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Capstone Project Report

Cache
Financial mobile application for Gen Z

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Executive Summary

As studies show, Gen Z has the lowest financial literacy compared to other generations. However, the current economic situation has motivated them to increase their financial literacy, and they are already investing in the stock market, though many do not know where to start. Gen Z seeks financial information online and turns to social media platforms like TikTok, Reddit, and YouTube for advice. The proposed mobile app, Cache, offers a solution to help Gen Z manage their finances effectively and increase their financial knowledge. Cache provides an intuitive and personalized interface to access accounts, budget, and keep track of expenses, plan, save, and invest, while also offering financial news, tips, and advice.

## Acknowledgments

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1. INTRODUCTION

Background & Objectives:
Knowledge and understanding of finances and ability to effectively navigate planning and management of earnings, spending, budget(s), investments, debt, etc., are low. However, as studies show, Gen Z's financial literacy is the lowest among all generations. The percentage of P-Fin Index questions answered correctly is 43% for Gen Z compared to 49% and 48% for Gen X and Gen Y respectively [1]. Two-thirds of Gen Z answered only 50% or less of the index questions correctly, and those who have never attended college correctly answered 39% of the index questions (see Figure 1.1). At the same time, the current economic situation, largely created by the pandemic, motivated Gen Z the most to increase their financial literacy [2]. They already are investing in the stock market (stocks and cryptocurrency), even without completely understanding how it works. As digital natives surrounded by mobile phones, the internet, and social media, they mostly consume and seek financial information online. This also translates to how they are becoming financially literate, turning to TikTok, Reddit, and YouTube for financial advice. [3] (see Figure 1.2). Meanwhile, those who are not investing (44%), report that they do not know where to start [4] (see Figure 1.3).

This presents a unique opportunity to, first of all, understand the habits and needs of Gen Z when it comes to managing and learning how to effectively manage their finances. Secondly, identify innovative solutions that will enable this generation to increase their financial literacy, allow them to make informed decisions, and plan their future.

The proposed mobile app, Cache, presents an innovative digital platform that provides a secure one-stop-shop to easily plan and manage financial life and increase knowledge about finances. With an intuitive and personalized interface, the mobile application enables Gen Z to access all accounts, budget, and keep track of expenses, plan, save, and invest while also providing financial news, tips, and advice on topics of interest to increase their financial knowledge.

Distribution of correct answers to *P-Fin Index* questions
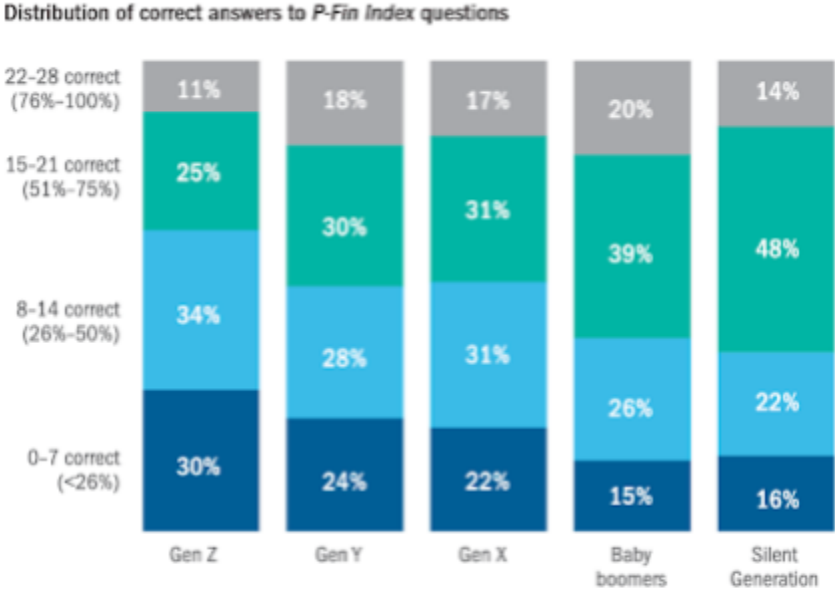
Source: *TIAA Institute-GFLEC Personal Finance Index* (2021).

Figure 1.1: Financial literacy within generations

2. DESIGN PROCESS

Benchmarking:
In order to best understand what is currently available on the market, the design team analyzed 12 existing financial applications as well as 2 social media apps that Gen Z also uses to find financial information (see Figure 2). Identifying the gaps within these applications helped guide how the team could find a need in the existing market. By comparing the applications and platforms, the team was able to conclude that currently on the market, there is no one application available that helps with budget management and planning, meets the need to seek and receive advice on finances and increases their financial knowledge, and helps them invest and further plan their finances in one platform. This provided a need for us to come up with such a one-stop-shop financial mobile application.

What resources do you use to learn more about personal finance basics (e.g., budgeting, saving money, managing debt/credit)?

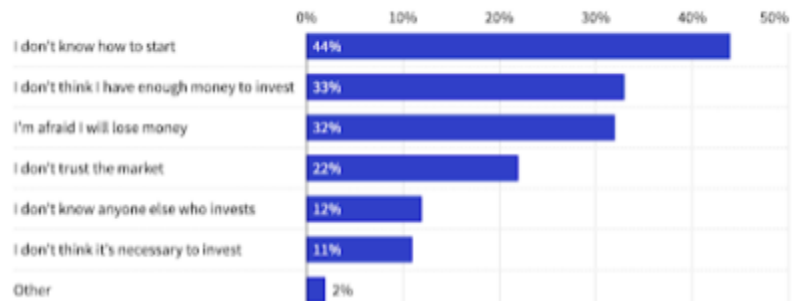|	Gen Z (18-25)		Millennial (26-41)		GenX (42-57)	
1	Youtube/online videos	45%	Internet search	47%	Internet search	46%
2	Friends/family	44%	Friends/family	42%	Friends/family	40%
3	Internet search	39%	Youtube/online videos	40%	Financial information websites	36%
4	TikTok	30%	Financial information websites	35%	Youtube/online videos	32%
5	Financial information websites	29%	Facebook	31%	Finance experts or influencers	26%

Multi-select. N=1,000 for each generation.

Source: 2022 Investopedia Financial Literacy Study (1/27 - 2/7)

Investopedia

Figure 1.2: Resources Gen X, Gen Y, and Gen X use to learn about finances

Why don't you invest your money?

I don't know how to start	44%
I don't think I have enough money to invest	33%
I'm afraid I will lose money	32%
I don't trust the market	22%
I don't know anyone else who invests	12%
I don't think it's necessary to invest	11%
Other	2%

Why don't you invest your money? Base size is Gen Z who are not invested N=467

Source: 2022 Investopedia Financial Literacy Study (1/27 - 2/7)

Investopedia

	Venmo	Robinhood	Wells Fargo	Webull	Mint	$$ Chips	Titan		Personal Capital	Chase	tickertape	ck	Pinterest	TikTok
Ability to track crypto	yes	yes	-	yes	-	-	yes	yes	-	-	yes	-	-	-
Education available on crypto	yes	-	-	yes	-	-	yes	yes	-	-	yes	-	yes	yes
Ability to track stocks	-	yes	-	yes	-	-	yes	yes	-	-	yes	-	-	-
Education available on stocks	-	-	-	yes	-	-	yes	yes	-	-	yes	-	yes	yes
Able to track credit score	-	yes	yes	-	yes	-	-	-	yes	yes	-	yes	-	-
Able to track spending	-	-	yes	-	yes	yes	-	-	yes	yes	-	yes	-	-
Categorized spending	-	-	-	-	yes	yes	-	-	yes	yes	-	yes	-	-
Debt Mangement	-	yes	-	-	yes	-	-	yes	yes	yes	-	yes	-	-
Future planning	-	yes	yes	-	-	-	-	yes	-	yes	-	yes	-	-
Financial Advisor available	-	yes	yes	-	-	-	-	yes	-	yes	-	yes	-	-
Savings Account	-	yes	yes	-	-	-	yes	yes	-	yes	-	yes	-	-

Figure 2: Benchmarking

Research Methods:
To gain a deep understanding of the issue as well as explore possible solutions the team conducted **interviews** and **diary studies**. The team tried to uncover valuable insights from Gen Z who can best describe the problems they face when it comes to understanding how they should budget (earning, saving, expenses) and in general manage finances, and what are their frustrations and needs to increase financial literacy.

The team also collected data about Gen Z behavior and activities when using specific applications to manage their finances or to complete a transaction. With this study the team gained some understanding of their financial habits, how they are engaged with different applications to reach their goal, and how they feel about using those applications. An IRB exemption from the university was obtained for this study.

Participants and Procedure:
Participants for the survey were residents of the United States, between the ages of 18 and 25 recruited by the team members. The date and time of the interviews were coordinated and Zoom meeting links were shared over email. The discussions took place virtually and were recorded after participants signed and submitted the consent forms. Participants were informed that taking part in this research project was voluntary and that they could stop at any point during the interview. Interviews lasted between 35 to 50 mins.

