Final Report and Design Documents

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Executive Summary

Cross-promotion increases customer growth (“Industry Spotlight,” 2024), yet our team encountered small businesses that still rely on outdated paper-based methods such as business cards and printed coupons. Through customer discovery, we found that modern consumers prefer digital solutions. Our solution CoupCom is an online platform that allows small businesses to distribute and consumers to redeem digital coupons through QR codes. Businesses can upload coupons for free, while partnered businesses distribute them via displaying QR codes in-store, driving traffic and engagement within local communities. Users can collect local coupons by scanning those QR codes with their phone and entering their email. Upon redemption, users can show businesses the QR codes of the coupons that they want to use, which the coupon-issuing business can scan to apply the discount with their digital devices. Businesses are also provided with dashboards that offer statistical insights on the effectiveness of cross-promotion campaigns and customer growth and loyalty. Our revenue model is performance-based, charging businesses a small fee per user interaction and a larger fee when a coupon is redeemed, with distributing businesses earning a share of the revenue.

Unlike competitors such as Groupon and Honey, which cater to large brands and online shoppers, our platform is designed for small businesses with limited online capabilities. With a skilled team of computer science majors, we are well-equipped to develop the software for this business. While regulatory considerations may limit partnerships in some industries, our initial goal is to launch a minimum viable product within two months. We will measure success by user adoption and business partnerships in hopes of laying the groundwork for market leadership in community-driven digital promotions.

Introduction

Problem Statement

Businesses who participate in cross promotion see an average increase of 23% in customer growth (“Industry Spotlight,” 2024). However, our team has seen multiple small, local businesses who rely on traditional methods of cross promotion such as distributing business cards and printing coupons on grocery receipts. Our team found, through customer discovery, that these methods of cross promotion were not appealing to customers who preferred digital methods of coupons and promotions. In fact, we found that people rarely or never save business cards, Figure 1, and rarely or never use physical coupons, see Figure 2. When asking what are the preferred methods of coupon reception, every interviewee responded with some digital form, see Figure A2 in Appendix A.

Figure 1

How often do you [consumers] save business cards?

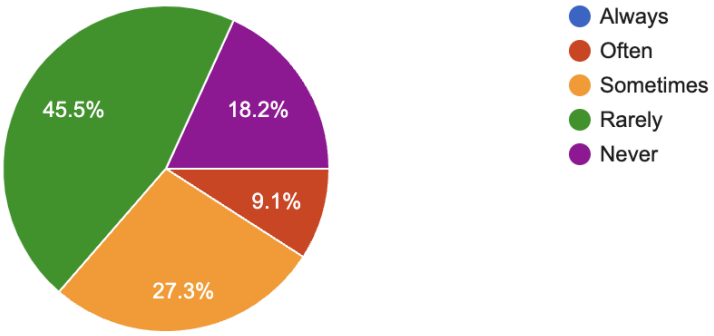
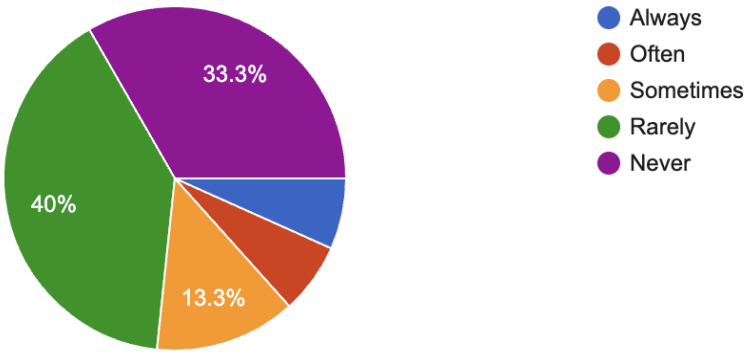


Figure 2

How often do you [consumers] use physical coupons?



Target Audience/Customer Segment

Our team wants to solve this problem of promotional difficulties for local businesses who have limited digital presence or literacy. We also want to provide local business owners that have a strong sense of community with a means to help out neighboring businesses. Our intended users are consumers who physically shop at local stores, see Figure A1 in Appendix A.

Therefore, our intended customers are local businesses who want to create coupons. Our stakeholders include other local businesses who would distribute these coupons for both a community and monetary incentive. Our users however are customers at these businesses who want to get and use coupons.

Proposed Solution

High-level Description

Our online platform CoupCom allows for small businesses to distribute coupons of nearby businesses in a clean, effective, paperless way. We understand limits on local business's advertising; therefore, businesses can start a promotional campaign with us by uploading their coupon for free. Nearby partnered businesses can then sign up for a distribution campaign which will give them access to a unique distribution flyer that customers can scan in-store. When customers scan the QR code on the flyer, they will be given a random coupon from nearby businesses. If they decide they want the coupon, they can enter their email to clip the coupon which will link it to their account. Customers can then sign into our website through email verification or Google authentication which will display all of the users coupons. When the user clicks on a coupon, they have the option to use the coupon which will display another QR code for the respective business to scan inorder to redeem the coupon. We believe the use of QR codes will give us the flexibility we need to appeal to consumers' preferred methods, see Figure A2 in Appendix A.

Revenue and Business Model

Customers are charged for how successful their campaign was; a small fee is taken for user interactions with the coupon and larger fees for use of the coupon. The business that distributed the coupon is incentivized with a percentage of the customer fees. The biggest constraint on our business model is being able to build a network of distributors that will facilitate our software.

Market Strategy

The best ways to reach out to these businesses are to go in person with a personal demo and offer to set up the distribution QR codes. We also noticed that many small businesses have social media accounts which we can contact for both distribution partnerships and for sale. Because our business model promotes connections and community, it's important for us to build personal relationships with these businesses.

Competitive Landscape

Competitive Analysis

Companies such as inCust and Mezzofy are our direct competitors who offer services like coupon creation and the opportunity to bundle your company's coupons with other coupons. It's important to note, however, that these businesses exist in the UK and China respectively, and serve more modern businesses with online existence. Our competitors use various distributors but don't specialize in community efforts and local cross promotions as we do.

Online savings and coupons pose many indirect competitors. For example, large discount websites such as Groupon offer online marketplaces of coupons. Moreover, browser extensions like Honey have a focus on eCommerce. These two types of solutions are online centered and expensive. For instance, Groupon's rate for the average business is half of the profit from the coupon (Fav, 2020). In addition, these solutions do not take locality into account.

Table 1

Comparisons with CoupCom's Indirect Competitors

Competitor	Key Service	Target Customers	Limitations
Groupon	Online coupons, discount promotions	Large brands, national chains	Not optimized for small local businesses
Honey	Browser extension for automatic discount codes	Online customers	Cannot be used for in store
Traditional Paper Coupons	Physical coupon distribution	Local businesses	Risk of loss, difficult management

Differentiation & Strategic Analysis

CoupCom differs by catering to small local businesses with a more affordable option that fits into the lower budget that these businesses operate on. We support partnering businesses by building local digital networks and connecting them to neighboring businesses to help drive foot traffic to local areas. With a strong emphasis on community values, our customized online coupon system can be easily promoted by small businesses at local levels. It is difficult for competitors to replicate the core value of our product in a short period of time. In particular, it is important to enter the market first and raise brand awareness, especially since it requires strong collaboration with local networks.

Customer Discovery & Validation

Customer Discovery Process

We went to strip malls around the metro-Atlanta area and interviewed a total of six local business owners, who were our potential customers, regarding their current advertising strategies

and its effectiveness. Out of the six customers, five of them indicated that they would be interested in our product. We also interviewed seven shoppers, who were our potential users, in a Kroger in the same area that cross-promote local businesses by printing coupons on paper receipts.

Interview Findings & Market Research

Santos Cielo is a restaurant that currently engages in forms of traditional cross promotion. They work with nearby businesses such as a nail salon where they exchange each other's business cards. Santos Cielo's manager agreed that people did not want to carry around physical cards. We also found that Santos Cielo has coupons physically printed on Kroger receipts. However, when talking to Kroger customers themselves, we found that they did not use physical coupons often, see Figure 2 in *Problem Statement*.

Joe Uhl, the founder of Horned Owl Brewing, thought that this would be helpful in drawing through more customer traffic to an area, which would be beneficial to all surrounding local businesses. He also mentioned that he would be willing to advertise for other local businesses for free, and the city of Kennesaw, which occasionally holds beer festivals to attract customers to support local businesses, may be interested in this solution. Another interested customer, Nathan, the manager of Cellars Fine Wine & Spirits, would like to learn more about the cost and benefits of our product compared to different advertising methods.

On the other hand, all potential users, with many of them being avid coupon users, agreed that storing and sorting through paper receipt coupons were a problem for them. They are all interested in having a simple, convenient solution to help them consolidate their coupons in one place and shop locally. In fact, they mostly wanted digital forms of coupon management, see Figure A2.

Customer vs Stakeholder/User Feedback

As local business owners, our customers are interested in promoting their business to consumers that live in the same area. Most of them have a tight advertising budget and rely on word of mouth. They are seeking new solutions as they are disappointed in the inefficacy of paper-based cross promotion efforts. They value the cost-effectiveness and ease of use of our solution. As members of the community, many of them feel the sense of responsibility to support other members of society who are not in direct competition with them. Understanding that increased foot traffic mutually benefits businesses within the local area, they also value the community aspect of our solution.

As consumers, our users love discounts and low prices. Those who frequently use paper-based coupons find it troublesome to keep track of the coupons they own. As members of the community, many of them are also interested in supporting small local businesses as opposed to patronizing big corporations in a more sustainable way. Similar to our customers, they value the affordability, ease of use, and community aspect of our solution.

Team Structure and Capabilities

Why Your Team

Consisting of five CS majors with a wealth of academic and internship experience in software development, our team is the right team to implement this solution which is completely software-based. While Sophia and Abrianna are skilled in frontend and backend development respectively, Aleks, Bryan, and Thomas are proficient in full stack development. Our biggest learning challenge will be creating scalable software which will most likely bring us to use cloud services.

Team Roles & Decision-Making

With an odd number of people in the team, we agreed to make decisions by majority consensus. Everyone on the team is a software engineer. All of us are responsible for developing the software for our product, with Oskar having the extra responsibility of managing presentations as the presentation manager.

