

Lab 1 - BetterSwipe Product Description

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1. Introduction

The current landscape of rewards credit cards presents consumers with a golden opportunity to save a significant amount of money. However, the complexity involved in choosing the right card has become a formidable obstacle for many individuals. The sheer multitude of options is staggering, as exemplified by Credit Karma's synopsis of 53 cash back cards, 12 miles cards, and 20 points cards (Credit Karma, 2023). This abundance of choices is a double-edged sword, offering potential rewards but simultaneously overwhelming consumers.

Compounding the problem is the arduous process of researching a new credit card, with 69% of consumers finding it too time-consuming (Experian, 2017). This time investment is further exacerbated by the fact that 61% of individuals are overwhelmed by the sheer number of options, and 57% struggle to find cards that meet their specific needs (Experian, 2017).

Adding to the complexity of choosing rewards credit cards is the existence of three distinct reward systems—cash back, points, and miles—each with its unique intricacies and potential returns. The need for a tailored approach for selecting the best rewards card, or set of cards, becomes apparent as different rewards may yield varying returns. The challenge, therefore, is to recommend cards that not only align with the preferred reward system but also maximize rewards based on an individual's actual spending history. Consequently, the process becomes not just complex but also emotionally taxing for consumers.

Moreover, the statistic that 69% of reward credit card holders are underutilizing their rewards (Black, 2022) reveals a substantial gap between the potential benefits of these cards and consumers' ability to harness them effectively. This underutilization points to a critical issue—consumers lack guidance in selecting cards that not only align with their needs but also maximize the potential rewards based on their spending patterns.

In summary, the problem at hand is multifaceted: consumers are faced with an overwhelming number of choices, navigating three distinct reward systems is complex, and the process of finding a card that maximizes rewards based on individual spending history is cumbersome. A solution is needed to simplify this process, providing consumers with personalized recommendations that make the most of the benefits offered by rewards credit cards.

In response to the multifaceted challenges posed by the overwhelming variety of rewards credit cards, BetterSwipe provides an innovative and tailored solution to empower consumers in making informed and efficient choices. BetterSwipe simplifies the credit card selection process by employing users' transaction histories to construct personalized expenditure profiles. This profile will undergo continuous monitoring, ensuring that it evolves alongside users' spending habits to accurately reflect their financial behaviors over time.

BetterSwipe takes a proactive approach in assisting users by comparing their personalized expenditure profiles to the diverse array of benefits offered by available rewards credit cards. Through sophisticated algorithms and analysis, BetterSwipe identifies and evaluates credit cards that align most closely with the individualized spending habits and preferences reflected in the users' profiles. This comprehensive comparison allows users to gain valuable insights into the potential advantages and rewards associated with each credit card option. BetterSwipe empowers users to make well-informed decisions, selecting credit cards that not only suit their financial behaviors but also maximize the benefits and rewards tailored to their unique preferences. In essence, BetterSwipe acts as a personalized advisor, navigating the complexities of the rewards credit card landscape to ensure users unlock the optimal advantages for their specific financial circumstances.

By providing continuous monitoring, personalized expenditure profiles, and interactive fine-tuning options, BetterSwipe aims to alleviate the challenges associated with researching and selecting rewards credit cards, ultimately enabling users to maximize the benefits of their chosen cards more effectively.

2. Product Description

BetterSwipe is an online tool crafted to present users with a curated selection of rewards credit cards by analyzing their spending patterns through bank statements. BetterSwipe's main goal is to streamline the decision-making process, offering individuals precise recommendations tailored to their credit card requirements. By doing so, BetterSwipe aims to dispel any uncertainties surrounding rewards cards and assist seasoned users in customizing their card portfolios based on their specific spending and rewards preferences.

2.1. Key Product Features and Capabilities

BetterSwipe creates a user spending profile by analyzing past transactions and suggests suitable rewards cards accordingly. Upon registration and activation of multi-factor authentication (MFA), users have the option to manually input additional data points, including credit score and details about their existing credit cards, to enhance the BetterSwipe experience. Once their profile is complete, users can upload purchase statements to the application. In cases where the statement is not in a commonly machine-readable format like Comma Separated Value (CSV), BetterSwipe employs Optical Character Recognition (OCR) to identify and consolidate spending categories.