Some of the interview participants were further recruited to participate in the diary studies. For about a week they were asked to keep a diary or report information in general terms about their financial activities, leaving out any sort of personal and sensitive details. As this was a self-reported longitudinal study, more active work was done with these participants - engaging/re-engaging them throughout the study and encouraging or motivating them. Participants were informed that taking part in this project was voluntary and that they could stop at any point during the study.
A total of 11 interviews and 4 diary studies were conducted.

Apparatus:
Interview questions covered broadly phrased open-ended questions related to participants' personal budget planning and financial products they use to effectively manage their finances, after which they were introduced to several scenarios related to imaginary situations of needing to save, spend, and invest funds. The scenarios were introduced in order not to ask them personal financial questions, but rather to uncover their behavior, concerns, frustrations, and approach to certain concepts. During the last portion of the interview, they were asked to share their experience using some of the financial applications and features they like or dislike, followed by a set of questions about what they would like to see or improve in those applications to meet their true needs.

For the diary study, participants were asked to complete a Google form questionnaire every time they used a financial product to complete a specific task. These included

activities related to their bank account, mortgage, loan, investment account, credit card, stocks/shares/bonds, etc. They were asked to briefly describe their goals leaving out details and dollar amounts. Examples included: wanted to check the stock market today or purchase a stock/cryptocurrency; wanted to track my expenses for the past week; wanted to see if the payment hit my account; wanted to send money. Whether they reached their goals or completed the task, what type of additional information they needed to complete the task, and whether they were satisfied with the process and the results (see Appendix A).

3. DATA ANALYSIS

Data Analysis Methods and Techniques:
To analyze the qualitative data, the team started with affinity mapping using the Figma tool to organize insights into themes based on their relationship. We watched interviews, reviewed diary submissions, and spent some time grouping and regrouping our notes multiple times until settling upon our final diagram (see Figure 3). Thematic analysis technique was also used to construct and interpret patterns and meanings from interviews and diary studies.

Figure 3.1: Affinity diagram

Key Insights and Findings:

Understanding the habits of GenZ, their goals, needs, and frustrations helped us later think of effective methods to educate them and help plan their finances. It became clear that there are a number of topics Gen Z has no solid knowledge of and it was also obvious that they are interested in deepening their understanding of finances and learning more about effective budgeting and smart investing.

Knowing who or where they turn to get the information, allowed us to get a better picture of how they seek, receive, and engage with information. We also explored their learning preferences, information sources, and trust in what they see and hear about finances. As a result, we categorized them into three main groups:

a. **Visual learners** - those who spend time searching and reading online, watching videos, etc.
b. **Visual-kinetic learners** - those who are in favor of hands-on learning and prefer following tutorials and instructions.
c. **Auditory learners** - those who prefer to get information from their social networks, family, and friends, discuss it with them, or listen to podcasts, etc.

This generation is in the early stages of securing a steady income and some still heavily depend on their parents, so it was not a surprise to learn that they mostly spend their money or some try to save whatever they can, but it was somewhat surprising to learn their determined and pragmatic approach to their wants and needs while spending, saving or even investing. It became clear that they are interested in learning more about saving or investing their funds and they would like to receive tips and advice on that.

The majority of participants our team interviewed were not investing in the stock market because of limited knowledge, financially they could not afford it or considered it risky. However, it was also interesting to see that some were ready to invest if they had enough funds and knowledge of how to. This confirmed once again the findings of other studies on why Gen Z is lacking confidence in stepping into financial independence and planning their future.

To sum up our findings, four major themes emerged from our data analysis:
- **Efficiency** - the need to help the users effectively budget and track their expenses, save, and invest
- **Knowledge** - lack of deep financial knowledge and desire to learn
- **Customization** - the need to get specific information or complete a specific task based on their needs and wants using an intuitive, personalized, and easy-to-maneuver interface
- **Security** - have peace of mind that their accounts are safe and secure and they can easily access all their financial information as needed.

Personas and Storyboards:
These insights helped the team generate three different personas whose goals and actions represent the needs of Gen Z. These personas were created to allow the team to propose and design solutions that would meet their needs, behaviors, and

expectations. After generating personas, the team then began creating storyboards to spotlight the persona's behavior when interacting with the design. These use cases helped to define how tasks will be performed, what are the goals and motivations of users, how to address those in our design, and what would be the outcomes (see Figure 3.2).

Figure 3.2: User Personas

Utilizing the developed user personas, conceptional storyboards were then developed to show three different scenarios. These scenarios looked at why the typical user of Cache would be using the application, such as learning more to deepen their knowledge of all things finance, develop their stock portfolios, as well as making use of the budgeting and savings features.

Chris, (Figure 3.3) who's interested in learning about the stock market, opens up Cache to use the education features. He has no previous knowledge and wants to learn more about how the stock market works. In order to do so, he uses Cache's explore page to test his knowledge and hopefully earn himself a share of stock.

Anna, (Figure 3.4) who has been working a corporate job for a few months, wants to deepen her savings and grow her stock portfolio. She has set up a reminder to the stocks that she wants to follow and allows the application to notify her when the stock drops to a price that she's willing to purchase it at. Anna also takes use of the features to follow the news for stocks on her watchlist.

Lizzie, (Figure 3.5) is a freshman in college and is now managing her own budget for the first time. She is learning how to manage her money so that she is able to pay all of her bills as well as put money aside for her savings. She uses Cache to help her meet her savings goals of being able to buy her mom a Christmas present.

Figure 3.3: Chris' Storyboard - Learning about the stock market and investing

Figure 3.4: Anna's Storyboard - following movement in the market and purchasing stocks

Figure 3.5: Lizzie's Storyboard- Planning monthly budget and savings goals

4. IDEATION

Brainstorming:
Keeping the insights and outcomes of our data analysis in mind, the team moved to the ideation phase. In the ideation process, we tried to generate a broad set of ideas on the topics by practicing classic brainstorming. During the first round of brainstorming, the team generated and recorded as many ideas as possible deferring judgment, avoiding discussions on the feasibility or suitability of ideas, and building on the ideas. A total of 98 ideas were captured that covered different themes and categories of affinity mapping. During the second round of brainstorming, the ideas were ranked based on the a) importance of the idea for the users, b) feasibility, and c) impact.

Finalizing and grouping ideas the design team set upon the following themes and categories of ideas where **efficiency**, **familiarity**, **personalized approach**, **learning**, and **security** were larger topics and concepts of category discussions (see Figure 4):

- **Budgeting:** The system helps the users plan their budget, decide how to spend money each month, and reach specific financial goals. Notifications and customizable features help the users plan effectively.
- **Payment Processing:** The system enables easy transactions of depositing checkers, paying credit cards and bills, electronic transfer of money, etc. Through notifications, reminders, prompts, outlines, and illustrations it helps the users stay on top of things and easily complete necessary financial tasks.
- **Automated Assistance:** Intelligent assistant performs tasks based on a combination of user input, location awareness, and the ability to access information from a variety of online sources.
- **Experiential and Informational Learning:** The system provided a secure one-stop-shop and helps them understand finances, learn more about effective

budgeting and smart investing, seek, receive, and engage with information, receive news, and follow tips and advice. It also provides opportunities for users to practice and test their knowledge as part of the learning process.
- **Security:** It is essential for the system to protect user information and account security from attacks.

Figure 4: Idea Grouping and Categorization

After successfully completing brainstorming, grouping ideas into distinct themes, and combining ideas into system solutions, our design team decided which key elements need to be included in the design prototype. The ideas that were highly ranked during the second round of brainstorming and considered feasible, were implemented in the low-fidelity design prototype.