Support Network

Our mentor Aaron meets with us weekly to learn about our progress and provide us with feedback. Experienced in building his own start ups and helping others with the process, he guides us through each step from identifying a problem, discovering customers, devising a solution, to implementing the design. He will continue to be our go-to person for all project-related questions in the next steps of this product.

Regulatory, Legal, & Risk Considerations

Liabilities & Legal Challenges

As our product does not store any personal identifiable information, there aren't any safety or security concerns. Because we do not engage in any particularly novel technologies, we don’t have a claim to anything that could be protected in our solution rather than our niche market.

Regulatory Pathways

There are regulations in place for the distribution of coupons for the sale of alcohol which vary from state to state. This will restrict our expansion to some degree. For example, in Georgia, we will not be able to distribute coupons for breweries and liquor stores where the sale of alcohol

is their only business, and food industry coupons must not be applicable to alcoholic beverages (“GA R&R,” 2023). There are also similar restrictions in place for other products such as tobacco (“SLATI Overview,” 2024) and cannabis (Lamboy, 2025). Our product is still valid in all other areas.

Risk Assessment and Mitigation

We have identified some common cybersecurity risks such as account takeover (ATO) and Distributed Denial-of-Service (DDOS) attacks. Our website only supports HTTPS connections to ensure all data is encrypted in transit. We utilize Google OAuth2 and Firebase, which are credible third-parties that encrypt data at rest, to store all customer login information. For business sign in, we store only the password hash instead of the plain text in our PostgreSQL database. We are also using an Amazon CloudFront distribution which act as a proxy to our backend server running in an Amazon EC2 instance to prevent some instances of DDOS attacks (Amazon Web Services, 2023).

Design Process & Development Plan

Design Requirements & Constraints

Our main stakeholders are small business owners. These businesses don’t often have the funding to run a successful advertising campaign. The average cost of online advertisement can range anything from ‘$100 - $10,000 per month’ (Fields, 2025). Our other stakeholder is the customer. Customers want to be able to save as much money as they can on their purchases. Another stakeholder is our partner business that helps cross-advertising, who want to gain some additional revenue and attract more customers.

User Story 1:

- As a small business owner, I want to collaborate with other local businesses to drive more foot traffic to our area in a cheap and affordable way.

User Story 2:

- As a small business owner who currently uses physical coupons, I want the coupon making to stay the same level of complexity

User Story 3:

- As a small business owner, I want to be able to view statistics about my advertising.

User Story 4:

- As a customer, I want to find accessible coupons so that I can save money on purchases.

User Story 5:

- As a customer, I want to have a way to digitally manage coupons instead of having to constantly deal with paper coupons that can be lost.

User Story 6:

- As a customer, I want the coupon redemption to be quick and easy without cluttering my phone.

From these user stories, we have understood many constraints. For example, being able to balance data collection for businesses to view statistics will be hard since increased data collection will increase the initial barrier toward user coupon redemption. We also understand that storing all transnational data will make our database large overtime. We have thus detailed the following functional requirements:

- The solution must allow businesses to signup with business and address information
- The solution must collect some user identifying information for business statistics

- The solution must allow for businesses to see direct statistics, and derived statistics
- The solution must allow businesses to create coupons with minimal field entries, and a picture of the coupon
- The solution must allow distributing businesses to get access to a distributive QR code which distributes coupons based on locality
- The solution must allow users to add coupons without downloading an application
- The solution must provide a system that allows users to see and redeem their coupons

We plan on making our solution web-based, overcoming the pain point some customers have pointed out that they may be unwilling to download an app. This web-based application will allow for a customer account and a business account. From which, the business can issue coupons through QR codes in a paperless way that minimizes the paper cost of a manual coupon. Coupons dealt out are to other businesses nearby within a reasonable distance that will allow more people to be driven to the local area. Currently, coupons issued will be from businesses of the same zip code as the distributing business. The region of locality will decrease in size in the future to smaller areas such as the strip malls or shopping centers such that the increase in foot traffic is more likely to be mutually beneficial to both the coupon issuing and distributing businesses. The customers will then have a wallet on their side of the application that keeps track of the coupons they have collected.

After we have gained some traction, we can replace this with adding the coupons to the Apple or Google wallet, but this is costly for us starting out. We will prioritize making the business accounts that can manage what coupons they have given out and address coupons customers present. The email addresses collected will also allow us to provide valuable loyalty insights to businesses that issue coupons for them to analyze the effectiveness of their

campaigns. Such statistics are not available should customers decide to add coupons directly to their digital mobile wallets.

On the business side, the application must be able to create a QR code that can be scanned by customers, which issues unique coupons upon scanning. It must also be able to redeem customer coupons and offer a discount on the prices. On the customer side, the application must be able to log this user in on the web-app and allow the user to view the coupons they have available. Once logged in, the user is able to either scan a QR code to add a new coupon to their digital wallet, or the user should be able to see all the coupons they have handy and present the one the user wants to redeem.

There are legal constraints on the sale of coupons affecting the price of alcohol and tobacco in the state of Georgia. For this reason, we are avoiding targeting liquor stores and tobacco vendors. Besides, The platform will store user emails and coupon redemption history; we must comply with basic data-privacy regulations. We will ensure HTTPS encryption, secure authentication, and minimal personal data retention.

Design Concept Ideation

There are six key user flows for our application:

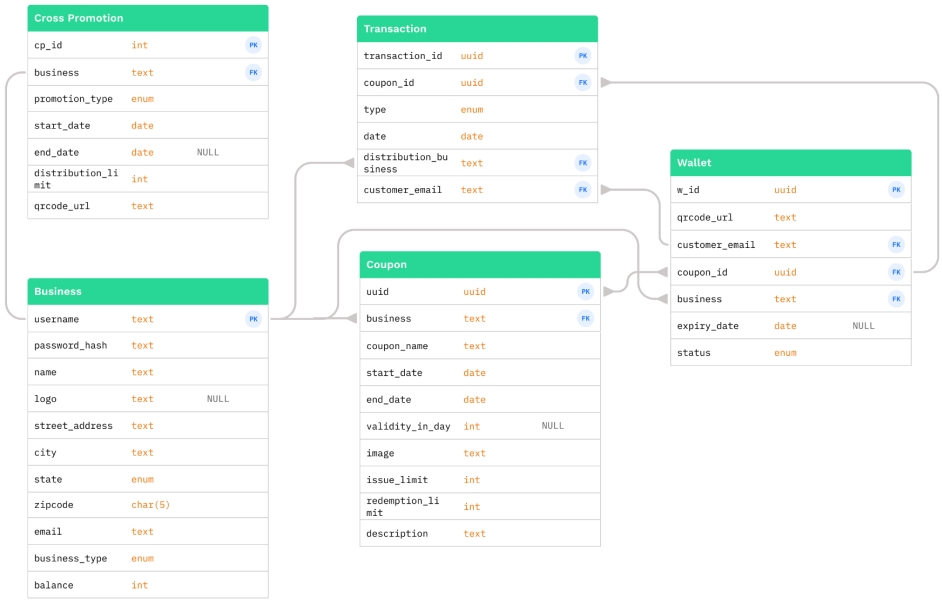
1. Business creating an account
2. Business uploading a coupon
3. Businesses opt in to cross promoting others
4. Business viewing their cross-promotion statistics
5. Customer getting a coupon
6. Customer redeeming a coupon.

The user flow diagrams can be found in Appendix B and the full description with the mockup is provided in *Prototyping & Tools*.

The inputs for our applications are the account information for each business, their cross-promotion campaigns, and customer emails. The outputs for our applications are the QR codes that businesses display in store to distribute coupons, statistics related to their cross-promotion campaigns, and the coupon QR codes that are unique to each customer. Our inputs and outputs will be stored in a PostgreSQL relational database with five tables (an annotated version can be found in Appendix C):

Figure 3

Backend Database Schema Entity-Relationship Diagram

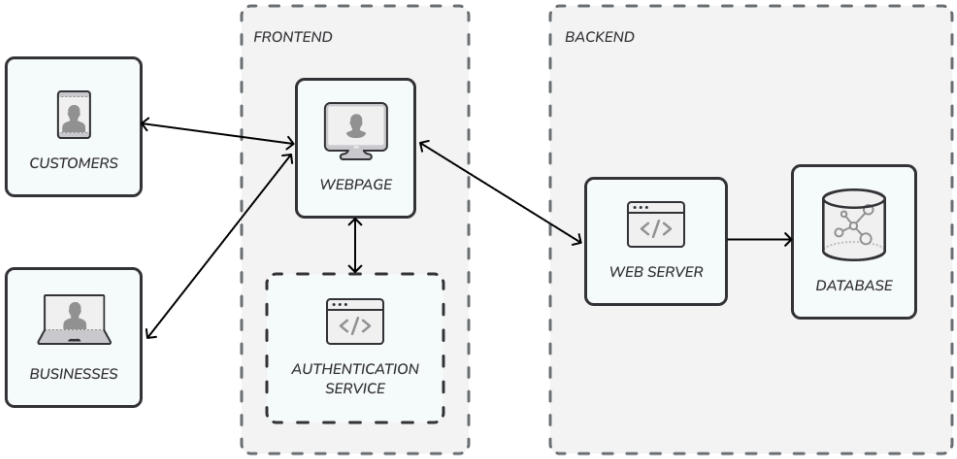


Business account information is stored in the Business table. Information related to their cross-promotion campaigns are stored in the Cross Promotion table (for promoting others) and the Coupon table (for promoting themselves). Customer emails are attributes in the Transaction table and Wallet table. The QR codes that businesses display in store and customers use to

redeem a coupon are attributes in the Business and Wallet tables respectively. Cross-promotion campaign statistics are derived from the Transaction table.

Figure 4

Complete Software Architecture Flow Diagram



Our backend architecture consists of a web server for our website and a PostgreSQL relational database as our data store. The web server sends and receives information from the database.

With our data store decoupled from our coupon distribution mechanism (the frontend), our design is highly scalable. It can be easily extended to support other means of distribution such as text and digital wallets. We can also expand the Wallet table to collect more customer information for businesses to conduct further analysis on their customer base after we have gained more traction.

