Software Engineering Department

Ort Braude College

Capstone Project Phase A – 61998

Chargeless Advertisement tool-”Share2Grow”

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Abstract

In the evolving landscape of digital marketing, businesses are increasingly exploring cost-effective strategies to drive traffic and sales without relying on traditional paid social media advertising. This project presents a platform designed to empower businesses by enabling them to generate unique, trackable links that redirect customers to their websites. The platform operates on a "refer-a-friend" model, where customers who visit the business through these links can create their own unique referral links to share with others.

Through a simple process of entering an email, photo, and relevant business details, the platform creates a customized URL (e.g., www.domain/123.com) with an embedded unique identifier. This identifier allows businesses to accurately track customer interactions, including website visits and discount acceptances, providing detailed insights into the effectiveness of their promotional efforts.

Customers who use these unique links can further spread the business's reach by sharing their own referral links. This viral mechanism encourages widespread sharing, fostering a network effect that enhances visibility and engagement. As each new customer shares their link and brings in additional traffic, the business benefits from increased exposure and organic growth.

In addition to creating a traditional campaign landing page, the platform offers an alternative method: business owners can generate a unique link that directs customers straight to the business's own website. There, the link can be embedded as a banner, allowing customers to participate in the campaign directly on the business's site. This provides flexibility for businesses that prefer not to rely on the platform's default campaign pages, while still taking advantage of referral-based marketing.

The platform also offers customers access to a searchable database of active campaigns. Once registered on the platform, customers can browse various deals using tags defined by business owners when creating new campaigns. This allows them to find and participate in relevant campaigns, potentially earning rewards or discounts based on the campaign's setup. The platform offers customers the chance to engage with multiple promotions, either accumulating deals or earning money, depending on the structure defined by each business.

Furthermore, the platform includes comprehensive analytics and reporting tools, allowing businesses to monitor the performance of each link, understand customer behavior, and optimize their promotional strategies. By offering a scalable, data-driven solution, this platform provides businesses with the tools they need to boost sales and enhance customer engagement, all while minimizing marketing costs and leveraging the power of organic promotion through referrals.

1. Introduction:

Introduction:

In the digital age, where marketing costs continue to rise, businesses are seeking creative and cost-efficient ways to expand their customer base. Our new platform, based on a "friend referral" model, offers an effective solution that enables businesses to increase their exposure and drive traffic to their own websites. Through the creation of unique, trackable links, business owners can analyze shares, track who shared the campaign, how many customers arrived through the link, and what actions they performed on the site.

Additionally, the platform offers flexibility for businesses: they can either create a custom campaign page or integrate the link directly into their website, allowing customers to participate in the campaign directly from the business's site. As customers share the links, they can earn rewards, discounts, or additional incentives based on the number of shares and engagement they generate.

Not only does the platform facilitate organic marketing driven by customers, but it also provides advanced tools for tracking and data analysis, including IP-based tracking, to improve and optimize marketing strategies. This way, businesses can reduce marketing costs, increase customer loyalty, and boost exposure—all without the need for paid advertisements.

2.Related Work

The platforms and tools we reviewed provided important insights into the strengths and limitations of existing solutions in the market. Referral marketing platforms like ReferralCandy and InviteReferrals excel at encouraging customers to share content, but they are often limited in scope, customization options, and sometimes even charge a fee for each share made. Additionally, business-sorted shares come with a cost. Platforms for managing and tracking shared links, such as Bitly and Hootsuite, offer useful features for managing social media sharing but don't provide a comprehensive, fully integrated customer-driven marketing solution.

Our platform, "Chargeless Advertisement Platform," is based on the idea of free sharing, with no fees for each share. We combine the best elements of referral marketing, link tracking, and social media sharing. Our platform allows businesses to leverage networks like Facebook, Instagram, WhatsApp, and others to effectively spread campaigns while tracking shares, their sources, and their impact—all completely free of charge.

This way, businesses can drive organic growth through their customers, track their marketing results with precision, and improve their marketing strategies without having to pay for each share. Our unique approach allows businesses of all sizes to enjoy the benefits of broad sharing without relying on paid advertising.

3. Background

In an era where businesses are constantly seeking innovative ways to market themselves and attract customers without relying on expensive traditional advertising methods, the "Chargeless Advertising Platform" was created. This platform is designed to offer a cost-effective and efficient marketing solution through a "word-of-mouth" approach using unique, trackable links.

The platform’s goal is to enable businesses to conduct high-quality, targeted marketing without spending on paid advertisements. Businesses can easily create marketing campaigns and share links that lead directly to promotional content. Each shared link is automatically tracked, allowing businesses to see the performance of every campaign, measure the impact of shares, and gain actionable insights into customer behavior.

Additionally, the platform offers an alternative method for businesses that prefer not to create a dedicated campaign page. Instead, they can embed a link directly on their website, where customers can click and join the campaign from there. Customers will also have access to the platform itself, where they can search for deals and promotions using tags added by business owners when creating campaigns.

With the "Chargeless Advertising Platform", businesses are equipped with the tools to manage marketing campaigns efficiently while keeping costs low and enhancing customer engagement. The platform fosters a deep and genuine connection with customers by promoting word-of-mouth marketing, driving traffic, and boosting sales in a natural, cost-effective way.

Key Elements:

1. **Market Demand:** The platform responds to a growing need for cost-effective marketing solutions. As businesses look for alternatives to traditional advertising, the platform offers a way to engage customers and drive sales without relying on expensive ad campaigns.
2. **Convenience and Accessibility:** The platform is designed to be intuitive and easy to use for businesses of all sizes. It provides simple tools for creating and sharing unique links, along with detailed analytics to track performance. Customers can easily participate by sharing links across their preferred social media channels.
3. **Wide Applicability:** The platform is versatile and can be applied across various industries. Whether a business aims to promote a new product, increase website traffic, or enhance brand awareness, the platform offers the tools necessary to achieve these goals.
4. **Trust and Transparency:** Trust is built into the platform through transparent tracking and clear reward structures. Businesses can see exactly how their campaigns are performing, while customers are assured of receiving the rewards they have earned.
5. **Sustainability and Growth:** By focusing on organic growth and customer-driven promotion, the platform encourages sustainable business practices. It reduces reliance on paid advertising and fosters long-term customer loyalty through continuous engagement.

6. **Community Engagement:** The platform also seeks to build a community around each brand by encouraging customers to share their experiences and participate in marketing campaigns. This creates a network of loyal customers who are actively involved in the brand's success.

3 Technologies and API'S:

3.1 API'S:

3.1.1 FireBase API:

3.1.1.1 Firebase Authentication

- **What is it?** Firebase Authentication API provides methods for user authentication, including email and password, Google accounts, Facebook accounts, and more.
- **How will we use it?** We will use Firebase Authentication to authenticate business owners and customers on our site. This ensures that only registered users can access features like creating campaigns or participating in promotions.

3.1.1.2 Firebase Firestore

- **What is it?** Firestore is a NoSQL cloud database offering real-time updates, queries, and storage for large-scale applications.
- **How will we use it?** Firestore will be used to store all information related to campaigns, shares, and participating customers efficiently. It will also support real-time updates and tracking of marketing actions.

3.1.1.3 Firebase Storage API

- **What is it?** Firebase Storage allows secure storage of files such as images, videos, and other media in the cloud, with easy access from the application.
- **How will we use it?** Business owners will be able to upload marketing images and materials for their campaigns, and the files will be stored in Firebase Storage, making them accessible via promotional links.

3.1.2 IP Geolocation API

- **What is it?** This service allows for the identification of the user's IP location, including details such as city, country, time zone, and ISP.
- **How will we use it?** This API will help track the geographical locations of users clicking on promotional links to better understand customer behavior and identify where visitors are coming from.

3.1.3 Google Analytics API

- **What is it?** Google Analytics API tracks site activities such as visits, clicks, time spent, and more, providing comprehensive statistical and behavioral insights.
- **How will we use it?** Google Analytics will be used to track interactions with campaigns, providing businesses with in-depth insights into the performance of their promotional efforts and shares.

3.1.4 Algolia API

- **What is it?** Algolia API provides a powerful search and discovery engine that enables fast and relevant search capabilities across large datasets. It includes features like full-text search, filtering, and faceting.
- **How will we use it?** Algolia will be used to enhance the search functionality on your platform. It will allow users to quickly find campaigns, promotions, and other relevant content by searching through tags, keywords, and other criteria. The advanced search capabilities will improve user experience and engagement by delivering precise and relevant results in real-time.

3.1.5 WordPress REST API

- **What is it?** The WordPress REST API allows for interaction with WordPress sites programmatically. It enables you to create, read, update, and delete content, including posts, pages, and custom post types, through RESTful endpoints.
- **How will we use it?** We will use the WordPress REST API to create and manage customizable advertising pages. Business owners can use these pages to set up their promotional content and share it through the platform. By integrating with

WordPress, we can offer an easy-to-use interface for creating and customizing marketing materials without manual intervention.

3.2 Technologies that we will use: [What is an API (in 5 minutes) (youtube.com)]

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

3.2.1.1 Front-end:

For the front-end development of the "Chargeless Advertisement Platform," React is the framework of choice. React allows for the creation of interactive, dynamic user interfaces efficiently. By leveraging HTML, CSS, and JavaScript with React, we can design reusable components that handle user interactions seamlessly.To enhance the design and responsiveness of the platform, we will also use Bootstrap, a popular CSS framework that provides pre-designed components and a responsive grid system, ensuring a consistent and mobile-friendly layout.

3.2.1.2 Back-end :

The back-end of the "Chargeless Advertisement Platform" will be built using Node.js and Express, which allows us to create scalable and efficient server-side applications. The platform will handle client-server communication through the front-end using the fetch API to send requests (such as GET and POST) to the server. Data will be stored and managed using a NoSQL database like Firebase, which is flexible and scalable. Security will be ensured through input validation and protecting against vulnerabilities like SQL injection. We will also use JSON Web Tokens (JWT) for secure authentication, and Express will handle routing, error handling, and request processing efficiently.

3.2.1.3 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.

3.2.2 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.

3.2.2.1Communication 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.

3.2.3 Database:

NoSQL databases like Firestore or MongoDB are well-suited for the "Chargeless Advertisement Platform" due to their flexibility and scalability. These systems are designed to handle dynamic data structures, making them ideal for storing user-generated content, tracking metrics, and campaign analytics without the constraints of a traditional relational database.Both Firestore and MongoDB can scale easily to handle large volumes of data, which is crucial for tracking user interactions, shared links, and the growth of traffic on the platform

3.2.4 Protection: Protecting Site:

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

3.2.5 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).