The design team agreed that the proposed model of design solution should address the following topics and tasks:

- Provide a secure platform to easily access all accounts and financial profiles
- Help efficiently manage and keep track of expenses
- Teach and show how to (tutorials, short explanations, etc.)
- Present an intuitive, and personalized interface based on the needs of the user
- Provide financial news, advice, projections, and tips

5. CONCEPTUAL DESIGN

Information Architecture:

To best determine how the user would achieve the goals of the application, the information architecture was developed. By determining the multiple paths the user could take to get the same results, this, in turn, helped inform design decisions and the best way to lay out the information. From the login, the user is able to complete onboarding on how the application works and then proceeds to link all available accounts. From there, they are able to see their budget, develop their savings goals, transfer funds, check stocks, and finally utilize the education portion of the app (see Figure 5.1)
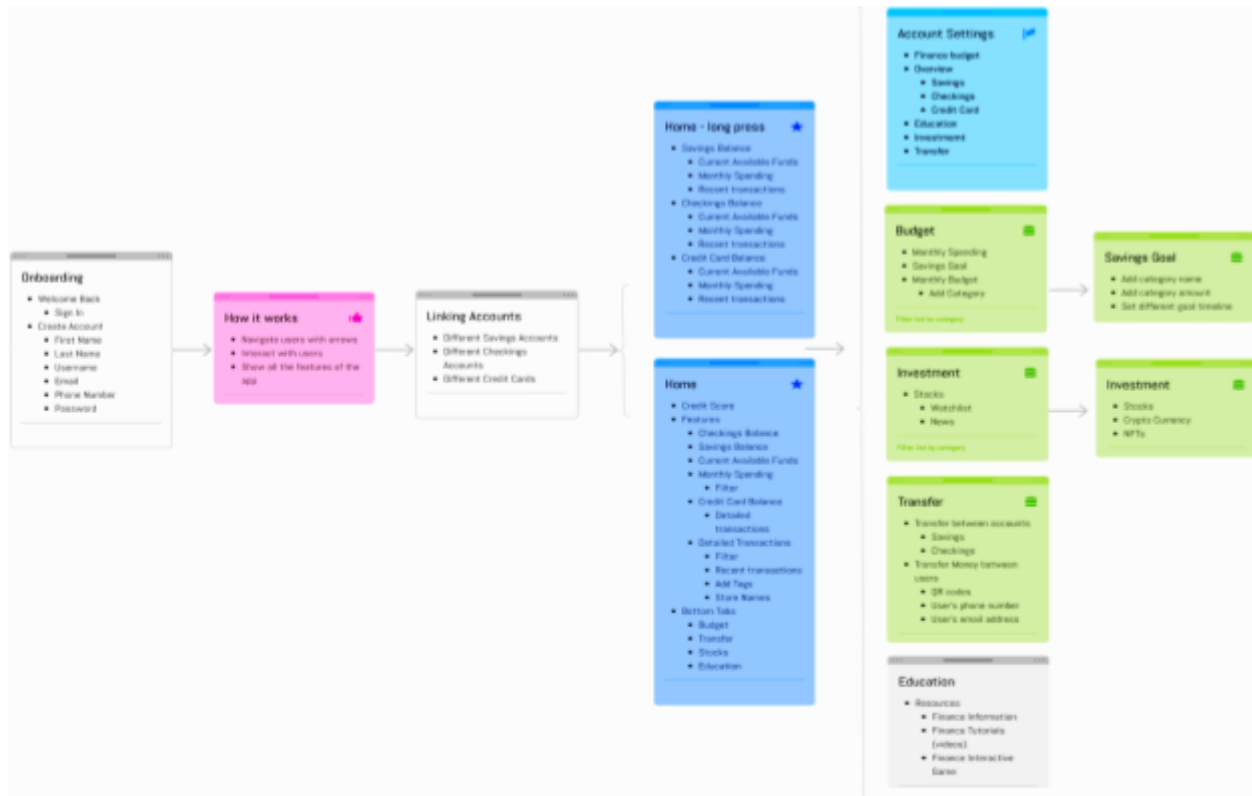

Figure 5.1: Information Architecture

Task Analysis:
In order to help develop the prototype, a task analysis was performed. From there it was determined that to best help our users, Cache would be broken down into three main tasks, budgeting, stocks, and education. Budgeting was then broken down into five subtasks, checking credit scores, checking budget, checking card balances, viewing available funds, and viewing recent transactions (see Figure 5.2). These features were determined to be the most important and were then given the priority of the home screen. Education was then given the second most importance, and can be broken down into two different learning styles (see Figure 5.3). Firstly there is the experiential learning style in which the user can participate in an interactive learning lesson, to which they would be put into an earning-based system upon completion. If that style of learning was not for the user, they could then partake in informational learning, where

the user can find a topic of their choosing and read articles about that topic. The third major task was the user's stock portfolio which can be broken down into three subtasks: providing a detailed view of stock, buying and then selling stocks (see Figure 5.4).
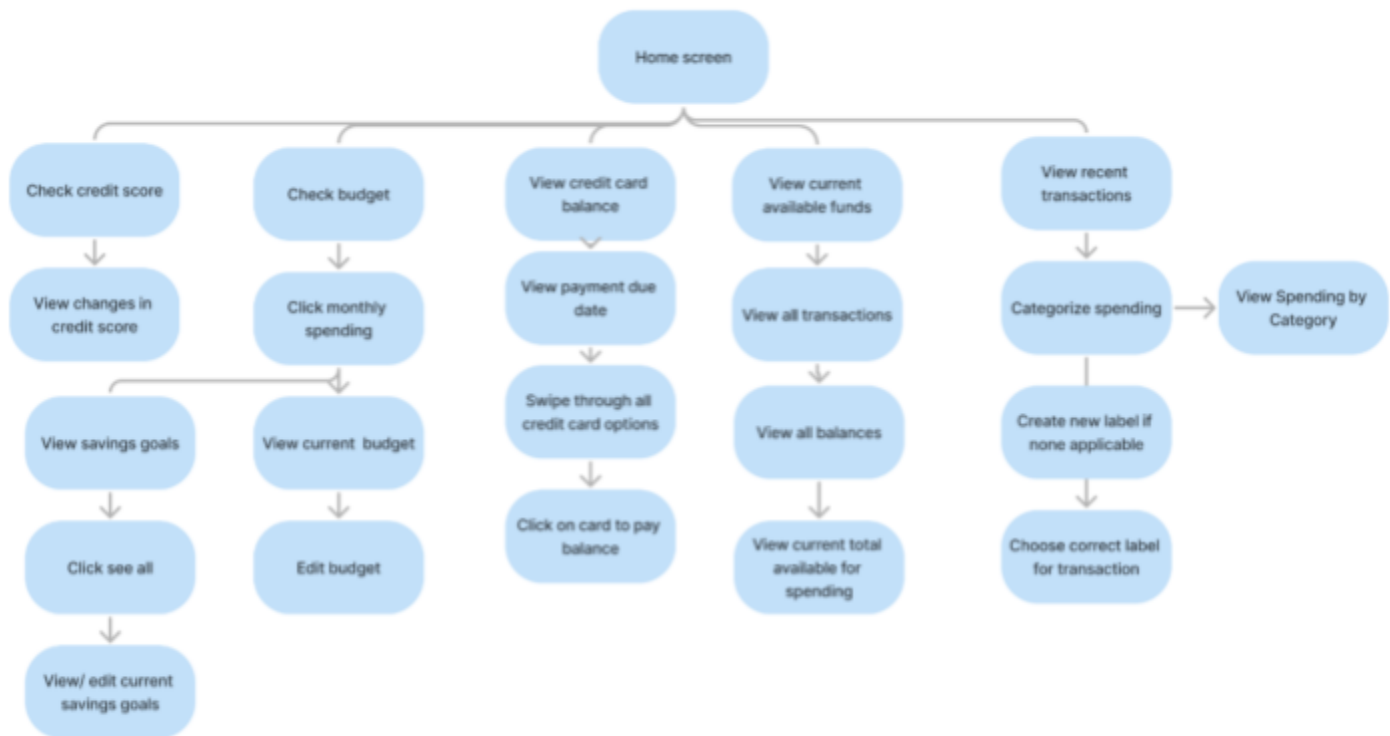

Figure 5.2: Task Analysis of Budgeting

Interface and Interaction Design Principles:
The team followed the following interaction and design principles in designing the low and later high-fidelity prototypes:
- **Aesthetics and minimalist design** - present a clean, minimalist, and functional interface
- **Visibility and clear feedback** - lead the users through interaction and guide them, so they know what possible actions are available. This principle is important not only when users click on buttons or icons to complete tasks but also during interactive tutorials to make things more obvious, visible, and accessible.

Figure 5.3: Task Analysis of Stocks

Figure 5.4: Task Analysis of Education

- **Customizability** - allowing the user to set notifications, access only information that is relevant to them, change their preferences later, and add more content as things become relevant to them.
- **Familiarity** - make sure their prior experience with similar apps and their knowledge of how such systems work can be applied to the new application.
- **Forcing function and error prevention** - the interface needs to simplify and make tasks easier for the user at the same time protect users from making errors. This is especially important when paying bills, purchasing stock/shares/crypto, etc., or transferring money between accounts.
- **Predictability** - the user can determine the effect of future action based on past interactions.
- **Generalizability and user control** - extending interaction knowledge to new

situations

- **Task migratability** - giving the user flexibility to do certain tasks manually or have the automated system perform it for them (for example, paying bills, making stock, or other purchases).
- **Substitutivity** - allowing the users to choose between a percentage or exact amount, a share or a dollar amount to be saved or invested.
- **Reduce memory load** - notifications, reminders, clear instructions, and familiar labels to decrease the user's memory load.

6. DESIGN PROTOTYPING

Low-Fidelity Prototyping:
To begin our prototyping, wireframes were then sketched and developed, easily illustrating the previously developed task analysis. Within this step, the overall layout as well as key features, graphical themes, typography, and iconography were determined.