One of the scalability risks that we have identified is the increase in time required to derive business statistics that rely on database operations such as lookups and joins as the size of our Transaction table increases. This can be mitigated by a time-space tradeoff: use a less denormalized database schema to store frequently used information in multiple tables, such as

storing the name of the issuing business and the coupon value in the Transaction table, to decrease the reliance on joins and use indices on frequently queried attributes for faster lookup time.

We have considered creating a mobile app and allowing customers to create full-fledged accounts. We decided against these two approaches as we noticed from our customer discovery (see “Design Justification”) interviews that customers are mostly unwilling to download an app or give out too much personal information in exchange for small discounts in our customer discovery interviews.

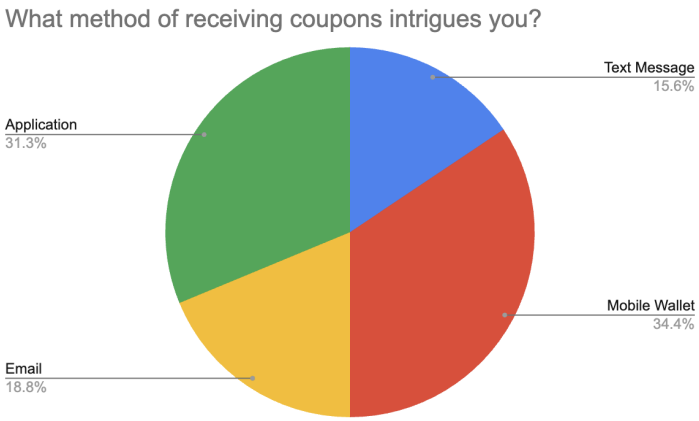
From our presentation feedback, some of our audience particularly noted that they liked our purely web-based application and our plan to integrate with Apple and Google Wallets. We decided on our current solution as we believe that it will deliver a better user experience and introduce fewer friction in growing our user base compared to these two alternatives.

Design Justification

As noted in *Design Concept Ideation*, our team has looked at different designs such as creating a mobile application and having users create accounts. In this design, customers would download an app and create an account. This would be desirable for business since we could obtain lots of user information. However, after doing customer research we found that only ⅓ of people would want to use an application (see Figure 5 below). We interpreted the results as 31.3% of people wanted a dedicated application while 68.7% wanted integrated methods.

Figure 5

Preferred Coupon Reception Methods



Through additional interviews we found that the initial barrier for downloading an app to obtain a coupon was high. Therefore, we decided to not have an app, and allow for users to access their coupons via email. This is the only data we need to collect and is only done for first time verification. After the user clicks on the link to take them to their online wallet (see *Prototyping & Tools)*, we can create a cookie so they don't need to go into their email again. Therefore they can simply type in our website to get their mobile wallet unless they switch browsers or delete cookies. In this instance, they can get the link back from their email. We decided to settle with this approach since it minimizes data collection, provides storage for user coupons, and still allows businesses to track statistics. We've vetted our UI with a few interviews to gauge user experience. Most of the responses were positive which matches the presentation feedback.

We also note that mobile wallets such as Apple and Google wallet are attractive, therefore we hope to be able to support this as a feature later on. However, we are prioritizing email for clutter purposes, feasibility, and accessibility (likelihood of using email vs mobile wallet). If

during launch, users want different redemption methods, we will easily be able to modify our solution due to our scalable design.

We will have a variety of methods to analyze our design. To verify our design from a technical standpoint we will measure api response time and page load speed. From a user/stakeholder perspective we will take feedback after doing a soft launch. To measure the effectiveness of our design, we will monitor statistics similar to the business view. From these, we can analyze coupon redemption rate, etc to see if our solution solves the problem.

Prototyping & Tools

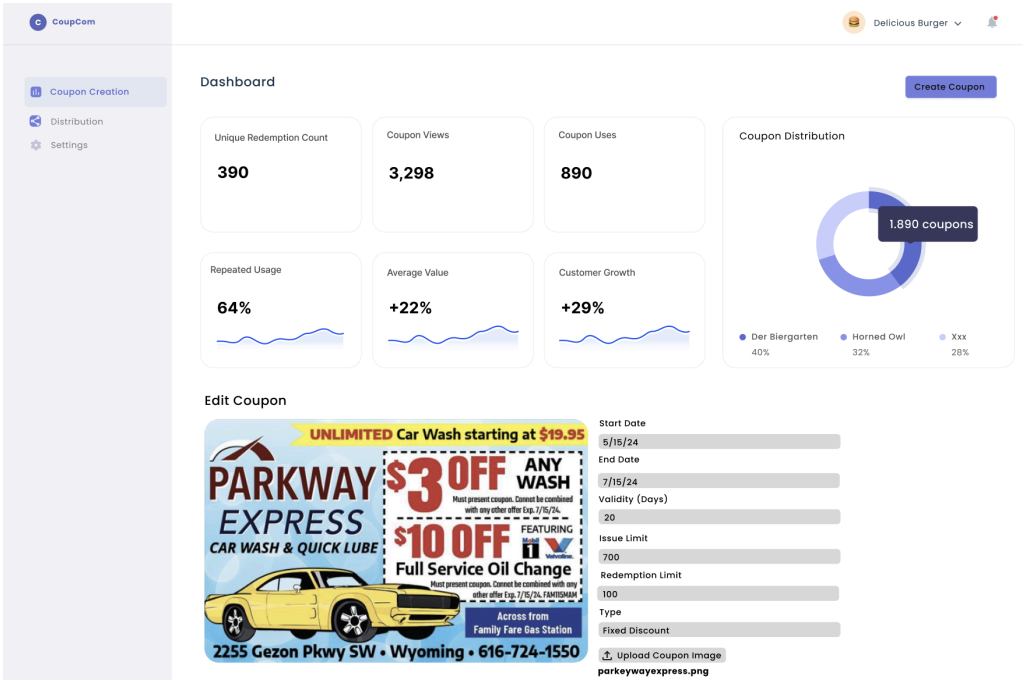
We have two main perspectives, the business side and the user side.

Business Perspective

First, a business creates an account with us (signup information is contained in Appendix C in the Business table). Afterwards, the business is presented with the coupon dashboard if they have an ongoing campaign, shown below. They will be able to see statistics about their campaign and also edit their coupon.

Figure 6

Coupon Dashboard Desktop Web Page User Interface

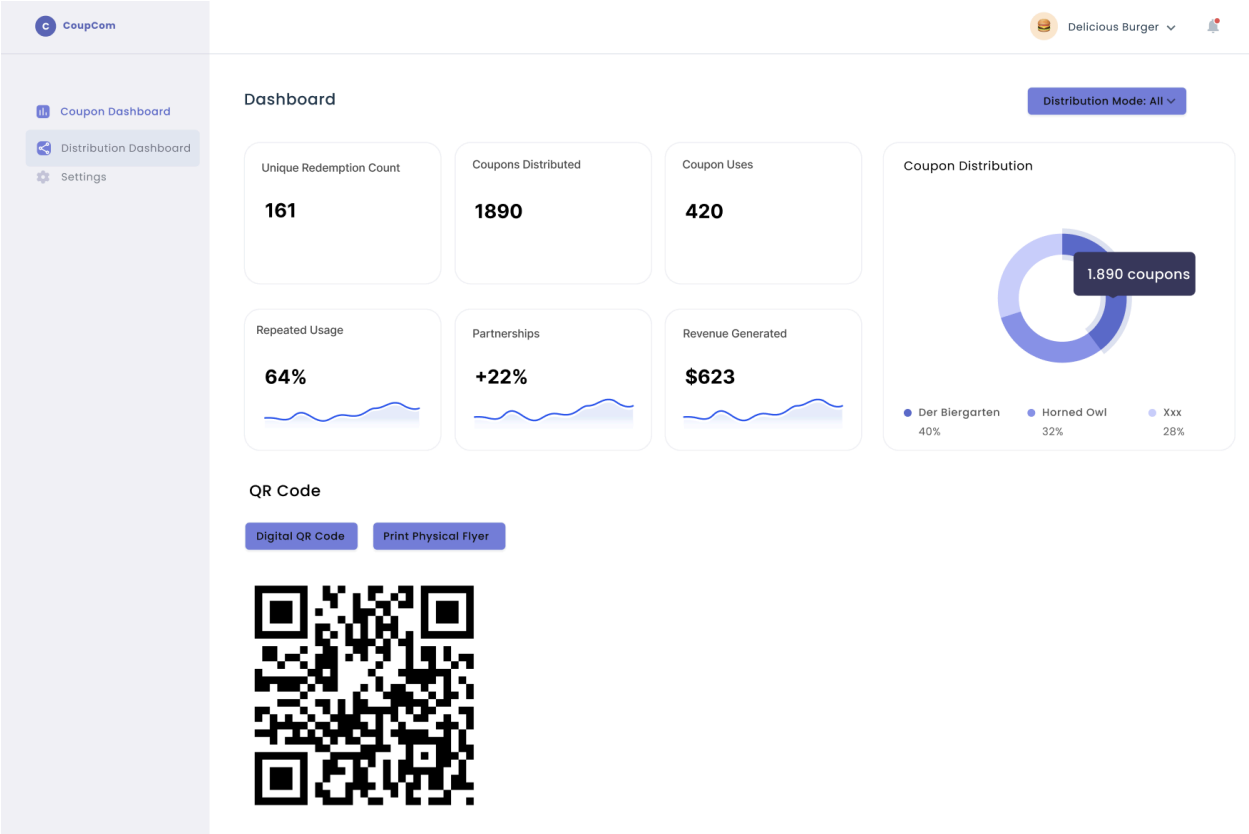


If the business wants to create a coupon, they can click “Create Coupon” and enter the same fields as shown above in the “Edit Coupon”.

Businesses that want to distribute coupons can then click on the distribution dashboard (shown below) where they will see their distribution statistics and get access to their distribution QR Code.

