WPI

Stride

Building the Stride Score App for Informed Education and Career Decisions

Kseniia Romanova, Pooja Kawatkar, Dang Nguyen

WPI

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A Stride and WPI Collaboration

Project Team:

Kseniia Romanova | kromanova@wpi.edu

Pooja Kawatkar | pkawatkar@wpi.edu

Dang Nguyen | dhnguyen2@wpi.edu

Project Advisor

Professor Wilson Wong | Department of Computer Science

Professor Robert Sarnie | WPI Business School

Professor Marcel Blais | Department of Mathematical Sciences

Professor Jim Ryan | WPI Business School

Project Co-Advisor

Marc Trudeau | Agile Coach

Abstract

This paper explores Stride Funding's innovative approach to democratize education through the development of a website that empowers students to compare different college degree programs and their ROI, helping them make the best decision based on their financial and educational goals. The website was developed using GitHub, React, and VS Code. In a society where financial struggles impede students in their pursuit of higher education, traditional financing options pose barriers. Founded in 2018, Stride Funding emerged as a mission-driven fintech startup aiming to revolutionize education finance. Through robust solutions like Income Share Loans and Employer Sponsored Loan, Stride envisions a more affordable and accessible education environment.

Executive Summary

Stride Funding, founded by Tess Michaels in 2018, stands out as a promising company that offers solutions in the difficult realm of higher education funding. Stride Funding is a fintech startup that aims to transform access to education by providing outcomes-driven financial products. Their approach includes flexible income-based repayment plans, employer sponsored loan programs, and other financial products - none of which require a cosigner or minimum credit score to qualify - thereby promoting educational access and economic mobility. With influential investors and a skilled team, the organization is known for its forward-thinking leadership and its vision of creating a more equitable world, where educational opportunities are available to learners of all backgrounds.

To support Stride's goal of enhancing educational accessibility, our team developed a React-based web application using public data sources processed in Excel. Utilizing Visual Studio Code as a key technology, the application was created over 7 weeks in close collaboration with stakeholders to ensure that our final product aligns with the project requirements. We utilized Slack for communication and Jira as our project management platform for efficient task monitoring. Daily meetings and consultations with sponsors and advisers provided consistent feedback and risk mitigation. Stakeholder interactions, including presentations and interviews, allowed us to refine the project understanding and align with Stride's vision.

After creating multiple mockups in Figma and finalizing our app, we delivered a product that empowers students to explore different educational programs and their projected Return on Investment (ROI) through an interactive map, filters, and a personalized favorites feature. Users can assess and choose educational programs while gaining insights into program availability, location, career, salary outcomes and more academic opportunities. Additionally, students can bookmark their preferred programs as favorites and effortlessly email them to themselves, providing a convenient way for future reference. Our team documented our data cleaning process using Jupyter notebook, ensuring replicability, as well as deployed the app through Vercel.

The project our team delivered aligns with Stride Funding’s corporate mission to reduce the debt burden for students. Through our application, we have not only provided students with a powerful tool to discover their optimal educational and career paths but also empowered Stride Funding to expand its reach and impact. By initiating a dedicated support program for students, our app serves as a catalyst for broadening the company's influence within the educational landscape. As we look ahead, our team is enthusiastic about the potential upcoming enhancements to the web application, which will further improve user satisfaction and accessibility, reinforcing Stride Funding's mission on an even grander scale.

Acknowledgement

We want to thank all the individuals and organizations whose support and guidance were vital in completing this project. We are grateful to our advisors, Professor Wong, Professor Sarnie, Professor Ryan, and Professor Blais, as well as our team assistant Manasi Danke, for their insights and mentorship during this project. They played a significant role in shaping the direction and success of our work through our weekly meetings and feedback sessions.

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1. Introduction

In a world where the pursuit of higher education often feels like an enormous financial challenge, the limitations of traditional financing options become evident. Students frequently face obstacles in securing access to credit products through conventional lender due to a lack of an established credit history or access to a co-signer. The reliance on credit scores, a metric that many students are yet to establish, creates a barrier to accessing educational funds. Furthermore, many students do not have access to a willing or qualified co-signer. Amidst this financial struggle faced by students, Stride Funding stands as a source of hope and innovation.

Stride Funding, founded by Tess Michaels in 2018 while a student at Harvard Business School, is a mission-driven fintech company dedicated to reshaping access to education and career pathways through groundbreaking forms of financing (Kafafian, 2021). Unlike traditional loans that lock students into rigid repayment structures, Stride offers affordable repayments based on income as well as employer sponsored loan programs. The company has been recognized as a visionary leader by FinTech analysts for its innovative funding arrangements and commitment to career support.

Stride Funding's core mission is to create a better, more equitable world by building financial journeys that open doors and give power to learners ("About Us"). Instead of relying on conventional metrics like FICO scores or cosigners, Stride Funding's approach utilizes innovative techniques to provide students of all backgrounds with alternative financing products, like: Income Share Loans, Deferred Tuition Agreements, employer-sponsored loan programs, and more (Kafafian, 2021). The company envisions a world where educational opportunities are accessible to all, irrespective of their background, fostering economic mobility and career success. Stride Funding's commitment to this mission has earned it a place on the Forbes Fintech 50 2023 list and the title of Startup of the Year by Startup Boston in 2022 ("About Us").

In alignment with its overarching mission, Stride Funding guided the team through the development of an educational opportunity website. This platform aims to empower students to explore and access information on a plethora of educational programs with ease. This enables students to make an informed decision based on their needs both academically and financially by evaluating various college degree programs and their projected return on investment (ROI). Using a map and user-friendly interface, students can navigate their way through the website, allowing them to discover personalized educational opportunities that match their goals. This application reflects Stride Funding's commitment to helping students align the cost and value of education; shaping the future of educational financing through innovative solutions, creating a world where education is a gateway to success, accessible to learners of all backgrounds.

2. Background

2.1 Company Background

Founded by Tess Michaels in 2018, while a student at Harvard Business School, Stride Funding is a small private financial service company headquartered in Boston, Massachusetts with a dedicated team of approximately 40-50 employees (Kafafian, 2021). As a mission-driven fintech company, their core mission revolves around broadening education access and offering students innovative lending solutions as an alternative to fixed repayment installment loans. As Tess Michael states, “I think economic mobility is very much something I’m a huge believer in. Both my parents were immigrants, and education was the reason they really were able to progress in their careers and their journey to America” (Lasater, 2020). Stride Funding achieves this by utilizing educational and earnings datasets, coupled with advanced modeling techniques, to focus on accessing a student’s future career trajectory rather than their family’s credit history.

The company facilitates student-employer connections through school and university partnerships as well as their direct-to-students funding platform, offering outcomes-driven financing products. Over the past year, the company raised $105 million to support non-degree students pursuing alternative education programs like tech bootcamps and vocational schools, closing the largest Income Share Loan fund to record (“Stride Funding Partners with FinWise Bank”). Their national impact is evident through the launch of pioneering schools and programs, currently supporting students in over 150 bootcamp programs. Stride Funding’s exceptional achievements were acknowledged with a spot on the 2023 Forbes Fintech 50 List and named 2022 Startup of the Year by Startup Boston (“About Us”). Tess Michaels, the company’s founder, was also honored with the 2022 Founder of the Year award in the Startup Boston Community Awards.

The Company is sponsored and supported by Firework Ventures, GSV Ventures, Slow Ventures, Juvo Ventures, Graham Holdings and other impact investors. It has assembled a strong team with experience across the education, finance, and technology spectrum: SoFi, IBM, Intel, Klayvio, JPMorgan Chase, Liberty Mutual, Goldman Sachs, and Wells Fargo (Conner, 2019). Its capital partners include Silicon Valley Bank, Strada Education and Ascendium Education Group amongst others (Kafafian, 2021). Embracing a dynamic hybrid work culture, the company fosters collaboration, community, and work-life balance. Over the course of five years, the company has consistently striven to help students achieve their career goals. Stride Funding’s Savings Calculator web app empowers customers to measure their return on investment and its impact on retention (“Solve Nursing Retention with Stride”). The company’s comprehensive program also includes reducing students’ education costs and ensuring employment opportunities post-graduation (“Build Your Pipeline, Solve Retention”). This approach benefits educational institutions by boosting enrollment, while employers recruit students, establishing sustainable

pipeline of retained full-time employees at minimal upfront cost and risk. Stride Funding, guided by the fundamental belief that equitable education financing should be rooted in students' potential, not their past, actively contributes to creating a more equitable world by building financial pathways that open doors, empower learners throughout the nation, and facilitate economic mobility (Kafafian, 2021).

2.2 Background Research

2.2.1 Student Loans

Student loans are an essential financial resource that aids students in covering their college-related expenses. Whether obtained through government-backed programs or private lenders, these loans, along with accumulated interest, are expected to be repaid in a specified timeframe. These loans are favored by 36.7% of undergraduates from the 83.8% seeking financial aid (Hanson, 2022). Students can choose between federal and private loans, with borrowing limits determined by factors such as citizenship status, schools' cost of attendance, and credit scores.

Federal loans, with their low fixed interest rates, tend to be the primary choice for college loaners. They offer a default ten-year repayment period and provide flexible alternatives for borrowers who face financial difficulties. Therefore, federal loans present an attractive solution for unemployed or part-time students with limited credit histories, as they impose no minimum income prerequisites. The U.S. Department of Education issues four types of federal student loans: direct subsidized, direct unsubsidized, direct parent plus, and direct grad plus. Direct subsidized loans are specifically tailored towards undergraduate students in significant need of financial aid, while direct unsubsidized loans are available to both undergraduate and graduate students. Under the direct subsidized program, the government covers the interest that accumulates while the student is in college and for a six-month grace period post-graduation. However, with direct unsubsidized, the borrower is responsible for all accrued interest. Additionally, the Parent PLUS program is available for parents supporting their child's undergraduate education, while the Grad PLUS program assists graduate students with their educational goals. The distinction between these programs lies in the borrowers' identities. In the former, parents take out loans for their children, whereas the Grad PLUS program enables students to be borrowers for themselves.

Private student loans make up approximately 7% of the student loan market and are issued by financial institutions, including banks and credit unions (Tretina 2023). These loans primarily target undergraduate and graduate students, operating on a credit-based system, and offering the choice between fixed or variable interest rates for added flexibility. Students seeking private student loans have the autonomy to select their preferred loan period, typically ranging from five to twenty years, and personalize their repayment plan.

2.2.2 Websites

In today's digital world, the aesthetics and user-friendliness of websites hold a pivotal role in enhancing brand visibility, fostering customer engagement, and driving business growth. Studies suggest that a successful website should have a modern design, clearly defined structure, timely updates, user-friendly interface, speed, and reliability (Alhawari, 2021). By integrating these elements, businesses can build digital presence that not only captivates users but also strengthens brand credibility and longevity.

This emphasis on positive user experience is further reinforced by the fact that 95% of consumers prioritize it over other factors (DesignRush, 2019). A well-crafted website is crucial for businesses to convey their values, foster consumer connections, and expand their customer base (Pato ML, 2021). Websites can also enable the collection of data on customer behavior, preferences, and market trends, which can be analyzed to make informed business decisions and refine marketing strategies. In essence, a visually appealing website serves as a strategic asset for businesses to thrive digitally.

It is also important to adhere to the key principles of web design. The use of color should be minimized, following the recommendation of a maximum of five different colors, as stated in Handbook of Computer-Human Interaction (Juviler, 2022). Legible typefaces are essential, with a maximum of three different typefaces and sizes. Graphics should only be used if they aid user tasks or functions. Regarding navigation, keeping it simple, consistent, and including it in the footer contributes to a positive user experience (Juviler, 2022).

In addition to these principles, the overall look and feel of a site should be consistent across all pages, encompassing backgrounds, color schemes, typefaces, and tone of writing. Consistency positively impacts usability and user experience. User testing, feedback gathering, and implementation of changes based on insights are the final keys to improving website design. After all, design decisions should align with the preferences of the end-users (Juviler, 2022).

Furthermore, for web applications to evolve with their businesses, it's crucial that they exhibit flexibility and scalability tailored to the company's requirements, thereby streamlining the process of implementing updates ("5 Key Benefits of Web Applications for Business"). As businesses expand, the time required for incorporating relevant functionalities and features is significantly reduced.

2.2.3 Return on Investment

As a fundamental financial metric, Return on Investment (ROI) serves as a tool for accessing the profitability of an investment relative to its cost. By quantifying the return gained on an investment relative to its initial outlay, ROI enables investors and decision makers to gauge the efficiency and profitability of various options (Ip, 2016). At its core, ROI is a simple yet powerful formula that calculates the net gain or loss generated from an investment, expressed

as a percentage of the initial investment cost (Bodycomb, 2012). The formula for calculating ROI is as follows:

$$ROI = \frac{(Profit\ from\ Investment(10 years) - Cost\ of\ Investment)}{Cost\ of\ Investment} \times 100\%$$

When contemplating the decision to pursue higher education, the calculation of the ROI becomes imperative. With the escalating costs of tuition and the substantial investment of time and effort required, prospective students should evaluate the potential long-term financial benefits against the initial costs. By estimating the future earnings resulting from a college degree and comparing them to the associated expenses, individuals can assess whether the investment in higher education aligns with their long-term career goals and financial aspirations.