The budget screen was then developed to allow users to view their credit scores, balances, and transactions. It was then determined that a long press would bring up transaction details, allowing the user to categorize transactions (see Figure 6.1). The stock screen would provide a watchlist, a detailed stock view, analytics, news articles, and a place where the user could buy or sell stocks with ease (see Figure 6.2) Education would offer topics with experiential and informational learning options through the use of articles and interactive lessons that guide the users with incentives (see Figure 6.3).

Figure 6.1: Budgeting Wireframes

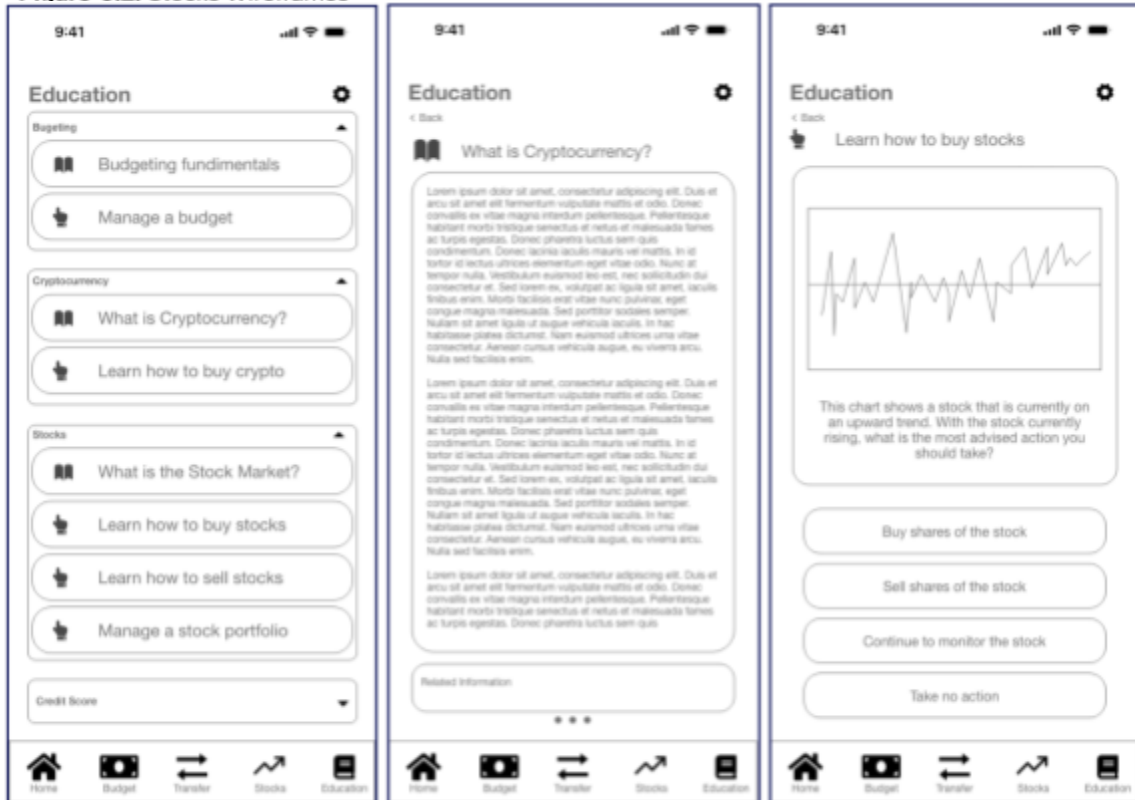**Figure 6.2:** Stocks Wireframes

Figure 6.3: Education Wireframes

UI Theme Guidelines:
Taking from graphic design trends, the user interface theme guidelines were then decided upon. Using digital lavender, gen z green, and blue violet to be the main application colors, with a deeper version of blue and green as secondary colors. The typography and iconography were chosen to be clean and minimal, using Josefin Sans, Yrsa, and Mukta, for fonts, and simple easily recognizable icons (Figure 6.4).

Figure 6.4: UI Theme Guidelines

High-Fidelity Prototyping:
Using what was developed for our wireframes and conceptional designs, the design process of turning them into the first ideation of our working high-fidelity prototype then took place. Determining what the most important features were, lead to the design choices of our budget, explore, and stock pages.

For budgeting, the user is presented with a screen that shows their budget, linked cards, and recent truncations, which can be easily edited to add additional tags or change what the system automatically tagged (Figure 6.5). This allows the user quick access to knowing exactly how much they have spent recently as well as what they currently have available in their account.

Secondly, education, now titled explore, had the goal to create a game-like system that encouraged users to continuously come back to learn more, utilizing two forms of learning, either reading articles or microlearning, where the user can earn virtual currency and turn their currency into actual shares of stock (Figure 6.6). The user is able to have the choice of how they would like to learn about a chosen topic.

Finally, there is the investing feature. The user is then able to apply their recently acquired skills and use them for their investments. In this area, they are presented with a watchlist, expandable details as well as a place to easily buy and sell shares of stock (see Figure 6.7).

Figure 6.5: High Fidelity Prototype of Budgeting

Figure 6.6: High Fidelity Prototype of Explore

Figure 6.7: High Fidelity Prototype of Stocks

7. USABILITY EVALUATION

Usability Goals:
During the product testing phase, Cache was evaluated to assess:

- How easily the users can learn to use the app
- Whether the system provides the correct functionality for the users to carry out desired actions (for example, budget and learn about finances)
- How efficient and effective it is in carrying out tasks with no waste of time and effort and doing what it is supposed to do
- How memorable the system is
- And how safe it is to use it (in this case the team assessed perceived safety)

Evaluation Methods and Procedures:
To understand the thinking of users and observe and identify design features that are easy or hard to use in Cache, a mix of qualitative and quantitative methods was used during the testing. The team used moderated remote usability testing, contextual inquiry/interviews, and think-aloud protocol. To Evaluate the usability of the mobile application, System Usability Scale (SUS) Questionnaire was utilized. The questionnaire consists of 10 questions that need to be answered according to a 5-point Likert scale (from strongly disagree to strongly agree). Five of the questions are positively phrased and the other five are negatively phrased.

The goal of qualitative testing was to understand how real users interact with our design, identify usability issues and inform design decisions, while quantitative data offered an indirect assessment of the usability of the design as well as the perception of usability.

The usability testing allowed the team to uncover the participant's mental models of the processes, evaluate how particular screens are aligned with their mental models, and collect information about their personal preferences and habits. SUS helped measure the **effectiveness** of the design and whether the users successfully achieved their objectives, the **efficiency** of the system to support successful task completion, and the overall **satisfaction** level of participants with the experience.

Some of the interview participants were recruited to return and test the high-fidelity prototype. The rest of the participants were new to the subject. The testing was done over Zoom and the XD prototype link was shared with the participants. During the usability testing, participants were asked to complete tasks in their own environment using their own devices. Some of the participants used their web browsers and some used their phones. They were asked to complete several tasks and answer questions about their experience, while the moderators were observing them. When asking participants to complete tasks, the moderators made sure the tasks were actionable and realistic and avoided words used in the interface. Participants were also instructed to verbalize their thoughts while interacting with the design. After each testing session, participants were given the SUS questionnaire to complete. The team used Google Forms to collect responses. The team ran 8 usability testing sessions.

Results & Reflections:
During the usability testing, the design team identified the following groups of issues related:

- **Information visualization & attention** (for example, cluttered visual interface, hierarchy problem between primary and secondary information display, information disclosure or ambiguity, etc.).
- **Perception, cognition, and reasoning** (for example, cognitive overload, mismatch of design intentions and user perceptions, user onboarding, and information reading and scanning patterns)
- **Personal preferences and digital accessibility**.