Figure 7

Distribution Dashboard Desktop Web Page User Interface



The distributing business can display their QR code digitally, or print out. The actual contents will look similar to this:

Figure 8

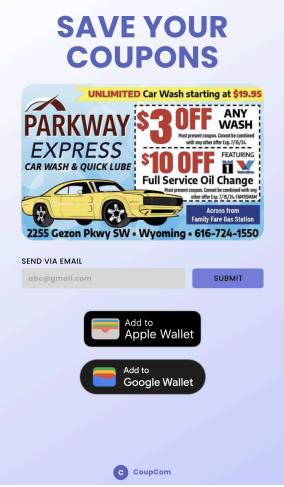
Distribution QR Code User Interface

User Perspective

The two key user flows are obtaining a coupon, and redeeming. First the user will scan the distribution QR code (see above). This will prompt the user to enter their method of reception seen below.

Figure 9

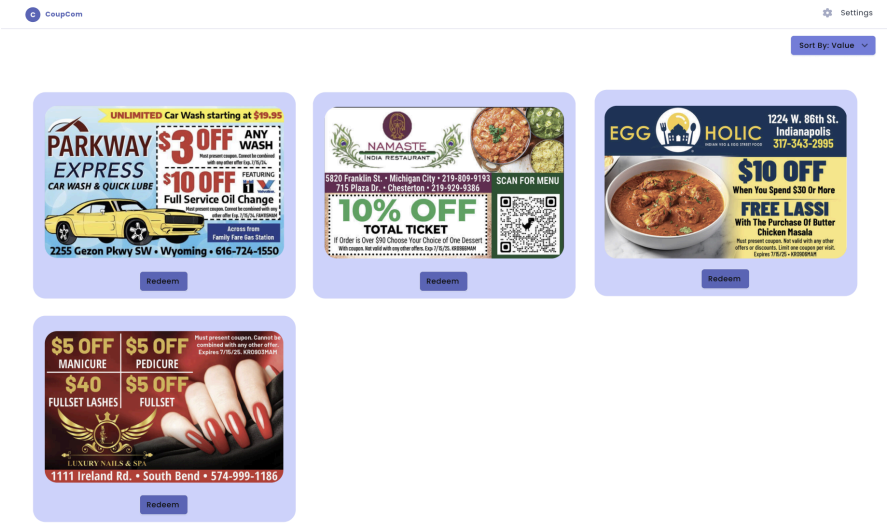
Coupon Reception Mobile Web Page User Interface



If the coupon is sent to their email, they can click on the link to open up their coupon wallet through a browser. We will be able to store their email on their browser in subsequent access to make it easier for the user. This means on subsequent access they can simply look up the website.

Figure 10

Coupon Wallet Desktop Web Page User Interface



To redeem the coupon, the user can click “Redeem” from the coupon wallet which will bring up a redemption QR code for the business to scan, the business simply has to be logged in and scan from their camera which will take the coupon off of the wallet. The redemption page is shown below:

Figure 11

Coupon Redemption Mobile Web Page User Interface

If the user added the coupon to their built-in mobile wallet instead, they just need to show the pass.

Figure 12

Coupon in Apple Wallet

Our mockup was made using Figma where we detailed all interactions. We chose to do our mockup in Figma because all interaction is done via web-based UI. In order to create our MVP we will create a frontend based off of our Figma mockup. We will also need to create our database and a backend to manage our logic.

Technical Validation & Analysis

Quantitative Analysis

To make our system trustworthy, we performed some testing on key technical milestones. We tracked page load times, which were under 1.5 seconds on all pages, and our API response time averaged around 200 milliseconds. We even tested database operations like coupon redemption and QR code generation under load. Even at higher traffic levels, all the key

functions operated within acceptable parameters without perceived delay. These numbers help to confirm that our design can support typical user activity, at least on a small to medium scale.

Experimental Testing

We tested usability during the Computer Science Junior Design CREATE-X Capstone Expo, where we marketed CoupCom to various visitors that included students, professors, and general visitors. While we were unable to reach owners of small businesses in this event, we were able to gather opinions from typical consumers who are comparable to our target consumer segment.

The users tested key user flows such as scanning the distribution flyer and clipping a coupon. Each user could successfully perform these activities on their own, which proves that the interface was user-friendly. One suggestion that we got was to make the suggestions for coupons more personalized, such as distributing coupons based on a user's coupon redemption history. Although this feature has yet to be deployed, we see it being a bonus feature well worth investigating with future versions of CoupCom. Generally, the expo testing confirmed our site is running and understandable, even with people who don't know the system.

Design Meets Requirements

Based on our initial testing and feedback we have received, we believe that our design satisfies our functional requirements which we set right at the outset. Businesses are able to sign up, put up coupons, and see figures for their campaigns. Consumers can clip coupons using QR codes and redeem them quite easily. The system is responsive and usable on both desktop and mobile, which is consistent with the desire for a web-based solution we found in customer interviews. We've also been able to strike a balance between light data collection and the ability

to provide valuable insights to businesses. Overall, the MVP does what we set out to do and is testable at scale.

Final Design Overview

Design Introduction & Features

Our final design consists of one website for both business and users. Businesses and users will login separately. On the businesses side there are two dashboards, one for coupon statistics (unique redemption count, coupon clips, coupon uses, repeated usage, customer growth), and one for distribution statistics (unique redemption count, coupons distributed, coupon uses, repeated usage, partnerships, revenue generated). We also allow businesses to see which coupons they're distributing (distribution dashboard), and which businesses are distributing their coupons (coupon dashboard). On the coupon dashboard, you can create coupons which will be available for nearby businesses to distribute. On the distribution dashboard, you can create a distribution campaign to cross-promote businesses nearby. Businesses can specify how long the campaign will last and a distribution limit if applicable. This will then give them access to a flyer which they can display digitally or print out to hang. Customers can scan the flyer which will find a random coupon for nearby businesses. Customers can then link the coupon to an email and sign in using that email to view their coupon. After clicking on the coupon, a QR code will pop up for businesses to scan and redeem the coupon.

Key Features:

- Business account creation
- Coupon Creation
- Coupon Statistics

- Cross-promotion campaign creation
- Cross-promotion / distribution statistics
- Clipping Coupons for Customers
- Viewing all coupons on our website
- Redeeming a coupon

Decision Process & Justification

We pivoted from our initial prototype by letting customers have “accounts” and straying away from cookies. Customers can now sign in using Google Authentication which is easy and familiar, but still gives us access to valuable information for statistics. We also knew that businesses would want to see statistics on their coupon / campaign. Because these businesses did not already have an online presence, and advanced advertising techniques, we wanted a small number of statistics shown on the screen. We also wanted them to be impactful statistics so we focused on showing things related to customer growth through unique redemptions and also the opposite through repeated usage. This way businesses have insightful information on their campaign. We also wanted the distributing business to be reassured at their impact so we provided similar statistics along with revenue generated to simulate incentives.

Advantages Over Alternatives

Our final design was chosen because it simplifies the experience for both businesses and users by having everything under one platform. By allowing both businesses and customers to be in the same ecosystem, we streamline engagement and data collection. Using Google authentication simplifies login, enhances trust, and provides more accurate tracking for statistics. Providing different dashboards also gives businesses a clear understanding of their success. Compared to traditional methods of advertising, our cross-promotional model is more

community-driven. It allows businesses to support each with shared visibility which other marketing strategies don't offer. Because businesses can directly see what other businesses are supporting them, it aids in community building.

Risks to Commercialization

Even with the potential of CoupCom, there are a number of risks that will affect its growth and use. One of the major risks is that owners of small businesses may resist new technology, especially owners who are not familiar with web-based applications. To address this, we will offer on-site onboarding support, easy-to-read step-by-step instructions. Also, we made user-friendly interfaces that require minimal technical knowledge as well as making the business model as non-invasive as possible. For the most part, the only real changes the businesses need to address is to hang up a flyer and set up a simple account.

Another risk is data scalability and management. With growing popularity, the volume of coupon transactions and user interactions may become too large for the database to handle, slowing down performance. To address this, we designed a scalable backend architecture with table indices on frequently queried fields. We will also monitor database performance on a regular basis and check partitioning strategies or caching systems if growth is found to be greater than projected.

Some other risks include friction in customer acquisition. For example, without an existing group of customers, other businesses may be hesitant to join as they may have concerns regarding the effectiveness of our cross promotion campaigns. They may also drop out in the middle if they find the promotion cost too high. However, without an existing network of participating businesses, it will also be difficult for us to expand our customer user base. We are partly mitigating this risk by charging only for successful promotional instances such that the

initial onboarding cost for businesses is low enough to entice them to try us out. Businesses can also earn a small share of successful promotions to offset their advertising costs (one cent per clip and five cents per redemption).

Frontend Design & Branding

Visual/Frontend Design Philosophy

We decided to focus on simplicity when designing the frontend so we would have more time to focus on the functionality of the needed features. We also decided that a 2-color scheme would be optimal for the application as to not overwhelm the user with too many colors and graphics. On the business side, we worked to primarily focus on the display of promotional campaign metrics while on the user end, we worked on a minimalistic screen that would have as much free space as possible, thereby prioritizing the coupon display.

Branding Concepts

The only branding we currently have is our logo, see Figure 13. We opted for a simple logo in hopes that it could increase our brand recognition with it being easy on the eye. The simplicity of our logo also echoes the user experience we would like to deliver: digital cross-promotion can be so simple that it is just one click away and does not require any technical expertise. The circle in the background also signifies the cross-promotion is not a one-way transaction, but instead benefits all parties involved: the business getting promoted gets more customers, the business promoting others gets a small share of the advertising fee and indirectly enjoys the increased foot traffic in the same area, and customers are able to discover local businesses that they are originally not aware of and support them at a lower price. The

community as a whole also benefits from the economic growth and may even have more jobs created.

Figure 13

CoupCom Logo

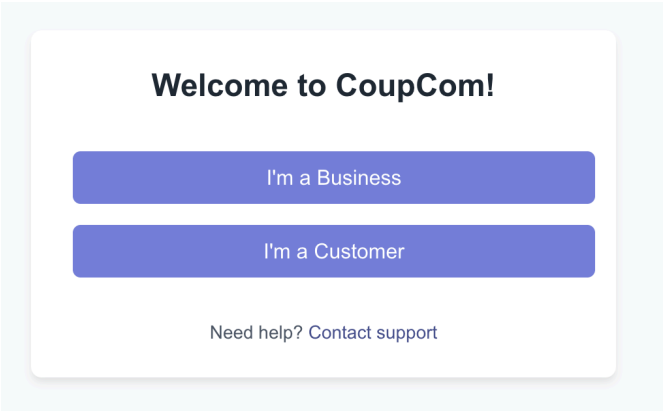
Final Prototype

Mockups and Final MVP

In a dual user ecosystem, our entry point allows users to login as a business or a customer, see Figure 14. “Business” refers to both a business that wants to create a coupon or give out coupons. “Customer” refers to customers at those businesses who are clipping and using coupons.