2.2.4 Student Struggle with Traditional Banking System

The struggle with the traditional banking system of United States and the affordability of college expenses has been an ongoing challenge for students pursuing higher education. As college costs increase, 70% of teens believe their decisions for post-graduation and higher education have been affected, with 49% concerned about the overall cost and 43% worried about taking student loans (Reinicke 2022). This issue is especially pronounced among students from lower income backgrounds, as only 1-5% of colleges fall within their financial reach. When federal student loans are considered, 70% of the colleges remained unaffordable for them (Bidwell 2017). To lower the student debt of post-graduation, some students adjusted their college plans, opting for in-state schools, commuting from home during their college years, or altering the duration of their degree program. Among 1,000 teenagers surveyed in a study conducted by Junior Achievement USA and Citizens Bank, 54% expressed worries about financing their futures, resulting in decisions hindered by high expenses (Reinicke 2022). Mindy Hager, vice president of student lending at Citizens Bank, advocates a guideline suggesting students to borrow an amount not exceeding their anticipated first-year post-graduation salary (Reinicke 2022).

The burden of student loans becomes apparent after graduation, as the costs of college education have steadily increased over the years, prompting a surge in the demand for financial aid. Unfortunately, a significant portion of student borrowers underestimate the impact of interest rates on their loan repayments. Long-term loans can result in students paying thousands of dollars more than their initial loan principal, often leading to enduring debt. In 2023, the student loan debt reached $1.75 trillion, with federal student loans accounting for 92% of this amount (Hahn, 2023). Limited understanding of the available loan options contributes to this financial predicament, posing a significant challenge for both students and parents when seeking financial assistance. Exploring other financing options such as scholarships, grants, and work-study programs before borrowing can help mitigate the risk of accumulating excessive debt.

Tailored specifically to higher education students, Stride Funding is committed to further the development and distribution of the Income Share Loans (ISLs) for graduate schools, steering away from fixed repayment installment loans (Conner 2019). With an ISL, students do not make a payment until after they have left their program and are earning above the minimum income threshold. The effective Income Share Percentage (ISP) on the Income Share Loan (ISL) is a fixed percentage of the monthly gross-income and will range between 1% and 15%, for a period of 60 months after the beginning of the payment term ("About Us"). ISLs play a pivotal role in aligning the education cost and value, allowing students to finance their tuition based on a percentage of their post-graduation earnings. In addition to ISLs, Stride Funding offers Deferred Tuition Agreements (DTA), a flexible alternative that requires payments from students only when they are earning an adequate living wage (Kafafian 2021). In contrast to the inflexible structure of traditional loans, Stride Funding provides a range of alternative and cost-effective repayment options based on the students' future income levels. Leveraging its ability to collect and analyze educational data from a diverse set of programs, the company strives to expand access to financial products. Students who participate as ISL and DTA holders are protected when earning below a minimum income threshold, and if they are unemployed or underearning, qualify for payment deferrals. If they can prove they never earn above the threshold throughout their maximum repayment period, they will not owe any payments at all. In the case of ISLs, when students earn more, they pay more, but when they earn less, they pay less- making them a flexible option. They also include a Maximum Payment Cap (never more than 1.5x the original amount funded, and often lower), so even if they earn a large amount after graduation, their payments have a limit.

2.2.5 Post-Secondary Student Data Sources

For developing an app that helps students choose the right educational program that matches their interests, the choice of data source is critical to providing accurate and valuable information. Among the data sources currently being used, the U.S. Bureau of Labor Statistics (BLS) stands out as one of the best options. BLS data is highly reliable and trusted for labor market insights, including information on job industries, employment projections, and salary statistics (BLS, 2023). This data can be invaluable for the app's filters related to industry, average salary after graduation, and return on investment (ROI). Its historical data can offer a comprehensive view of the job market, helping students make informed decisions about their educational and career choices. However, it's essential to ensure that the data obtained is prior to 2020 or is up to date (2023), considering the impact of the COVID-19 pandemic on the job market, and to consider supplementary sources for a well-rounded perspective.

In addition to the BLS, the Educational Data Initiative and College Scorecard are valuable sources for educational program-related information. These sources provide data on various educational programs, schools, majors, and tuition costs (Hanson, 2023). However, it's crucial to assess the reliability and relevance of this data, as educational programs and

institutions can change over time. The World Population Review can also contribute by offering location-related information (Rothstein, 2023), which is valuable for students considering the geographic aspect of their education along with the cost of living in one state relative to another. Overall, the best data source should meet criteria related to reliability, consistency, data quality, and relevance. To provide the most accurate and useful guidance, a combination of trusted sources like BLS and others, are a great contribution to the website filters that can help students make informed decisions about their educational and career pathways.

2.3 Similar Applications

Our MQP web application strives to make it easier for students in need of financial aid to access affordable education without fear of debt. To explore the most impactful method and clearly present the benefits of the Stride Funding solution, our team researched the best ways to implement visualizations and financial calculations. To make our application user-friendly, we decided to have a customized map and a table to visualize the optimal educational programs for the users based on their filters, which help calculate their unique ROI value.

Physician assistant students, typically investing four years in an undergraduate program followed by an additional two years in graduate school, experience a greater burden of student debt compared to their peers in other academic disciplines. Stride Funding addressed the issue of nursing retention in the field through a return-on-investment (ROI) calculator, see Figure 2-2. This calculator allows users to gauge their potential ROI impact on nurse retention by leveraging Stride's Talent Pipeline Solutions. The webpage is designed to efficiently compute ROI based on a series of specific user-provided inputs, which pertain to the user's healthcare system, with pre-filled values reflecting national averages. Nurses can gain insights into their ROI for various roles by providing details such as the type of nursing roles, recruitment costs, and turnover rates ("ROI Calculator"). With the Stride Pipeline, the company "facilitates upfront financing for talented students, disbursed directly to their institution." Similar to our application's objective, the company matches employers and students upon the students' graduation, launching their career as a full-time employee. This ensures students gain affordable education, while also solidifying a first career opportunity. In our Stride Funding application, we also took inspiration from the ROI calculator and implemented similar user-provided inputs and filters (e.g., living cost, education program, industry, etc.) that ultimately output the student's ROI.

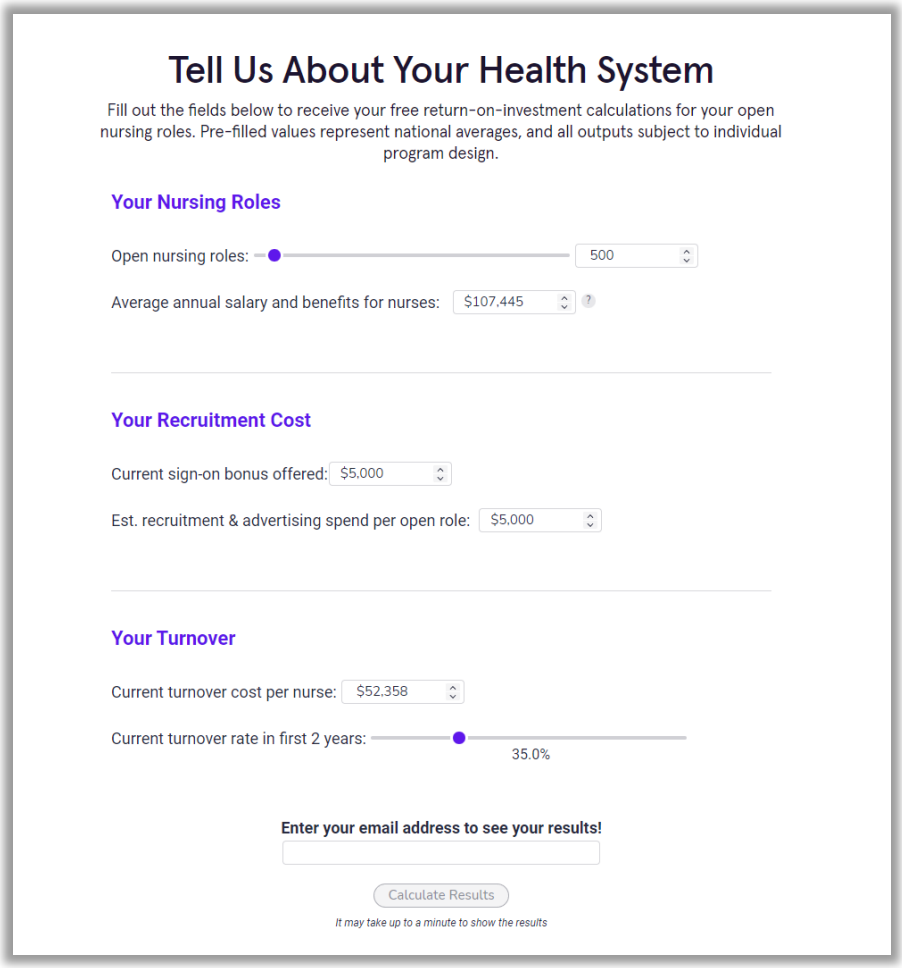

Figure 2-1: Stride Funding's webpage that applies filters based on the user's input before calculating return-on-investment ("ROI Calculator").

UNC Kenan-Flagler's Undergraduate Global Program webpage offers an informative platform for showcasing their global program, whose opportunities provide an overseas experience with a business focus. The variety of programs are displayed through a combination of visualizations such as an interactive map and a table ("Undergraduate Business Global Programs"). Users can effectively navigate through these visualizations using a set of filters that enable them to pinpoint the best program options suitable to their needs. These filters consist of program type, program term, region, country, duration, and language of instruction. Similarly, our application implements a map with filters including the educational program, the industry, location of educational program, tuition cost, living cost, career average salary, career employment rate, and ROI. The map itself is enriched with location pinpoints, which, upon hovering, provides the user with detailed information regarding the specific program associated with that location. This approach not only offers a visual representation of the options, but it also provides users with a clear detailed overview of their optimal program.

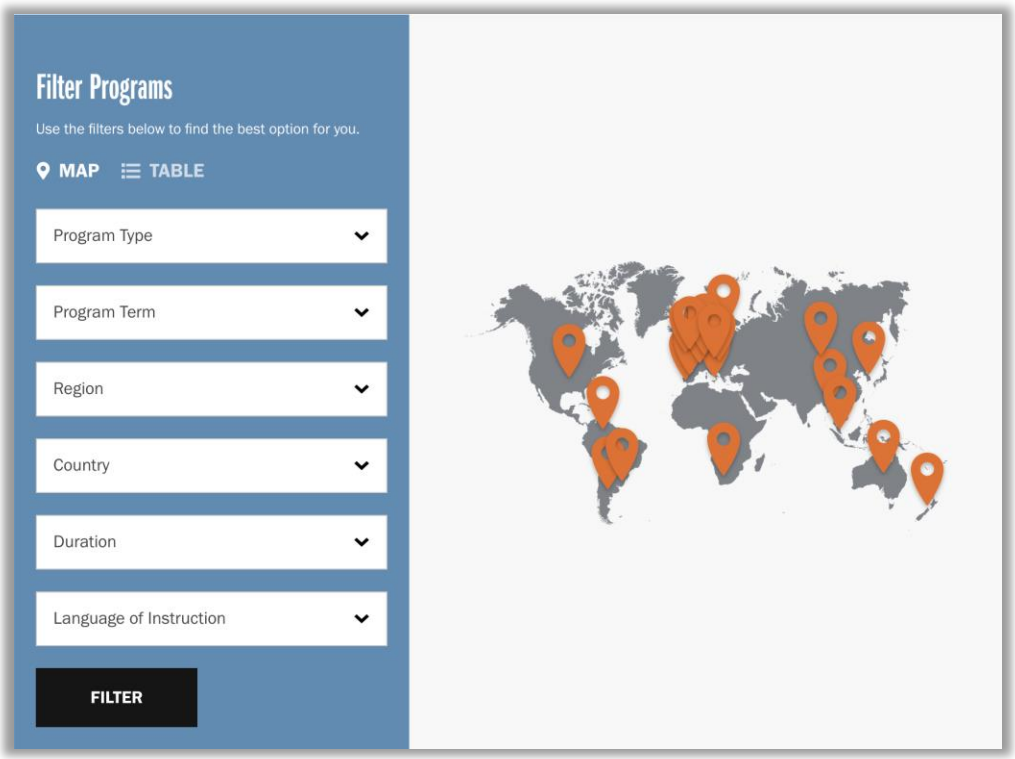

Figure 2-2: UNC's Undergraduate Global Programs website provides a map and a table visualization of the optimal programs after students input their filter options ("Undergraduate Business Global Programs: UNC Kenan-Flagler Business School").

3. Methodology

In this chapter, we delve into the systematic approach employed to conduct our research, providing a comprehensive understanding of the techniques, tools, and procedures utilized to address the research objectives. By outlining our research design, data collection methods, and analytical strategies, this chapter serves as the foundation upon which our study is built. It offers insight into the rigor and validity of our research process, ensuring the reliability of the findings we present in subsequent chapters.

