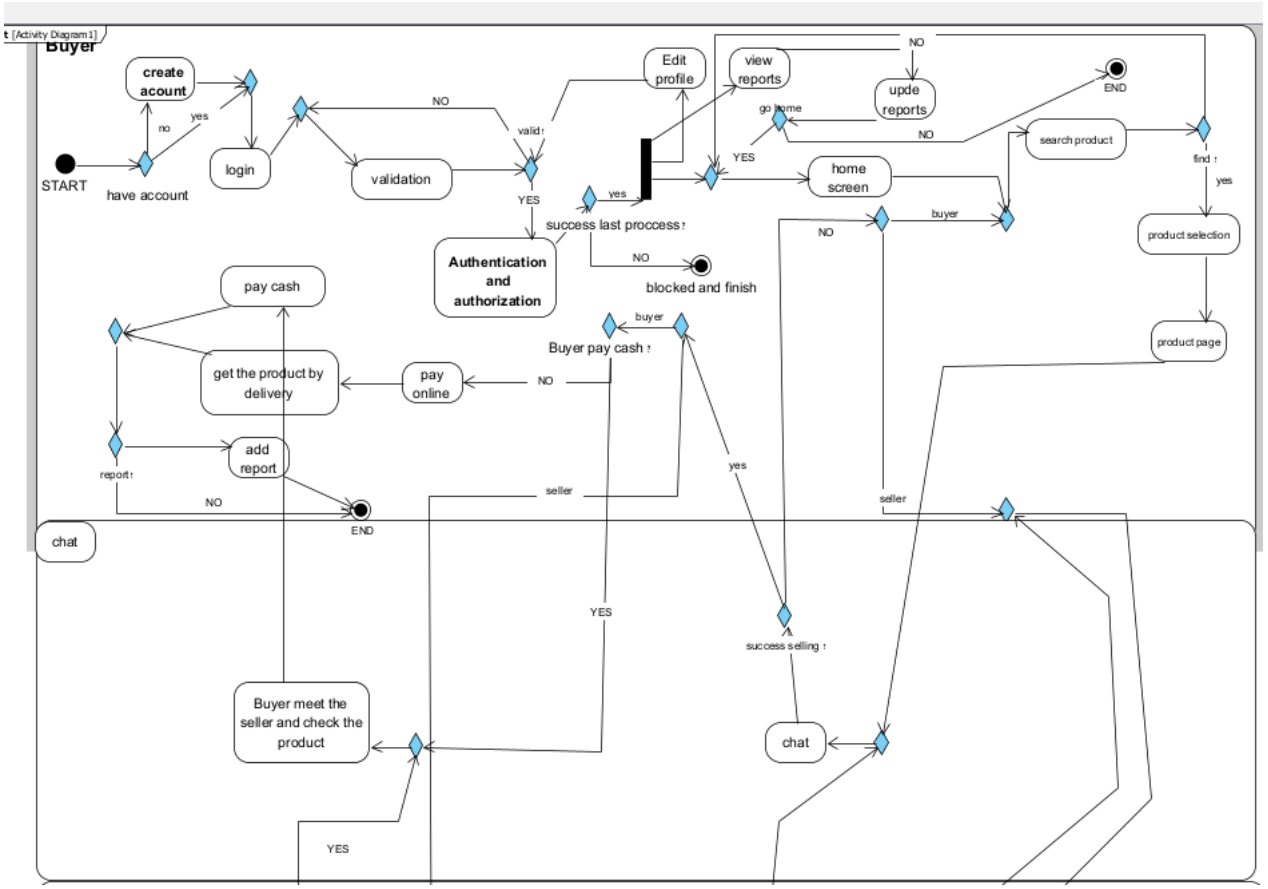
8.Diagrams

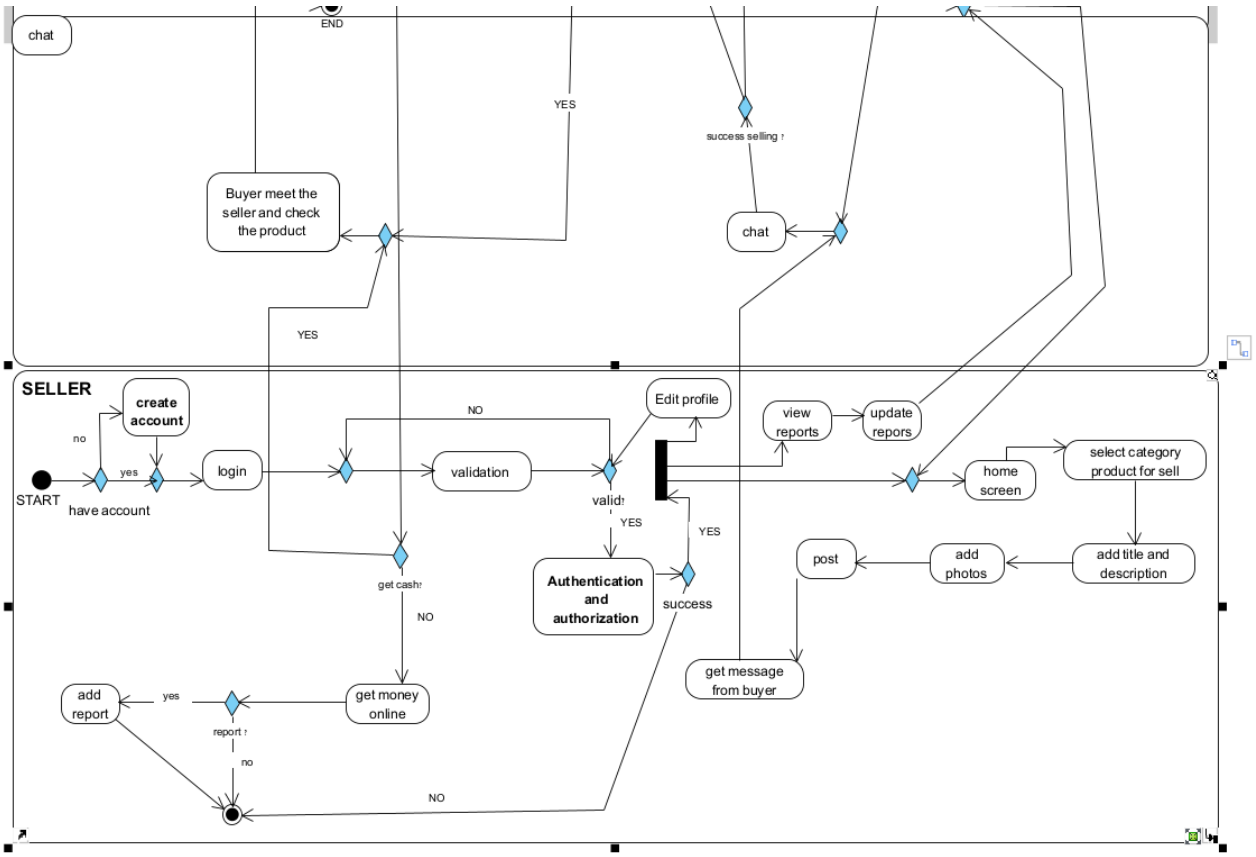
8.1 use case diagram:


L&O
Search products
<<Include>>
view products ...
Login
seller
registered User
EXIT
Check out
<<Include>>
place order
sell section
<<Include>>
<<Include>>
select payment method
<<Include>>
select shiping address
create a new product listing
Buyer
<<Extend>>
Manage account
<<Include>>
view order history
add reports
Edit or Remove exist items
<<Include>>
credit payment
verfiy check out
extension points
ExtensionPoint
<<Include>>
update profile
chat
extension points
ExtensionPoint
<<Include>>
new user
registretion
<<Extend>>
sell products
handles reported content
Authentication
manages user accounts
Website Administrator
moderates the product listings
paypal