Figure 14

CoupCom Entry Point

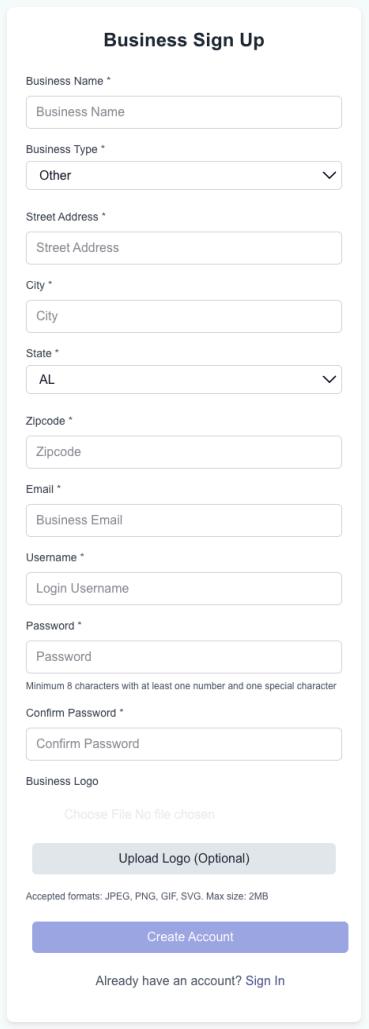


If the business does not have an account, they can sign up, see and provide information we need, see Figure 15, such as the type of business they are (restaurant, nail salon, etc). This

will be important when businesses decide to distribute other coupons since we provide the option to distribute all coupons, or only non-competing coupons (outside of the business type). We also need information such as where the business is located, especially zip code which will determine what businesses they can distribute to or from.

Figure 15

CoupCom Business Sign Up

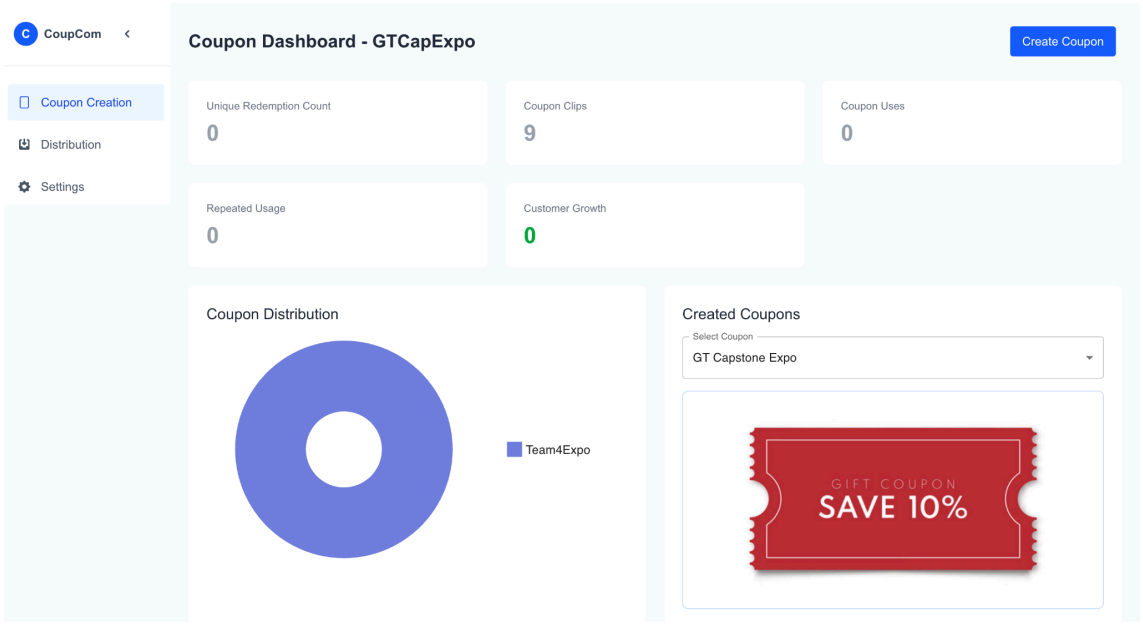


After logging in, businesses are presented with the coupon dashboard, see Figure 16. From this dashboard, they can see cumulative statistics over all their coupons, including a chart

showing what businesses distributed their coupons. They also have a view to show all the coupons they've created.

Figure 16

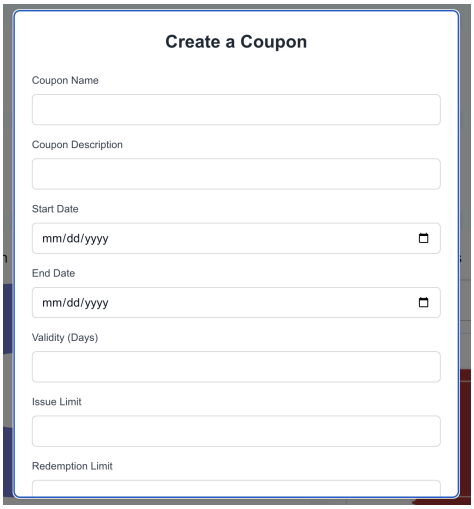
CoupCom Coupon Dashboard



To create a coupon, see Figure 17, businesses click the "Create Coupon" and fill in the coupon name, description, start and end date, validity in days (how long can you keep it in your wallet), issue limit, redemption limit, and an image of the coupon.

Figure 17

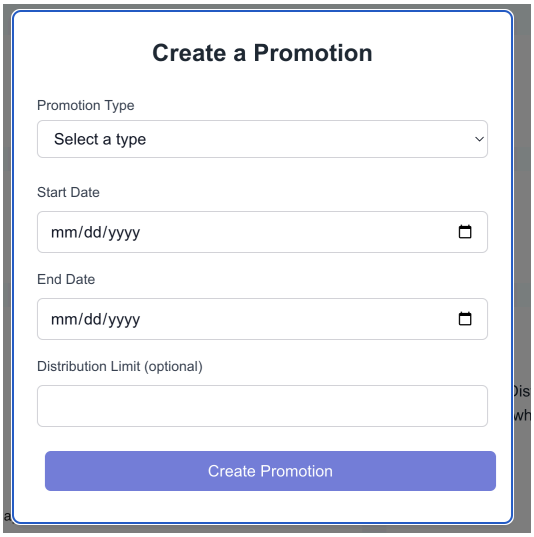
CoupCom Coupon Creation



We also provide the opportunity for businesses to opt-in to distributing coupons, see Figure 18. This can be found in the distribution dashboard by clicking “Create Distribution Campaign”. Businesses will then specify if they want to distribute for all businesses, or only non-competing businesses. They also specify how long they want to distribute coupons for with an optional distribution limit.

Figure 18

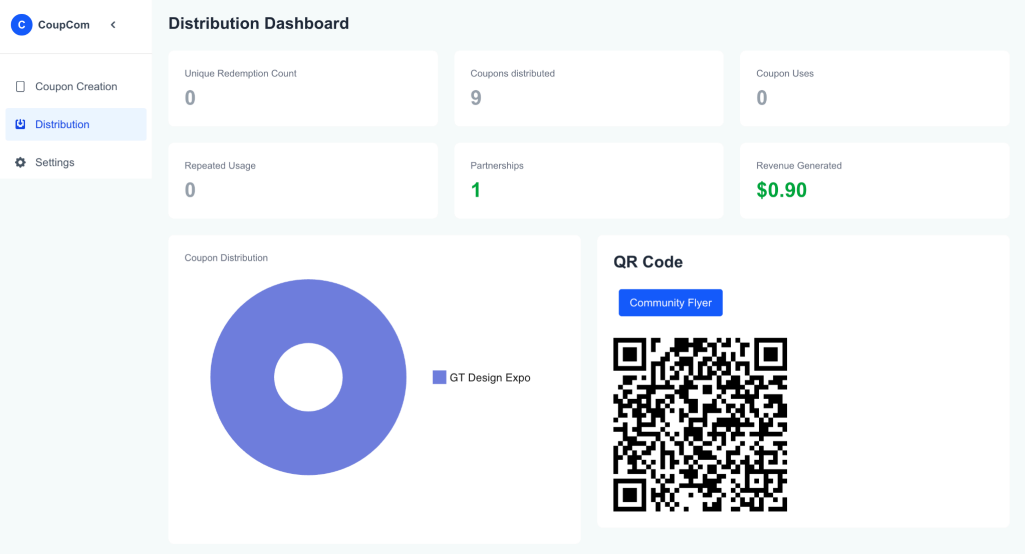
CoupCom Cross-promotion Campaign Creation



After creating a cross-promotion campaign, businesses then have access to the distribution dashboard, see Figure 19. From the dashboard, businesses can see statistics related to how much they've distributed, how many businesses they've distributed for, and revenue generated calculated by how many coupons they distributed, and how many were used.

Figure 19

CoupCom Distribution Dashboard



From the dashboard they also have a QR code which will let the owner navigate to the flyer on another device after signing in. By clicking on “Community Flyer” they have access to their unique flyer, see Figure 20, and QR code which users will scan to clip coupons. Businesses can either show this digitally, or print it out.

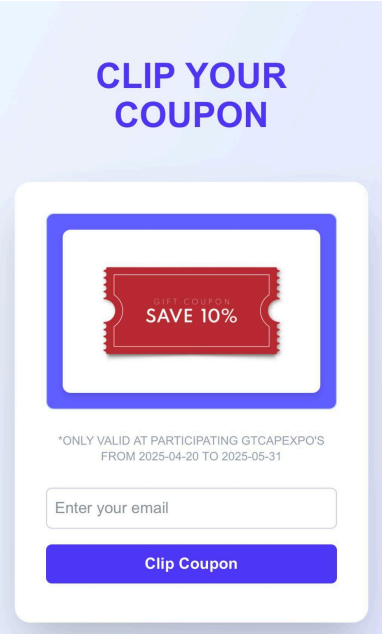
Figure 20

CoupCom Community Flyer

After a user scans the QR code, they are taken to a page, see Figure 21, which finds a random coupon from nearby businesses (relative to the distributing business).