3.1 Agile Framework

Our team started by implementing Agile into our project. Agile is a modern software development framework and project management approach that prioritizes flexibility, collaboration, and customer-centricity. It was initially conceived to address the limitations of traditional, linear project management methodologies. Agile emphasizes iterative and incremental development, effectively allowing teams to respond to changing requirements and customer feedback (Atlassian, 2023).

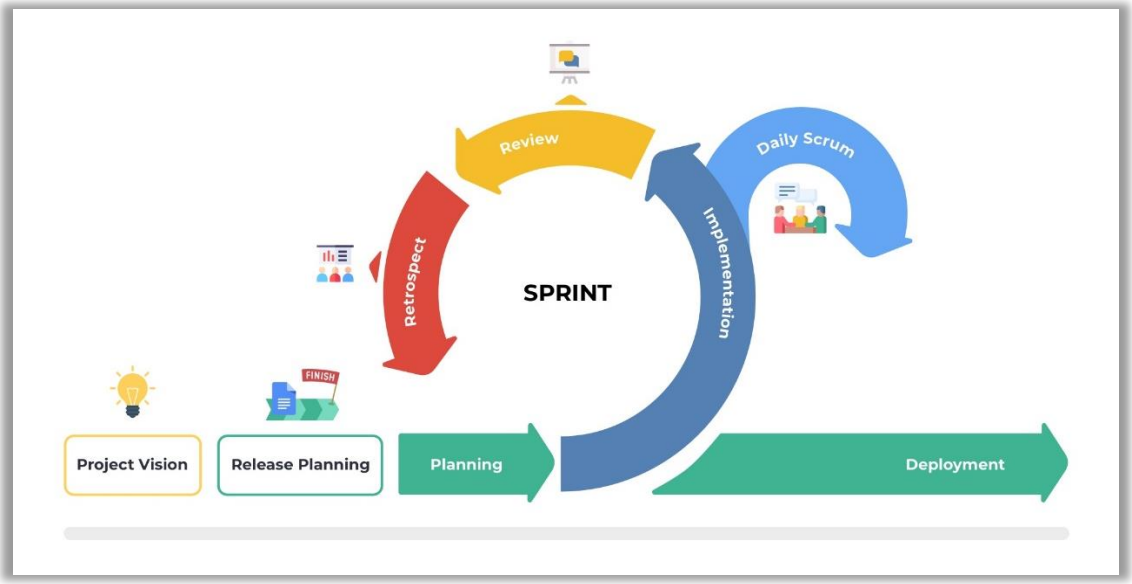

Figure 3-1: Visual representation of Agile Scrum framework including all steps in the continuous development cycle.

This framework works by breaking down complex projects into smaller, manageable units called iterations or sprints. These iterations typically last two to four weeks, during which cross-functional teams work collaboratively to deliver a potentially shippable product increment. Agile encourages frequent stakeholder engagement to ensure the product aligns with customer needs and market demands. Key principles of Agile include customer satisfaction through

continuous delivery, embracing change, and delivering working software as the primary measure of progress.

In the context of agile development, user stories and epics play a crucial role in effectively expressing and overseeing the requirements of a software project with a strong focus on customer needs (Atlassian, 2023). User stories are concise and user-centric explanations of software functionality expressed in simple language from the viewpoint of an end user. The conventional structure of user stories often adheres to the pattern of "As a [specific user type], I want [a specific action] so that [a particular benefit or value]." User stories, on the other hand, serve as compact and manageable work units that provide guidance to development teams in comprehending and delivering features in a gradual manner, guaranteeing a continual cycle of feedback and adjustment. In contrast, an epic can be defined as a comprehensive user story of considerable scope, which may involve numerous interconnected features or a substantial functional component (Atlassian, 2023). Epics offers a systematic approach for arranging and assigning tasks on a larger scope, enabling teams to deconstruct intricate projects into more feasible user stories. Agile teams can effectively preserve adaptability, address evolving requirements, and incrementally provide value by establishing a hierarchical structure comprising of epics and user stories. This approach facilitates the cultivation of collaborative relationships between developers and stakeholders throughout the entirety of the development process.

Key Agile meetings include the Daily Standup, where team members briefly discuss their progress and any impediments; Sprint Planning, where the team selects and commits to a set of user stories for the upcoming sprint; Sprint Review, where the team demonstrates the completed work to stakeholders; and Sprint Retrospective, where the team reflects on their processes and identifies areas for improvement. These meetings foster transparency, collaboration, and continuous improvement, making Agile a practical framework for today's dynamic business environment.

There are various positions which play a critical role in the development process when it comes to Agile. The three most common roles are the Product Owner, Scrum Master, and Development Team. The Product Owner defines and prioritizes the product backlog, representing the customer's needs. The Scrum Master facilitates the Agile process, ensuring the team adheres to Agile principles and helping to remove obstacles. The Development Team consists of cross-functional members responsible for designing, coding, testing, and delivering the product.

Within the context of the project, the team includes a combination of user stories and epics that are aimed to address in each sprint. The stories are assigned a score based on their relative difficulty. These stories are then prioritized in the project backlog by the team according to the agreed-upon value of each story.

4. Software Development Environment

In pursuit of innovative solutions, Stride allowed us autonomy in selecting our software development tools. These choices were guided by Stride's mission to create a website app aimed at empowering students to explore possible different educational programs offered by colleges across the U.S. achieve educational excellence. Consequently, we adopted a streamlined approach, relying on Jira for efficient project management, GitHub for version control, and Visual Studio Code as our integrated development environment. This software selection not only enhanced agility but also ensured seamless alignment with Stride's mission.

4.1 Project Management Software

In the context of large-scale projects, the implementation of management software is essential for comprehending, handling, and distributing work among team members. Moreover, it helps with resource allocation as well as project scheduling, allowing the team to channel their efforts primarily toward the core development activities.

4.1.1 Jira

For efficient project management and collaboration, our team relied on Jira as our primary project management tool. Jira, a product developed by Atlassian, is a versatile platform designed for issue and bug tracking as well as agile project management (Atlassian). This tool seamlessly integrated with our Agile Scrum framework and sprint-based development approach. Jira enabled the team to create stories and epics, prioritize them, assign points, and allocate tasks to individual team members. Additionally, it facilitated task tracking, providing a clear overview of pending, ongoing, and completed work (Atlassian). Jira's versatility and user-friendly interface made it the ideal choice for our team, promoting collaboration, monitoring progress, and ensuring timely project delivery.

4.2 Integrated Development Environment

Integrated development environment provides comprehensive tools for software development, featuring a source-code editor, build automation tools, and a debugger. In our project, the IDE played a key role throughout the project's lifecycle, from the initial stages of planning to the final phases of development and testing. This environment facilitated a streamlined workflow, enhancing our team's ability to construct a robust software solution with precision and efficiency.

4.2.1 Visual Studio Code

Our integrated development environment of choice was Microsoft Visual Studio Code (VS Code) 1.82. VS Code is a versatile and lightweight source code editor known for its powerful features, including robust debugging tools, intelligent code completion, and extension support ("Code Editing. Redefined."). These capabilities make it the preferred tool among developers for coding and debugging tasks. VS Code's user-friendly interface and efficiency greatly contributed to our website development, facilitating a smooth and productive development process.

4.2.2 GitHub Desktop

In our software development environment, we streamlined our project management and version control using GitHub Desktop 3.3.1. GitHub Desktop is a graphical user interface application that seamlessly integrates with GitHub, ensuring version control, collaborative coding, and project management tasks with an intuitive and user-friendly interface (GitHub). This integration allowed our team to effectively coordinate coding efforts, maintain version consistency, and manage project tasks, all within a streamlined and accessible platform.

4.3 Additional Software

Effective collaboration and communication are the core of any successful project. For our project, we used a variety of software tools to coordinate with team members, as well as sponsors and advisors. This ensured that our team stayed connected and informed throughout the project and enhanced our productivity and efficiency.

4.3.1 Zoom

Zoom 5.16.1, a cloud-based video conferencing service, was the primary tool that was used to facilitate meetings with our team, sponsors, and advisors ("One Platform to Connect"). Additionally, we relied on Zoom for our daily standups, sprint planning sessions and retrospectives, leveraging its screen sharing and recording capabilities to document and archive our discussions for future reference. Given the constraints of remote collaboration with Stride sponsors, Zoom was an essential tool for maintaining effective communication.

4.3.2 Slack, SMS

Our team utilized Slack 4.28, a cloud-based messaging app, to communicate with Stride sponsors and advisors. This platform has the capability to save information, optimizing the sharing of project-related data, which remained integral throughout the project's duration ("Where work happens"). Furthermore, we used Slack to resolve any blockers which proved to

be a faster option than traditional emails. Internally, our team utilized SMS to communicate with each other.

4.3.3 Microsoft Excel

Leveraging the expertise of our team members, particularly our MIS major, we efficiently harnessed Excel's capabilities to collect, manage, and filter the data required for our web application project ("Free online spreadsheet software: Excel: Microsoft 365"). This strategic utilization of Excel allowed us to streamline the data processing phase seamlessly, demonstrating our team's collaborative approach in optimizing the necessary components for the successful development of the website.

4.3.4 Jupyter Notebook

Our team incorporated Jupyter Notebook into our project workflow, responding to our sponsors' request for transparency in our data filtering process (Project Jupyter). With a dedicated focus on clarity and replicability, our team documented the step-by-step data filtration procedures in Jupyter Notebook. This not only ensures a comprehensive understanding of our data manipulations but also provides sponsors with the tools to recreate the process independently.

5. Software Requirements

5.1 Software Requirement Gathering Strategy

Over the course of the project, we partnered with Stride sponsors to define project requirements and scope. We maintained a regular cadence of weekly meetings to gather feedback and introduce innovative concepts to our sponsors. Early on, we encountered a scope adjustment, prompted by sponsors' interest in incorporating additional website features. Our daily scrum meetings proved invaluable in refining our project scope, ensuring it remained aligned with achievable objectives and guiding our development trajectory. Our scope and requirements continued to evolve, ultimately leading to the delivery of a minimum viable product as a result. Stride sponsors remained actively engaged, closely tracking our progress, and offering feedback for our user stories as we progressed through the development process.

5.1.1 Observation

Observation played a fundamental role as a research technique during the development of our app, involving the systematic and objective recording of behaviors, actions, and events in a specific context. Before the public release of the app, our team closely observed how sponsors and advisors interacted with it, aiming to gain firsthand insights into user behavior, identify usability issues, and assess overall performance. Through these observations, we were able to pinpoint problems with the user interface, navigate difficulties, and recognize areas where users might have experienced frustration or confusion. These insights proved invaluable, guiding us in fine-tuning the app's user interface, functionality, and overall design to ensure a seamless and user-friendly experience. Observations also provided an opportunity to gauge user engagement and satisfaction, enabling developers to make informed adjustments and improvements before exposing the app to a wider audience. In retrospect, pre-release observation significantly contributed to enhancing the app's chances of success by ensuring it met user expectations and delivered a high-quality experience.

5.1.2 Interviews

Interviews played a pivotal role in the context of our projects and research endeavors. They were an indispensable method for gathering primary data, insights, and perspectives from individuals who possessed crucial information or experiences related to the subject of study. In research, interviews are often used to conduct in-depth qualitative investigations, allowing researchers to explore complex issues, theories, or phenomena in greater detail. Through open-ended questions and dialogue, researchers could elicit rich, context-specific information that might not be obtainable through surveys or secondary sources alone. Moreover, interviews

facilitated the validation of hypotheses, the identification of potential variables, and the development of a comprehensive understanding of the topic at hand. They served as a bridge between data collection and analysis, helping researchers and project teams make informed decisions, refine their approaches, and contribute to the advancement of knowledge and project success.

Our team performed face-to-face interviews to gather more insightful qualitative data from talking to stakeholders. An interview is a form of a survey; however, it could be a lot more personal, where interviewees could reveal in-depth information about their experiences (Taherdoost, 2022). With the interview, our team hoped to gain a more personal connection with the app users to identify underlying problems we might have missed during the observation stage of the app functionalities. We derived a list of relevant questions regarding our topic of interest from the data collected through observation for the interview. As we interviewed the users, we also asked follow-up questions to the interviewee's responses.

5.2 Functional and Non-Functional Requirements

The functional requirements involve having a user-friendly interface with an intuitive navigation system, complemented by a dynamic map enabling students to explore educational opportunities. This map supports multiple filters, enabling students to refine their searches according to various criteria. In addition, the website provides users with the ability to save their search preferences and favorite opportunities, enhancing the overall user experience. Furthermore, the website facilitates communication between students and educational institutions, offering readily accessible contact details and application links.

In addition to the functional aspects, the non-functional requirements of the project were equally essential for its success. A well-documented codebase enabled seamless collaboration and knowledge transfer, allowing other teams or developers to maintain and contribute to the website. This documentation encompasses clear comments, adhering to consistent coding standards, API documentation, data models, and insights into the project's architecture. By documenting our code, we not only promote understanding within our development team, but empower future contributors to build upon our work. Another non-functional requirement was a modern and aesthetically pleasing design, ensuring a positive user experience. Both sponsors and advisors emphasized the importance of a visually appealing website. It should be compatible with various web browsers and maintain consistent visualizations across different devices and screen sizes.