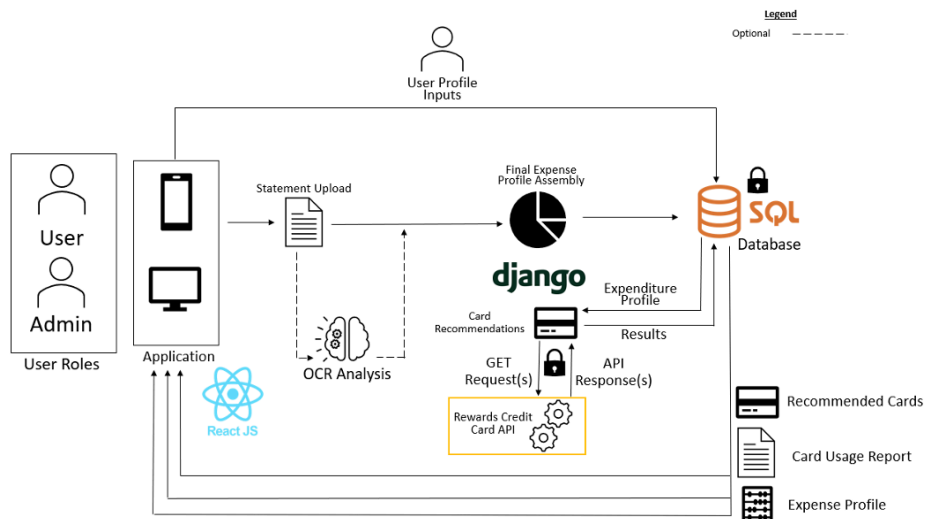
Spending types, such as retail, travel, and gas, are systematically organized, summarized, and transmitted to BetterSwipe. The platform then aligns this profile with a comprehensive list of credit cards. Utilizing its algorithm, BetterSwipe identifies the most advantageous cards, refining

the initial selection to a top three, which are then presented to the user. Both the expenditure profile graph and the recommended cards are securely stored in an encrypted database, enabling users to retrospectively review past profiles and recommendations. By amalgamating user-provided information with their spending profile, BetterSwipe delivers credit card suggestions that align with the user's preferences, offering optimal rewards and accurate interest rates devoid of any bias. In addition to the initial statement upload, BetterSwipe consistently tracks users' spending patterns by automatically and periodically ingesting statements from their banks or card providers. This ongoing monitoring provides users with valuable insights into optimal ways to use rewards cards and helps them determine whether obtaining a new card would be beneficial.

2.2. Major Components (Hardware/Software)

BetterSwipe comprises a cohesive integration of both hardware and software components. The Major Functional Component Diagram (MFCD) depicted below encapsulates the key elements of BetterSwipe and outlines the general data flow.

Designed as a web application accessible on network-connected devices, BetterSwipe relies on server infrastructure for hosting. The website is crafted using HTML, CSS, and Javascript, with the application's front-end developed using React. Tensorflow powers the Machine Learning (ML) solution, while the back-end is built on Django, and Microsoft SQL Server serves as the database solution. The BetterSwipe code repository is hosted on Github, employing Git for version control. Testing is conducted using pytest, and DUO provides Multi-Factor Authentication (MFA) for users.

Figure 1:*BetterSwipe Major Functional Component Diagram (MFCD)*

3. Identification of Case Study

BetterSwipe will be useful for both novice and seasoned consumers seeking to acquire a new rewards card with optimized benefits. As discussed earlier, research indicates a prevalent skepticism among individuals when it comes to obtaining a rewards card, and existing cardholders often underutilize the potential benefits available to them.

BetterSwipe's initial case study group will be comprised of University student volunteers who express an interest in acquiring a rewards card. This group is projected to utilize BetterSwipe as they embark on the journey to find their inaugural rewards card. The demographic of University students is generally characterized by a lack of extensive credit history and limited experience with credit cards. BetterSwipe aims to assist this particular user segment by furnishing them with data-backed recommendations. Simultaneously, the BetterSwipe team seeks to gain valuable insights from this case study regarding the app's user-friendliness for individuals new to the realm of rewards and credit cards. This real-world

application of the case study will not only put BetterSwipe to the test but also shed light on new use cases for the platform.