Figure 21

CoupCom Customer Clip-Coupon page



If the user wants to clip the coupon, they can enter their email and clip the coupon. This will increase the clip statistic and distributed coupon statistic for the respective businesses. Upon success, see Figure 22, the user can navigate to their CoupCom wallet, see Figure 23.

Figure 22

Successful Clipping of Coupon

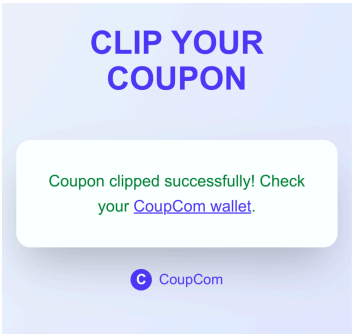
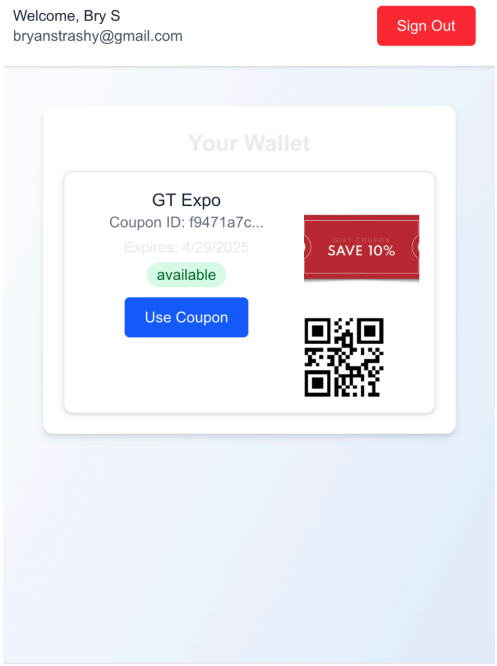


Figure 23

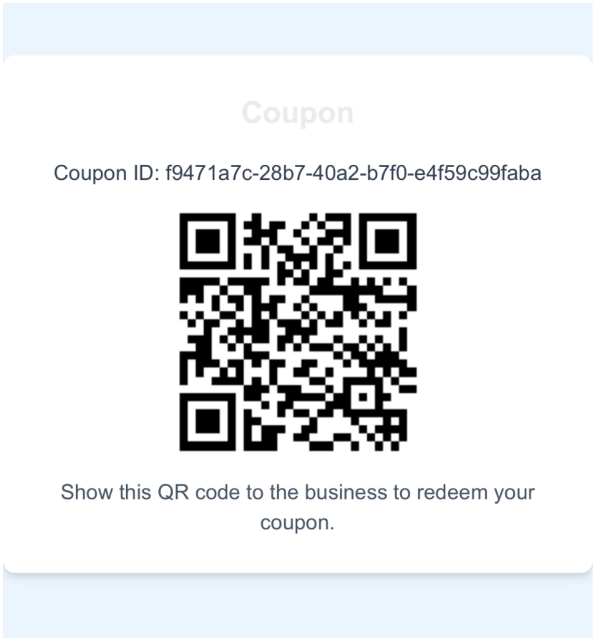
CoupCom Coupon Wallet



Inside of a user's wallet, they can see all coupons they've clipped along with the ability to use the coupon. When a user clicks on "Use Coupon" this will bring up a page with a QR code for the businesses to scan, see Figure 24. After the business scans the QR code, this will remove the coupon from the wallet and update statistics. Afterwards, the business can manually apply savings as if this was a paper coupon.

Figure 24

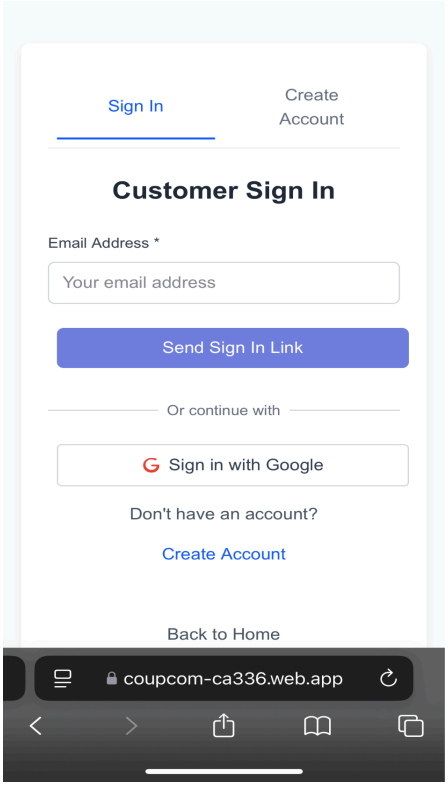
Coupon Redemption Page



We keep all the coupons linked to a specific user email when they clipped the coupon, however actually viewing and using the coupon requires the user to sign in, see Figure 25. This can be through our own sign in method or through Google Authentication. The user can either navigate to their wallet from the CoupCom website itself, or after clipping a coupon and clicking on the link provided.

Figure 25

CoupCom User sign in



Code and Hosting

Our code can be found at https://github.gatech.edu/ohovland3/Coupcom on the Gatech github.

Bill of Materials

We utilized Firebase for frontend website hosting and Amazon EC2 and CloudFront for backend server hosting. Firebase hosting cost $0.15/GB for data transfer (Google, n.d.). We used an on-demand t3.large Amazon Linux EC2 instance in the us-east-2 region (Ohio - CMH), which had a cost of $0.0832 USD per hour, (Amazon Web Services, n.d.-b), to run our Flask app and a

PostgreSQL database server. Our CloudFront distribution used to redirect HTTP traffic to secure HTTPS connections was within the free tier of 10M HTTP/HTTPS requests per month with a free public TLS certificate issued by AWS Certificate Manager (Amazon Web Services, n.d.-a).

Performance Assessment

We evaluated the performance of CoupCom both system stability and user experience-wise. Under our expo-based testing, users were able to operate the basic flows—scanning a QR code, clipping a coupon, and redeeming it—on their own, which tells us the interface is user-friendly and easy to navigate for newbies.

User feedback also noted that the system was quick and easy to use, which was a goal of ours to minimize friction. A few users wanted more personalized coupon suggestions, something we would take into account in later versions.

From the backend perspective, no error or lag occurred while using simultaneously, and real-time coupon status updates (e.g., clipped, redeemed) were observed. The results above prove that our MVP can be released confidently to actual usage and is prepared for further rollout.

Ethics, Safety, & Liability

Societal Benefits and Mitigation of Harm

CoupCom gathers only the basic demographic information (business name, address, type, logo) necessary and limited user data (email). All collected data are never sold. They are encrypted in transit with HTTPS and strictly used to provide the required service (creating, distributing, and redeeming coupons and statistical insights of cross promotion campaigns). User login data in third-party storage services (Firebase and Google OAuth2) are also encrypted at

rest. The plain texts of the passwords of business logins are also not stored directly in our database; the hashes of the passwords are stored instead.

Our solution promotes a more sustainable way for advertising by replacing paper-based coupons with digital coupons. It also helps uplift local businesses that have limited advertising budgets by providing them with a low-cost cross-promotion model, as they are only charged for successful instances of promotions (coupon clips and redemptions), and leveling the playing field for businesses with limited online presence.

Success Metrics & Future Plans

Defining & Measuring Success

Currently, our metric for success in the earlier stages was to have a working model and two small businesses using our application. After this semester, we currently have a working application, but sadly, we don't have any business accounts using our advertising software.

We would classify our endeavor as successful if we have a solid user base of at least one small area consisting of 4 small businesses using CoupCom to cross-promote and drive customers to the local area after our official product launch.

Plans to Pivot if Needed

Currently, we have no plans to pivot. We will reassess the viability of CoupCom after beta testing and our official launch in metro-Atlanta. If we are unable to gain traction to even cover the software cost of cloud hosting after six months of the launch, we will interview more businesses and customers to understand their greatest concerns with CoupCom, the reasons why they are not willing to onboard or why they decide to not continue using CoupCom, and whether CoupCom solves a real problem that they have. We will pivot to promoting our product in other

areas in the country such as on the West Coast if expanding our user base to communities in metro-Atlanta is infeasible. We will then reassess our progress after six more months again. If we are unable to profit at that point, we will completely pivot away from this idea and restart the customer discovery process to find another problem.

What Comes Next?

Our short-term plan is to conduct beta testing on our current working prototype to ensure we are delivering a seamless user experience. We will work with businesses that we interviewed during the customer discovery phase and reach out to other neighboring businesses to test out the business side of the user interface. We will also recruit potential users via social media like Reddit and LinkedIn and put up flyers in public areas as permitted to conduct testing on the user perspective of the user interface.

Our mid-term plan is to officially launch our product, targeting the metro-Atlanta area, after iterating on the user feedback we received in beta testing. We will conduct additional testing such as integration testing and canary testing prior to launching CoupCom to the public. We will reach out to businesses that are part of our beta testing program and advertise through social media like Instagram, Facebook, Reddit, and LinkedIn and door-to-door knocking, cold-calling, and cold-emailing on businesses in metro-Atlanta strip malls. Throughout the process, we will make sure that our team is receptive to all user feedback to facilitate customer acquisition.

Our long-term plan is to incorporate highly-requested functionalities. We will analyze feedback received through email and discussions on social media like Facebook and Reddit to determine the features to prioritize. One thing that was deprioritized in the development of our MVP that we are considering to implement in future phases, depending on the demand, is the

integration with digital wallets such as Apple Wallet and Google Wallet. Some other potential additions that may garner interest include increasing the frequency of the distribution of coupons issued by businesses that are paying a premium, user profiling with their coupon redemption habits, and utilizing user profiles to personalize the types of coupons being distributed.

Intellectual Property & Patent Strategy

Patentability & Novelty

Our idea takes advantage of a niche market and business model, but uses traditional technologies in a way that is unlikely to be patentable.