3.2.5.1 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.

3.2.5.2 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.

3.2.6 Authentication and authorization:

Firebase Authentication supports multiple authentication methods, including email/password, phone number, and social media logins (Google, Facebook,…) allowing users to securely sign in to the platform.

3.2.6.1 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 email and password, or a social media login) to ensure they are who they claim to be. For secure authentication, Firebase Authentication provides a built-in solution that supports various methods, including email/password, phone numbers, and third-party logins (Google, Facebook, etc.). When a user successfully logs in, Firebase generates an ID token and a refresh token. The ID token is sent back to the client and is included in subsequent requests to the server, ensuring the user remains authenticated. Firebase automatically handles the token lifecycle, including token expiration and refresh, ensuring secure and efficient authentication across all sessions.

3.2.6.2 Authorization:

Authorization is a crucial process that occurs after a user is authenticated, determining what actions or resources the user is allowed to access. Once Firebase Authentication verifies a user's identity, the next step involves enforcing access control rules to ensure that users have the necessary permissions for certain actions or to access specific parts of the platform.

Firebase provides a flexible and robust way to manage authorization through:

Firebase Security Rules: These rules are used to define access permissions for Firebase services like Firestore, Firebase Storage, or Realtime Database. Security rules can be configured based on the authenticated user's ID, role, or other custom laims set during the authentication process.

3.2.7 Hashing and encryption:

Firebase provides robust authentication mechanisms and built-in features for securely managing user passwords, eliminating the need for developers to handle the technical specifics of cryptographic algorithms like Bcrypt. When users sign up or update their passwords, Firebase automatically hashes and stores passwords securely in its backend system.

Firebase uses strong, adaptive hashing algorithms (such as SCRYPT) for password security. These algorithms incorporate features like salting ,adding random data to passwords before hashing and key stretching(multiple hashing iterations, similar to Bcrypt, to enhance security. This makes the hashing process computationally expensive, thus defending against brute force and other types of attacks.

3.2.8 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:

3.2.8.1 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.

3.2.8.2 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.

3.2.8.3 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.

3.2.9 Protection Personal Information:

Firebase offers comprehensive tools to ensure the protection of personal information, leveraging its robust authentication system, Firebase Authentication, to manage user identities securely. It automatically hashes passwords using strong algorithms such as SCRYPT, supports multiple authentication methods, and enforces detailed security measures with Firebase Security Rules. These rules allow granular access control and data validation to ensure data integrity. Additionally, all data transmitted to and from Firebase servers is encrypted via HTTPS, ensuring secure data transmission. For extra sensitive data, consider additional encryption client-side before sending it to Firebase. The platform is built on Google's secure infrastructure, complying with major standards like GDPR and HIPAA, allowing for specific data residency configurations. Firebase also enables real-time monitoring and auditing of database access, providing a high level of security and compliance, essential for protecting personal information within web applications.

4.Expected Achievements:

By the end of this project, we expect to achieve the following:

Functioning Referral Platform: A fully operational platform where businesses can create unique, trackable links and monitor customer engagement through referral marketing.

Increased Traffic and Sales: The platform will enable businesses to increase website traffic and sales by leveraging organic, customer-driven promotion rather than relying on traditional paid advertisements.

Efficient Link Generation System: Businesses will be able to generate custom referral links quickly and easily, allowing for seamless integration into their marketing campaigns.

User Engagement and Growth: Customers will be encouraged to participate and share referral links, creating a viral marketing effect. This will result in continuous user engagement and exponential growth for businesses using the platform.

Flexible Campaign Options: The platform will allow businesses to choose between using the default campaign landing page or embedding referral links directly on their website, providing flexibility to suit various marketing strategies.

Comprehensive Analytics and Reporting: The platform will provide advanced reporting tools, allowing businesses to analyze link performance, customer interactions, and overall campaign success. This will enable data-driven decision-making for optimizing marketing strategies.

Campaign Discovery for Customers: Customers will have access to a searchable database of active campaigns, enabling them to find relevant deals, participate in promotions, and potentially earn rewards or discounts.

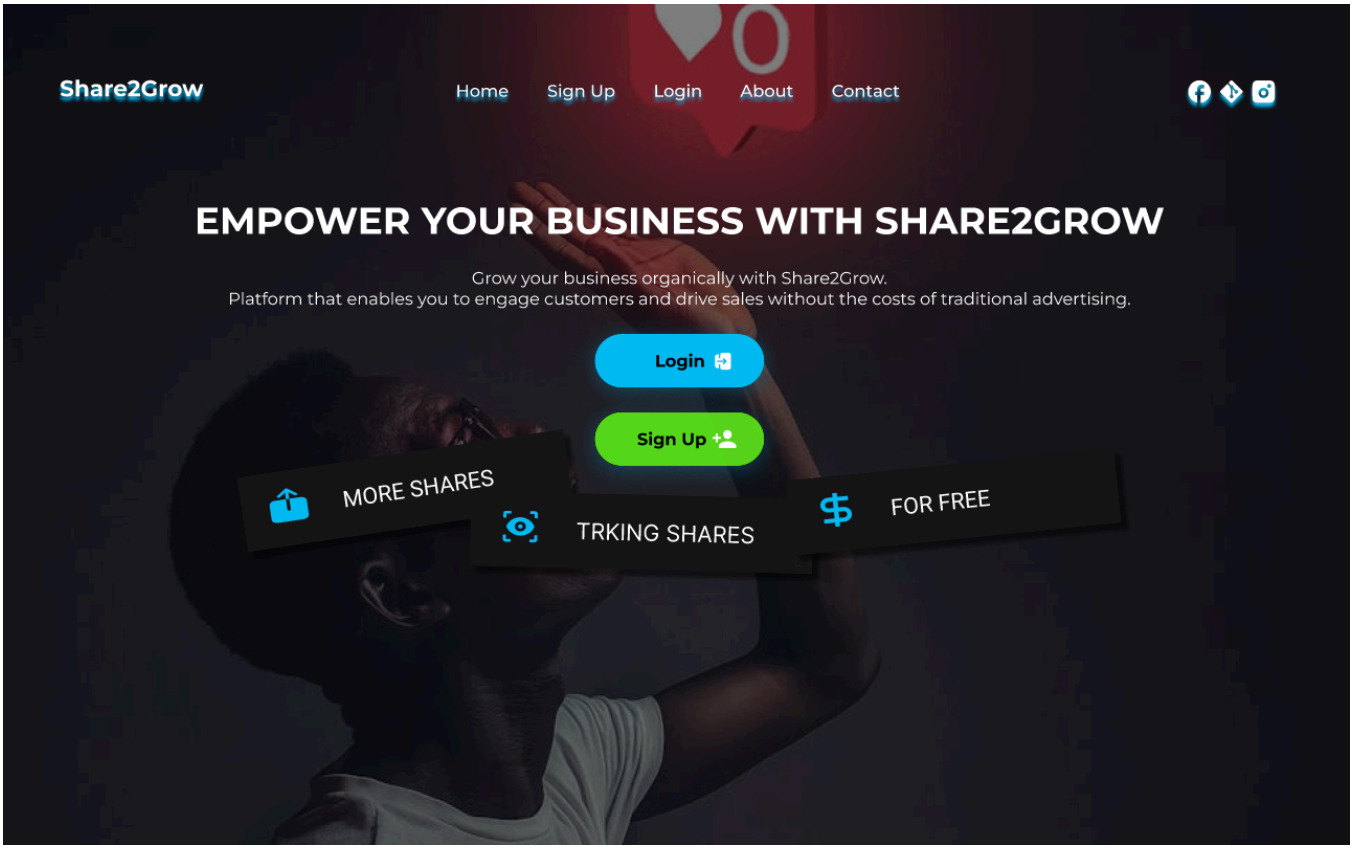
Scalability and Adaptability: The platform will be scalable, able to handle increasing numbers of users, campaigns, and referrals, ensuring its adaptability to businesses of all sizes and industries.

Reduced Marketing Costs: By focusing on organic promotion through customer referrals, businesses will significantly reduce their marketing costs while still driving traffic and sales.

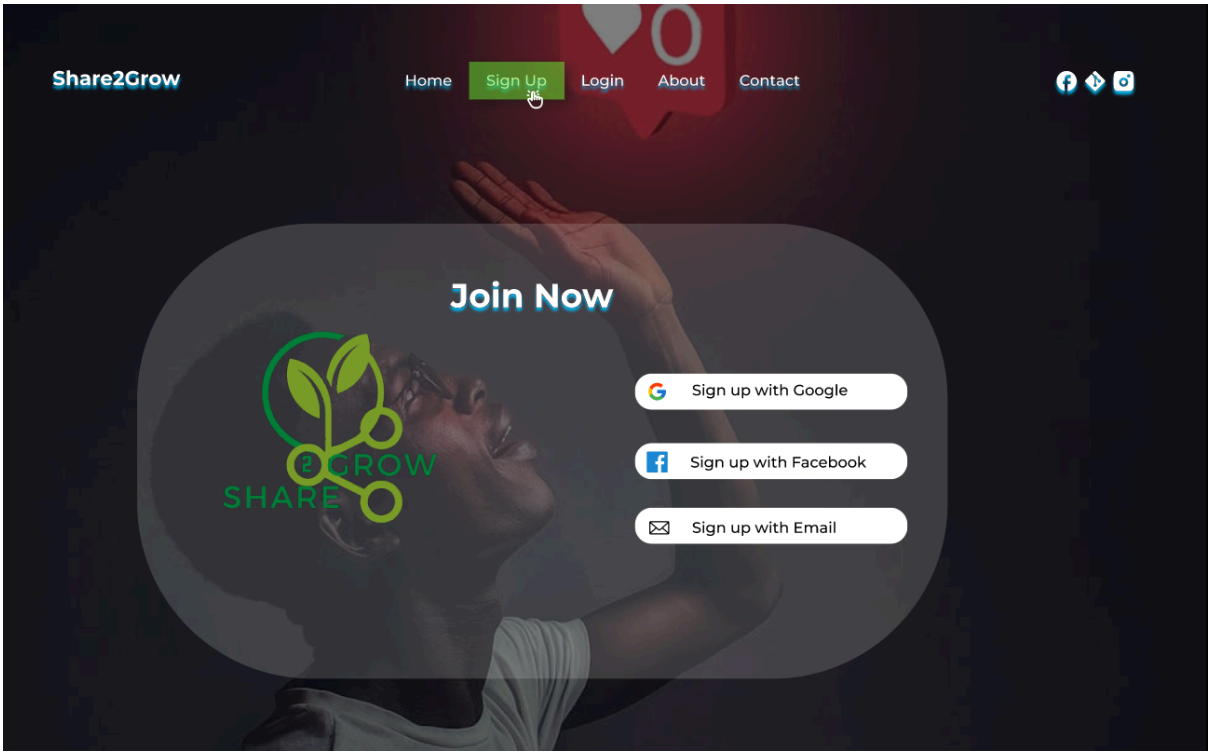
Enhanced Customer Loyalty: The platform's reward-based system will encourage customers to return, driving repeated engagement and fostering long-term relationships between businesses and their customers