5.3 User Stories and Epics

Sprint	User Stories & Epics	Points
Epic: Document our Findings in the Report		
A-0	As a Stride Team, we want to select a citation manager, so we can start managing our sources.	1
A-0	As a Stride team, we want to create documentation, so we can start writing our MQP report.	1
A-0	As a Stride team, we want to write the background research chapter, so we can have enough knowledge prior to creating a website.	2
A-0	As a Stride team, we want to write the software development chapter, so we have a documented list of used technologies.	2
A-0	As a Stride team, we want to write the introduction chapter, so we have a goal and a set of objectives.	2
A-0	As a Stride team, we want to write a software methodology chapter, so we have a description of Agile Scrum in our report.	2
A-1	As a Stride Team, we want to have better resources, so we can write the background chapter, with good supporting pieces of evidence.	2
A-1	As a Stride Team, we want to make small increments to our report so that we can avoid work piling up.	2
A-2	As a Stride Team, we want to revise our introduction chapter so that we can adjust based on new information.	2

A-2	As a Stride Team, we want to incorporate all resources and information into the background chapter, so that we have a clear structured background.	2
A-2	As a Stride Team, we want to reorganize our report, so that it is more coherent.	1
A-2	As a Stride team, we want to review previous teams' reports to make our chapters stronger.	2
A-2	As a Stride Team, we want to add additional information about interviews and observations to make our methodologies chapter complete.	2
A-2	As a Stride Team, we want to finalize information in the software development environment chapter to make it complete and strong.	1
A-2	As a Stride Team, we want to have a software requirements chapter, so we can organize our user stories, epics, and requirements.	2
A-2	As a Stride Team, we want to clean up the software development chapter, so that we can have a clean summary of previous retrospectives and weekly scrums.	2
A-3	As a Stride team, we want to continue adding to the Background chapter to add more context for the reader (3-4 sub chapters).	2
A-3	As a Stride team, we want to make sure the report has a consistent style to ensure good readability for the viewer.	1
A-3	As a Stride team, we want to peer review our work to have strong report chapters.	2

A-3	As a Stride team, we want to continue adding our weekly progress to our software development chapter of the report, to be able to reflect on our sprint and plan what our next steps should be.	1
B-1	As a Stride team, we want to complete the Website subchapter of the Background chapter, so we have more context on the topic.	2
B-1	As a Stride team, we want to complete the Data Source subchapter of the Background chapter, so we have more context on the topic.	2
B-1	As a Stride team, we want to complete the Student Struggle with Traditional Bank Systems subchapter of the Background chapter, so we have more context on the topic.	2
B-1	As a Stride team, we want to complete the Similar Applications subchapter of the Background chapter, so we have more context on the topic.	2
B-1	As a Stride team, we want to summarize the PQP sprint review paragraphs so that we have a general overview of what was completed before the project timeline began.	1
B-2	As a Stride team, we want to create an ERD so that we can clearly display the relationship between the dataset, and we can understand the Sponsor's criteria for the application's visualizations.	2
B-2	As a Stride Team, we want to create a process model to clearly display the project workflow, helping us better understand the tasks that need to get done.	2
B-2	As a Stride Team, we want to create a critical path so that we can better understand and prioritize the sequence of the tasks that need to be completed for the project.	3

B-2	As a Stride team, we want to continue working on the software development portion of the report, so that we can make continuous improvement as we move forward.	1
B-2	As a Stride Team, we want to revise and add to the website subchapter, so that we can make continuous improvement to our report as we move forward.	2
B-3	As a Stride Team, we want to continue working on the report, so that we can address the feedback we get from sponsors and advisors.	2
B-3	As a Stride Team, we want to rewrite the Abstract, so that it's more concrete.	2
B-3	As a Stride Team, we want to create a higher architectural model in the design section, so that we can display the project flow.	3
B-3	As a Stride Team, we want to address advisor comments on ERD, Critical path, and process model, so that it is most accurate for our project.	1
B-3	As a Stride Team, we want to create Data model and Network model, so that we can elements of data and standardized their relationship.	3
B-4	As a Stride team, we need to create a class diagram that represents our React components, so that we can see the flow of our web application.	2
B-4	As a Stride team, we need to continue updating our Software Development subchapter, so that we can keep track of our progress in each sprint.	1
B-4	As a Stride team, we want to create a UML diagram, so that it can easily display the design of our web application.	2

B-4	As a Stride team, we want to add all the diagrams to the report, so that it can display our design.	1
B-4	As a Stride team, we want to work on the Business/Risk/Management subchapter, so that we can better understand the company culture and meet the requirements for the paper.	2
B-5	As a Stride team, we want to write our Assessment subchapter, to reflect on what we have learned.	3
B-5	As a Stride team, we want to write our Future Work subchapter, so that we can brainstorm and recommend suggestions on the next steps of the project.	3
B-5	As a Stride team, we want to write our Conclusion subchapter, so that we can sum up the paper.	2
B-5	As a Stride team, we want to continue adding to our Software Development subchapter, so that we have an updated summary of our sprint.	1
B-5	As a Stride team, we want to clean up the citations and references subchapter, so that the structure is more organized.	3
B-5	As a Stride team, we want to implement feedback onto our high-level hierarchy diagram, so that it includes React components.	1
B-5	As a Stride team, we want to update our class diagrams, so that we understand better how the variables are connected between each component itself.	1
B-5	As a Stride team, we want to add user stories and epics in the methodology subchapter, so that we can explain the concept to the readers.	1

B-6	As a Stride team, we want to implement all our feedback into our report, so that we have a finalized draft.	3
B-6	As a Stride team, we want to create a presentation, so that we can show our project to our sponsors and advisors.	5
B-6	As a Stride team, we want to go work in the Stride Funding office, so that we can work in person and meet our Sponsors.	3
Epic: Implement Software Application		
A-0	As a Stride team, we want to install project related software, so we can start exploring new technologies.	1
A-1	As a student, I want to access a menu bar so I can easily navigate the app.	2
A-1	As a student I want to access the main Stride page, so I can learn more about other educational programs.	2
A-1	As a Stride Team, we want to have a Figma mockup, so we can plan on how to position different features.	2
A-1	As a Stride Team, we want to explore the public Data sources so that we can start data cleaning and analysis.	2
A-1	As a student, I want to view a footer, so that I can find an overview of the website and links to other websites.	2
A-3	As a student, I want to review instruction on how to filter out the best educational program so I can compare them and figure out the one that matches my interest.	2

A-3	As a student, I want to learn more about the website through the website overview so that I can understand the purpose of the app.	2
A-3	As a Stride team, we want to finalize the metrics we will use to filter for the map.	1
A-3	As a Stride team, we want to figure out the main data source we will use to work on the website.	2
B-1	As a Stride team, we need to figure out the best way to store the data, so that it's most efficient when the data must be linked to the website	2
B-1	As a Stride team, we need to find data for the tuition costs of the nation, so it can be incorporated into the general dataset.	2
B-1	As a Stride team, we want to clean the Tuition cost, state, and national occupation dataset, so that we can start using this finalized information for the website.	3
B-2	As a Stride team, we want to calculate the ROI on education for every state (once data has been cleaned), so users can easily view this information after filtering.	2
B-2	As a Stride team, we want to have a scheduled meeting with the Data Science team from Stride Funding, to get data clarifications and advice for data sources and data incorporation into web application.	2
B-2	As a Stride Team, we want to get a list of the Employer Sponsor Program from Stride Funding, so that we can figure out a way to link the data to the website.	1
B-2	As a Stride Team, we want to update our mockup based on sponsor feedback, so that we can have a better website layout.	2

B-2	As a Stride Team, we want to pick a database to store our data, so that we can access it efficiently for the website. As a Stride Team, we want to pick a database to store our data, so that we can access it for efficiently for the website.	2
B-3	As a Stride Team, we want to combine the data into one dataset and link the data to the webpage so that we can create a table.	3
B-3	As a Stride Team, we want to reorganize the website layout through Figma, so that we can resolve the sponsor feedback in terms of website user friendliness.	3
B-3	As the Stride Team, we want to create a sample data to use for mockup code, so that we can start data implementation.	1
B-3	As a Stride Team, we want to create and link the mock-up table to the website, so that we can ensure the code works.	3
B-3	As a Stride Team, we want to start documenting our data sources and method to clean data in Jupyter notebook.	3
B-3	As a Stride team, we want to create all filters, so that we can filter the data based on different values.	3
B-3	As a Stride Team, we want to create a ReadMe file in our GitHub repository, so that we can note documentation for future work reproduction.	2
B-4	As a student, I want to see a Map, so I can visually see the filtered programs to my liking.	5
B-4	As a Stride team, we want to change the UI of the web application, so that it aligns with Sponsors' alignment.	5

B-4	As a student, I want to view more information about each filter, so I can understand what to select.	2
B-5	As a Stride team, we want to display missing data as unavailable, so that we can be as transparent as we can with the users.	3
B-5	As a student I want to send the result to my email so I can review the different educational program before making my decision.	3
B-5	As a Student, I want to compare educational programs so that I can choose the best one.	3
B-5	As a Stride team, we want to incorporate a simpler map, so that we can it more user-friendly.	3
B-5	As a Stride team, we want to implement the final excel data so that we are using accurate information for the map and table.	5
B-5	As a Stride team, we want to investigate converting our excel datasheet into JSON, so that we have another way to access the data.	1
B-6	As a Stride team, we want to create Jupyter notebook, so that we can begin to document our data cleaning process.	5
B-6	As a Stride team, we want to implement our website/UI feedback, so that we have a more visually appealing web application.	3

Table 5-1: All User Stories and Epics.

6. Design

6.1 High-Level Architectural Diagram

Our data pipeline begins with the extraction of information from government public sources, which serves as a foundational dataset for our application. This data is initially sourced in Excel format, where it undergoes a cleaning process. We eliminated empty fields, reconciled disparities across diverse sources, and refined the dataset consistency. Once cleaned, the data is imported into Stride web application folder, a central hub for managing and analyzing educational information built using React libraries. Within the App.js, the Excel data is transformed into a JSON format. It is then passed as a prop to other components, such as Filters.js, where the filters are applied, and a new JSON variable is created. This structured approach ensures that our application is equipped with accurate, reliable, and standardized data, empowering users with a tool for their educational exploration. The overall architecture of the data process that we used is shown in Figure 6-1 below.

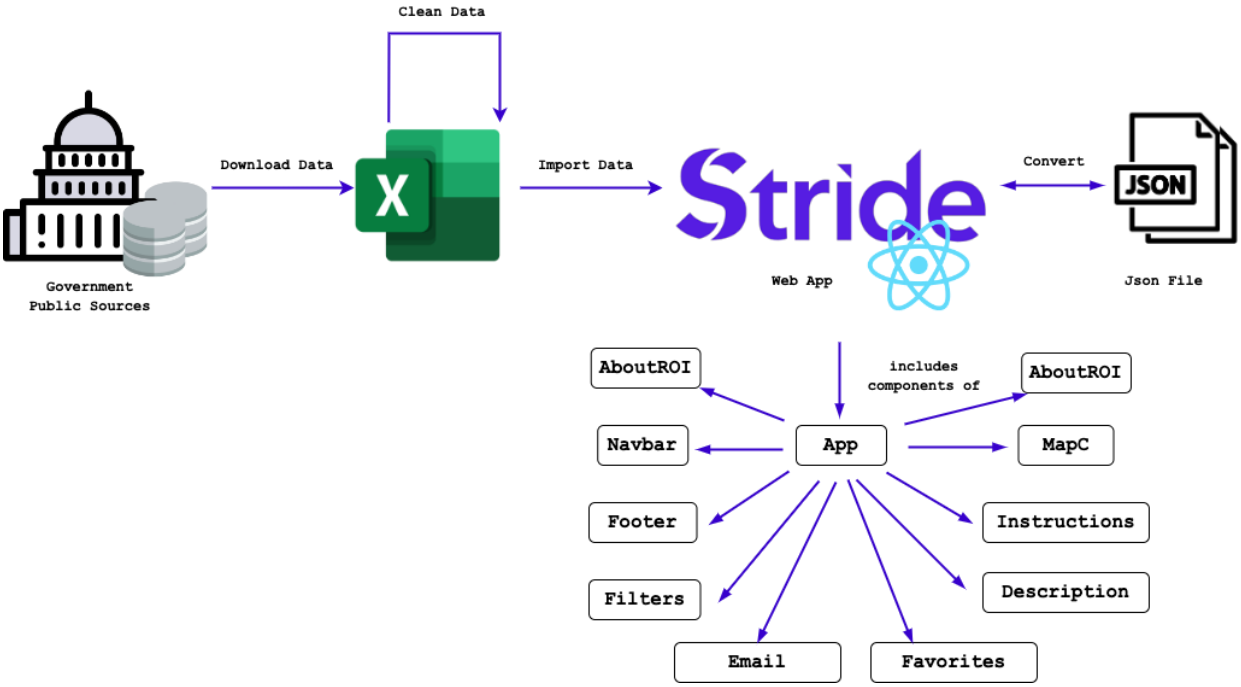

Figure 6-1: High-level hierarchy diagram.