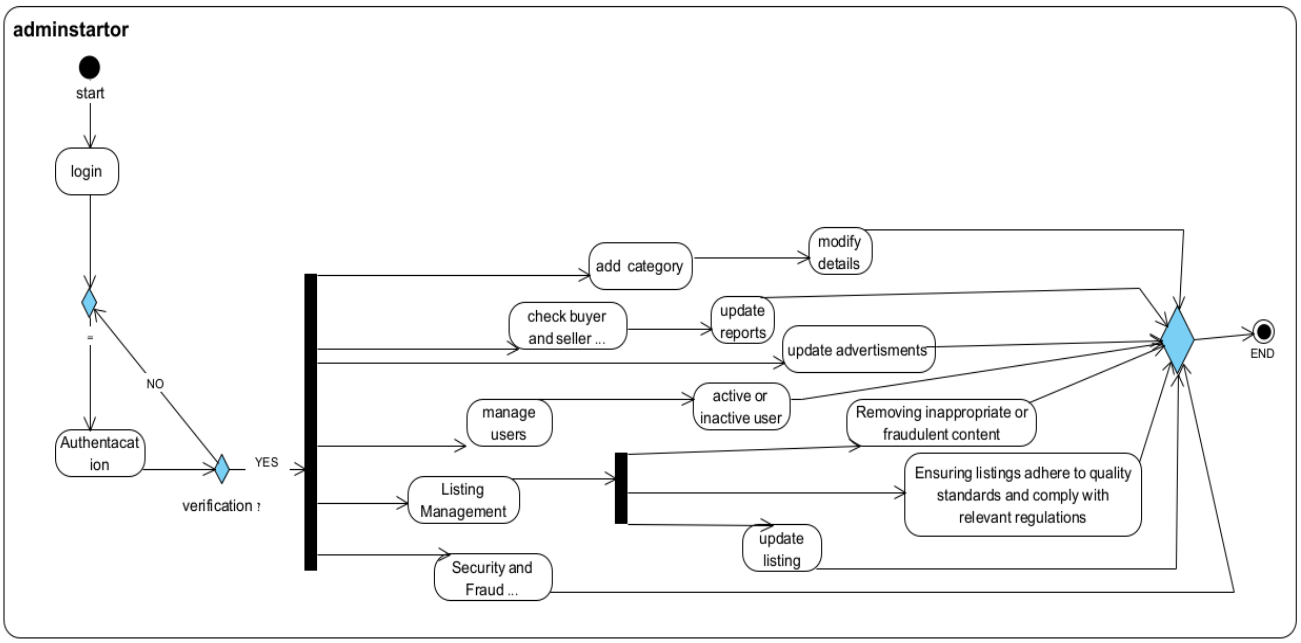
8.2 Activity diagram:

activity diagram is to visually represent the flow of activities and actions within a system, process, or workflow The goal of the activity diagram for the buyer in our project is to outline the series of actions and interactions involved in the purchasing process, enabling a smooth and efficient buying experience for the user.