Let's follow Sarah, a junior at Old Dominion University who is employed. Despite her interest in credit and rewards cards, Sarah lacks experience and knowledge about applying for and using them. This is where BetterSwipe comes into play. Choosing to utilize BetterSwipe, Sarah inputs her credit profile and uploads her past bank statements. The platform then generates a detailed breakdown of her spending habits and presents a tailored list of cards aligned with her expenditures and credit profile. BetterSwipe instills confidence in Sarah, empowering her to select a cash reward card with a lower credit history requirement as her optimal choice.

Looking ahead, BetterSwipe envisions a diverse user base, extending beyond individual users to include businesses. This expansion allows businesses to strategically assess which card companies to partner with based on their unique use cases. Furthermore, BetterSwipe's analytics offer significant advantages to rewards card providers, providing valuable insights into consumer spending behaviors and preferences, ultimately enabling them to better understand and cater to their target audience.

4. Product Prototype Description

The purpose of BetterSwipe is to simplify the credit card decision-making process by recommending cards that align with users' individualized expenditure profiles. This innovative solution addresses the overwhelming abundance of credit card options by providing continuous monitoring of spending habits, ensuring that users' profiles remain up-to-date and reflective of their evolving financial behaviors. By combining advanced data analysis with user-driven customization, BetterSwipe seeks to empower individuals to make informed choices, ultimately maximizing the benefits derived from their selected rewards credit cards.

4.1. **Prototype Architecture (Hardware/Software)**

The BetterSwipe prototype, designed as a web application accessible on any PC with an internet connection, closely mirrors the architecture depicted in Figure 2. It distinguishes itself in terms of deployment, functioning within a local machine while maintaining accessibility on any desktop with internet connectivity. The final product will extend compatibility to include mobile devices like Android and iOS. A key element lies in its unique capability to recommend rewards cards tailored to users' individualized expenditure profiles, addressing the complexity of the credit card market and providing a curated selection aligning with users' needs.

Depicted in the Major Functional Component Diagram (MFCD), the BetterSwipe prototype's functionality includes the analysis of spending patterns to identify the most suitable cash back, points, or miles cards. This personalized recommendation system ensures users benefit from a selection precisely aligned with their specific needs and preferences. An interactive feature for fine-tuning expenditure profiles allows users to input additional information, refining recommendations based on unique financial circumstances, ensuring a more accurate and personalized selection process.

While the prototype's MFCD showcases ongoing partial implementations, such as OCR/Expense Classification and Rewards Credit Card API, these features are expected to significantly enhance functionality when fully realized. They aim to contribute to better card recommendations based on users' financial habits, optimizing the overall user experience. The MFCD serves as a roadmap, visually guiding users through the prototype's key components and their interplay within the hardware and software architecture.

Despite the BetterSwipe prototype closely resembling the Real-World Product (RWP) architecture, several adjustments exist, primarily due to the prototype's use of Docker for