IP Protection Plan

Going commercial, we will register with the US Copyright Office and acquire a trademark for our company name.

Learning Reflection

Skills Gained and Lessons Learned

From this semester, we learned what it takes to build a startup as entrepreneurs. We learned how to do customer discovery by going door-to-door and speaking to potential customers who, in this case, were the owners of small businesses. We also learned to gather their feedback and incorporate them to further the development of our product. On the technical side, we have learned how to properly develop a business webpage that connects frontend and backend in a smooth manner. we learned to set up secure HTTPS and deploy our frontend using Firebase hosting, implement Firebase authentication, design dynamic, server-rendered pages using Next.js and TypeScript as well as integrate frontend with Flask backend running on AWS EC2 with

PostgreSQL. The project taught us how to write useful code for real-world users and going back and adding to our code when given feedback. Lastly, as a team, we acquired the interpersonal skills to coordinate and communicate effectively.

Influence on Future Projects and Professional Plans

This project gave us the confidence to tackle full-stack applications in future internships and projects. It taught us solution-based thinking including solving real user problems. Working in a team environment to develop an entrepreneurial project, this has been a rewarding learning experience that will be beneficial to us whether we decide to continue to pursue this project full time after this semester, create another startup later on, or join other companies.

What Would You Have Done Differently?

If we were to start again, we would learn to pivot faster initially. In the earlier stages of our development, we got stuck on certain ideas for extended periods when we should have switched our way of thinking earlier on to allow for more time to fully flesh out our final project idea. We would also have a more detailed implementation plan in place with sprint deadlines along with clearer task delegation. In the development phase, we would have streamlined the deployment phase sooner rather than later as we encountered some late-development bugs that were hard to handle. Lastly, we could have run through a couple practice demos before our actual one to ensure that everything was running smoothly.

Appendix A

Customer Discovery Results.

Figure A1

How often do you shop at local businesses? Our team aims to focus on those who don't normally shop at local businesses, and incentivise them to frequent community locations.

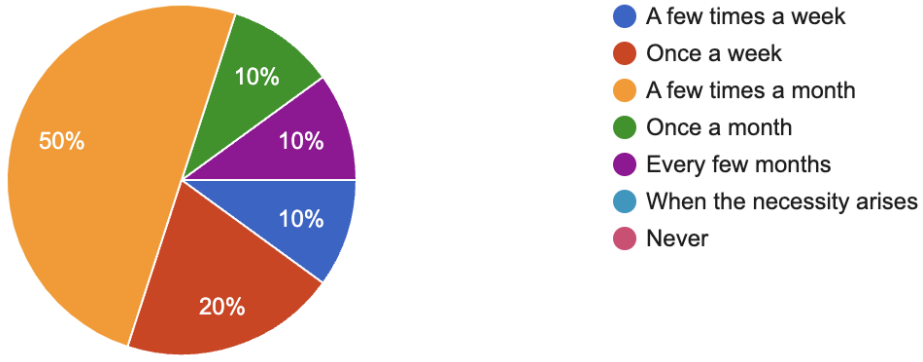
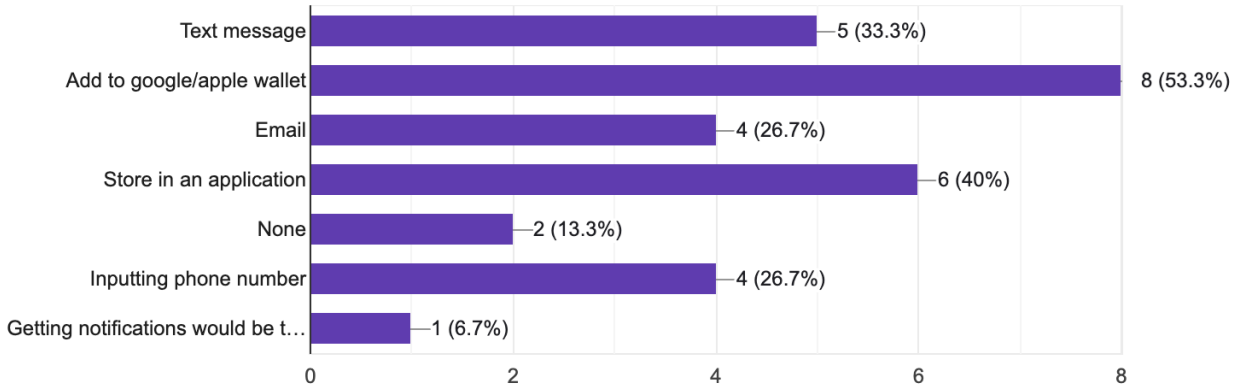


Figure A2

What is your preferred method of receiving coupons?



Appendix B

Business and Users User Flow Diagrams.