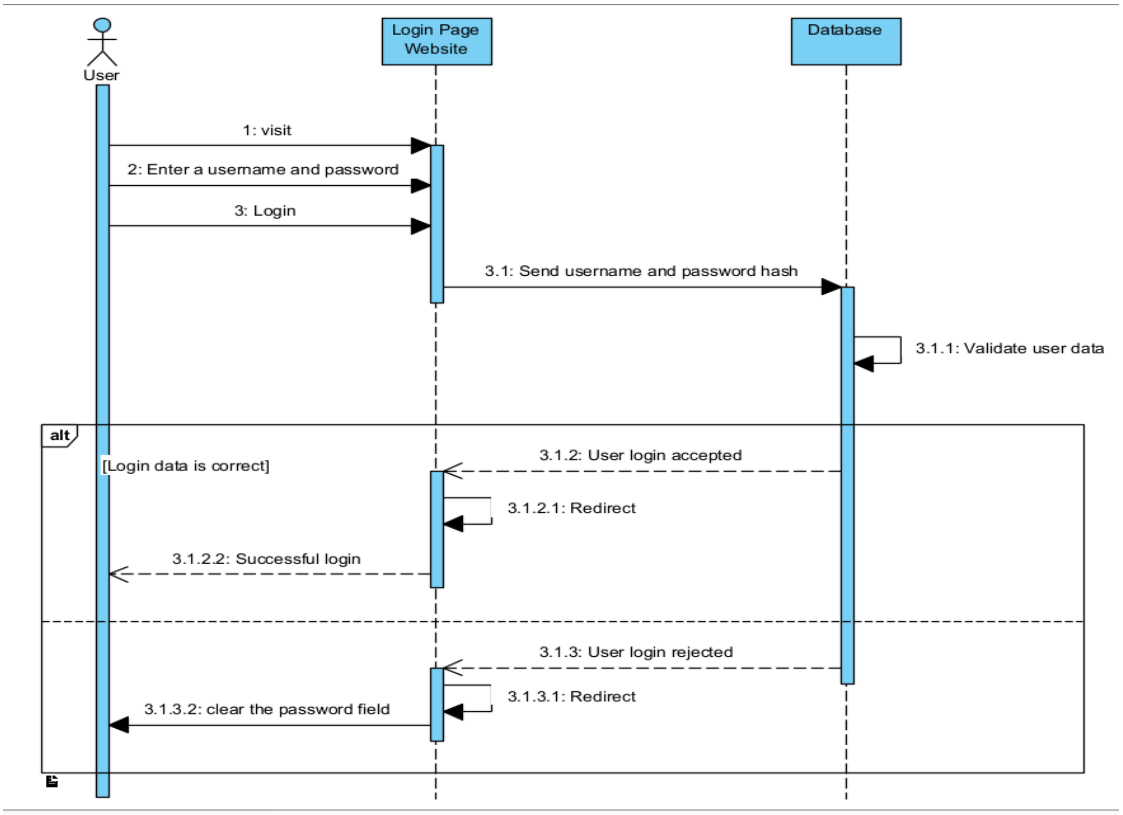
The goal of the activity diagram for the admin in our project is to illustrate the administrative tasks and responsibilities involved in managing the website, ensuring the security, integrity, and smooth operation of the platform.



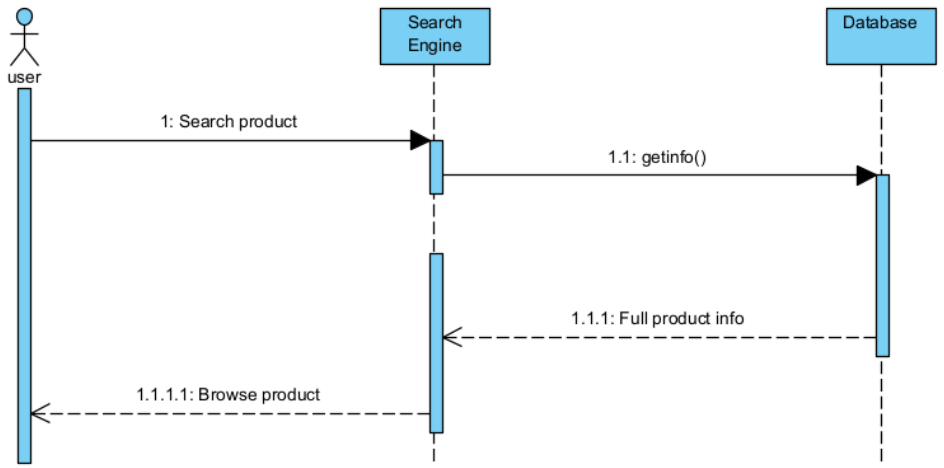
8.3 Sequence Diagram

This sequence diagram shows the logical flow between the customer and the website:

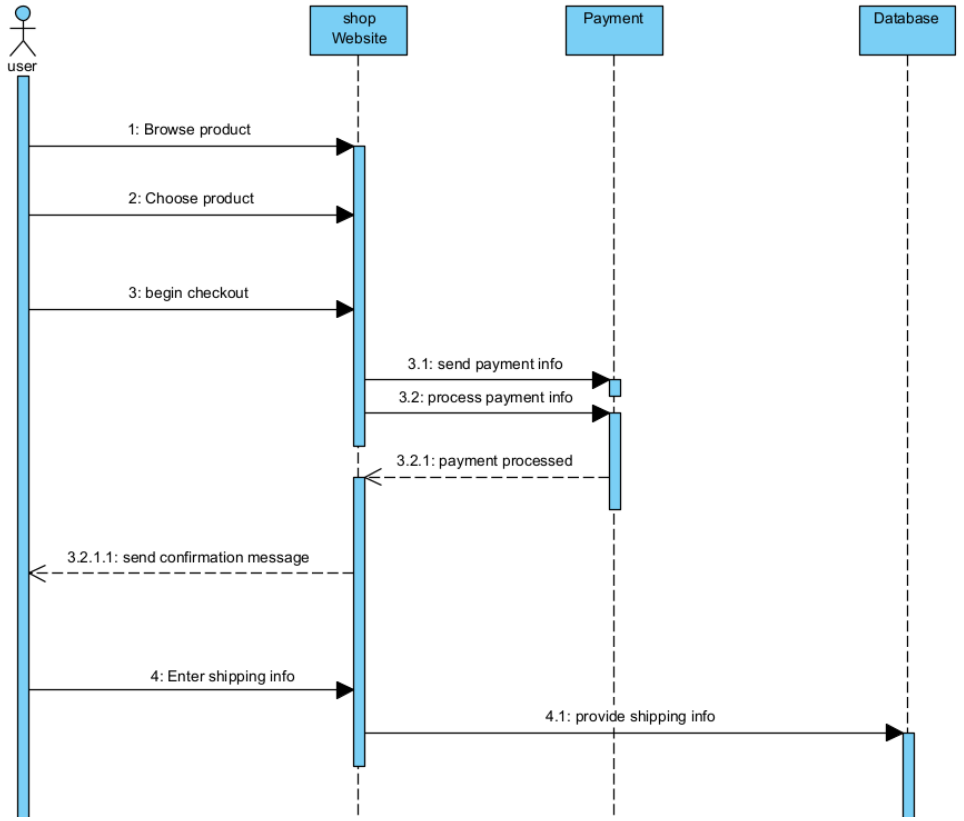
1)sequence diagram when the customer do Login to the website



2)sequence diagram when the customer search on product in the L&A website.



3)sequence diagram when the customer do Online Shopping:



9. Verification and Evaluation

9.1 Evaluation

To ensure ongoing evaluation and improvement of our project, we have devised a comprehensive plan that combines various techniques and algorithms to assess the performance and effectiveness of our website.

Firstly, we will continue to monitor website traffic using analytics tools, tracking the number of visitors, their demographics, and traffic sources. This will provide insights into the website's growth and reach. Additionally, we will closely analyze user engagement metrics, such as time spent on the site, bounce rate, and page views per session, to gauge the level of user interest and the effectiveness of our content. Conversion rates will be regularly assessed to measure the website's success in facilitating transactions and generating revenue.
We will employ Conversion Rate Optimization (CRO) algorithms to analyze user behavior and optimize the website's design and content, improving conversion rates. A/B testing will be conducted to compare different variations of webpages and identify the most effective design, layout, or content changes. Machine learning algorithms will help us analyze user data and behavior, enabling us to tailor the website experience to specific user groups and enhance user satisfaction.