4.1 Main Screens for Our Site:

You can view the prototype screens we created in Figma :



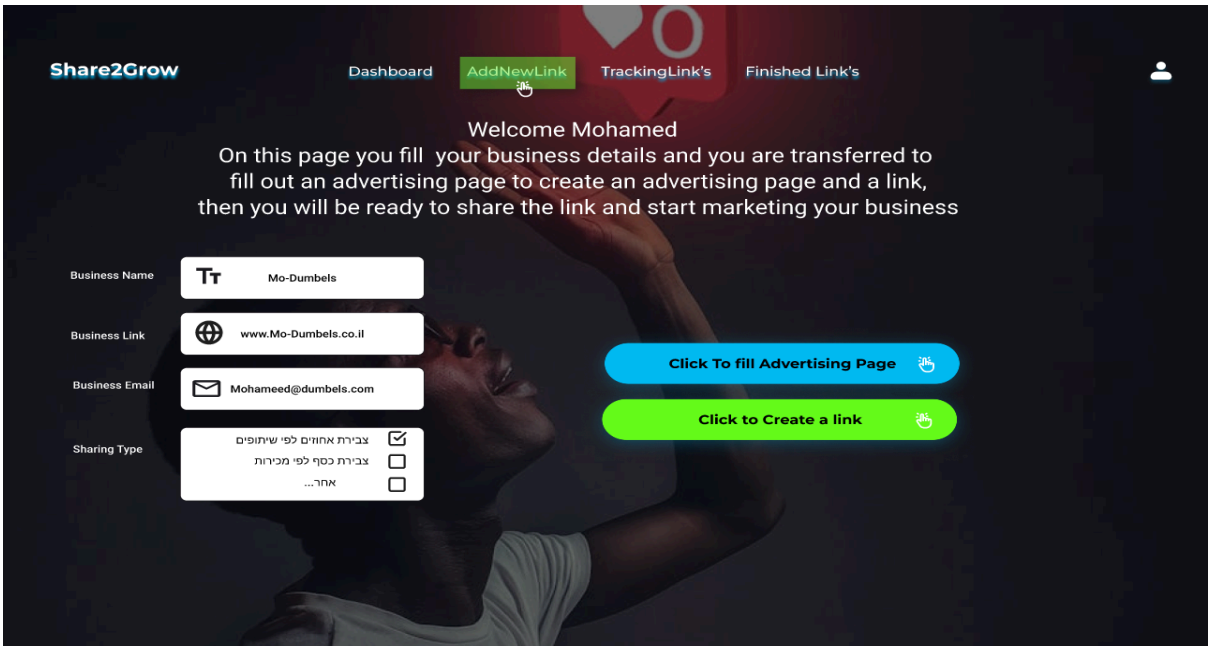
→This is the interface that appears to the business after searching for our website in the Google search engine, but he will not be able to use it until after he registers, after clicking on the word “Login” in the blue button, and then he will pass to the registration page or sign up for the first time.



→This page is show that the customer can join with facebook and email using firebase :

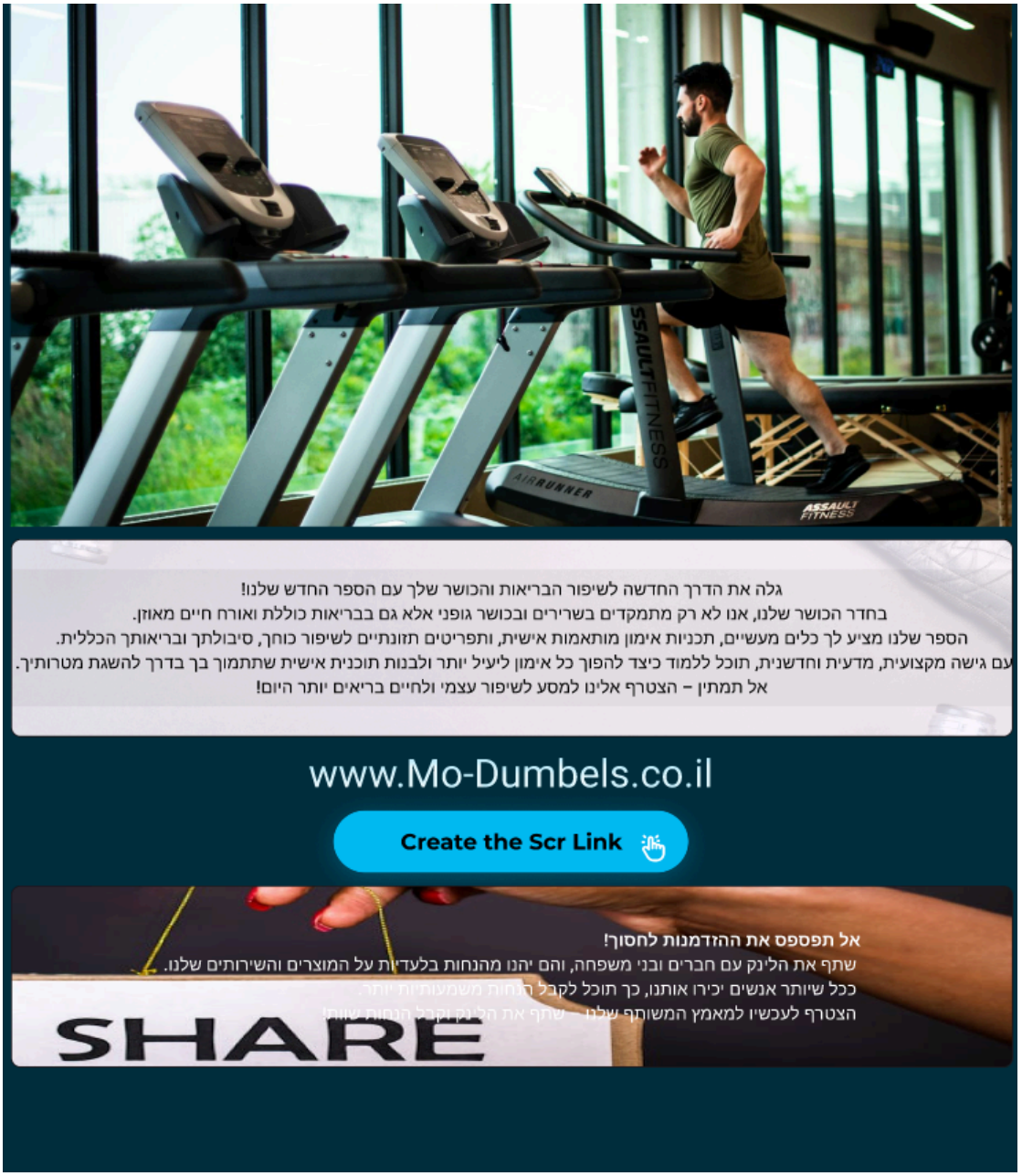
In this page after login the business put the fit information like name, link to his website, email, and kind of the discount he wants to do for customers.

→After do all this step go to next screen to create link for his website



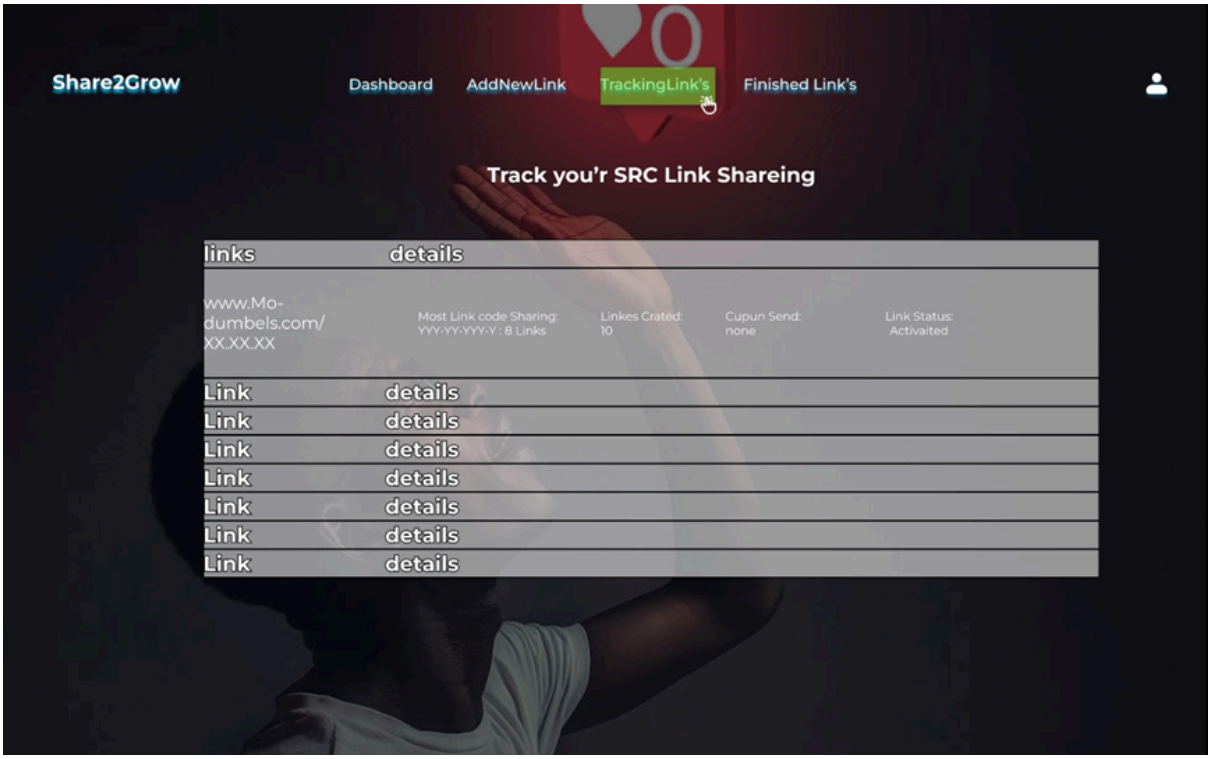
→In this screen the business uploaded a picture for his website or products after that press to create a link to share that for customers and begin the campaign to customers.