Figure B1

Business Account Creation User Flow Diagram

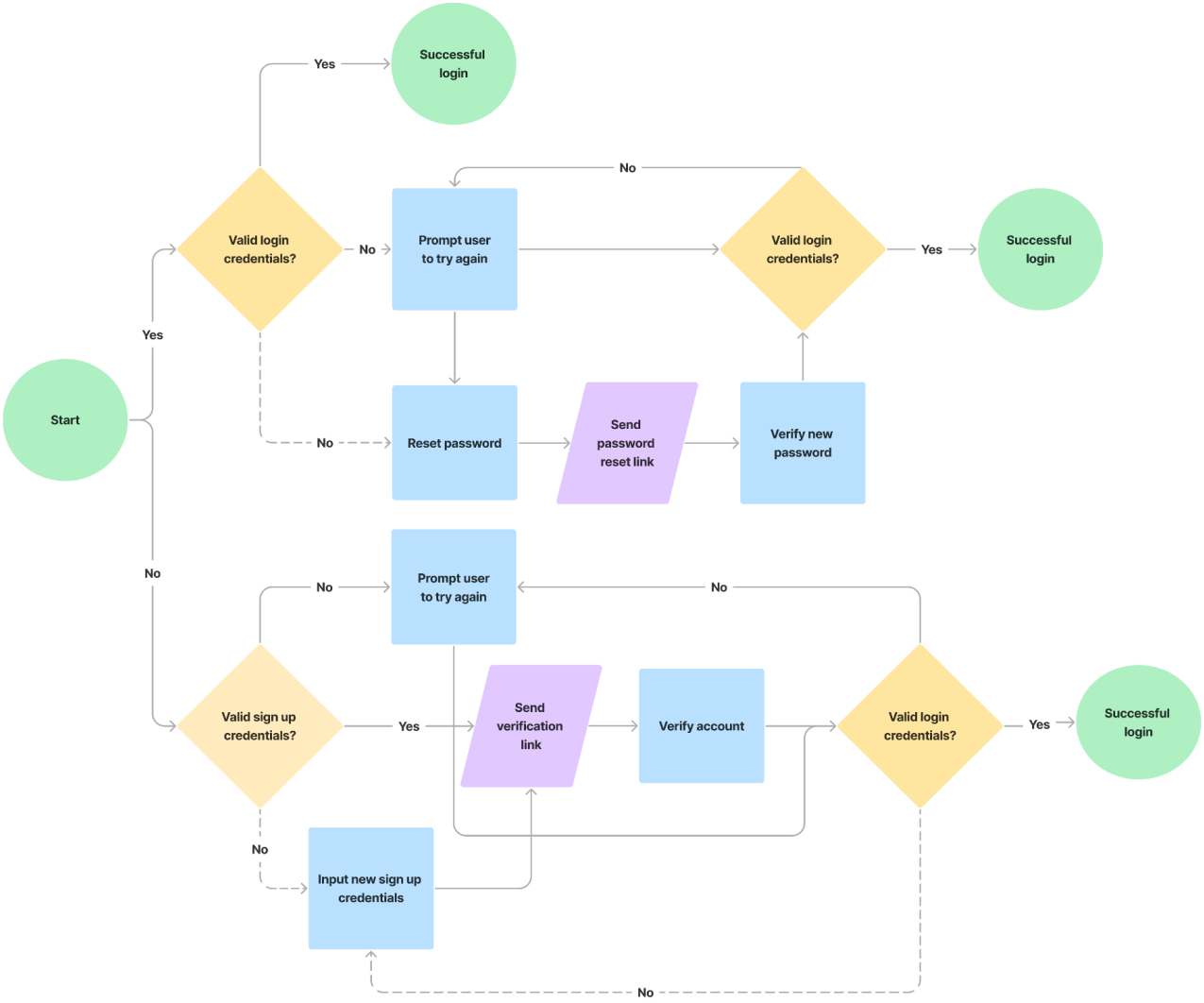


Figure B2

Business Coupon Creation and Distribution User Flow Diagram

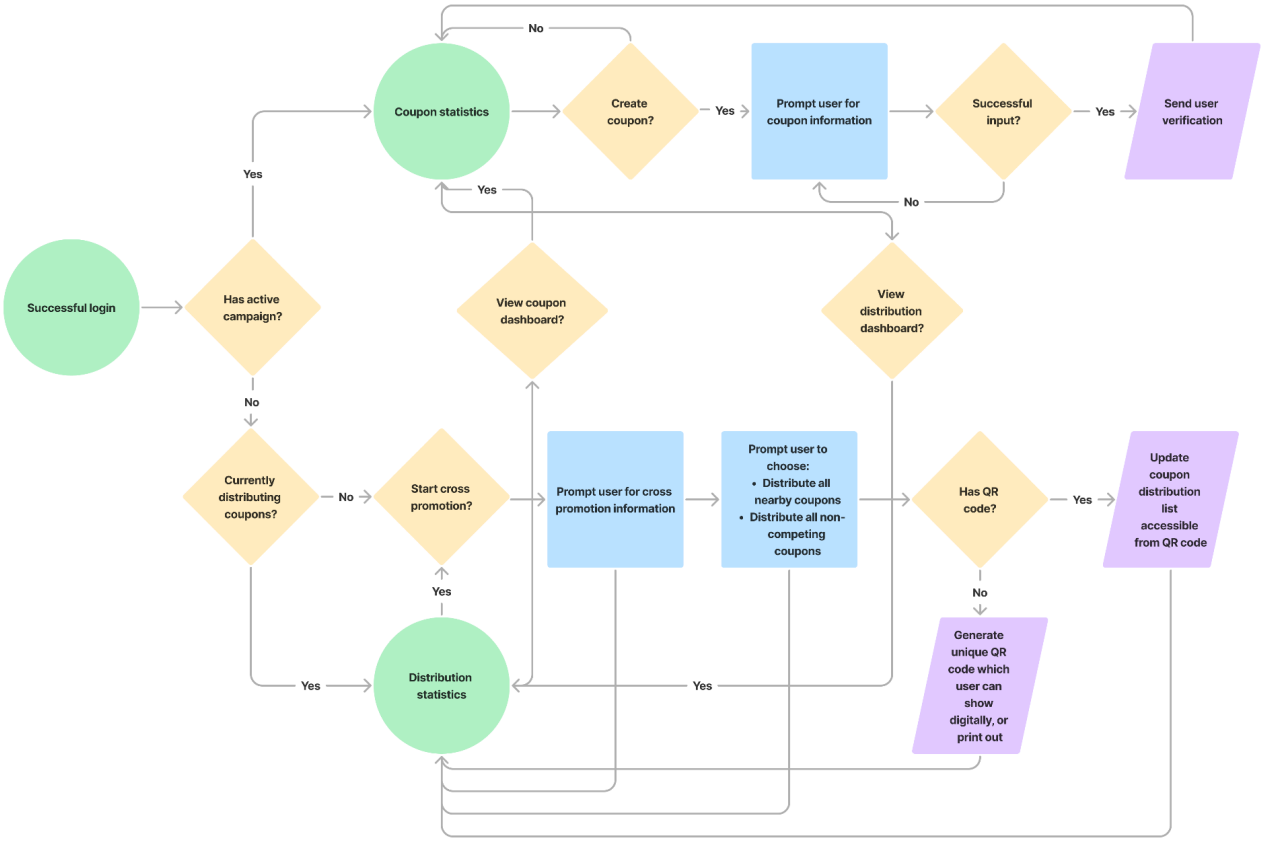


Figure B3

User Coupon Redemption User Flow Diagram

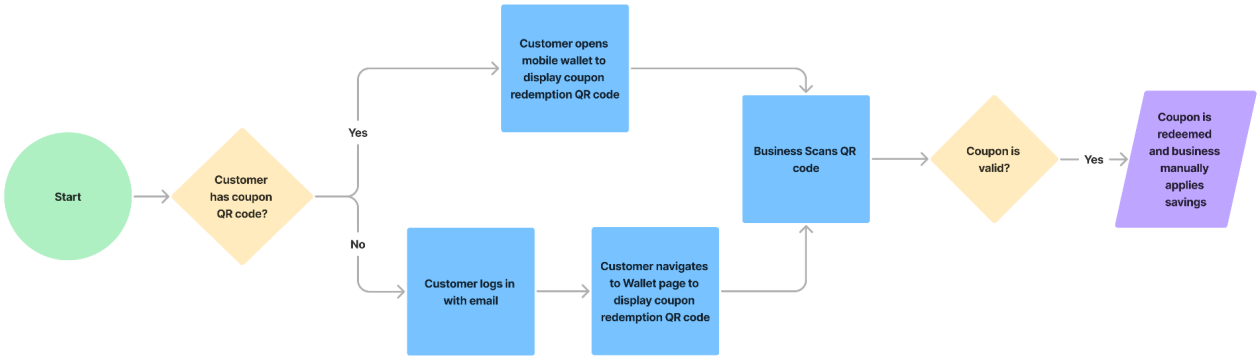


Figure B4

User Coupon Collection User Flow Diagram

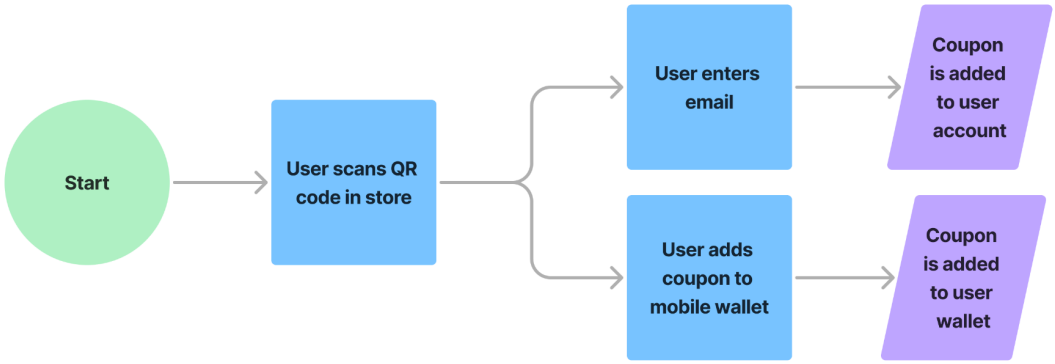
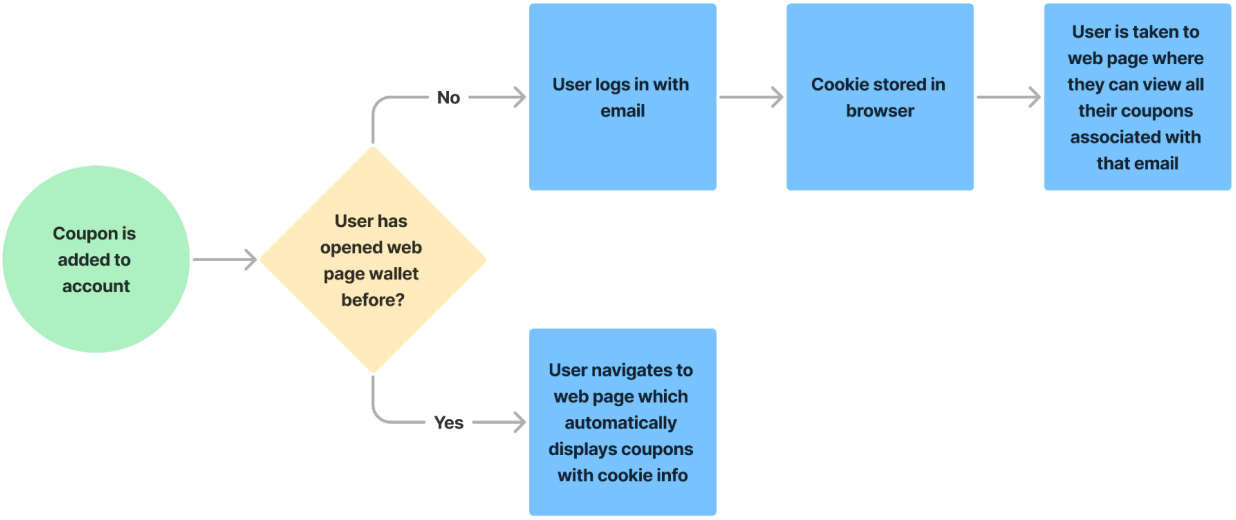


Figure B5

User Clipped Coupons Look Up User Flow Diagram

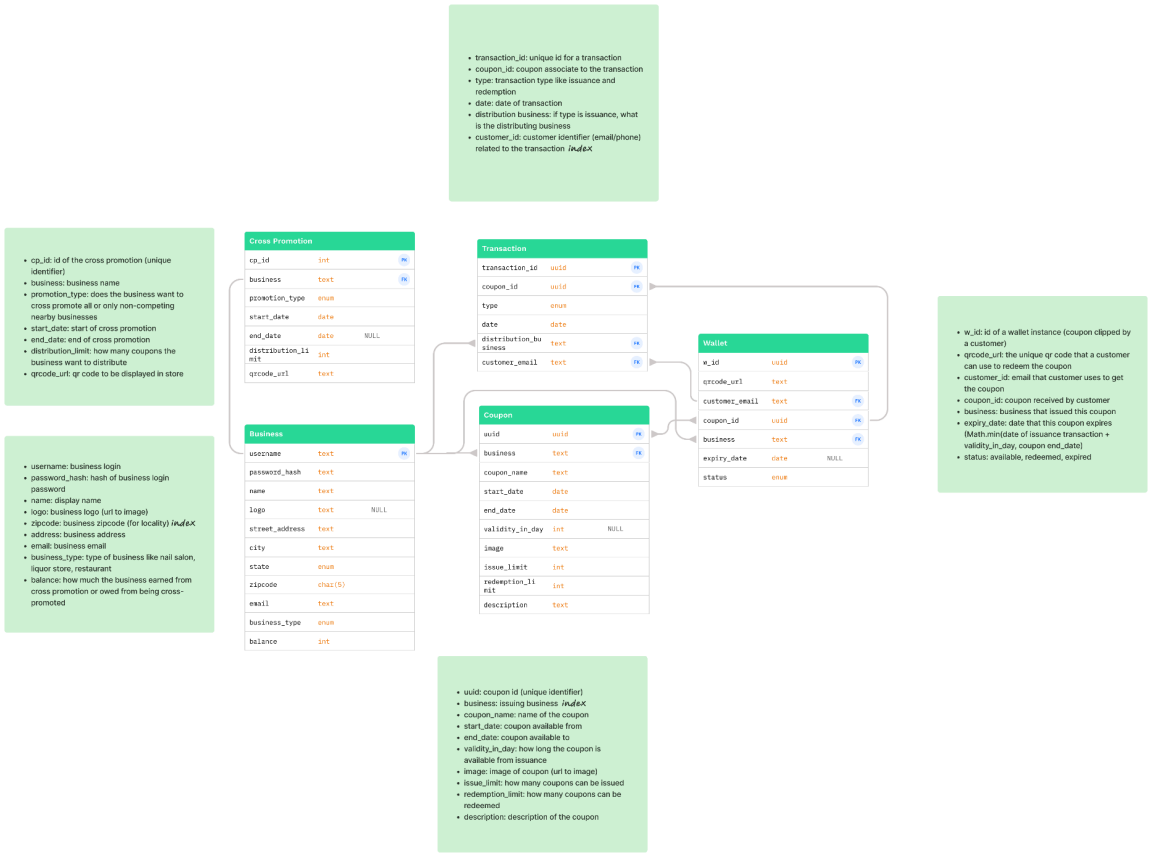


Appendix C

Database Schema with remarks for Each Field of All Tables.

Figure C1

Annotated Database Entity Relationship Diagram



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