Sentiment analysis algorithms will be utilized to gain insights into user sentiment expressed through feedback and reviews, aiding in identifying areas for improvement and tracking changes in user satisfaction. We will leverage web analytics tools, such as Google Analytics, which employ various algorithms to collect and analyze website data, providing valuable insights into user behavior and interactions. Lastly, we will optimize our website for search engines using SEO algorithms, ensuring better visibility and increased organic traffic.

By continually evaluating these metrics and implementing data-driven changes based on algorithmic analysis, we are confident in our ability to enhance the project's performance, user experience, and overall success in the future.

9.2 Verification

Testing the code:
In order to verify the website's viability, we plan to examine the following scenarios:
1.Signing in to the application
2.Signing up to the application
3.the user performs a product advertising operation on the website
4.The user is browsing a product on the website

5.1Table 1-signing in :

Test name	description	Accepted results	Actual results	comments
Signing in unsuccessfully	If user isn't signed up ,check sign in results Click: sign in	Return failed to sign in with error message	Failed to sign in and the following message: "please check your signing in information "	The user was not found in the database
Signing in successfully	The user is signed up to the application,found in the database Click: sign in	Sign in the application successfully, and direct the user to his home page .	Sign in the application successfully and direct the user to his home page	The user is signed in now
Wrong username	The user entered a wrong username Click: sign in	Failed to sign in the application ,with error message	Failed to sign in with the following message: "username does not exist"	The username does not exist in the database

Wrong password	The user entered a wrong password Click: sign in	Failed to sign in with error message	Failed to sign in with the following message: ”the password is incorrect	The username exist in the database but the password is incorrect

5.2 Table 2 -singing up:

Test name	description	Accepted results	Actual results	comments
Empty nickname field	The user left the field “nickname” empty click :sign up	Failed to sign up to the application with an error note under the nickname field	Failed to sign up to the application with the following message: ”please enter nickname”	The user is not added to the database
Empty email address	The user left the “email” field empty Click: update	Failed to sign up to the application with an error note under the email field	Failed to sign up to the application with the following message: ”please enter an email”	The user is not added to the database
Invalid email address	The user entered an Email that does not contain @ and .com Click: sign up	Failed to sign up to the application with an error note under the email field	Failed to sign up to the application with the following message: ”invalid email”	The user is not added to the database
Empty phone number	The user left the “phone number” field empty Click: sign up	Failed to sign up to the application with an error note under the phone number field	Failed to sign up to the application with the following message: ”please enter the phone number”	The user is not added to the database
Invalid phone number	The user entered a phone number that contains or more than 10 number or less than 10 numbers Click: sign up	Failed to sign up to the application with an error note under the phone number field	Failed to sign up to the application with the following message: ”phone number is not valid”	The user is not added to the database

Empty password	The user left the “password” field empty Click: sign up	Failed to sign up to the application with an error note under the password field	Failed to sign up to the application with the following message: ”please enter the password”	The user is not added to the database.
Empty password confirmation	The user left the “password confirmation” field empty Click: sign up	Failed to sign up to the application with an error note under the password confirmation field	Failed to sign up to the application with the following message: ”please enter the password confirmation”	The user is not added to the database.
Incorrect password confirmation	The user entered a different password in the field “password confirmation” than the password he entered in the field “password” Click: sign up	Failed to sign up to the application with an error note under the password confirmation field.	Failed to sign up to the application with the following message: ”password confirmation is different than password”	The user is not added to the database.
Signed up successfully	The required information that the user entered are correct Click: sign up	Signed up to the application successfully with a success message	Signed up to the application successfully with the following message: “signed up successfully.”	The user is added to the database