Will the customers press to the link of business , them go to this page:



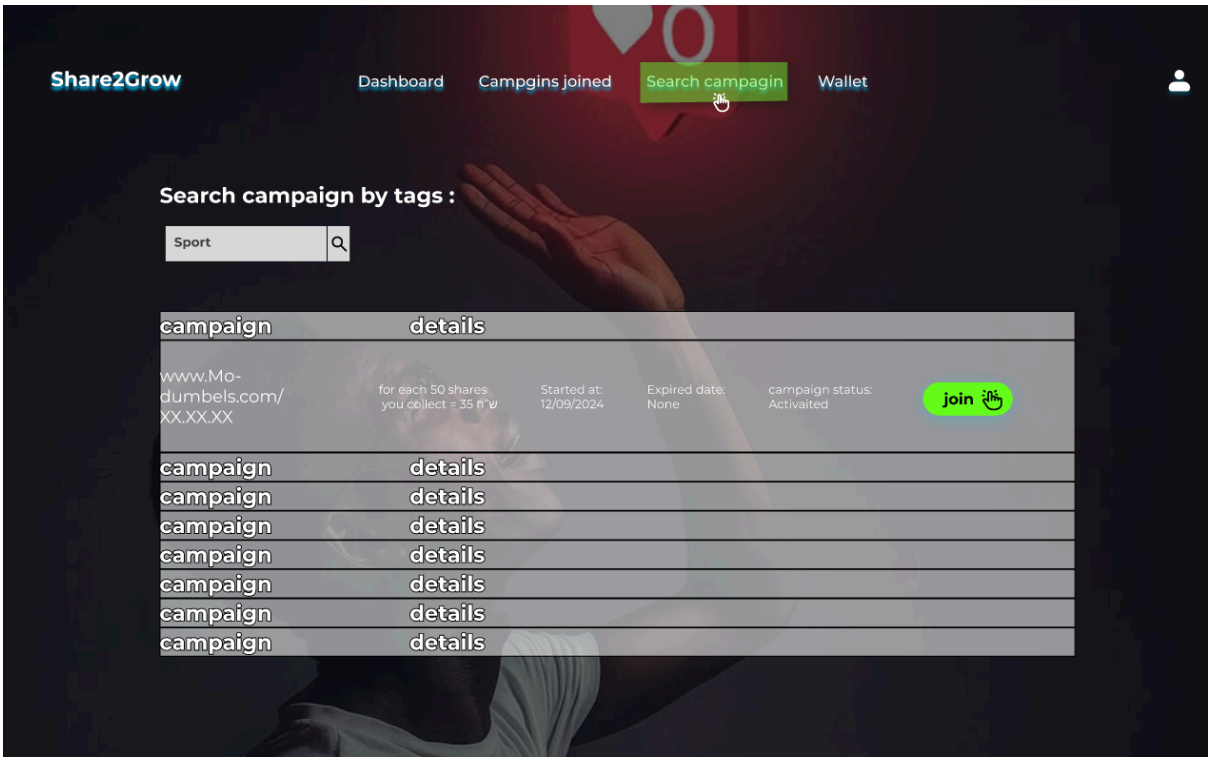
→This page has information to the customer explaining about the business and a link to the website .

after the customer see the website and agree for the website and the discount can to press on the "Create the Scr Link " and get to link with par of time for his campaign , customer get the time of your campaign in email how much time the link is be active to get the discount .



→In this page appears information about all the links published by customers and all links how much view and share are accepted from other customers and about the reminder time of all campaigns to end.

→ after the user logging in to our webSite he can search an campaign to join:



5. The Process

5.1 Research – Digital Marketing and Referral-Based Advertising

To broaden our understanding of the digital marketing and referral-based advertising landscape, we conducted in-depth research to answer the following questions:

How do referral-based marketing platforms function, and what are the common practices involved in sharing and tracking user-generated links?

We examined various models of referral marketing, customer-driven promotions, and affiliate programs across platforms that rely on user engagement for traffic generation. We studied the processes involved in creating unique links, sharing them across social media, tracking the effectiveness of link performance, and rewarding users for successful referrals.

What are the challenges and difficulties faced by businesses and users in referral-based marketing platforms?

We delved into the pain points experienced by both businesses and users, including trust issues regarding the legitimacy of shared links, challenges in tracking real-time performance, difficulties in managing complex reward systems, and user concerns about privacy. We also explored how to overcome issues of fraud and link misuse, which can undermine the success of referral programs.

Which age groups and demographics are most likely to engage with referral-based marketing, and how can they benefit from such a platform?

We analyzed market data and user behavior trends to identify key demographics for our platform. These include tech-savvy young adults, social media influencers, small business owners, and individuals seeking work-from-home opportunities to earn extra income by sharing referral links. We aimed to target those who are comfortable using digital tools and social platforms to promote products.

What are the current limitations of existing referral-based marketing platforms, and how can our platform address these issues?

We identified common challenges such as limited tracking transparency, difficulty in managing rewards, and the complexity of integrating with social platforms. Our research focused on simplifying these processes through clear, user-friendly interfaces and providing real-time analytics to users and businesses to help them track link performance and earned rewards.

Are there any non-technology-based methods for generating traffic and promoting businesses, and how relevant are they in today's digital world?

We explored traditional methods like word-of-mouth, physical coupon distribution, and local promotions to understand their current relevance. While these methods are still effective in some cases, we recognized that digital referral systems offer greater reach and convenience, allowing businesses to scale faster and target a broader audience.

What technological advancements have been made in the field of digital marketing and referral platforms, and how successful have they been in improving user engagement and conversions?

We researched the latest trends in digital marketing, including advanced link-tracking systems, AI-driven recommendation engines, real-time data analytics, and integrated social media sharing tools. These technologies have been successful in boosting user engagement and improving conversion rates, and we identified those that align with our platform's goals of providing seamless, data-driven tracking and rewarding users for their participation.

Based on this research, we held discussions and brainstorming sessions to consolidate our findings. We analyzed market trends, user feedback, and existing solutions to identify key areas of focus for the development of our platform. These insights will help guide the

creation of a user-friendly, secure, and efficient referral-based marketing system that benefits both businesses and users.

5.1.1 Constraints and Challenges – Referral-Based Marketing Platform:

One of the major challenges in developing this project is understanding that the referral-based marketing space is highly competitive and diverse. It involves managing a wide range of businesses, user behavior, and the tracking of shared links. Additionally, ensuring transparency and trust in referral tracking and reward systems is crucial but can be challenging in an online environment. To address these challenges, we will focus on creating a platform that emphasizes user-friendliness, accuracy, security, and transparency.

To address trust issues in referral tracking, we will implement a robust tracking mechanism that accurately monitors each link's performance. Verification processes for businesses and users will be incorporated to ensure that legitimate entities are participating. Building a reputation system, where users can see verified metrics like successful referrals and earned rewards, will add further credibility. Additionally, clear reporting tools and real-time updates will help users and businesses track link performance.

Lastly, to ensure users trust the reward system, we will offer transparent payout structures, allowing users to see exactly how their earnings are calculated and ensuring that they receive timely rewards for their efforts. This will foster confidence in the platform and encourage further engagement.

5.1.2 Conclusions from Research – Inspiration for the Platform:

Our conclusions and inspirations for developing the "Chargeless Advertisement Platform" were shaped by research into successful referral-based marketing systems and user engagement strategies. Studies on digital marketing and consumer behavior indicate that users are motivated by transparent reward systems, ease of use, and the opportunity to earn from sharing products they believe in. We found that users are more likely to participate

when the process of sharing links is seamless, tracking is accurate, and rewards are clearly defined.

Additionally, research highlighted the importance of features such as real-time link performance tracking, user verification to ensure legitimacy, and personalized recommendations to enhance the user experience. We also learned that businesses benefit from a user-friendly dashboard that provides insights into referral performance, customer engagement, and the effectiveness of promotions.

These insights have inspired us to design a platform that emphasizes simplicity, transparency, and user trust. Key features like clear reward systems, advanced link-tracking capabilities, and secure payout options will form the core of the platform. This approach ensures that both businesses and users can easily engage with the platform, fostering an environment of mutual benefit and sustainable growth.

5.2 Methodology and Development:

Agile Methodology:

I have chosen the Agile methodology for its iterative and flexible approach. By breaking the development process into smaller components, I can easily make adjustments and adapt to evolving requirements and feedback from users and businesses.

Building the Platform:

I will begin by developing the core structure and layout of the platform using modern web development technologies such as React for the front end and Node.js with Express for the back end. The goal is to create a user-friendly interface that focuses on intuitive design and smooth navigation. Additionally, the platform will be optimized for responsiveness across various devices, ensuring accessibility for all users.

User Registration and Authentication:

To provide a personalized experience for businesses and users, I will implement a secure user registration system using Firebase Authentication. This will allow users to sign up with

email/password credentials or via social media accounts. I will ensure that all sensitive information is protected through industry-standard encryption and security protocols.

Link Creation and Sharing:

One of the key features of the platform will be enabling businesses to create unique, trackable links for their promotions. Each link will have essential information like tracking IDs, referral codes, and campaign-specific details. To enhance usability, I will integrate easy-to-use tools for sharing links via social media and email.

Referral Tracking and Reporting:

A sophisticated tracking system will be implemented to monitor the performance of shared links in real-time. Users and businesses will have access to detailed analytics, including the number of clicks, purchases, and conversions generated by their shared links. This data will be available through personalized dashboards.

Reward System and Payouts:

To incentivize users, I will develop a reward system where users can accumulate earnings based on successful referrals. The platform will track how many purchases are made through the user's link, and these earnings will be displayed on the user's dashboard. Payouts will be handled through secure payment gateways, ensuring that users are compensated for their promotional efforts.