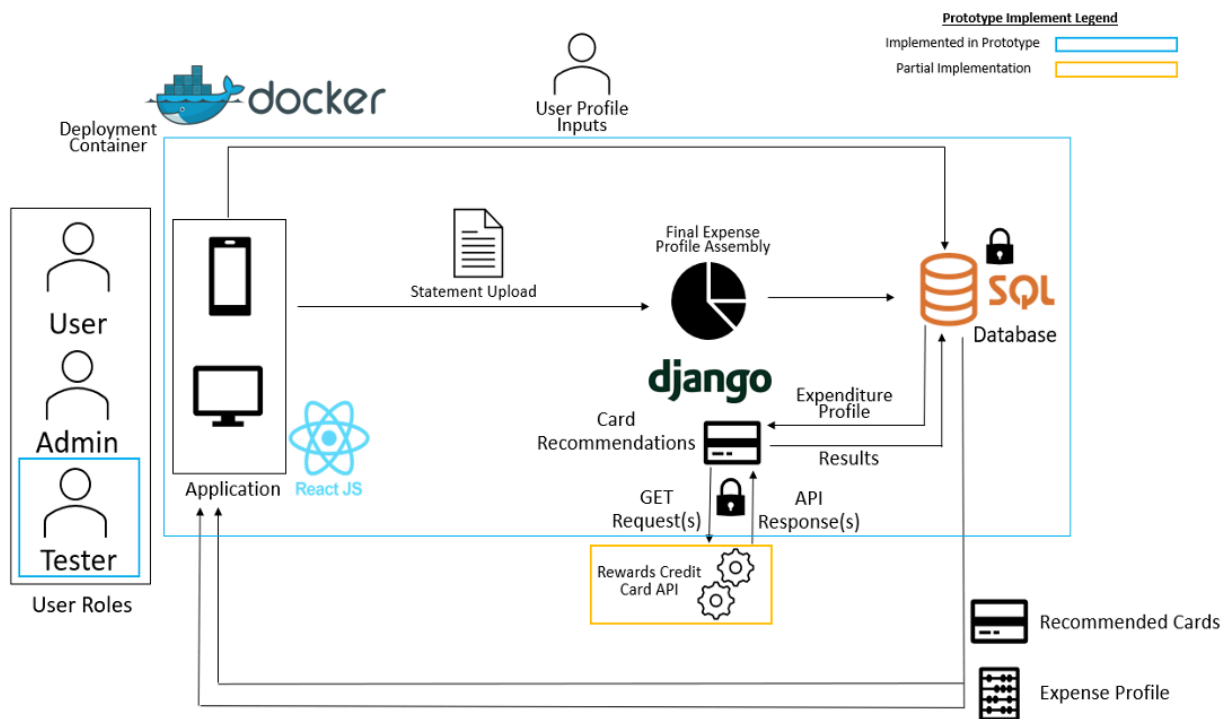
containerized hosting. This enhances mobility and ease of deployment across the development team. GUI components like the 'Help' or 'Feedback' sections may be eliminated or reduced.

Standard users are simulated for the prototype, with a "Tester" user role specifically implemented. API integration may be limited based on cost and/or functionality considerations.

Functional elements involving continuous monitoring, such as card usage reporting, savings predictions, and purchase recommendations, will be partially implemented or eliminated in the prototype, given their longer timeframes for fruition compared to the core elements. Notably, certain elements like uploading/reading of bank statements, card recommendations, and expenditure profile analysis remain identical for both the prototype and RWP, serving as key components aligned with prototype development objectives and will not be reduced or eliminated.

Figure 2:

BetterSwipe Prototype Major Functional Component Diagram



4.2. **Prototype Features and Capabilities**

The BetterSwipe prototype, designed with the primary objective of streamlining the credit card selection process, introduces several key features to enhance user experience and maximize the benefits of rewards credit cards. The initial phase of the user journey involves a secure Login and Registration process, establishing a personalized environment for users. Upon registration, users gain access to a Card Recommendations and Comparisons module, which simplifies the overwhelming task of card selection and aids in identifying cards that align with individual preferences and spending habits.

Ensuring data security is paramount, and BetterSwipe prioritizes user privacy through advanced encryption measures for both data at rest and in transit. This commitment safeguards sensitive information throughout the user's interactions with the application. Real-time insights into spending patterns are provided through constant monitoring of user purchases.

One of the innovative features, the Categorization of expenditures, is partially implemented (as illustrated in Table 1). This feature organizes user purchases into distinct categories, enhancing understanding of spending habits and contributing to more accurate card recommendations.

The prototype maintains a current expenditure profile, allowing users to monitor their spending behavior and receive recommendations based on that profile. Expenditures are categorized and evaluated against reward offerings, facilitating a comparison of the financial benefits for each potential credit card.

Recognizing diverse user needs, BetterSwipe accommodates those who prefer managing transactions in bulk through the Upload .csv Transactions List feature. This streamlines the

process, enabling users to conveniently upload and manage their transaction history for more efficient analysis and personalized recommendations.

The objective of the prototype implementation is to serve as a proof of concept for the overall BetterSwipe application, assessing potential risks and mitigation strategies. The partial implementation of features involves the use of simulations or static data to emulate real-world scenarios, providing valuable insights into the effectiveness and feasibility of the proposed functionalities. The rationale for the partial implementation is to showcase key aspects of the features while allowing for iterative development and refinement based on user feedback and testing.