5.3 Table 3 -the user performs a product advertising operation on the website:

Test name	description	Accepted results	Actual results	comments

Invalid Phone Number of details The product owner	The user entered a phone number that contains more than 10 digits or less than 10 digits. Steps: Click on the "Sign Up" button. Enter a phone number with more than 10 digits or less than 10 digits in the phone number field. Attempt to sign up.	The sign-up process should fail. And error note should be displayed under the phone number field.	The sign-up process failed with the following message: "Phone number is not valid." An error note is displayed under the phone number field.	The user was not added to the database due to an invalid phone number. The application correctly identified the invalid phone number and provided an error message, ensuring data integrity and user validation.
Missing Product Title	The user attempts to create a product listing without entering a title. steps: Navigate to the "Create Listing" or "Sell" page. Leave the product title field blank. Fill in other required information for the listing. Submit the listing	The listing submission should fail. And error message or note should be displayed indicating that a product title is required.	The listing submission failed with an error message stating that a product title is required.	The application correctly identifies the missing product title and prevents the user from submitting an incomplete listing. and The error message provides clear guidance to the user, ensuring data integrity and completeness.
Invalid Price Format	The user attempts to create a product listing with an invalid price format. Steps: Navigate to the "Create Listing" or "Sell" page. Enter an invalid price format, such as alphabetic characters or symbols, in the price field. Fill in other required information for the listing.	The listing submission should fail. An error message or note should be displayed indicating that a valid price format is required.	The listing submission failed with an error message stating that a valid price format is required.	The application correctly detects the invalid price format and prevents the user from submitting a listing with incorrect pricing information. and The error message provides clear guidance to the user, ensuring accurate and consistent pricing.

	Submit the listing.			
Uploading Multiple Product Images	The user attempts to create a product listing with multiple images. Steps: Navigate to the "Create Listing" or "Sell" page. Select and upload multiple images for the product. Fill in other required information for the listing. Submit the listing.	The listing submission should be successful. The uploaded images should be correctly associated with the listing and displayed on the listing's page.	The listing submission was successful. The uploaded images are correctly associated with the listing and displayed on the listing's page.	The application allows users to upload multiple images, enhancing the visual representation of the product and providing more information to potential buyers. The images are accurately displayed on the listing's page, improving the overall user experience.
Invalid Category Selection	The user attempts to create a product listing with an invalid or non-existent category selection. Steps: Navigate to the "Create Listing" or "Sell" page. Select an invalid or non-existent category for the product. Fill in other required information for the listing. Submit the listing.	The listing submission should fail. An error message or note should be displayed indicating that a valid category selection is required.	The listing submission failed with an error message stating that a valid category selection is required	The application correctly detects the invalid or non-existent category selection and prevents the user from submitting a listing with incorrect categorization. The error message provides clear guidance to the user, ensuring proper organization and searchability of products on the website.
Successful Listing Creation	The user successfully creates a product listing with all required information. Steps: Navigate to the "Create Listing" or "Sell" page. Enter a product title. Provide a detailed product description.	The listing submission should be successful. The listing should appear on the website's product listings page with accurate details.	The listing submission was successful. The listing appears on the website's product listings page with accurate details.	The application successfully creates and displays the product listing, allowing users to advertise their products effectively. The listing's details are correctly presented, ensuring potential buyers have

	Select a valid category for the product. Enter a valid price for the product. Upload appropriate images for the product. upload owner details Submit the listing.			access to accurate and relevant information.
Edit Product Details	The user successfully edits the details of an existing product listing. Steps: Locate an existing product listing created by the user. Click on the "Edit" or "Update" option for the listing. Modify one or more details, such as the title, description, price, or images. Save the changes. Verify that the updated details are reflected correctly on the listing's page.	The changes made to the listing details should be saved successfully. The updated details should be accurately displayed on the listing's page.	The changes made to the listing details were saved successfully. The updated details are accurately displayed on the listing's page.	The application allows users to edit and update their existing product listings, providing flexibility to make changes as needed. The updated details are correctly reflected on the listing's page, ensuring accurate and up-to-date information for potential buyers.
Promote Listing	The user successfully promotes their product listing to gain better visibility. Steps: Locate an existing product listing created by the user. Click on the "Promote" or "Boost" option for the listing. Select the desired	The promoted listing should receive enhanced visibility or featured placement as per the selected promotion package or options.	The promoted listing received enhanced visibility or featured placement as per the selected promotion package or options.	The application offers promotional options to users, allowing them to increase the visibility of their product listings. The promoted listing is appropriately highlighted or displayed, providing increased exposure and potential for higher engagement.

	promotion package or options. Proceed with the promotion process. Verify that the listing receives enhanced visibility or featured placement on the website.			