6.2 Class Diagram

The class diagram shown in Figure 6-2 illustrates the main components that make up the Stride app and their relationships between each other. At the core is the App.js component that

handles fetching the data and storing the data in parsedData variable. It then transfers this variable to Filters.js component where filters are applied to parsedData and a new variable called filteredData is set. Then filteredData is passed to other connected components: MapC.js and ROI.js, which contribute to the application's seamless functionality. Filters.js empowers users to customize displayed data, while MapC.js and ROI.js handle the rendering of an interactive map and table based on applied filters. The Navbar.js and Footer.js provide easy navigation, Description.js showcases concise information tooltips, Instructions.js guides users on effective app utilization, and AboutROI.js showcases return-on-investment formula and definition. There is also Favorites.js component that handles rendering of the student's favorite list of educational opportunities and includes an option to email the results using Email.js component. This list of favorite college-major pairs is stored in favorites variable which is created in App.js and then passed down as a prop to Favorites.js and Email.js. Some of the components have additional variables which assist with displaying and managing the data, such as view variable in App.js that controls what component is shown on the website: MapC.js, ROI.js, or Favorites.js.

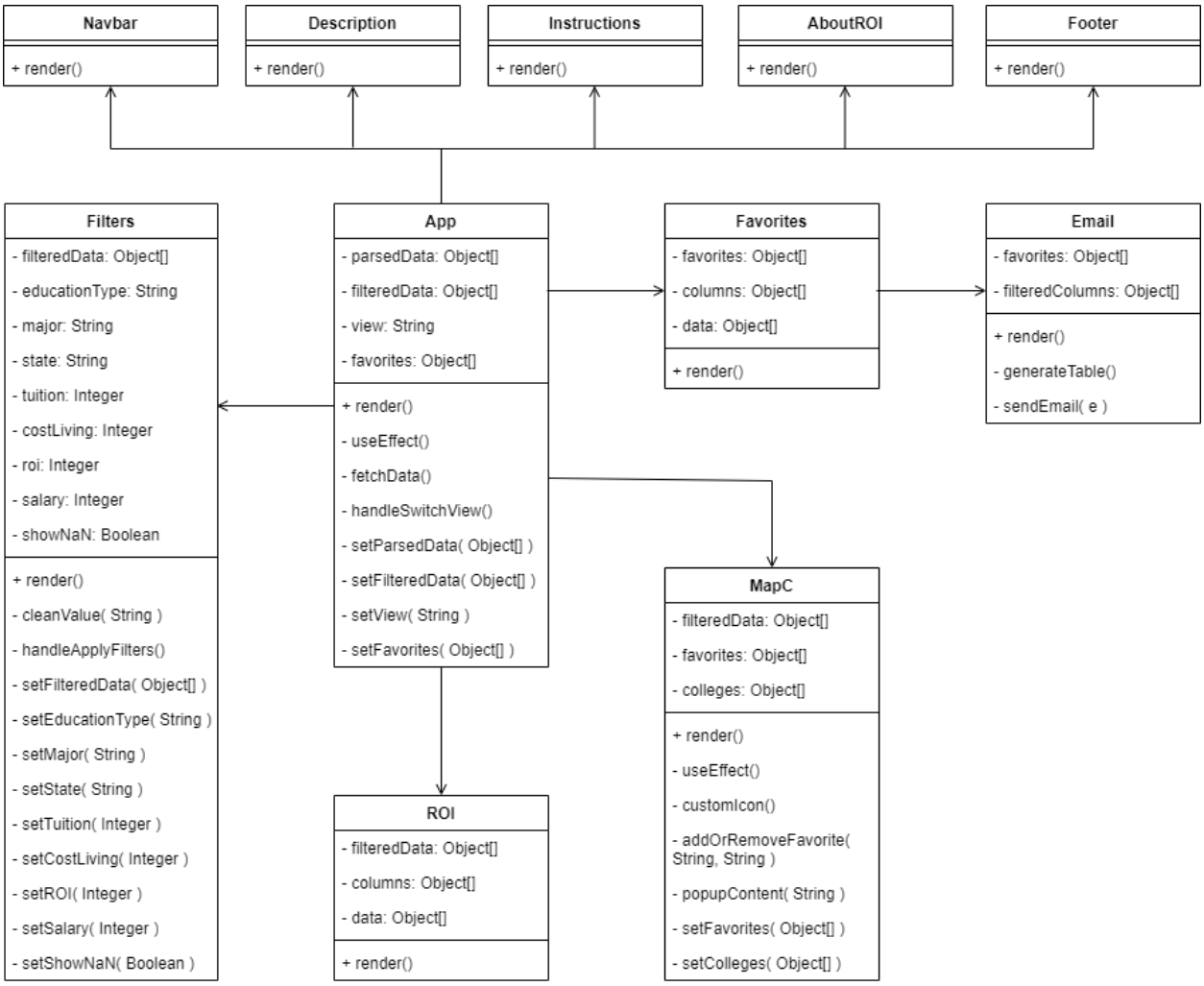

Figure 6-2: Class diagram.

6.3 Use Case Diagram

The use case diagram shown in Figure 6-3 demonstrates the application's functionality through the company's and the students' requirements. Our main goal for our primary user was to provide a user-friendly webpage with multiple features. Once the students open the webpage, they should be able to view the Navbar, Footer, Description, and Instruction components. They should also be able to view all the Filters they can choose from and apply it to the Map and Table features of the application, using the Filter Programs button. The Map feature is first displayed without any of the Filters applied but provides the students with an option to view the map with the preferred Filters and to select the specific program. Similarly, the Table feature gives students the flexibility to view the table without any Filters applied or with the selected Filters. Once the student has selected programs, they are able to either add a specific program to their Favorites or remove a specific program from their Favorites. Based on their preferences, the student can view their ROI. To make the students aware of what is being calculated and how it is being calculated, they can view further ROI information. Ultimately, the student can send themselves an email about their favorite programs, making it easier for the student to stay organized with the programs they preferred.

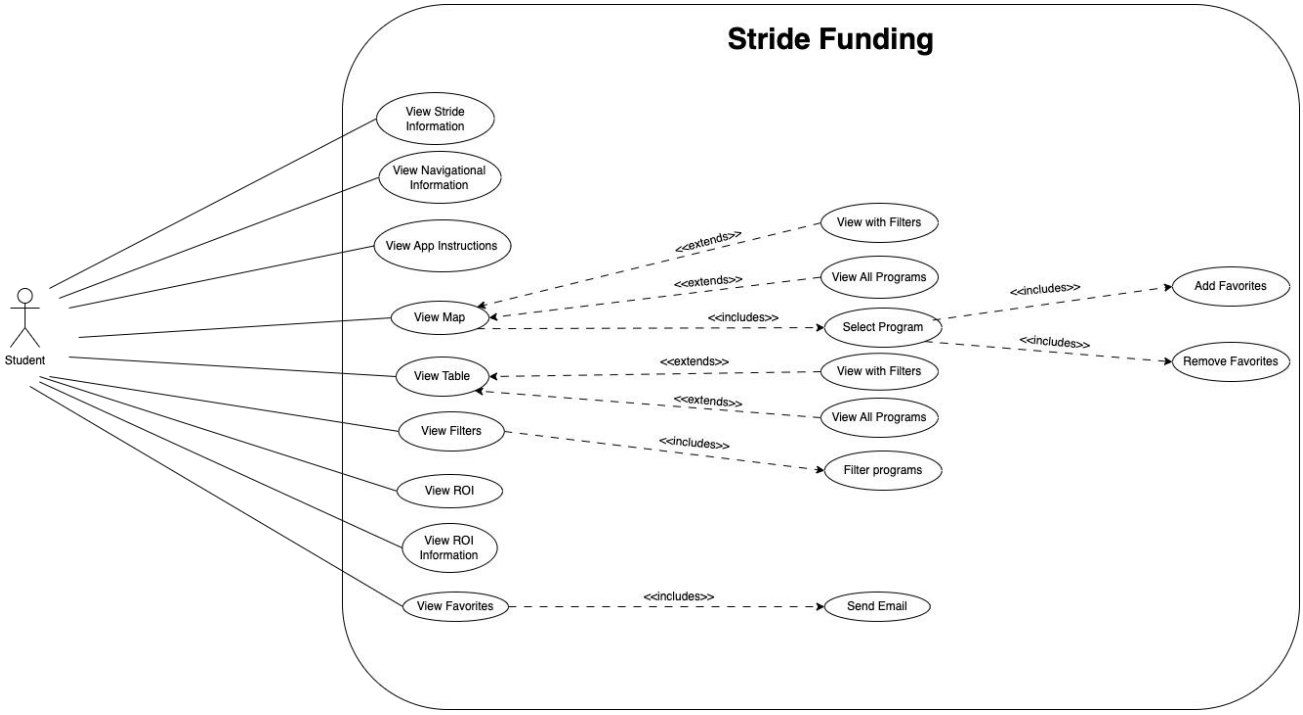

Figure 6-3: Use Case diagram.

6.4 Data Model

With many different data sources at play, it is important to comprehend the interconnection between diverse data sources and their integration to facilitate the development

of the application. In each dataset, there exists at least one shared field between two datasets, enabling our team to merge the data, as depicted in figure 6-4 below.

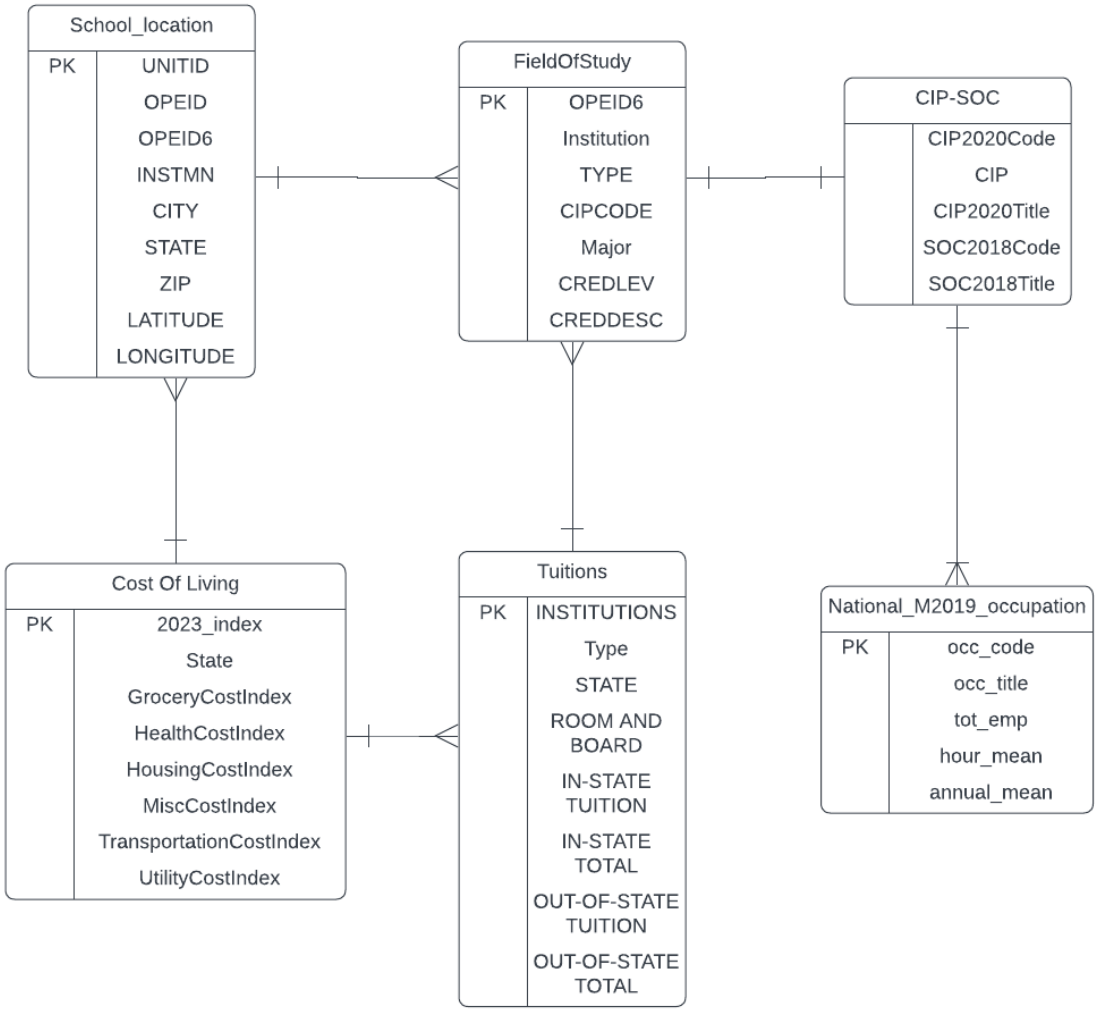

Figure 6-4: Data model displaying the relationship between different datasets.