The design SUS score, based on the responses of 8 usability testing participants, was 76.88 (an average of individual SUS scores). SUS scores range from 0-100, where a score above 68 is considered above average and anything below 68 is below average. These scores are interpreted using percentile ranks as well as an approximation of the letter grades the scores correspond to. Referring to Figure 7.1 and Figure 7.2 we can see that the design is under the 80th percentile and corresponds to letter grade B - good and acceptable. However, in order to get a more precise score, the design needs to be tested and evaluated by more participants.
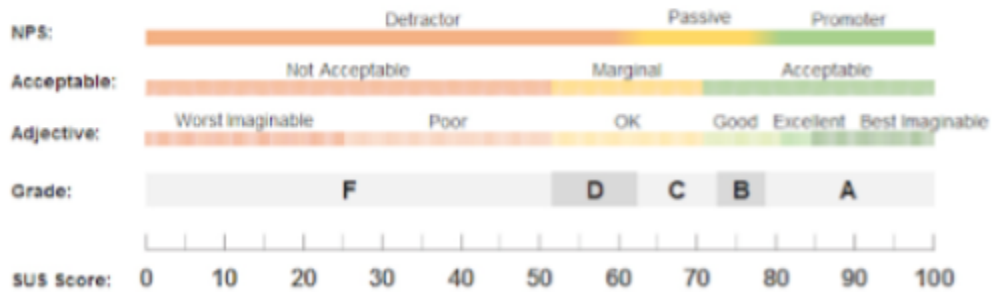
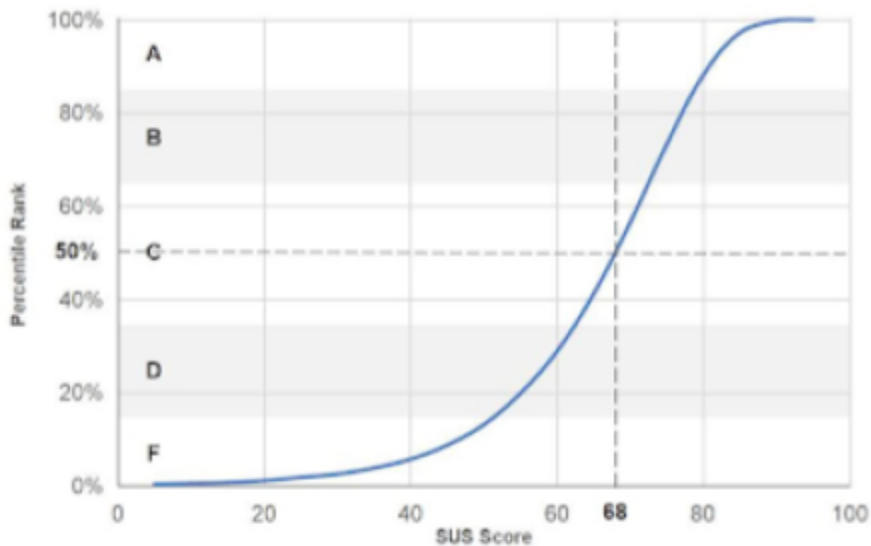**Figure 7.1:** Grades and adjectives associated with raw SUS scores.

Figure 7.2: SUS on a curve with percentile ranks

Design Iteration:
After conducting user testing, several features of the application were reevaluated and improved for a better user experience. First, the tags feature on the home page was changed to display only the most important tag with a numerical bubble next to it to show how many other tags apply to that transaction, making the interface less cluttered. Supplementary information was added to the Investments screen to aid understanding, such as how much they have gained or lost in one day, and by bolding the number of shares owned. The user was also made aware of the power to determine and assign a color to their tags.

The budget page was reworked by moving savings goals to its own page and placing the button at the bottom of the budget page to establish a hierarchy of primary and

secondary actions. We also reformatted the budget screen to display exact amounts instead of percentages, allowing the user to have a better understanding of how much they have left in each category.

The microlearning section of the application also underwent changes. The onboarding page was reevaluated to provide additional information and explain exactly what everything meant to help guide and inform the user. The initial prototype implied that there was an article to be read before completing the activity, causing confusion among users. The introduction of the needed information helped users understand the activity better and removed unfavorable associations with learning and knowledge.

Finally, customizability and personal preference were implemented into the application, allowing the user to choose colors for labels and increase the overall text size. Background colors were standardized, eliminating confusion around assumed color coding. Unnecessary scrolling was eliminated, simplifying the user experience and preventing user error. The emphasis on the budgeting explore page was changed to prioritize the article topic instead of how long it takes to read, allowing users to easily identify article topics. Overall, these changes were made to enhance the user experience and improve accessibility and personal preference (See Appendix B).

Issue identified	Solution
Remove Visual Clutter	Removed multiple tags from home screen, only displaying the most relevant and a numerical bubble
Information visualization and cognition	Added supplementary information, bolding text
Support progressive disclosure of information	Making a clear path of how the user adds tags to a transaction
Prioritize content and support less thinking	Developed a hierarchy of information by moving savings goals to its own page, utilizing exact amounts over percentages
User onboarding	Provided clear information around what the symbols meant
Mitigate the mismatch of design intentions and user perception/concept associations	Provided needed information to remove negative association with testing
Reduce memory load	Integrated a question mark button, allowing users to reference back any time during activity
Support accessibility and customizability	Allowed changing of colors as well as text sizes

Prevent information distortion and ambiguity	Removed assumed color coding
Support how users divide their fixation across the page	Eliminated unnecessary scrolling, changed emphases from time to titles

8. CONCLUSION

Summary:
When developing and testing Cache, there were several iteration considerations that needed to be taken into account, such as optimizing the number of tasks to test, balancing between discoverability and cluttered interface, simplifying functionality, and understanding unique user preferences. However, there were also limitations to the testing process, such as limited access to the desired user population, uneven gender distribution of participants, limited course time, and limitations of the testing tools (Zoom and Adobe XD).

From usability testing results it can be inferred that overall, Cache is:
- Easy to learn and use
- Provides the correct functionality for the users to carry out the desired actions
- Supports users in completing tasks with no additional time and effort
- And the system is doing what it is supposed to do - easily manage finances and increase financial knowledge in one platform

In sum, Cache is a unique platform that provides users with an all-in-one solution for managing their budget, increasing financial knowledge, and planning their financial future and investments. The product distinguishes itself from other banking apps by offering these comprehensive services within one platform.

Recommendations for Future Work:
For future endeavors, the team plans on continuing iterations of Cache by implementing and testing remaining features, such as transferring money from one account to another, as well as peer-to-peer developing and testing the security and adding account features. From there we recommend the testing and further development of Cache, utilizing in-person testing to optimize the testing experience by pushing the limitations of Adobe XD, having working prototypes on phones, as well as testing lighting conditions to make sure Cache works well whenever the user opens it.

To optimize user interaction, it is important to keep the audience in mind and make informed decisions, prioritize accessibility, and consider using the same participants throughout the entire testing process for more efficient usability testing.

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[1] "Gen Z Has the Lowest Financial Literacy, Study Reveals". *TIAA Institute*. *https://www.tiaainstitute.org/about/news/gen-z-has-lowest-financial-literacy-study-reveals*.

[2] "Financial literacy and well-being in a five generation America". *TIAA Institute. https://www.tiaainstitute.org/sites/default/files/presentations/2021-10/TIAA%20Institute_GFLEC_P%20Fin%20Index%20Finacial%20literacy%20and%20wellbeing%20in%20a%20five%20generation%20America_TI_Yakoboski_October%202021.pdf*

[3] "TikTok and TFSA; Personal finance; Your personal finance salvation can be gained from some improbable sources: Gen Z and millennials". *https://www.proquest.com/docview/2478290096?accountid=14578&parentSessionId=YlNI%2FBm3vaRqxq4JYflYuVE6%2BzA2aCi%2FFilMEqGBOYQ%3D&pq-origsite=summon*

[4] "Generation Z: Stepping Into Financial Independence". *Investopedia https://www.investopedia.com/generation-z-stepping-into-financial-independence-5224362*

[5] Jeff Sauro, P. D. (n.d.). 5 ways to interpret a sus score. MeasuringU. Retrieved April 23, 2023, https://measuringu.com/interpret-sus-score/

APPENDIX A

IN-DEPTH INTERVIEW QUESTIONNAIRE

Protocol & Questions:
Begin the study by introducing yourself and then summarizing the following paragraph from the consent form:

> "This interview is part of a research conducted by a team of graduate students at the University of Michigan-Dearborn studying the habits, frustration, and needs of young adults who manage their budgets and finances, invest in the stock markets, and in general how they are engaged with different applications to complete financial tasks. We also want to learn what type of platform you use or need to learn more about finances and how best to manage your personal finances.
>
> Taking part in this research project is voluntary. You do not have to participate, and you can stop at any point during the interview.
>
> The interview will be recorded, just so that we accurately capture all information. The information you provide will be combined with the data received from other participants of the study. Only de-identified results will be used, which means that all personally identifiable information that could be linked to you will be removed and replaced with a participant code. All data provided to us will be kept confidential and stored on a secure database.
>
> If you agree to participate, please sign the consent form so we can continue."

Share the consent with the interviewee to sign.

Begin the interview by reminding the interviewee that we are not measuring their knowledge but rather how they do things.

When answering questions, please remember that there are no right or wrong answers. Keep in mind that everyone has their own ways of doing things.

SECTION I
Q. We will start with some demographic questions:
- How old are you?
- How do you identify yourself?
- What is your occupation?
- What is the highest degree or level of education you have completed?
- What is your marital status?

SECTION II
Now I am going to ask more questions about finances. I would like you to think about managing your personal finances.

Q. Who is responsible for day-to-day decisions about money in your household?

Q. What about your personal finances? Do you have a personal budget where you decide your spending, paying the bills, savings, or investing? What type of financial products do you use?

