

Lab 1

Lab 1 - Rewards Maximizer

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## 1. Introduction

In 2023 American consumers owned an average of 3.90 credit cards. (Experian, 2024). Each card can have different reward programs based on who it is issued by or who the issuer is affiliated with. This provides a great opportunity for customers but can overwhelm them with choices thus discouraging them from going through the process of comparing them. This affects all types of customers including seasonal offers that they might not be tracking. Credit card rewards programs can have fine print that may include additional and can be hard for some customers to understand and tie in with vendor rewards programs. With existing solutions many consumers are concerned about sharing their financial information with a third party, which is a requirement for most existing services. As consumers we should have more options that can provide us with what we need without losing control of what gets shared and to whom. Existing websites that offer similar services but utilize adware as well as sponsored content, which can be hard to navigate. These revenue strategies may work, but it does leave consumers wanting to seek for the information somewhere else as trust can be lost when the feeling of something being sold starts occurring. User interfaces have been trending to more minimalistic designs but which can be complicated to include ads in a thoughtful manner thus leaving these websites in a tight spot. Existing solutions do not include vendor reward programs which can provide even more savings to customers. Rewards Maximizer is a software in the form of a website application that will allow users to maximize their credit card rewards by letting them search for purchase categories and the system will utilize the credit cards in the wallet to automate the process of comparing them while also taking into consideration vendor specific reward programs.

## **2. Product Description**

Rewards Maximizer is a web application that optimizes user purchases by comparing credit card rewards and vendor-specific deals/rewards. It aims to provide users with the best possible rewards for their purchases by utilizing the digital wallet system and recommendation algorithms. This will be accomplished by allowing the user to enter credit and rewards in their possession into a wallet inside the program. The customer will then enter what they are trying to buy, which will prompt Rewards Maximizer to search for potential purchases from different businesses and return the credit and rewards cards that will award the most points or discounts to the searched item.

### **A. 2.1 Key Product Features and Capabilities**

Rewards Maximizer addresses the key issues faced by consumers in managing multiple credit card rewards and vendor-specific deals through its features:

B. Rewards Maximizer will provide:

1. A simple, clean interface with focused information for the user.
2. A digital wallet with which to add all cards of interest.
3. Optimized credit card recommendations which will tell the user which card will save the most money for a given purchase.
4. Crowdsourced information about credit cards and rewards programs from fellow users of the application.

C. Rewards Maximizer will not:

1. Give the user more general financial advice.
2. Store the user's specific credit card information.
3. Provide real-time customer support.

Features	Rewards Maximizer	PayPal Honey	Rakuten	NerdWallet	Rocket Money
Crowdsourcing	✓				
Search and compare credit cards	✓			✓	
Wallet functionality	✓			✓	✓
Gives cash back on purchases		✓	✓		
Search web and applies coupons		✓			
Exclusive use of anonymous data for analysis	✓				
Integration of vendor-specific deals and reward systems	✓	Partial	Partial		
Company Updates	✓	Partial	Partial		
Search company rewards and loyalty programs	✓			Partial	
Notifications and Alerts	✓	✓	✓	✓	✓

Figure 1: Competition Matrix

## **D. 2.2 Major Components**

### **A. Front-End**

1. HTML/CSS/Javascript: Core web development technologies
2. Bootstrap: CSS framework for responsive design
3. Ember.js: JavaScript framework for building web applications

### **B. Back-End**

1. Rust: Programming language for backend development and database integration
2. Rocket: Web framework for Rust also manages web applications
3. MySQL: Relational database management
4. Diesel: ORM for Rust, simplifies database interactions
5. Python: Programming language utilized for web crawler
6. BeautifulSoup: Python library for parsing HTML and XML documents

### **C. Testing**

1. QUnit: JavaScript testing framework for unit testing Ember.js applications

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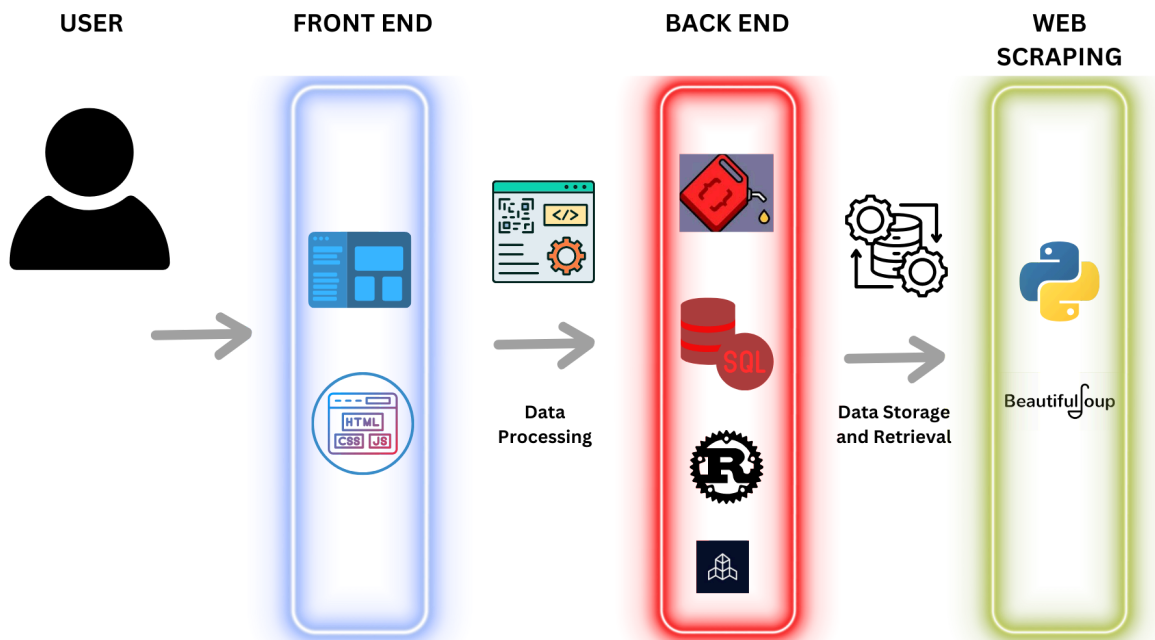