Each of the datasets provided contains distinct information that is essential for the filters of the web application. The dataset "School_location" includes information about various universities and their respective geographical locations. This dataset includes longitude and latitude, which are crucial data that our team utilized to accurately map the precise location of each institution for the purpose of filtering. The website relies on FieldOfStudy as a significant data source. FieldOfStudy data provides comprehensive information on various majors provided by institutions throughout the United States, including the Major CIPCODE and other relevant

details. This dataset is of significant size, containing a substantial amount of PrivacySurpressed data pertaining to debt and post-graduation earnings. According to the CollgeScorecard Data Home, the PrivacySurpressed data refers to incomplete data that is currently being finalized. Once a sufficient number of data entries have been collected, the PrivacySurpressed data will become accessible for viewing. However, the data will not be accessible for several more years as College Scorecard is now in the process of collecting additional data on post-graduation earnings.

The data sources "Tuitions" and "National_M2019_Occupation" provide information regarding the expenses associated with attending school and the income levels achieved after completing education. Tuitions encompass both the in-state and out-of-state fees charged by colleges around the United States, as well as the expenses for room and board. The National_M2019_Occupation dataset provides data on numerous occupations in the United States, including the employment rate and average wage for each occupation. The ROI for various educational programs was calculated using the tuition cost and average earning data.

The Cost-of-Living data offers comprehensive information on the cost-of-living index for each state, which is further classified into other categories of indexes. Key indices that students are expected to cover when attending college encompass housing, transportation, utility, and grocery indices, which represent significant expenditures. Cost of living indexes are calculated by first creating a benchmark for comparison. When doing cost comparisons among states, the average cost of living in the United States is used as the benchmark. For example, if a state has a cost-of-living index of 200, it indicates that the cost of living in that state is double the national average (Cost of living by state 2023).

All the data sources are consolidated into a master excel sheet by utilizing the Index & Match method for precise value matching. A diverse range of fields are combined to generate a complete dataset that is utilized for the website. In order for the Index & Match formula to function, it is necessary for at least two of the data sources to have a shared field. The Index () formula enables the retrieval of specific cell values in a table by specifying the row and column numbers, whereas the Match() function determines the position of a cell within a row or column.

6.5 Website Mock-Up

6.5.1 First Mock-Up

The first website mockup that our team created is depicted in Figure 6-5. To instill a sense of familiarity among users, we employed the same aesthetic as the main Stride website, utilizing the distinct purple color scheme and matching font and style. This intentional design choice aims to establish a visual connection between the two platforms, allowing users to seamlessly associate this website with the trusted Stride brand. Our design process involved a

comprehensive analysis of various websites with similar functionalities, from which we drew inspiration to enhance user experience. For example, the app design was inspired by Stride official website with purple and white color scheme and matching font. Our design was also influenced by UNC Kenan-Flagler's Undergraduate Global Program website which has a map on the right and filters on the left side of the screen. The resulting mockup features a top navigation bar for easy accessibility, followed by an introductory section, user instructions, and filter positioned next to an interactive map. Notably, the map can be seamlessly switched to a tabular format if needed, providing users with diverse options for exploring content. The inclusion of a footer at the bottom ensures a well-rounded and user-friendly interface.

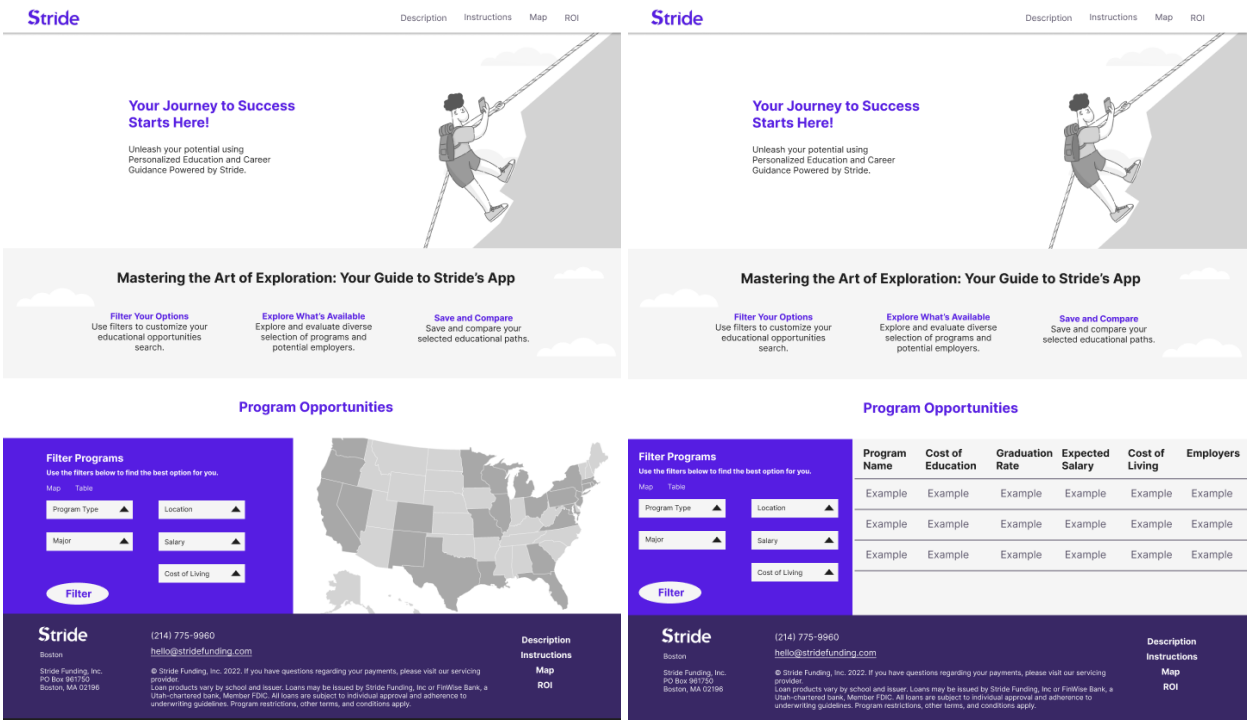

Figure 6-5: First website mockup.

6.5.2 Second Mockup

The second iteration of our website mockup, as illustrated in Figure 6-6, reflects a refined and enhanced user interface based on valuable feedback from sponsors. This version incorporates their insightful suggestions, such as tooltips accompanying each filter, providing users with clear and concise information about their functionalities. To improve usability, the filters have been redesigned to resemble a more intuitive form, by not only having drop-down menus but having a scroll feature, ensuring a seamless and straightforward interaction for users. We also included all the required variables in the table and filters. Additionally, popups were introduced for each marker on the map, enriching the user experience by providing contextual information at a glance. Our team has revisited certain stylistic choices, incorporating sponsor

feedback to ensure the second mockup not only aligns with the distinctive Stride aesthetic but also delivers an even more refined and user-centric interface.

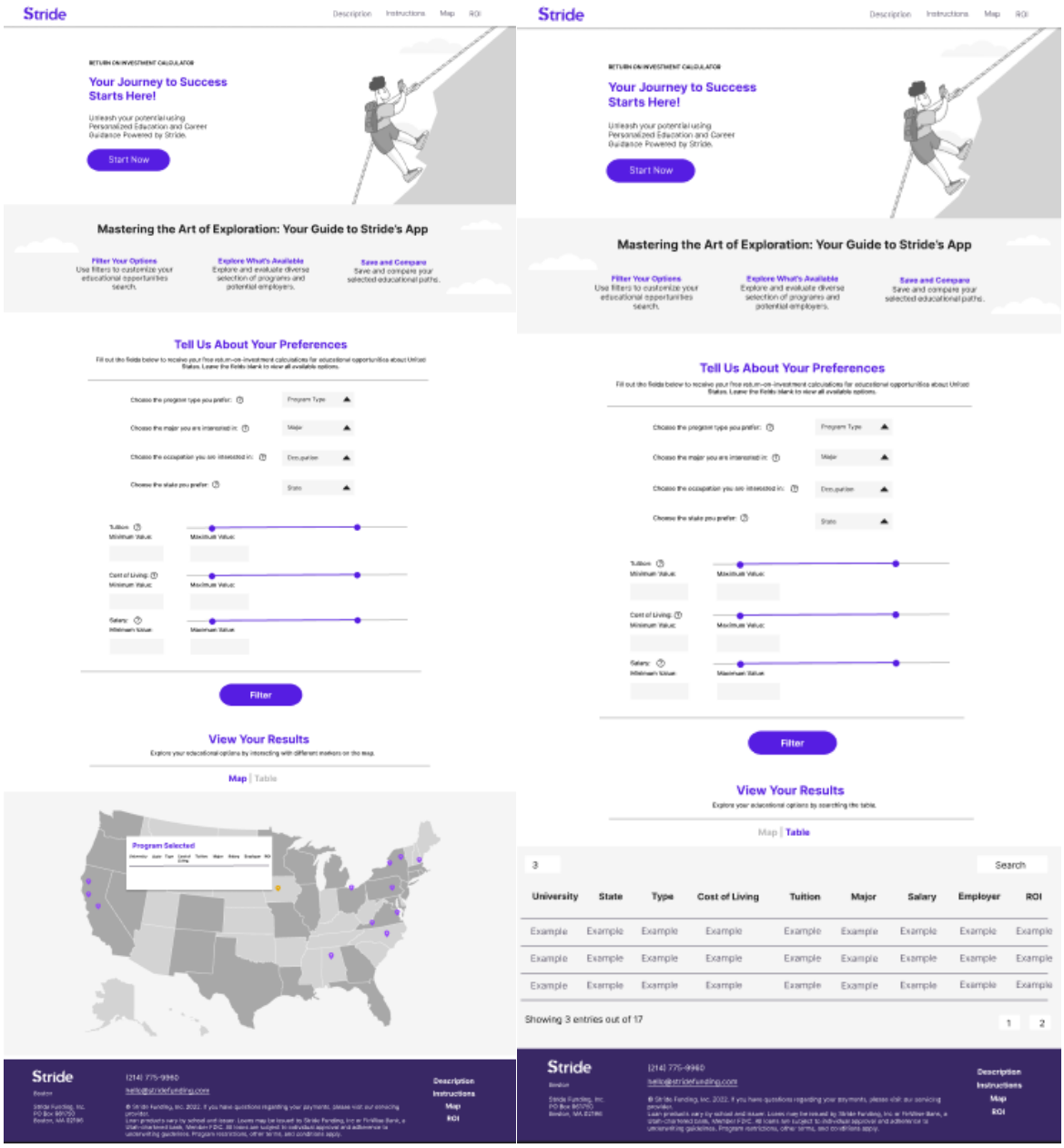

Figure 6-6: Second website mockup.

6.5.3 Final Website

The final iteration of our website design, showcased in Figure 6-7, is a combination of additional sponsor feedback and our design decisions. Combining the favorable layout from the first mockup, where the map and filters are positioned side by side, with the color scheme of the second mockup, we aimed to strike a balance between aesthetics and functionality. Responding

to the sponsors' preferences, we introduced a dedicated section for return-on-investment information. This section includes a comprehensive definition, formula, and sources, offering users a valuable resource to make informed decisions. Furthermore, we implemented a 'Favorites' feature, allowing students to curate a personalized list of preferred programs for easy reference. This final design not only reflects the unique identity of Stride but also incorporates iterative refinements based on sponsor input, resulting in a website that seamlessly integrates user-friendly features with a visually appealing and informative interface.