> *Interviewer, do not read anything, if the interviewee asks for an example, mention the following: bank account (checking and or savings account), mortgage, loan, investment account, credit card, stocks/shares/bonds.*

Q. Do you use any apps that track your money usage or help you manage your finances? Can you tell me what are those? What is the main purpose of this app? How often do you use it/them?

> *If the interviewee does not use apps, ask*

How do you keep track of your finances?

Q. How do you go about with your financial matters? Who/what do you consult? Where do you find information?
Q. Which source of information or who do you feel is the most influential in your decision when it comes to making financial decisions?

SECTION III
Now let's discuss a few scenarios.
Q. Let's imagine you want to buy a new product, before buying it, what do you usually do or consider?
Q. Would you rather spend your money or save that money or maybe even invest? Why?
Q. Now let's imagine a situation where your income does not cover your living costs, what will you do?
Q. Now let's imagine you have some extra money in your checking account, what would you do?
Q. In what situations would you consider risking some of your money?
Q. What is your knowledge about the stock markets, investing in stocks, cryptocurrencies, and NFTs? How did you learn about them? Do you spend time searching for information and learning more about them on a regular basis or occasionally?

> *If does not know much, ask*

Would you be interested in learning about them? What would be the best way for you to learn about the stock markets?

Q. Let's imagine a situation where you need to do a new task that is related to your personal finances, but something you have not done before. What would that be?

Since you have not done this before and have limited or no knowledge about it, what would you do in this case? You can list the steps or discuss your approach to finding a solution to this situation.

Q. What would be the best way for you to learn more about managing finances in general?

Financial Literacy Questions:
Q: How familiar are you with the stock market? Could you describe a bullish market? A bearish one?
Q: Do you know the current going rate for bitcoin?
Q: How would you explain the blockchain and NFTs to someone that doesn't know about them?
Q: What applications are you currently using to track stocks, NFTS, or cryptocurrency?
Q: If you have a question about what stocks you're investing in, where do you typically turn to find resources?

SECTION IV
Now let's talk about some financial apps
> *If they mentioned an app they use, ask the following questions, if not, move to the*
> *New app questions.*

Q. Could you please tell me what features you like in the app(s) you currently use?
Q. Is there anything you would like to see that is missing from the app(s)? Or maybe some feature annoys you and you want to change it?
Q. If you could change or add anything, what would that be?

New App Qs:
Q. Do you think there is a need for a new financial app that can help you plan your finances and learn more about finances? Why and why not?
Q. How would you personally use this app? Why would you not use it?
Q. What is one feature in this financial app **MUST** have?

Thank you for your time and for helping us with this study.
DIARY STUDIES FORM

This study is part of a research conducted by a team of graduate students at the University of Michigan-Dearborn to understand the habits, frustration, and needs of young adults who manage their budgets and finances, invest in the stock markets, and in general how they are engaged with different applications to complete financial tasks. We also want to learn what type of platform you use or need to learn more about finances and how best to manage your personal finances.

Taking part in this research project is voluntary. The information you provide will be combined with the data received from other participants of the study. Only de-identified results will be used, which means that all personally identifiable information that could be linked to you will be removed and replaced with a participant code. All data provided to us will be kept confidential and stored on a secure database.

This study will last for one week, during which time we ask you to answer a few quick questions that can be texted or audio recorded and sent to us every time you use a financial product. These can include activities related to your bank account, mortgage, loan, investment account, credit card, stocks/shares/bonds, etc.

If you agree to participate, please sign the consent form.

Google form questions:
1. In your response, please briefly describe your goal. Please note that no details or dollar amounts need to be recorded.
   > Examples:
   > want to check the stock market today or purchase a stock/cryptocurrency
   > want to track my expenses for the past week
   > want to see if the payment hit my account
   > want to send money, etc.
2. Name the app(s) you used.
   > For example:
   > Used Robinhood app or Chase bank app, etc.
3. Whether you successfully reached your goal or completed the task.
4. Whether you knew how to do it or had to search for additional information to complete the task. Please briefly describe what information you tried to look up and how.
5. Whether you were satisfied with the process and results and what were your frustrations.
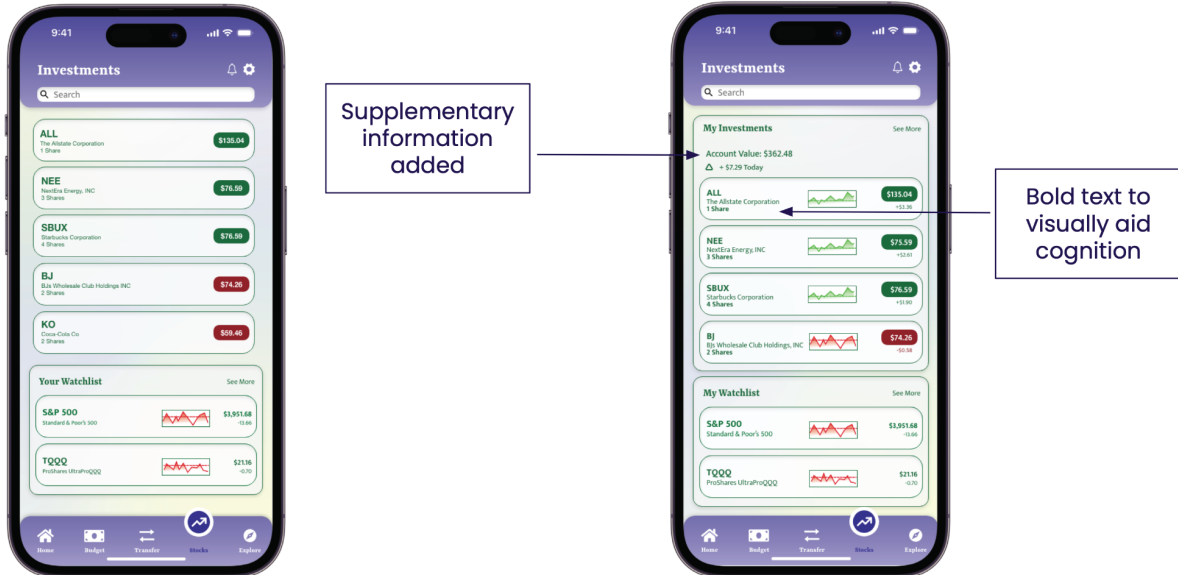
Appendix B

Remove visual clutter
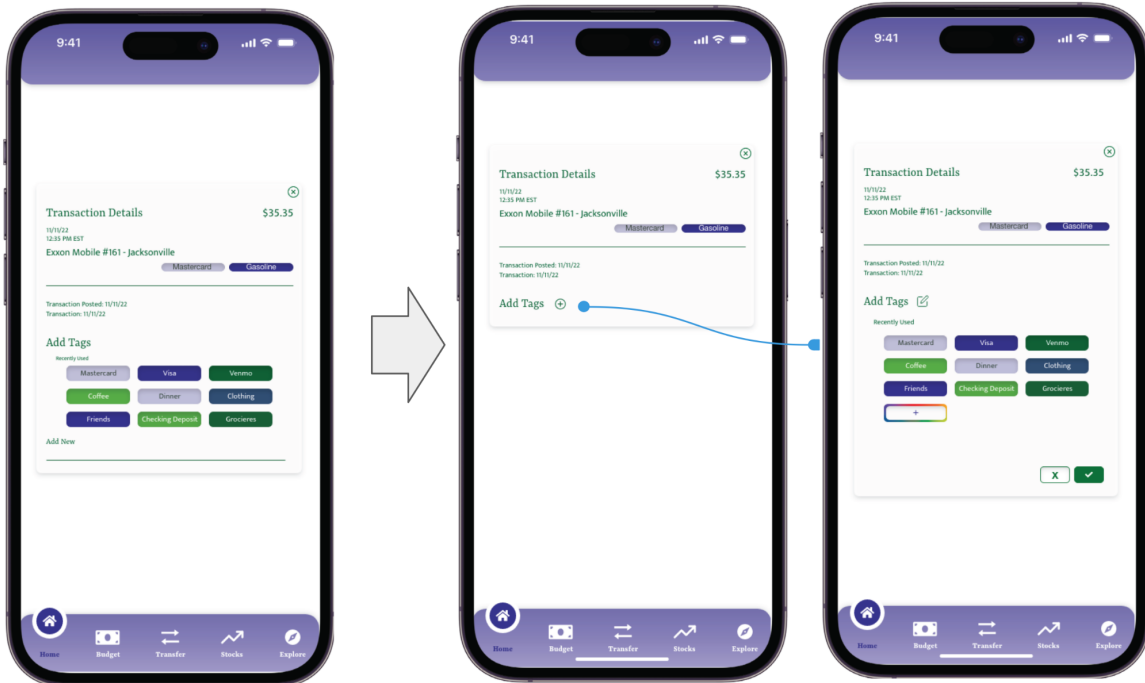Support clean, yet informative and functional interface
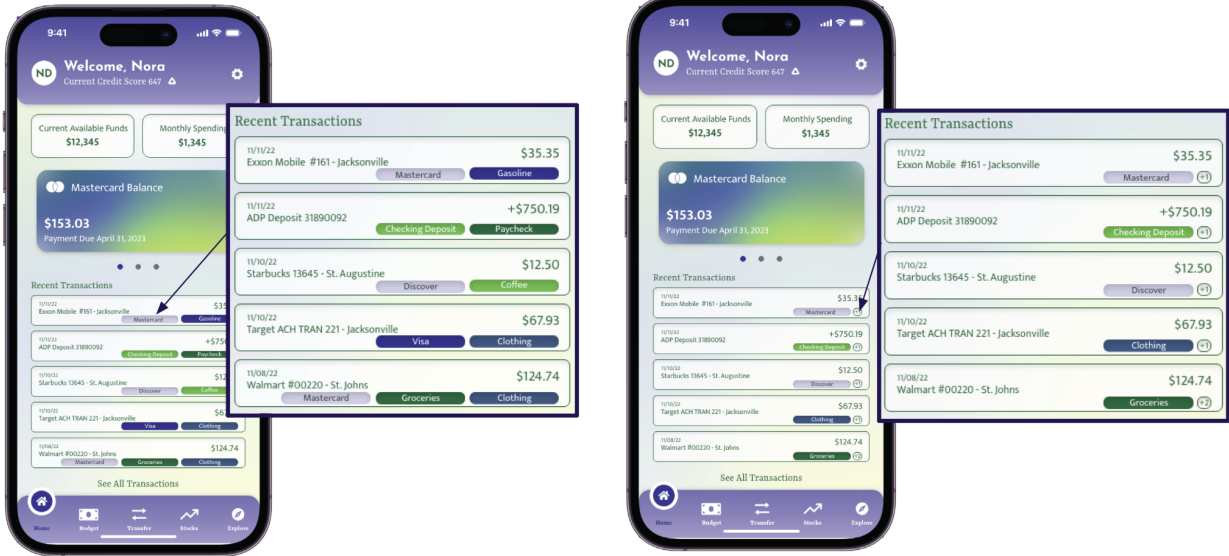
Information visualization and cognition
Visually aid cognition, simplify and enhance recognition, and display supplementary information for ease of comprehension