Figure 2: Major Functional Components Diagram

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### **3. Identification of Case Study**

- A. The application has the potential to be used by any consumer making purchases with a credit card or using vendor rewards programs.
- B. It is most likely to be used by the subset of these people who are money conscious and like to use and keep track of the kinds of cumulative small savings Rewards Maximizer can provide.
- C. It is possible the application may be used in the future by larger scale companies needing to buy products in bulk.

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#### 4. Product Prototype Description

- A. The prototype will implement:
1. Account management
  2. Login authentication
  3. The card and rewards search system
- B. The web crawler will be operating with an incomplete test dataset rather than live scraping multiple different financial sites.
- C. The card optimization algorithm will be simulated on test data rather than fully implemented with real up-to-date information.

Features	Real World Product	Prototype
User Account Setup	Fully Implemented	Not Implemented
Login Authentication	Fully Implemented	Not Implemented
Wallet Functionality	Fully Implemented	Not Implemented
Current Purchase Search	Fully Implemented	Not Implemented
Card Optimization Algorithm	Fully Implemented	Not Implemented
WebCrawler	Fully Implemented	Not Implemented
Feedback System	Fully Implemented	Not Implemented

Figure 3: Prototype Comparison Table

#### E. 4.1. Prototype Architecture (Hardware/Software)

- A. Hardware:
1. Basic server to host the prototype application.
- B. Software
1. Front-End:

HTML, CSS, JavaScript, Bootstrap, Ember.js

2. Back-End:

Rust, Rocket, MySQL, Diesel

3. Web Scraper:

Python, BeautifulSoup

4. Testing:

JUnit

### C. Prototype MFCD

The prototype will have a multi-functional component diagram (MFCD) similar to the final product but with some modules simplified or simulated:

1. User Interface (UI): Allows users to interact with the application, access the digital wallet, search products, and provide feedback.
2. Data Layer: Stores user information, card details, and interactions with the web scraper and card optimization algorithm.
3. Web Scraper: Operates with a test dataset instead of live data scraping.
4. Card Optimization Algorithm: Simulated using test data to demonstrate functionality.

## **F. 4.2. Prototype Features and Capabilities**

### A. Key Features

1. User Account Setup and Login Authentication: Demonstrates basic user management, verifying users can create accounts and authenticate.
2. Card and Rewards Search System: Allows users to search for cards and rewards based on data.

3. Digital Wallet Functionality: Enable users to add and manage cards/rewards in a digital wallet.
4. Card Optimization Algorithm: Simulated on test data to show the ability to recommend the best card/rewards based on purchases.
5. Web Scraper: Runs on a test dataset to validate the concept of gathering data from various sources.

#### B. Risk Mitigation

1. Testing key features early in the development process allows for improvements to the overall design based on feedback and results.
2. Identifying technical challenges and the limitations of the stack that was chosen helps refine later.
3. Development and feedback will give the opportunity to implement features that bring in revenue.

#### **G. 4.3. Prototype Development Challenges**

The development of the prototype is expected to encounter several challenges:

- A. Knowledge Gaps: Initial lack of knowledge on the intricacies of credit card rewards and vendor rewards programs may require additional research and learning.
- B. Technical Expertise: Inexperience with certain tools and technologies, particularly Rust, may pose development hurdles.
- C. Data Integration: Ensuring accurate simulation of the card/rewards optimization algorithm with test data instead of real-time information.

## 5. Glossary

Term	Definition
<b>Application Programming Interface (API)</b>	A software intermediary that allows two applications to talk to each other. APIs are an accessible way to extract and share data within and across organizations.
<b>CSS (Cascading Style Sheets)</b>	A stylesheet language used to create web pages. It describes how HTML elements are to be displayed on screen, paper, or in other media.
<b>Graphical User Interface (GUI)</b>	A form of user interface that allows users to interact with electronic devices through graphical icons and audio indicators instead of text-based interfaces, typed command labels, or text navigation.
<b>Git</b>	A version control system that tracks changes in a set of source files. It is designed for coordinating work among programmers, but it can be used to track changes in any set of files.
<b>GitHub</b>	A platform for software development and version control using Git. It provides tools for collaboration, code review, and project management.
<b>HTML (Hypertext Markup Language)</b>	The standard markup language used to create web pages. It describes the structure of a web page and is used to embed text, images, videos, and other media.
<b>JavaScript</b>	A programming language used to create dynamic content on web pages. It allows for the implementation of complex features such as interactive forms, animations, and other elements that enhance user experience.
<b>Rewards/Loyalty Program</b>	A program offered by one vendor to entice customers to return, usually offering discounts or free products as incentives.
<b>Rewards Credit Card</b>	Credit cards that offer you some type of reward, typically cash back, points, or travel miles, for every dollar a customer spends. These rewards can be redeemed for various benefits.
<b>WebCrawler</b>	A program that systematically searches web pages for specific information. It is often used by search engines to index content from across the internet.

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