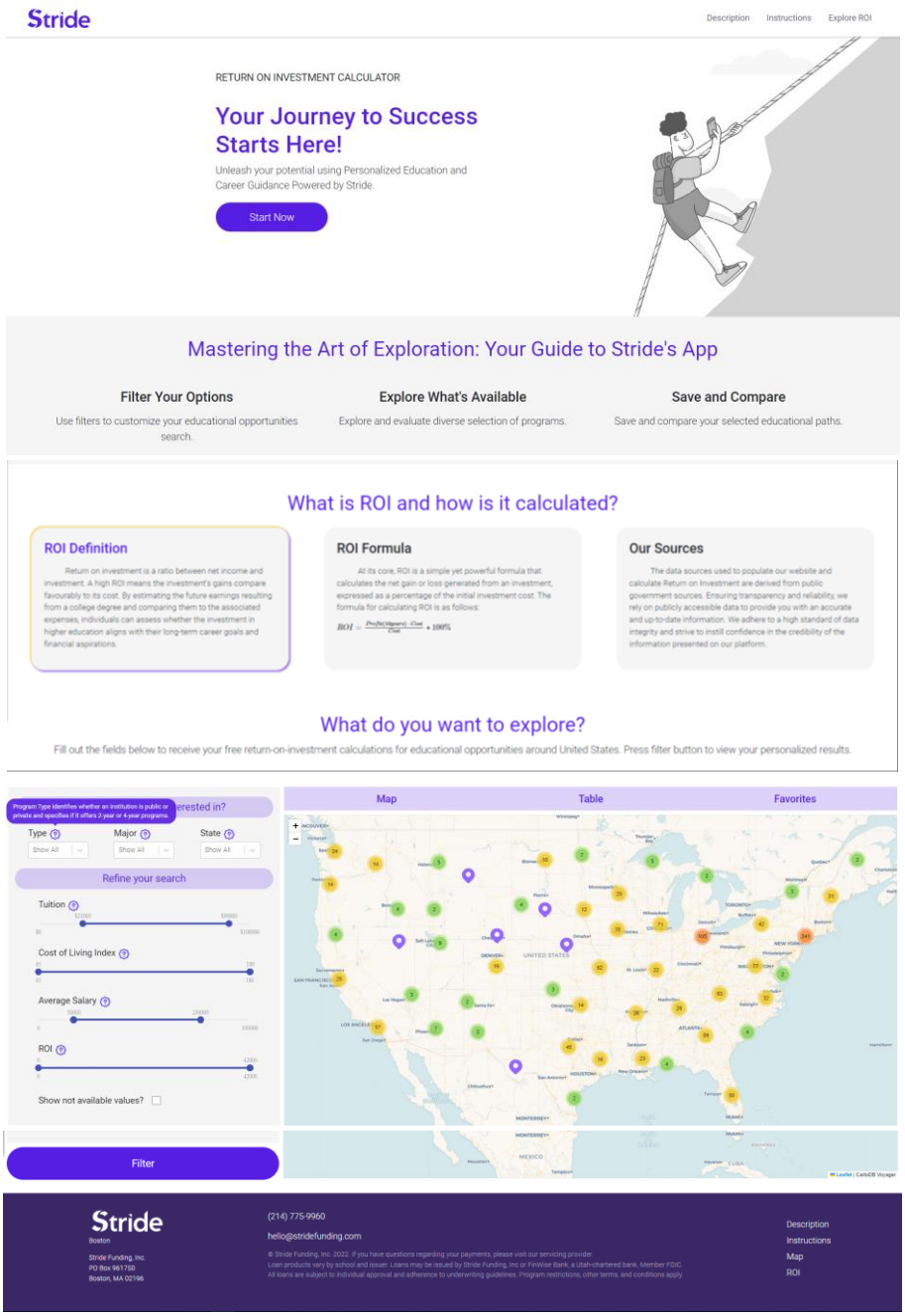

Figure 6-7: Final website look.

The final website design also introduced a versatile table view, as depicted in Figure 6-8. Users have the option to seamlessly switch from the map interface to a table, offering a different perspective on the diplayed information. This dynamic table is designed to accommodate various user preferences, allowing customization of the displayed rows on individual needs. The addition of pagination enhances navigation, making it effortless for users to explore a large dataset. Furthermore, the table incorporates a search function, empowering users to quickly locate specific information. To faciliate a comprehensive analysis, users can also sort the table by different columns, providing a tailored and efficient way to asses and compare various educational opportunities. Overall, the table view serves as a powerful complement to the map interface, ensuring that users have diverse and intuitive options for accessing and evaluating filtered educational opportunities.

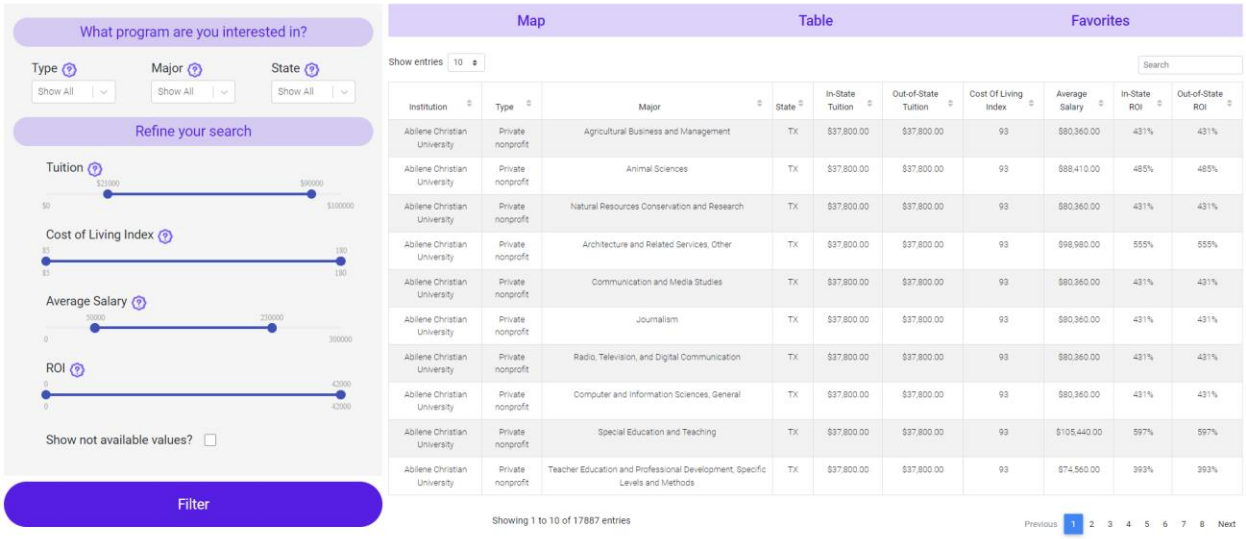

Figure 6-8: Final website table view.

The final website design incorporates an interactive map feature with markers, shown in Figure 6-9, offering users a rich source of information about each college. Upon selecting a marker, a pop-up window displays essential details such as the college type, tuition, cost of living index, Return on Investment (ROI), and a list of associated majors along with their average salary. This information empowers students to make informed decisions about their educational choices. Moreover, users can mark a specific program as their favorite directly from the marker pop-up. When a program is selected, the corresponding marker transforms to a distinct red color, providing visual confirmation. Additionally, all favorite programs are stored in the 'Favorites' tab table, offering users a centralized and easily accessible list for reference and comparison. This seamless integration of map markers not only enhances the user experience but also adds a layer of personalization and convenience to the exploration of educational opportunities.

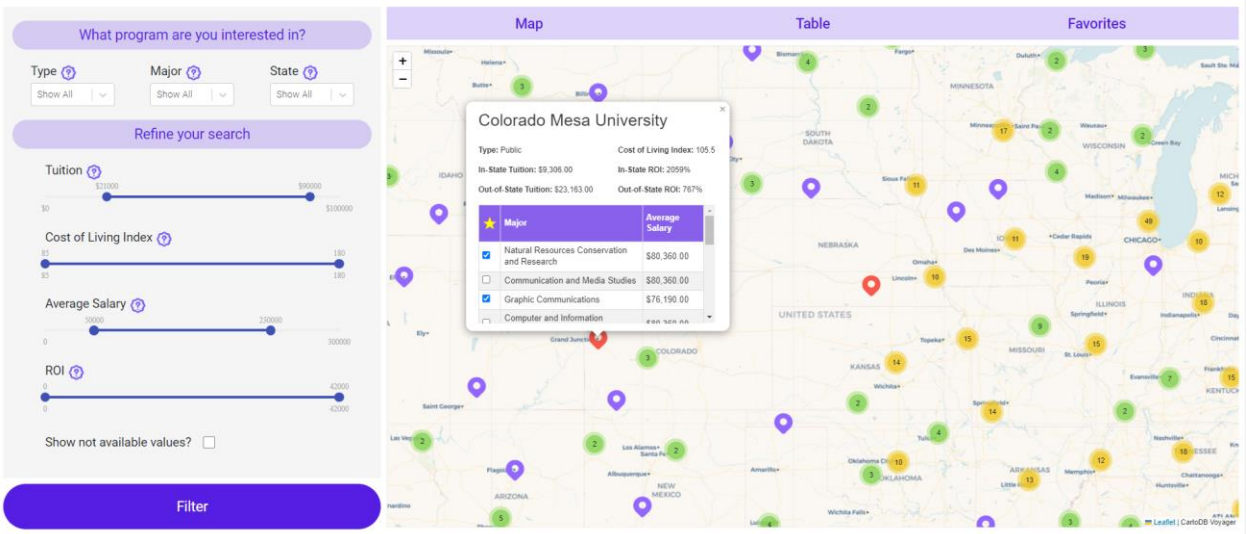

Figure 6-9: Final website popup view.

The 'Favorites' tab is a user-centric feature in our design, offering a streamlined way for students to manage and revisit their preferred programs, shown in Figure 6-10. This dedicated section includes a table similar to the primary table, showcasing all favorite academic programs in a clear and organized format. To enhance user interaction, an input field has been integrated above the table, allowing users to send an email to themselves containing the list of their favorite academic programs. This functionality serves as a practical tool for users to maintain a personalized record of their selected educational opportunities. By combining a user-friendly table layout with the convenience of email sharing, the 'Favorites' tab provides an efficient and organized means for students to curate, review, and share their chosen programs with ease.

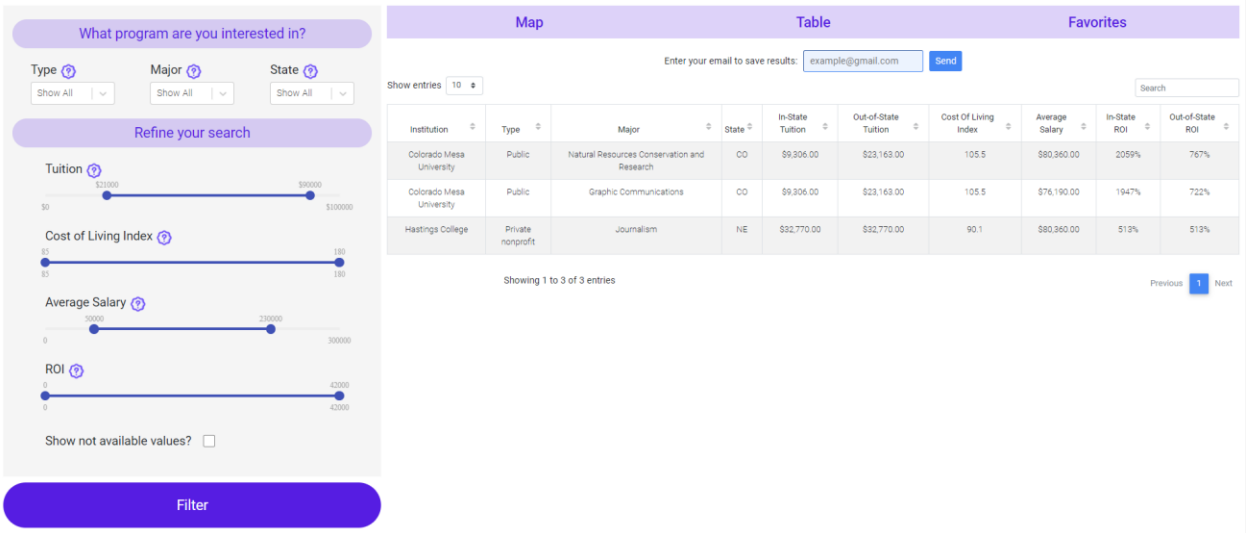

Figure 6-10: Final website favorites tab.

6.6 Process Flow Chart

From the standpoint of Management Information Systems (MIS), a process flow chart is an essential tool in the creation of web applications as it acts as the central framework for organizing and improving the flow of information within the project. An effectively organized process flow chart enables the systematic integration of technology, data, and human resources, harmonizing them with the strategic objectives of the organization. It facilitates the efficient handling of information during the entire process of developing a web application, guaranteeing that data is collected, analyzed, and distributed in a way that promotes well-informed decision-making. By employing a systematic method, the reliability and accuracy of information are improved, hence enhancing the overall effectiveness. In addition, a process model within the framework of web application projects assists MIS specialists in foreseeing and resolving potential obstacles, guaranteeing the seamless transmission of information and the effective execution of technological solutions to fulfill organizational goals. Refer to Figure 6-11 below for the process flow chart of the Stride web application.

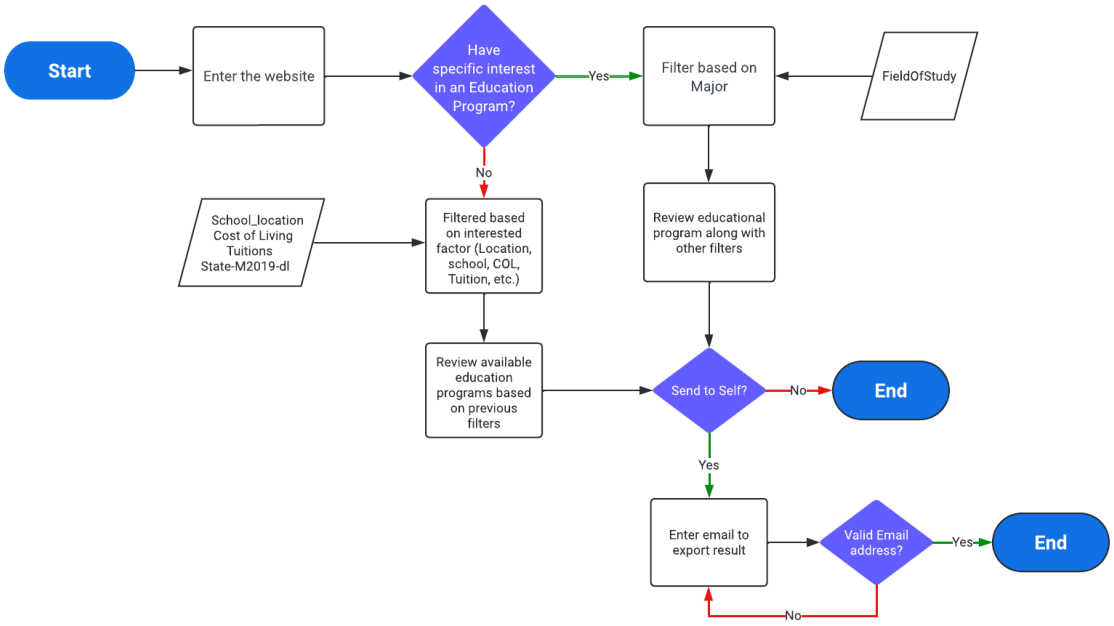

Figure 6-11: Process Flow Chart.