Supplementary information added

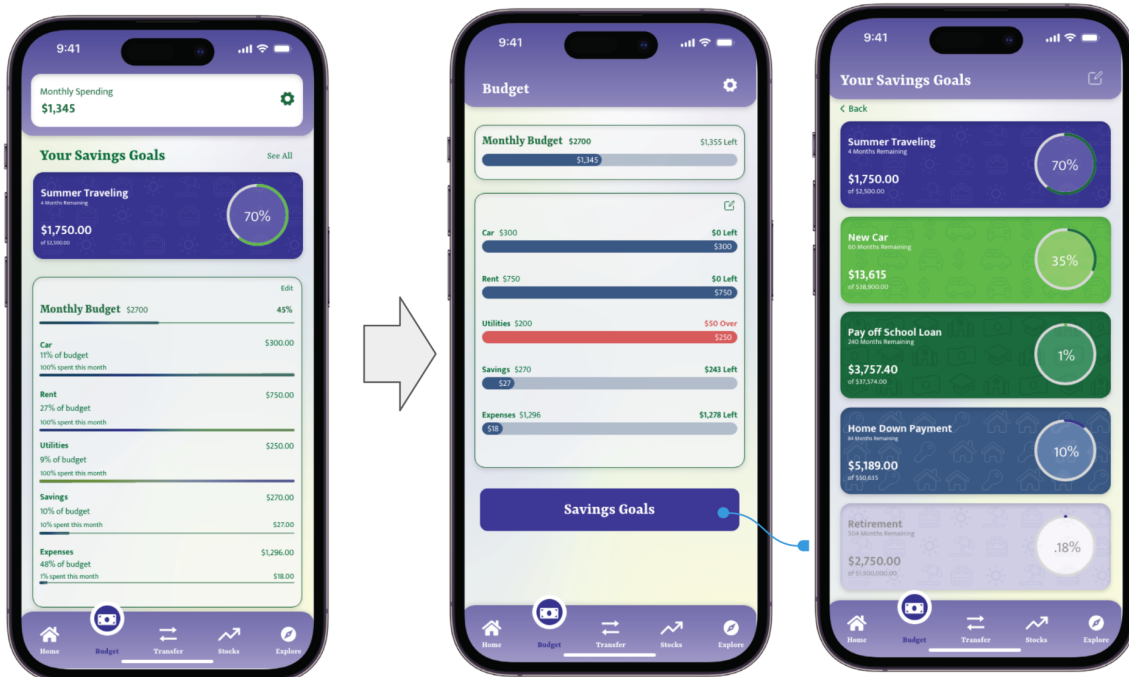Bold text to visually aid cognition
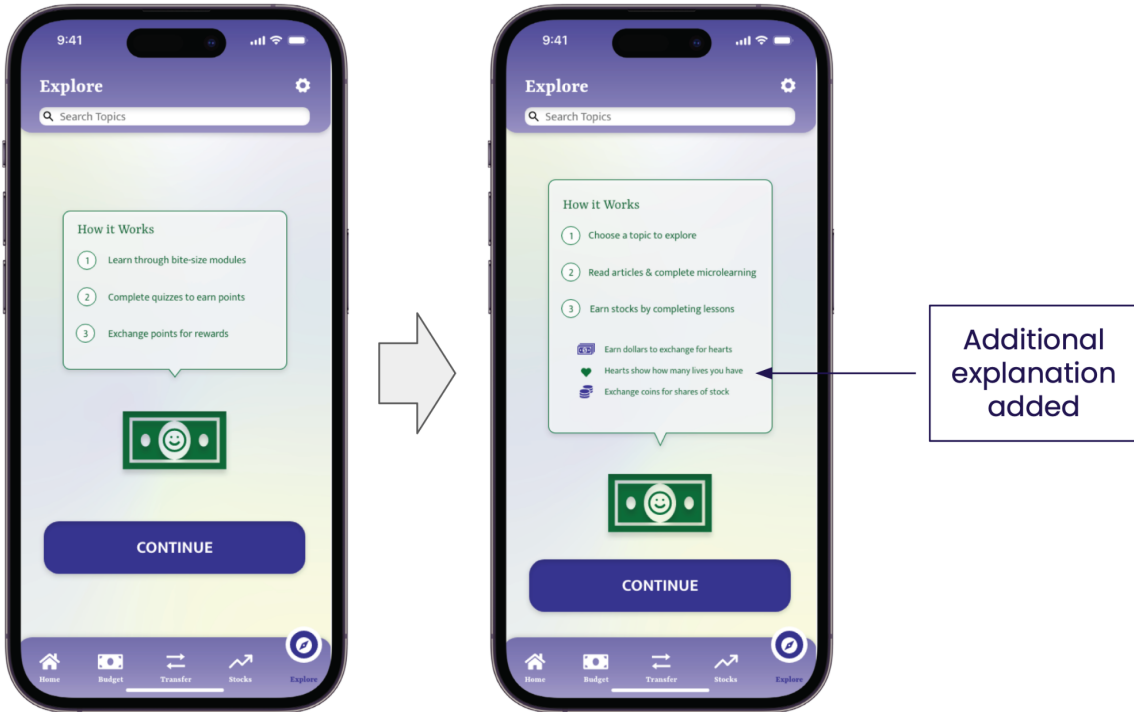
Support progressive disclosure of information

Prioritize content and support less thinking
Eliminate hierarchy problems between primary and secondary action/ information display
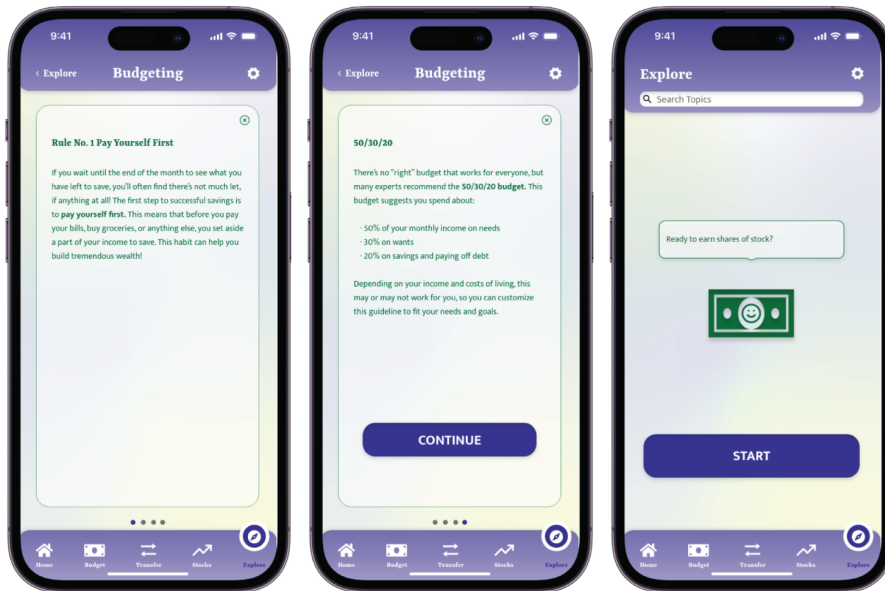
User onboarding