User Reviews and Trust Mechanisms:

Building trust is essential for the platform. I will implement a review and rating system that allows businesses and users to provide feedback on each other. This will help establish a reputation system, ensuring credibility and reliability across the platform. Clear guidelines will be in place to handle disputes or fraudulent activities.

Admin Dashboard and Moderation:

To effectively manage user accounts, links, and reported content, I will develop an admin dashboard. This will enable me to ensure compliance with the platform's policies, moderate content, and manage user disputes as they arise.

Analytics and Reporting:

The platform will include analytics tools to track referral performance, user engagement, and traffic patterns. Businesses will be able to generate reports on the effectiveness of their campaigns, while users will be able to monitor the performance of their shared links. Data insights will help guide improvements to the platform.

Multimedia Support:

To enhance promotional campaigns, I will allow businesses to include multimedia elements in their campaigns. This could include images, videos, or other interactive elements to help showcase their products and services effectively.

Testing and Quality Assurance:

Rigorous testing will be conducted throughout the development process to identify and resolve any bugs or issues that may affect the user experience. Cross-browser and cross-device compatibility will be prioritized to ensure the platform functions seamlessly across all environments.

Continuous Improvement and Maintenance:

Regular updates will be made to the platform based on user feedback, market trends, and technological advancements. Continuous monitoring and maintenance will ensure that the platform operates efficiently and securely, with prompt resolutions to any issues that arise.

Customer Support and User Engagement:

Providing excellent customer support will be key to ensuring user satisfaction. I will offer multiple support channels (email, live chat, help forums) to assist with any inquiries or issues. Community engagement will also be encouraged through user feedback forums and social media platforms to foster collaboration and trust.

6. Product

6.1 Requirements Functional:

1	User Registration: Allow businesses and users to create accounts and provide necessary information to generate and track referral links.
2	Link Creation: Enable businesses to generate unique, trackable promotional links, embedded with specific referral codes and campaign details
3	Referral Tracking: Implement tracking systems to monitor clicks, purchases, and conversions from shared links in real-time.
4	Reward System: Establish a reward mechanism for users, allowing them to earn based on successful referrals and purchases made through their shared links.
5	Dashboard for Businesses: Provide a dashboard for businesses to track link performance, view customer engagement, and monitor sales generated from shared links.
6	Analytics & Reporting: Provide detailed analytics tools to show businesses how their campaigns are performing, including traffic, conversions, and engagement.
7	User Profiles: Allow users to create profiles where they can view their shared links, track earnings, and manage their rewards.
8	Social Media Integration: Enable users to easily share links via social media platforms such as Facebook, Instagram, and Twitter.

9	Notification System: Send notifications to businesses and users regarding the performance of links, new referrals, or earnings updates.
10	Multi-lingual Support: Support multiple languages to accommodate businesses and customers from different regions.
11	Admin Moderation: Develop admin tools to manage user accounts, reported content, and ensure compliance with platform policies.

Non-functional:

1	the platform has a user-friendly interface and seamless navigation to improve the experience for both businesses and customers.
2	Security: Implement strong security protocols to protect user data, including SSL encryption for all transactions and secure password storage using hashing algorithms.
3	Scalability: Design the platform to scale smoothly as the number of users, links, and campaigns grows, ensuring performance is not impacted.
4	Cross-platform Compatibility: Ensure the platform functions smoothly across multiple devices, including desktops, tablets, and smartphones
5	Reliability: Minimize downtime and ensure the platform is operational 24/7 with proper server redundancy and failover systems.
6	Accessibility: Ensure the platform conforms to accessibility standards, making it usable for individuals with disabilities.
7	Compliance: Ensure the platform relevant data privacy laws, protecting users' personal information.

8	Load Testing: Conduct load testing to ensure the platform can handle high traffic volumes without performance degradation.
9	Error Handling: Implement comprehensive error handling and logging systems to identify, track, and resolve issues efficiently.
10	Data Backup and Recovery: Implement regular data backups and have a recovery plan in place to prevent data loss and ensure system resilience in the event of failures.

6.2 Architecture Overview

User Interface (UI):

The UI is responsible for providing an interactive and intuitive interface for businesses and users to create, share, and track promotional links. It includes components such as the homepage, user dashboards, link creation forms, link performance analytics, and notifications. The UI will be designed for ease of use, enabling businesses to manage their campaigns and users to track their earnings seamlessly.

User Authentication and Authorization:

This component handles user registration, login, and authentication using Firebase Authentication. It ensures that only authorized users (businesses and customers) can access features such as creating referral links, tracking performance, and redeeming rewards. Firebase Security Rules will enforce role-based access control to protect sensitive information.

Database:

The database will store all data related to users, businesses, referral links, performance metrics, transactions, and rewards. NoSQL databases like Firebase will be utilized due to their flexibility and scalability, which are ideal for managing user-generated data and real-time analytics.

Link Management:

This component manages the lifecycle of referral links on the platform. It includes functionalities for businesses to create, edit, and manage their referral links. The system will also track link clicks, conversions, and earnings. Expired or inactive links will be automatically removed or archived. Link management will also support categorization and tagging for organized analytics.

Search and Recommendation:

To enhance usability, the platform will integrate a search and filtering system allowing users to easily find businesses or promotional campaigns. This system will support searches based on criteria such as industry, type of promotion, and geographic location. A recommendation engine may suggest relevant campaigns to users based on their previous engagement or browsing behavior.

Messaging System:

A messaging system will be included to facilitate communication between businesses and their customers. This feature will allow businesses to answer inquiries, provide additional details about promotions, and engage with users who share their links. Notifications will alert users to new messages or important updates regarding their campaigns or earnings.

Security:

Security will be a top priority, incorporating features such as HTTPS for secure data transmission, encryption for sensitive information, and Firebase Security Rules for access control. Input validation and other security protocols will be implemented to protect against vulnerabilities like SQL injection and cross-site scripting (XSS).

Scalability and Performance:

The platform will be designed to handle increasing user activity as it grows. Techniques such as load balancing, database optimization, and horizontal scaling of servers will be implemented to ensure the platform remains responsive and efficient as traffic increases. Firebase will enable auto-scaling, making it ideal for handling dynamic user loads.

Analytics and Reporting:

Comprehensive analytics and reporting tools will allow both businesses and platform administrators to monitor key metrics. Businesses can track the performance of their referral campaigns, including clicks, conversions, and user engagement. The platform administrators can gather insights on user behavior, trends in link sharing, and campaign performance to continuously improve the platform.

6.3 Interfaces and Simulation Flow

6.3.1 Interfaces

User Registration Interface:

Allows businesses and users to create links by providing necessary details such as email, password, and business information.Validates user input and checks for duplicate email addresses.Displays error messages for validation errors.Upon successful registration, redirects users to the login interface.

User Login Interface:

Provides a login form for businesses and users to enter their credentials (email and password).Authenticates user credentials against the stored information in the Firebase database. Redirects authenticated users to the business dashboard or user homepage upon successful login. Displays error messages for invalid credentials or account inactivity.

Dashboard Interface:

Displays a personalized dashboard for businesses to view analytics, link performance, and campaign progress. Allows users to see the performance of their shared links, including the number of clicks, conversions, and earned rewards. Includes search functionality to allow users to search through past campaigns or referrals.

Link Creation Interface:

Allows businesses to create new, unique, trackable promotional links. Includes fields for entering campaign details such as title, description, promotional offer, and referral code.

Validates input and ensures all necessary information is provided before generating the link. Upon submission, the link is stored in the database and becomes available for sharing.

Link Performance Details Interface:

Displays detailed analytics for each unique link created by the business, including real-time metrics on clicks, purchases, and conversions. Shows information on how many customers have shared the link further and the resulting traffic generated from those shares.

Messaging Interface:

Provides a real-time messaging platform where users can ask questions about specific promotions or campaigns. Sends notifications to users and businesses when they receive new messages.

User Profile Interface:

Displays user profiles with information such as name, email, and rewards earned.Allows users to edit their profile information and track their shared links and associated rewards. Shows a history of user referrals, link performance, and rewards earned through successful referral**s.**

Admin Dashboard Interface:

Accessible only by platform administrators. Allows them to manage user accounts, moderate links, handle reported issues, and perform other administrative tasks. Provides tools for monitoring and analyzing the overall platform performance, user activity, and campaign trends.

6.3.2 Simulation Flow

6.3.2.1 Brief Flow:

User Registration:

User or business registers an account by providing necessary details and validating inputs. The system checks for duplicates and confirms registration.

User Login:

User logs in using valid credentials and is redirected to their respective dashboard.If credentials are invalid, the system prompts for re-entry.

Browsing Dashboard:

Business users can browse through their campaign dashboard to see link performance, traffic, and earned rewards. Regular users can view their referral activities and earnings.

Creating a Link:

Businesses click the "Create Link" button and fill in the required fields (offer, description, photo.). Upon submission, the system generates a unique, trackable

link.

Tracking Performance:

Businesses monitor the performance of their shared links through the analytics dashboard. Users check the performance of their shared links, including how many new visitors were generated.

Messaging and Support:

Users or businesses initiate communication with platform support through the messaging interface. Messages are sent, received, and notifications are provided for updates.

Admin Moderation:

Admins log in to their dashboard to manage user issues, moderate content, and review system performance.

6.3.2.2 Expansion Flow:

User Registration:

The user accesses the registration page and fills in details like email and password. The system validates the input and checks for duplicate accounts. On successful registration, the user is redirected to the login page. If there’s an error, it is displayed to the user.

User Login:

The user enters their credentials (email/password) and submits the form. The system checks against stored data and logs the user in upon successful authentication.

Creating a Link:

Businesses click on "Create Link", fill in the campaign details, and submit. The system validates and stores the link, making it available for sharing. Tracking

Campaigns:

Users access the dashboard to view the performance of shared links (clicks, conversions). Businesses track referral progress in real-time through analytics dashboards.

User Profile Management:

Users manage their profiles, view referral history, and update contact details. Users can see how many conversions they’ve earned from shared links.

7. Data Analysis and Reporting

The platform will primarily focus on gathering and analyzing data related to referral links, user behavior, and campaign performance. The goal is to provide actionable insights for businesses without the need for complex data models.

7.1 Data Collection:

Data will be collected from multiple sources, including user registrations, the number of referral link shares, and website traffic generated through these links. Additional referral data, such as conversion rates and customer actions after visiting a link, will also be tracked. All data will be securely stored and synchronized in real-time using Firebase.