5.4 Table 4 - The user is browsing a product on the website:

Test name	description	Accepted results	Actual results	comments
Product Details Display	The user accesses a product listing and verifies that all relevant details are displayed correctly. Steps: Navigate to a product listing on the website. Check if the product title, description, price, category, and other relevant details are displayed accurately. Verify that the product images are correctly displayed and provide a clear representation of the product. Ensure that any additional information, such as shipping details or seller contact information, is shown correctly.	The product details, including title, description, price, category, and other relevant information, should be displayed accurately. The product images should be clearly displayed and representative of the actual product. Any additional information related to the product should be shown correctly.	The product details, including title, description, price, category, and other relevant information, were displayed accurately. The product images were clearly displayed and representative of the actual product. Any additional information related to the product was shown correctly.	The application effectively presents the product details, ensuring accurate information for potential buyers. The displayed images provide a visual representation of the product, enhancing the user experience. The additional information is correctly displayed, facilitating informed purchasing decisions.
Related Products Display	The user accesses a product listing and verifies that related or recommended products are displayed accurately.	The related or recommended products should be displayed	The related or recommended products were displayed accurately	The application effectively presents related or recommended products, enhancing

	Steps: Navigate to a product listing on the website. Check if there are related or recommended products displayed alongside the current listing. Verify that the related products are relevant and complementary to the current listing. Click on some of the related products to ensure they are accurately linked and displayed.	accurately alongside the current listing. The displayed related products should be relevant and complementary to the current listing. Clicking on related products should lead to their respective listings without any errors.	alongside the current listing. The displayed related products were relevant and complementary to the current listing. Clicking on related products led to their respective listings without any errors.	the user's browsing experience and facilitating product discovery. The accuracy of the related products ensures that users are exposed to relevant options, potentially increasing engagement and conversions.
Product Reviews and Ratings	The user accesses a product listing and verifies the display of reviews and ratings for the product. Steps: Navigate to a product listing on the website. Check if there are reviews and ratings displayed for the product. Verify that the reviews accurately represent user feedback and provide insights into the product's quality and performance. Ensure that the ratings are displayed prominently and reflect the average rating for the product.	The product listing should display reviews and ratings accurately. The displayed reviews should reflect user feedback and provide insights into the product's quality and performance. The ratings should be prominently displayed and reflect the average rating for the product.	The product listing displayed reviews and ratings accurately. The displayed reviews reflected user feedback and provided insights into the product's quality and performance. The ratings were prominently displayed and reflected the average rating for the product.	The inclusion of reviews and ratings helps users make informed decisions and builds trust in the product. Accurate display of reviews and ratings allows users to gauge the overall quality and popularity of the product.
Product Availability and Inventory	The user accesses a product listing and verifies the display of availability and inventory information. Steps: Navigate to a product	The availability status of the product should be displayed accurately. The inventory information, if	The availability status of the product was displayed accurately. The inventory information, if	Accurate display of availability and inventory information helps users make timely purchasing decisions.

	listing on the website. Check if the availability status of the product (e.g., "In Stock," "Out of Stock," "Limited Quantity") is displayed accurately. Verify that the inventory information (e.g., remaining quantity) is correctly presented, if applicable. Test the behavior by adding the product to the cart or attempting to purchase when it is in stock.	applicable, should be correctly presented. The behavior when adding the product to the cart or attempting to purchase should align with the availability status.	applicable, was correctly presented. The behavior when adding the product to the cart or attempting to purchase aligned with the availability status.	The behavior when interacting with the product aligns with the stated availability, ensuring a consistent user experience.

10.References:

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github link:
https://github.com/othmanhabiballh