Provide explanation or guidance, inform but not overwhelm

Screen 1 (Explore):

How it Works
1. Learn through bite-size modules
2. Complete quizzes to earn points
3. Exchange points for rewards

CONTINUE

Screen 2 (Explore):

How it Works
1. Choose a topic to explore
2. Read articles & complete microlearning
3. Earn stocks by completing lessons

- Earn dollars to exchange for hearts
- Hearts show how many lives you have
- Exchange coins for shares of stock

CONTINUE

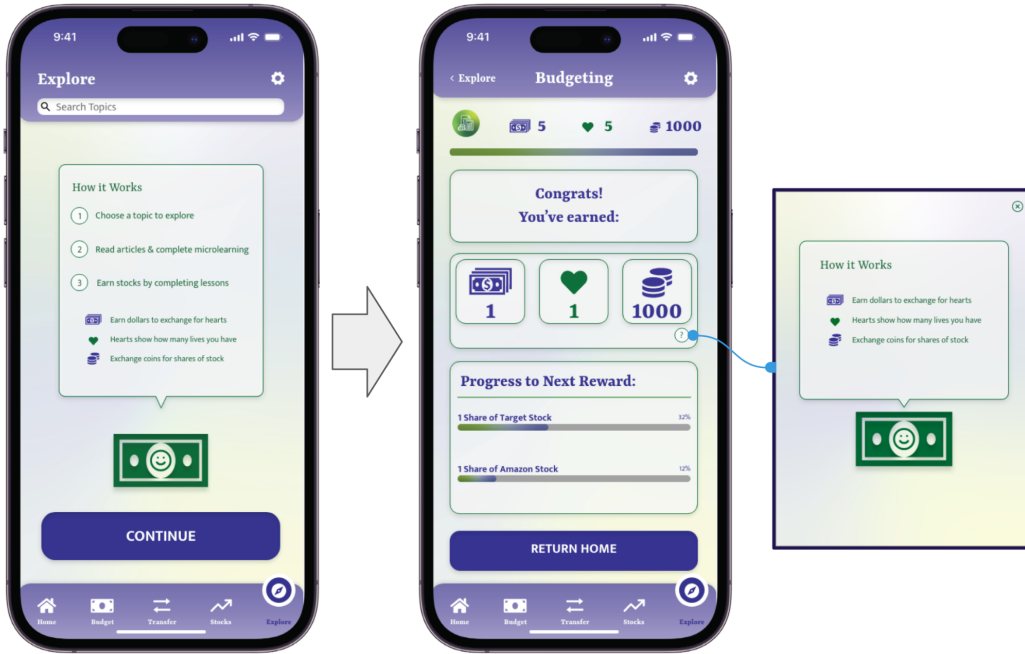Additional explanation added

Mitigate the mismatch of design intentions and user perceptions/concept associations

Introduce more guidance to somewhat break the stereotypical approach to concepts unfavorably associated with learning and knowledge testing

Screen 1 (Budgeting):

Rule No. 1 Pay Yourself First

If you wait until the end of the month to see what you have left to save, you'll often find there's not much left, if anything at all! The first step to successful savings is to **pay yourself first.** This means that before you pay your bills, buy groceries, or anything else, you set aside a part of your income to save. This habit can help you build tremendous wealth!

Screen 2 (Budgeting):

50/30/20

There's no "right" budget that works for everyone, but many experts recommend the **50/30/20 budget.** This budget suggests you spend about:

· 50% of your monthly income on needs
· 30% on wants
· 20% on savings and paying off debt

Depending on your income and costs of living, this may or may not work for you, so you can customize this guideline to fit your needs and goals.

CONTINUE

Screen 3 (Explore):

Ready to earn shares of stock?
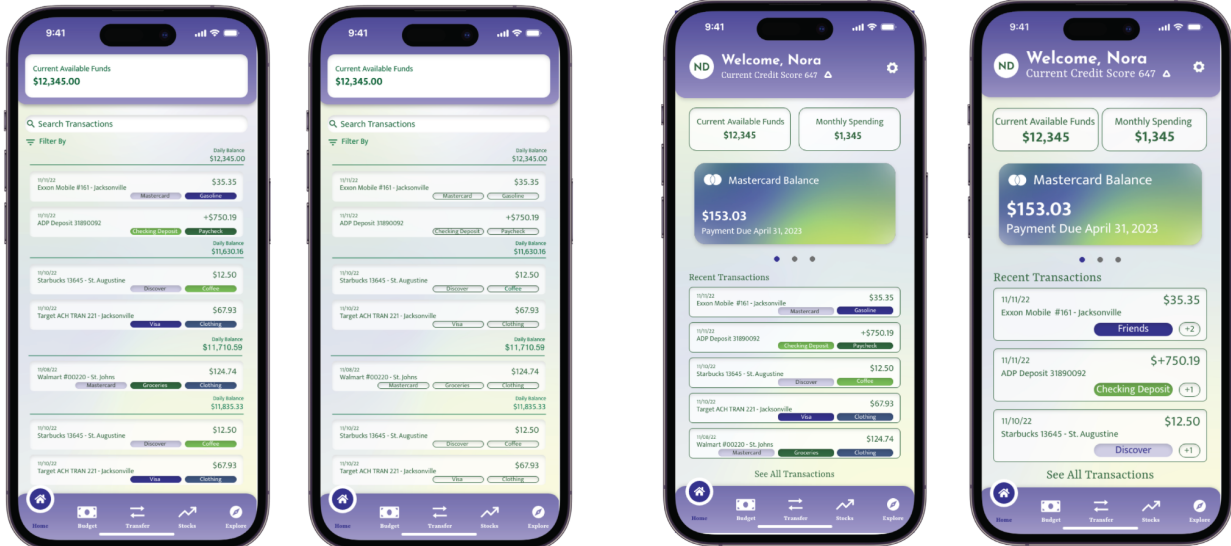
START

Reducing memory load

Reduce recall and the need to remember things
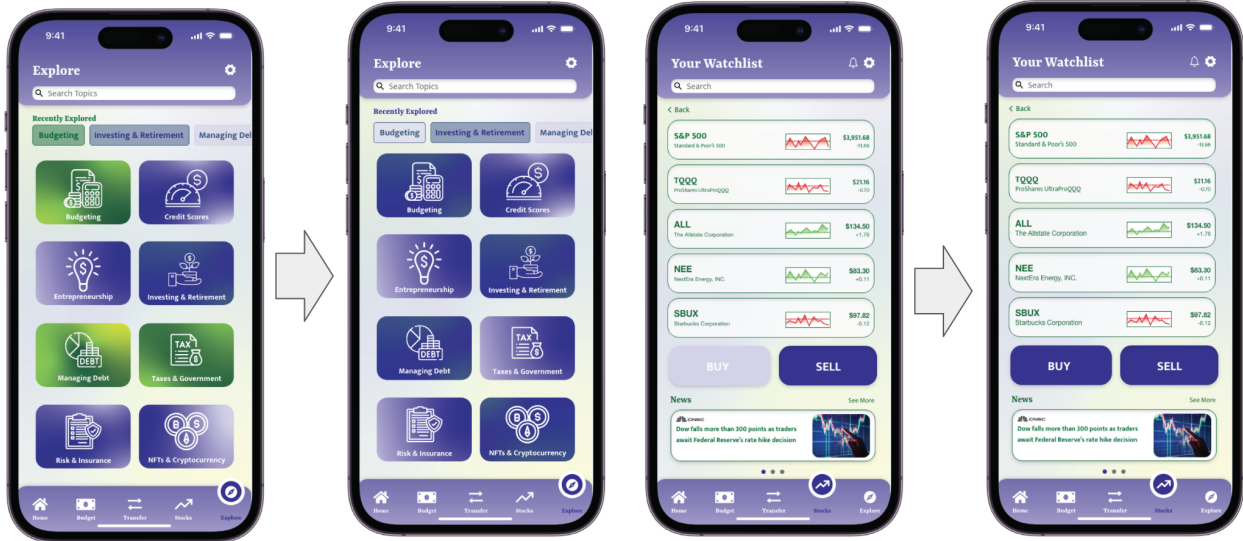

Supporting accessibility & customizability/personal preference

Color

Font Size

Prevent information distortion and ambiguity
eliminate confusion around possible color coding

Support how users divide their fixation across the page (scan/read information) & eliminate unnecessary scrolling