7.2 Data Preprocessing:

The collected data will be cleaned to remove any duplicates or incorrect entries, such as invalid link clicks. Inconsistencies like missing or partial records will be handled to ensure accuracy. The data will be formatted for analysis, transforming textual data (like referral actions) into structured metrics such as the number of clicks, conversions, and shares.

7.3 Exploratory Data Analysis (EDA):

EDA will be used to evaluate key metrics such as clicks, conversions, and customer engagement. Simple statistical measures like averages and percentages will help identify trends. Businesses will have access to visual representations (such as bar charts or line graphs) of link performance, allowing them to easily track campaign effectiveness.

7.4 Feature Extraction and Selection:

Relevant features like click-through rates, user referral activity, and geographic location will be extracted for reporting purposes. These insights will help businesses understand which factors contribute most to successful referral campaigns.

7.5 Simple Performance Metrics:

Instead of complex machine learning models, the platform will focus on providing performance metrics like total clicks, conversions, and referral shares. Businesses can use these metrics to track the effectiveness of their campaigns and make data-driven adjustments.

7.6 Predictive Insights (Simplified):

Based on historical data, the platform will offer simple predictions about campaign performance, such as recommending optimal times for sharing referral links or identifying high-engagement users. These insights will help businesses improve their link-sharing strategies and maximize customer engagement.

7.7 User Behavior Analysis:

User behavior will be analyzed by tracking how often and when users share links, as well as how many conversions are generated by each user. This will allow businesses to identify their most valuable customers and focus their efforts on high-potential referral chains.

7.8 Fraud Detection:

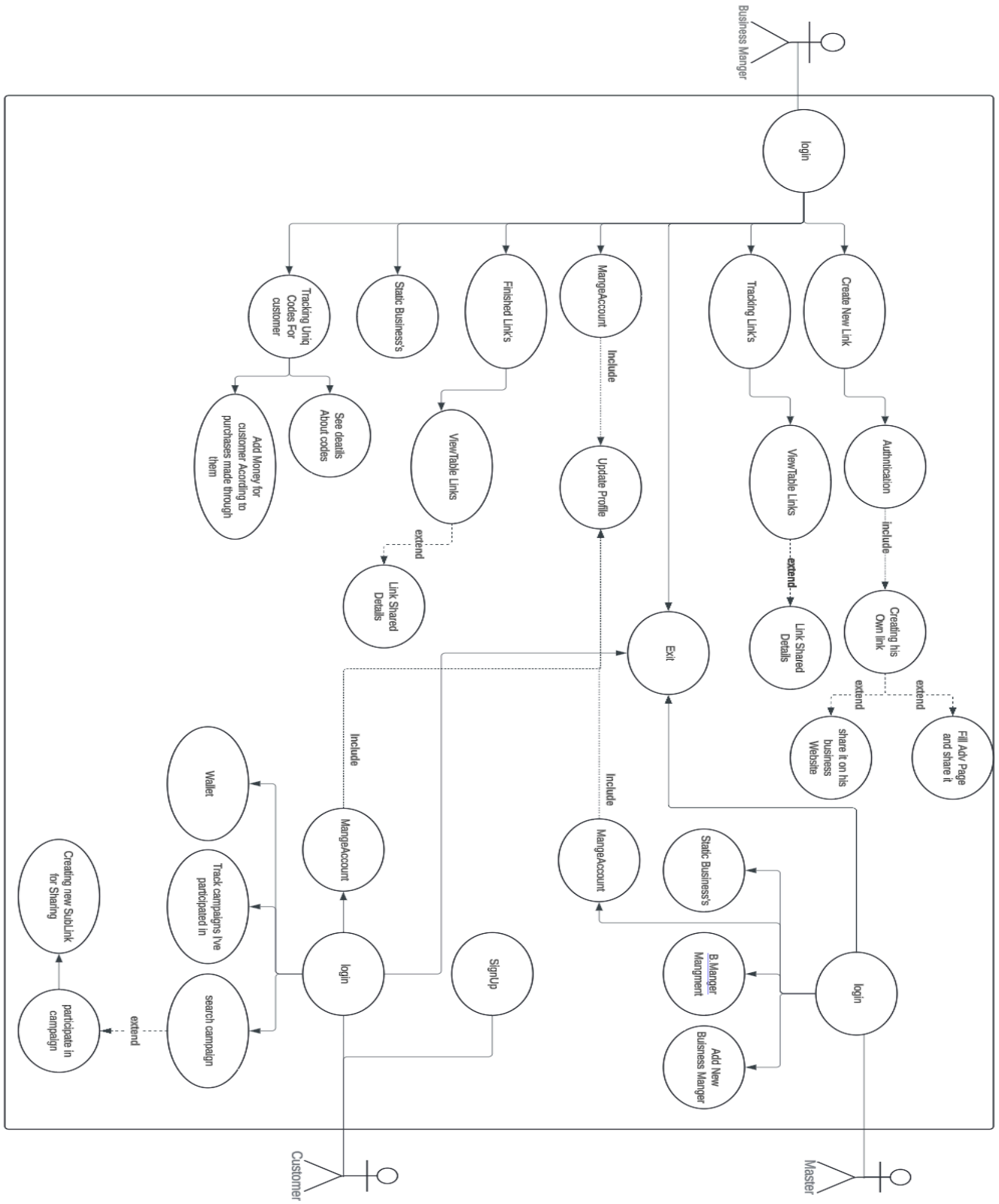
To ensure the integrity of the referral system, the platform will implement basic fraud detection methods. These will identify suspicious activities, such as repeated clicks from the same IP address or fake referrals. Anomaly detection will be used to flag unusual behaviors that could indicate fraudulent actions.

7.9 Performance Monitoring and Improvement:

The platform's performance, including data tracking tools and reporting features, will be continuously monitored. Regular updates and improvements will be made based on user feedback and emerging trends to ensure the platform remains functional and reliable.

8.Diagrams:

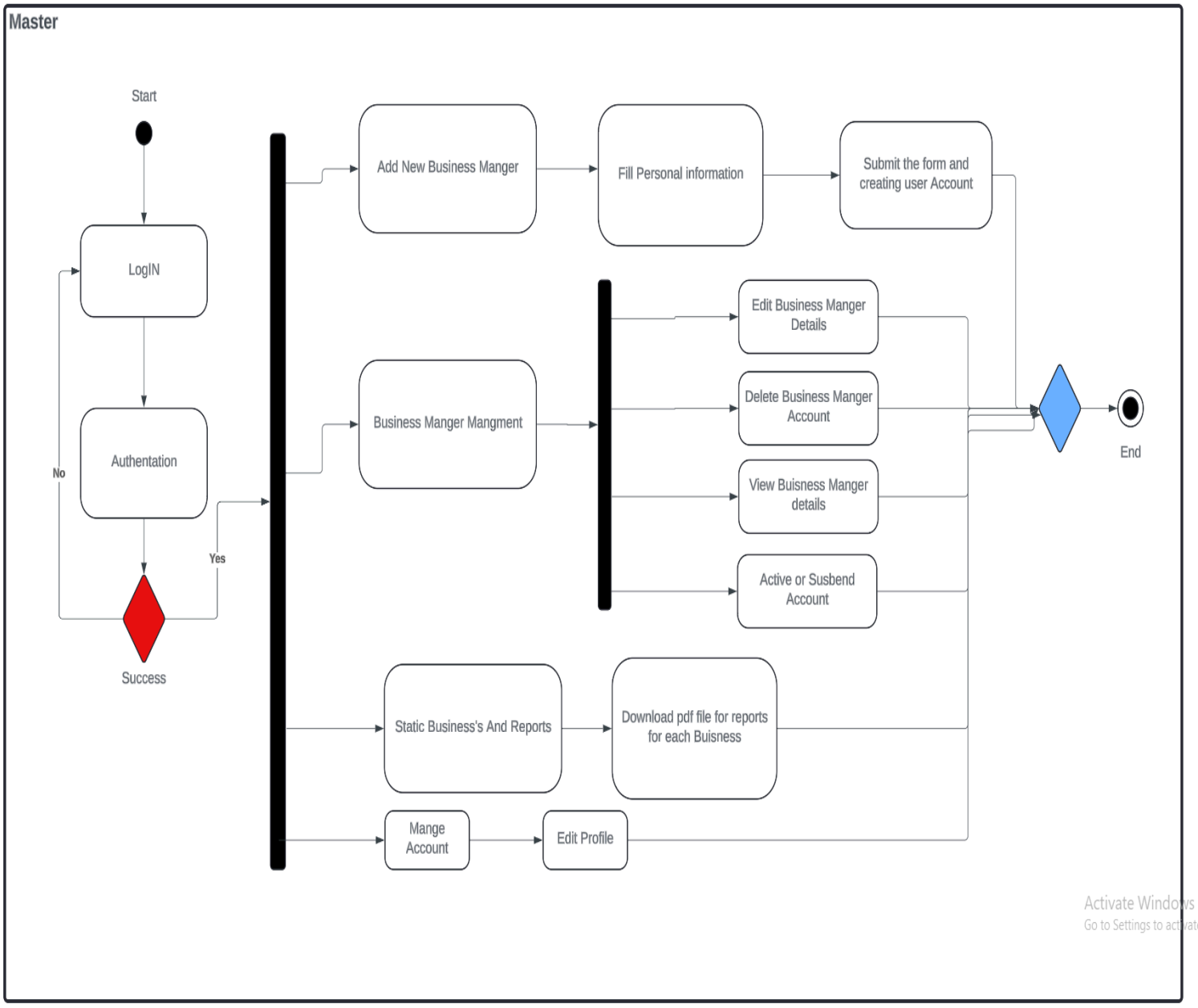
8.1: Use Case diagram:



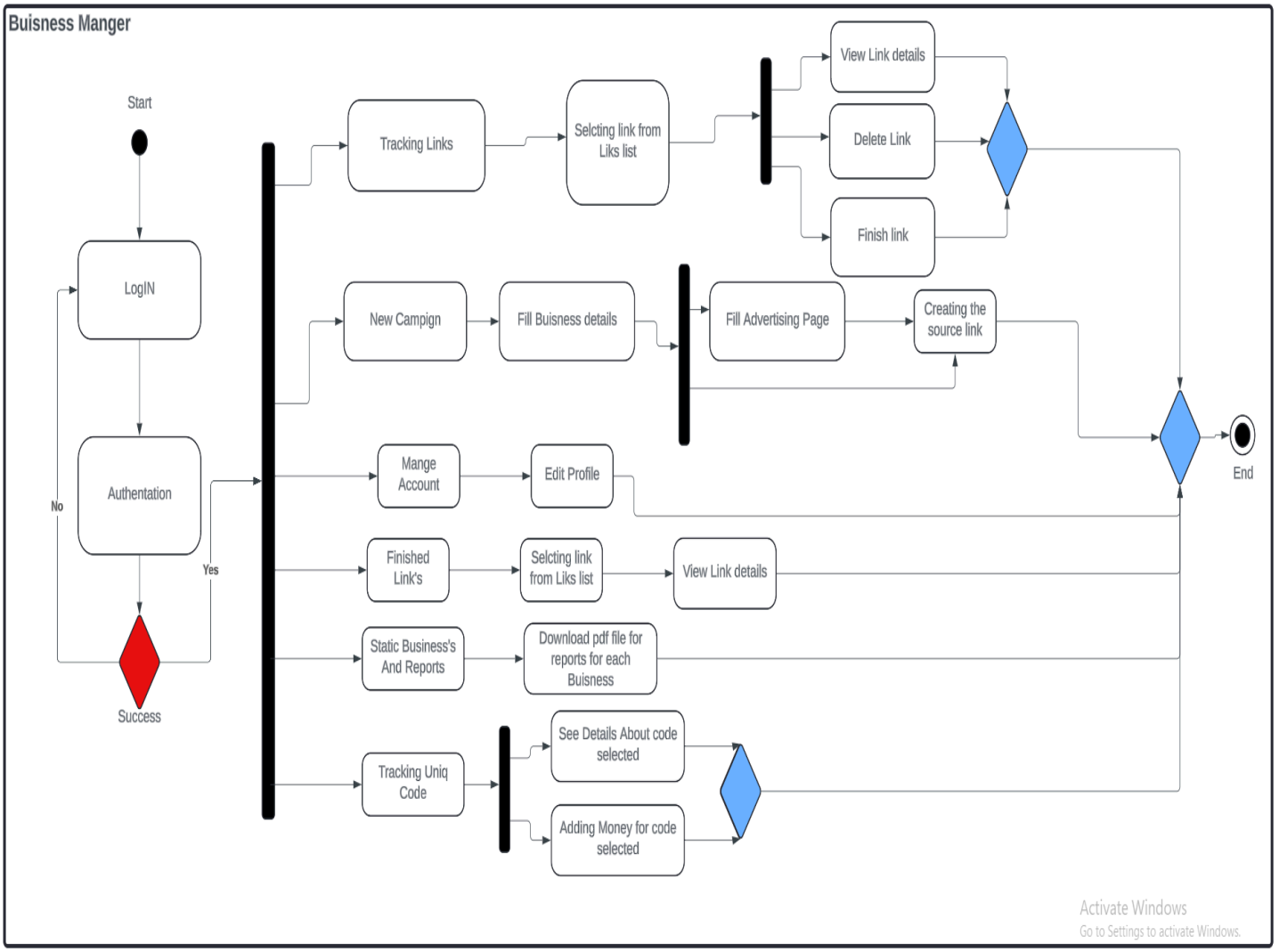
8.2: Activity diagram:

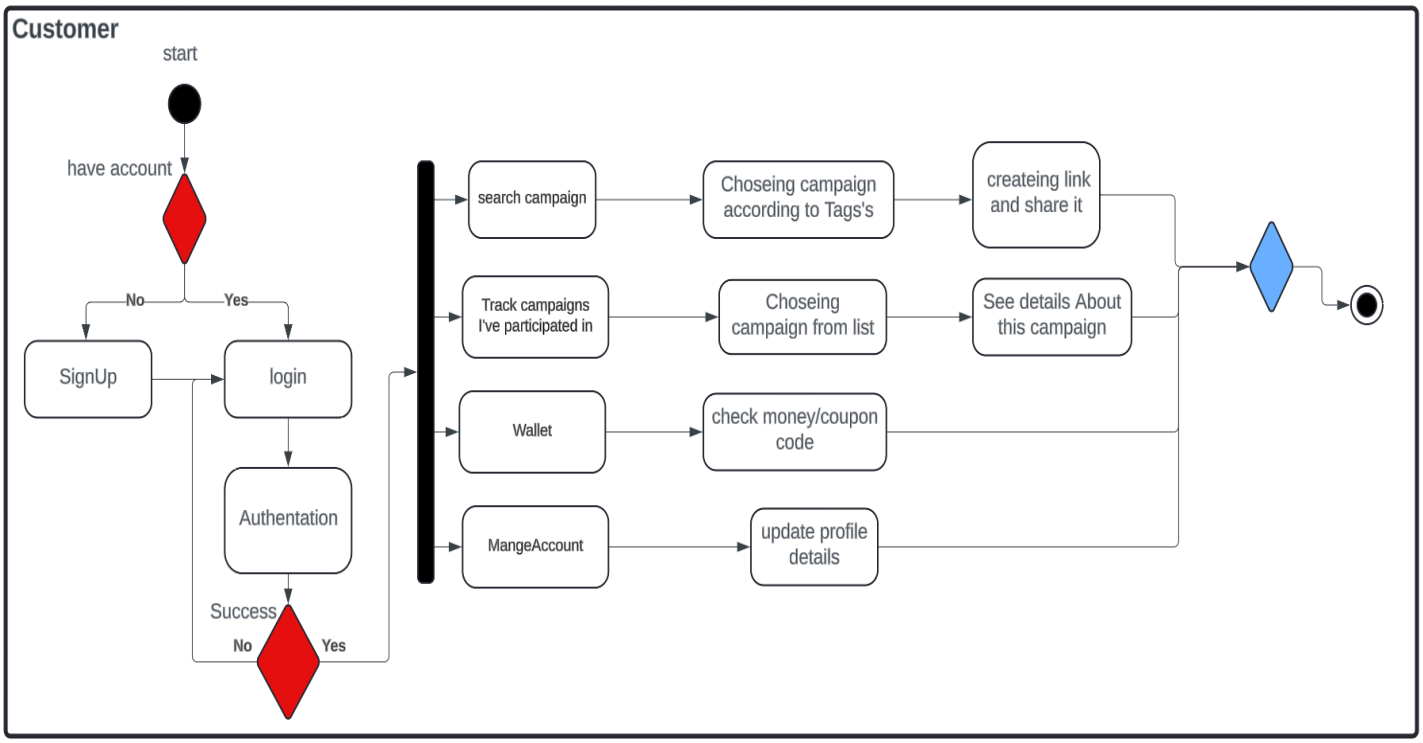
8.2.1:Master activity diagram:

The goal of the activity diagram for the master 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.



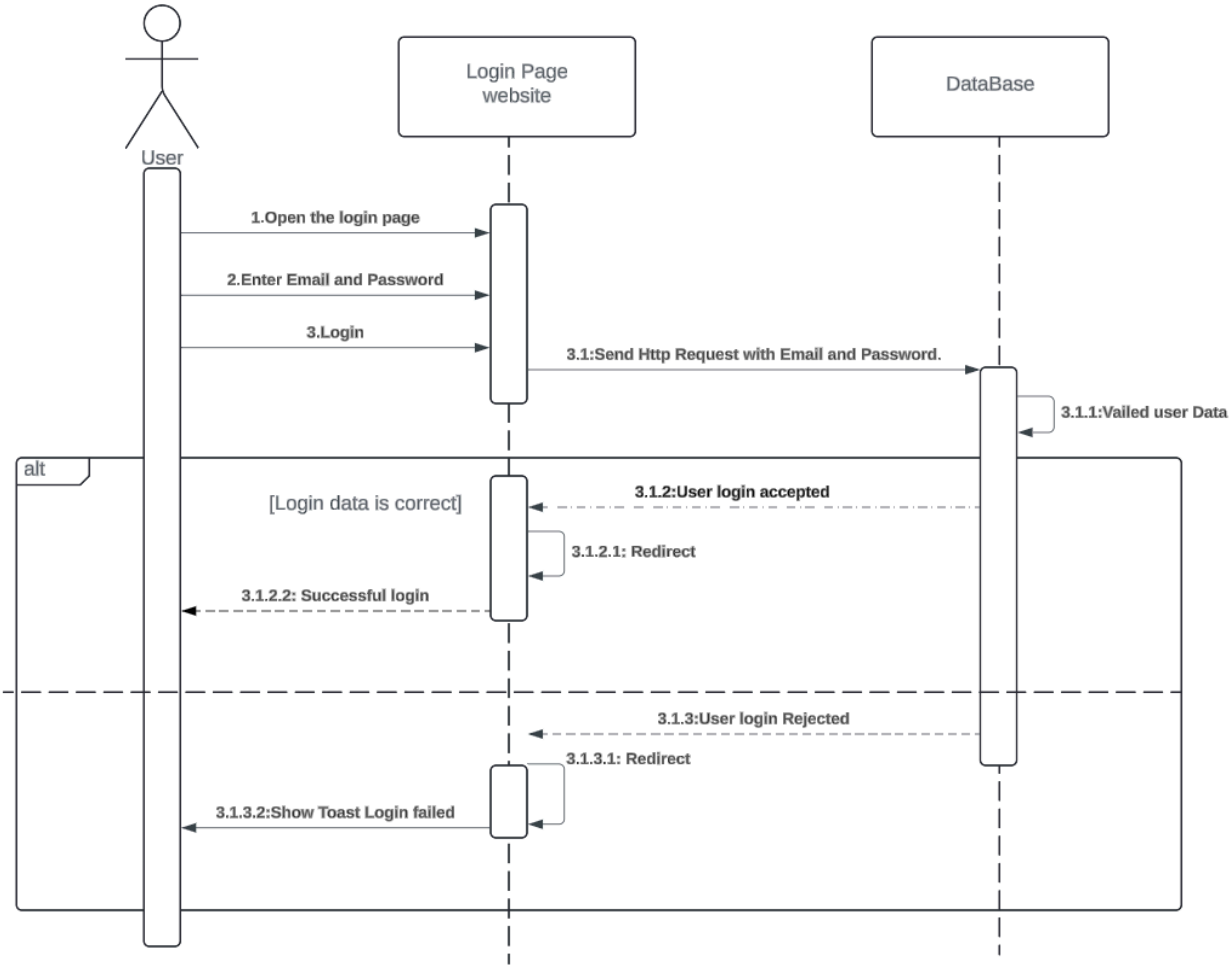
8.2.2:Business manager activity diagram:



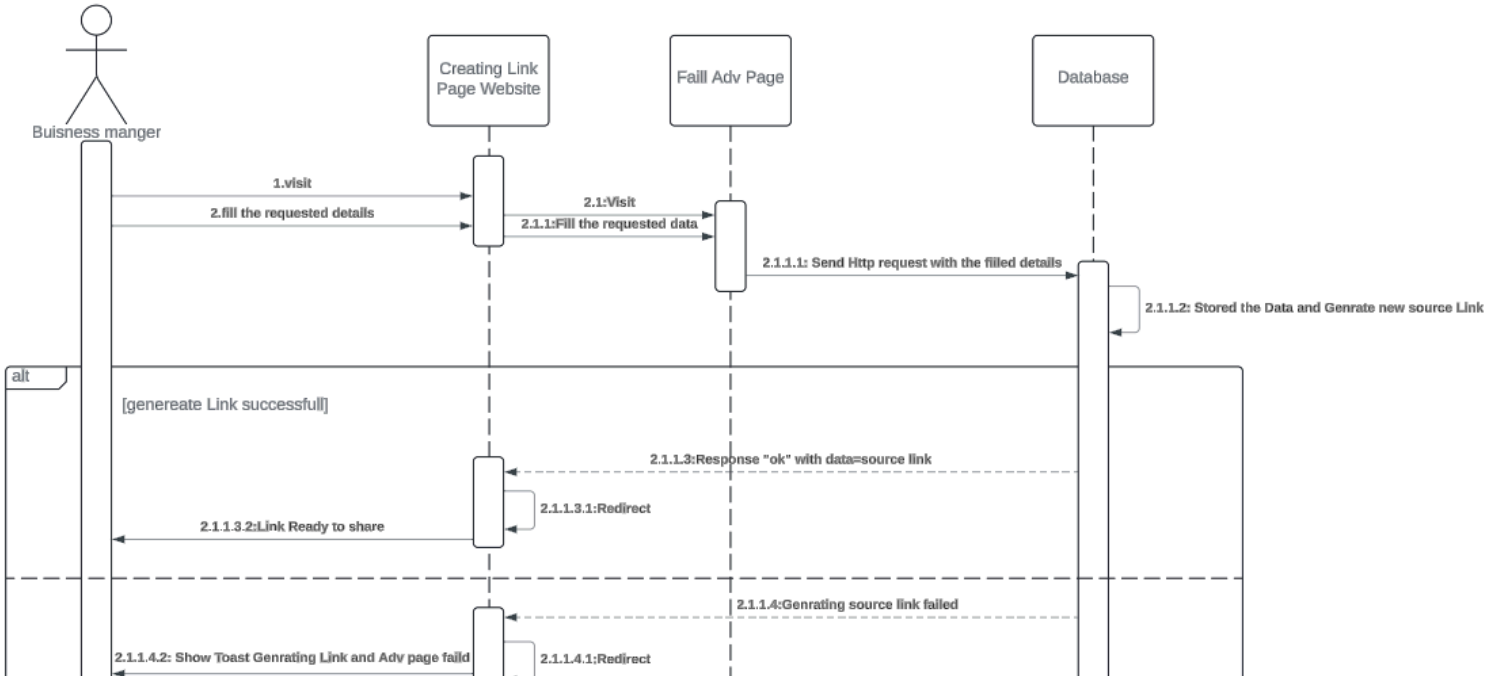


This sequence diagram shows the logical flow between the customer and the website:

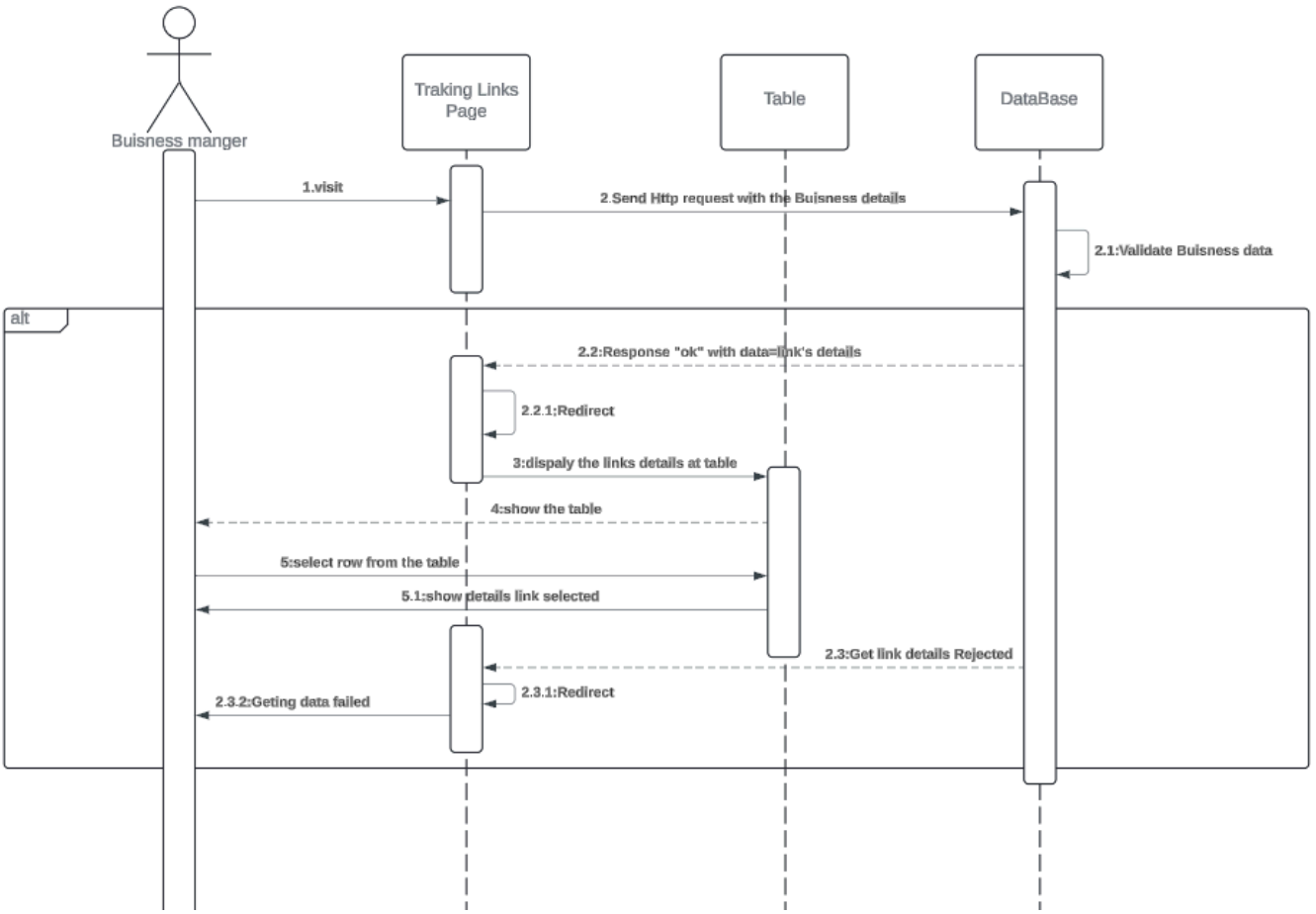
1. sequence digram when the business Manger do login to the website:



2.sequence digram when the business manger creating new link:



3.sequence digram when the business manger Traking Link's:



The evaluation process for the business marketing platform based on the "refer-a-friend" concept will be conducted to assess the system's effectiveness in achieving its primary goals—enabling business owners to market themselves for free in a simple and efficient manner. The performance evaluation will focus on several key aspects:

9.1.1. Performance Evaluation:

The platform's response speed under user load will be tested. It is expected that the system will handle a large number of link creations and shares simultaneously, with response times of less than a second per request. This should ensure a fast and seamless user experience for both business owners and customers.

9.1.2. Scalability:

The system will be designed with scalability in mind, and its ability to handle increasing numbers of users and actions will be evaluated. As the number of generated links and active shares grows, the platform should continue to operate efficiently without performance drops, allowing it to support organic growth of business communities.

9.1.3. User Feedback:

Feedback will be gathered from business owners and customers who use the platform. It is expected that the feedback will be positive, with users highlighting the platform's ease of use and its ability to quickly share promotions and business information. Businesses will likely report an increase in new customers and engagement through the shared links.

9.1.4. Success Metrics:

Metrics such as the number of links created, the number of shares, and the growth in customer acquisition through the unique links will be measured during the evaluation. The platform is expected to show a significant increase in referrals and new customers for businesses, successfully achieving its goal of free marketing.

The system will undergo a thorough evaluation, and it is expected to demonstrate effectiveness in meeting its objectives. The platform's flexibility and efficiency should contribute to its success in providing a simple solution for business marketing through social networks and personal connections.

9.2 Verification:

Testing the code: In order to verify the website's viability, we plan to examine the following scenarios:

9.2.1: business manager login into his account:

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 Email	The user entered a wrong Email Click: sign in	Failed to sign in the application ,with error message	Failed to sign in with the following message: "email does not exist"	The email 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

9.2.2: business manager creating source link:

Test name	description	Accepted results	Actual results	comments
Moving to fill adv page unsuccessful	The user did not fill all the requirements before click on “Fill Adv Page”	Failed to move to the adv page, show Toast to fill all the requirements label	Failed to move to the next step, check if all label are not “empty”	the page details will not saved to send to the database
Moving to fill adv page successful	The user fill all the requirements before click on “Fill Adv Page”	Move to the adv page, to start fill the information	Move to the adv page,	save the business details to store them at the db
creating source link	The user fill the requirements Label and the adv page and then click on “generate the source link”	Generate new Link successfully	Get the source link from the db	Store all the details and generate the link and sent the with response.data to the FR

9.2.3: business manager Adding money for uniq code link:

Test name	description	Accepted results	Actual results	comments
Writing wrong uniq code	The manger want to add money for some code, but he write wrong code	Failed to find the code link details, “uniq code not found ”	“uniq code not found ”	failed to found the the code in the databse

10: Reference:

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