Table 1

BetterSwipe RWP v. Prototype Features

Functional Element	RWP	Prototype	Current Plan
General			
Web and Mobile Interfaces	Fully Implemented	Partially Implemented	Partially Implemented
Account Registration	Fully Implemented	Fully Implemented	Fully Implemented
Authentication	Fully Implemented	Fully Implemented	Fully Implemented
Profile CRUD	Fully Implemented	Fully Implemented	Fully Implemented
History of Reports	Fully Implemented	Fully Implemented	Fully Implemented
Security			
MFA	Fully Implemented	Eliminated	Eliminated
Data-at-Rest Encryption	Fully Implemented	Fully Implemented	Fully Implemented
Data-in-Transit Encryption	Fully Implemented	Partially Implemented	Partially Implemented
Statement Analysis			
Statement Upload	Fully Implemented	Fully Implemented	Fully Implemented
Expenditure Categorization	Fully Implemented	Fully Implemented	Fully Implemented
OCR/ML Analysis	Fully Implemented	Eliminated	Eliminated
Expenses Summary	Fully Implemented	Fully Implemented	Fully Implemented
Rewards Card Features			
Card Recommendations	Fully Implemented	Fully Implemented	Fully Implemented
Card Comparisons	Fully Implemented	Fully Implemented	Fully Implemented
Rewards Card Details	Fully Implemented	Fully Implemented	Fully Implemented
Continuous Monitoring			
Savings Prediction	Fully Implemented	Partially Implemented	Partially Implemented
Future Purchase Recommendations	Fully Implemented	Partially Implemented	Partially Implemented

4.3. **Prototype Development Challenges**

The development of BetterSwipe, poses several challenges that necessitate thoughtful solutions. Constant monitoring of card information for updates introduces another layer of complexity. Ensuring that BetterSwipe seamlessly and accurately reflects the latest card information demands a reliable and efficient mechanism for real-time updates. The development team must overcome challenges associated with synchronizing and updating card data to provide users with the most current and relevant information.

An additional challenge lies in the dependence on external APIs. The BetterSwipe application's functionality relies on accessing external APIs to retrieve essential data for card recommendations and comparisons. The risk for the prototype would be determining if the information available via the "freeware" access to the API data will provide sufficient information to develop and demonstrate the comparison and recommendation algorithms - the contingency would be to seek alternative API's, or to prepare simulated or static data to be used for algorithm and feature development and refinement. Developing contingency plans and fallback mechanisms is crucial to mitigate these risks.

Furthermore, the effectiveness of BetterSwipe hinges on its ability to tailor card recommendations based on user data. However, a potential challenge may arise from a lack of sufficient data to offer personalized recommendations. In summary, the development of BetterSwipe faces challenges related to user privacy, real-time data updates, API dependencies, and the need for substantial user data. Addressing these challenges requires a strategic approach, incorporating robust security measures, reliable data update mechanisms, contingency plans for API dependencies,. Successfully navigating these challenges will be instrumental in effectively demonstrating the key features and capabilities of the BetterSwipe prototype.

5. Glossary

Artificial intelligence (AI): development of computer systems capable of performing tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns.

Application Programming Interface (API): 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.

Annual Percentage Rate (APR): is the cost you pay each year to borrow money, including fees, expressed as a percentage. The APR is a broader measure of the cost to you of borrowing money since it reflects not only the interest rate but also the fees that you have to pay to get the loan.

Amazon Web Services (AWS): is a subsidiary of Amazon that provides on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered, pay-as-you-go basis. Clients will often use this in combination with autoscaling.

CSS: Cascading Style Sheets, Programming language used to determine how HTML elements are displayed.

GitHub: Service that provides hosting and version control for software development projects.

Graphical User Interface (GUI): a form of user interface that allows users to interact with electronic devices through graphical icons and audio indicators.

HTML: Hyper Text Markup Language, a programming language used for creating Web pages.

Javascript(JS): a scripting programming language that enables dynamic updates of content.

Machine Learning (ML): a branch of AI and Computer Science which focuses on the use of data and algorithms to imitate the way humans learn, gradually improving its accuracy.

MySQL: Open source database management system that could be used from creating a simple shopping list to holding a large amount of company data.

Rewards Credit Card: credit cards which offer you some type of “reward”—typically cash back, points, or travel miles—for every dollar you spend, sometimes up to certain limits.

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