The process flow chart above displays the application process in order from the start to end from the users' perspective. When utilizing the app, depending on the type of filters user choose to use, the backend logic will vary to best assist users as they navigate through the application.

6.7 React

Managing substantial web traffic and extensive data loads on websites represents a paramount challenge faced by contemporary businesses. According to a Google's study, 53% of mobile users eventually abandon applications that take longer than three seconds to load (Hutsulyak 2023). In this context, responsive web applications play a crucial role in facilitating a high volume of user interactions. React, renowned for its versatility, streamlines and simplifies the development of high-performance cross-platform web applications by providing an efficient framework tailored to meet the demands of the modern digital landscape, see Figure 2-1.

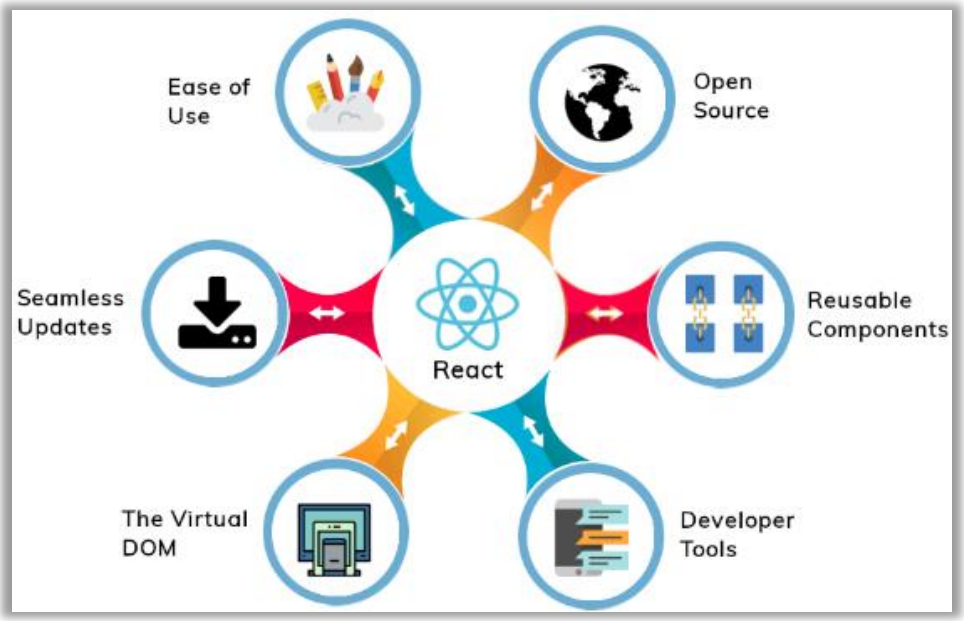

Figure 6-12: Overview of React benefits including ease of use, open source, reusable components, developer tools, virtual DOM, and seamless updates.

The current technology stack allows web developers to create versatile desktop, mobile, and web applications, integrating advanced technical concepts using basic web design components, including buttons, labels, grids, and interactive features. The main component of the server is its virtual Document Object Model (DOM), which maintains an in-memory virtual representation of the user interface instead of the physical DOM (React 2023). This approach results in expedited updates, as it allows the virtual DOM algorithm to calculate and apply changes optimally, avoiding unnecessary updates. This streamlined process enhances both read and write operations, providing a great performance boost.

Offering a clean component-based architecture and comprehensive code, React empowers users to develop modular code that fosters application scalability. It has an efficient rendering system, and its unique virtual DOM algorithm can effectively handle datasets and high user traffic, enhancing application maintainability, scalability, and flexibility.

In modern development, React has emerged as one of the most widely adopted libraries for creating intricate web applications. Its widespread usage and popularity owe much to industry leaders and prominent companies. Andrew Kuzmych, TechMagic's CTO and Head of the Web Competence group, has harnessed this innovative framework to promote an alternative approach to traditional JavaScript frameworks, with a specific focus on data and state management. This approach has driven improvements in performance levels.

7. Software Development

7.1 Application of Agile Scrum Methodology

Leveraging our diverse skill set, we strategically assigned Scrum roles before initiating embarking on project tasks. Dang managed the vision of our application, maintaining communication with stakeholders, including our advisors and sponsors. Kseniia, as a full stack developer, led the implementation of the web application using React. Serving as both scrum master and part-time developer, Pooja had the responsibility of running all scrum related meetings, crafting technical diagrams, and providing support for the full stack developer. With two computer science majors and one management information systems major, our team ensured a logical distribution of responsibilities and roles.

Our team adhered strictly to the Agile framework throughout the course of the project. The project has been partitioned into smaller segments to enhance manageability for our team. The duration of our sprint was one week due to the short project span, commencing on Monday and concluding on the subsequent Monday. The team convened daily at 10:00 a.m. for a scrum meeting, during which individuals provided updates on their completed tasks from the preceding day, any challenges they've encountered, and the tasks they would like to complete on the day of the scrum meeting. Our team also held our retrospective on Monday to end our current sprint before starting a new sprint following our sprint planning on the same day. By adhering strictly to the Agile model, our team was able to foster a collaborative work environment, resulting in the weekly delivery of functional increments to our project.

The assignment of story points followed the application of the Fibonacci sequence. Within our team, we employed a system of assigning numerical values to stories, with a score of 1 indicating the lowest level of difficulty and a score of 5 representing the highest level. Additionally, we alternated stories with scores of 2 and 3, taking into consideration their relative complexities. A comprehensive analysis of our team stories and epics can be accessed in the User Stories and Epics section dedicated to each sprint.

7.2 A Term Sprints

7.2.1 Stories Report

User Story	Points	Status
Sprint 0		
As a Stride Team, we want to select a citation manager, so we can start managing our sources.	1	Complete
As a Stride team, we want to install project related software, so we can start exploring new technologies.	1	Complete
As a Stride team, we want to create documentation, so we can start writing our MQP report.	1	Complete
As a Stride team, we want to write the background research chapter, so we can have enough knowledge prior to creating a website.	2	Complete
As a Stride team, we want to write the software development chapter, so we have a documented list of used technologies.	2	Complete
As a Stride team, we want to write the introduction chapter, so we have a goal and a set of objectives.	2	Complete
As a Stride team, we want to write a software methodology chapter, so we have a description of Agile Scrum in our report.	2	Complete
Total Points Completed:	**11**	
Sprint 1		

As a student, I want to access a menu bar so I can easily navigate the app.	2	Complete
As a student I want to access the main Stride page, so I can learn more about other educational programs.	2	Complete
As a Stride Team, we want to have a Figma mockup, so we can plan on how to position different features.	2	Complete
As a Stride Team, we want to have better resources, so we can write the background chapter, with good supporting pieces of evidence.	2	Complete
As a Stride Team, we want to explore the public Data sources so that we can start data cleaning and analysis.	2	Complete
As a Stride Team, we want to make small increments to our report so that we can avoid work piling up.	2	Complete
As a student, I want to view a footer, so that I can find an overview of the website and links to other websites.	2	Complete
Total Points Completed:	**14**	
Sprint 2		
As a Stride Team, we want to revise our introduction chapter so that we can adjust based on new information.	2	Complete
As a Stride Team, we want to incorporate all resources and information into the background chapter, so that we have a clear structured background.	2	Complete

As a Stride Team, we want to reorganize our report, so that it is more coherent.	1	Complete
As a Stride team, we want to review previous teams' reports to make our chapters stronger.	2	Complete
As a Stride Team, we want to add additional information about interviews and observations to make our methodologies chapter complete.	2	Complete
As a Stride Team, we want to finalize information in the software development environment chapter to make it complete and strong.	1	Complete
As a Stride Team, we want to have a software requirements chapter, so we can organize our user stories, epics, and requirements.	2	Complete
As a Stride Team, we want to clean up the software development chapter, so that we can have a clean summary of previous retrospectives and weekly scrums.	2	Complete
Total Points Completed:	**14**	
Sprint 3		
As a student, I want to review instruction on how to filter out the best educational program so I can compare them and figure out the one that matches my interest.	2	Complete
As a student, I want to learn more about the website through the website overview so that I can understand the purpose of the app.	2	Complete
As a Stride team, we want to continue adding to the Background chapter to add more context for the reader (3-4 sub chapters).	2	Complete

As a Stride team, we want to make sure the report has a consistent style to ensure good readability for the viewer.	1	Complete
As a Stride team, we want to finalize the metrics we will use to filter for the map.	1	Complete
As a Stride team, we want to figure out the main data source we will use to work on the website.	2	Complete
As a Stride team, we want to peer review our work to have strong report chapters.	2	Complete
As a Stride team, we want to complete the Bloomberg Core Concepts Certificate of Completion to become more knowledgeable with economic and business aspects of industry.	3	Complete
As a Stride team, we want to continue adding our weekly progress to our software development chapter of the report, to be able to reflect on our sprint and plan what our next steps should be.	1	Complete
Total Points Completed:	**16**	

Table 7-1: A-Term User Stories.

7.2.2 A Term Sprint Summary:

This 7-week PQP was set for us to feel prepared once our MQP term began. In the first week, we held an introductory meeting with our Stride Funding sponsors, who shared with us a revised project concept. This new concept involved creating a map that would display various opportunities for students based on their chosen filters. After saying they will have a final project description written and a slack page ready for communication by the weekend, we decided to shift our focus to the report. The second week, we decided to focus on the application itself. Specifically, we were able to complete a Figma mockup, which consisted of the Stride stylistic choices, along with a Menu Bar and Footer fully implemented to the website template. The third week's sprint goal was to make tremendous progress on our report, allowing us to start B term with completed chapter drafts and to shift our focus to the application website. By the end of the sprint, we were able to write the introduction, software environment, and software requirement

chapters of the report. We also focused on the methodologies chapter, consisting of the observations, target-consumer, and interviews chapter. For the report, the software development chapter was also refined, not only solidifying the organization and the structure, but also beginning to research the sub chapters. Towards the end of the sprint, we shifted focus on the data portion of the application, starting to find potential datasets we can utilize, and continued working on the report. To ensure productivity, our team held weekly progress presentations to our advisors. Our summary of A term stories can be viewed in Figure 7-1.

7.2.3 A Term Retrospective Summary:

Despite initial concerns about project progress, our team found a positive shift in momentum when we decided to prioritize the project report, specifically the background chapter. We recognized that having a strong foundation, with data and further research in place, would better equip us to tackle project application. We set up Jira for project management and established a GitHub repository to streamline collaboration. The following sprint week, our team made significant progress in both our application website and project. We presented our ideas, backed by a Figma Mockup and a website template featuring a menu bar and footer, to our sponsors and received valuable feedback, putting ourselves a few steps ahead of the project application timeline.

By the end of PQP, we had created a solid basis for our report, with chapters consisting of the Introduction, Background, Methodology, Software Development Environment, and Software Development Requirements chapters. While the report still required refinement, we took pride in the substantial progress we made, especially given the challenges on the website and data aspects of our MQP. Data presented a unique challenge as we initially aimed to finalize our dataset by the end of A term, but we were not able to select the most suitable datasets. The data given to us was not company private data; we will be utilizing public data sources. We are still unsure about how to connect the data to the app and to ensure yearly updates, since the government data is currently only focused on statistics up to 2022 with most of the data being older years. We planned to meet with the Stride Funding data science team prior to the start of MQP B term, however we were not able to schedule a meeting with them. Our primary objective for the first week of MQP is to make substantial progress in terms of the data, enabling us to kickstart our website application.

7.3 B Term Sprints

7.3.1 Sprint 1

7.3.1.1 Sprint 1 Story Report

User Story	Points	Status
As a Stride team, we want to complete the Website subchapter of the Background chapter, so we have more context on the topic.	2	Complete
As a Stride team, we want to complete the Data Source subchapter of the Background chapter, so we have more context on the topic.	2	Complete
As a Stride team, we want to complete the Student Struggle with Traditional Bank Systems subchapter of the Background chapter, so we have more context on the topic.	2	Complete
As a Stride team, we want to complete the Similar Applications subchapter of the Background chapter, so we have more context on the topic.	2	Complete
As a Stride team, we need to figure out the best way to store the data, so that it's most efficient when the data must be linked to the website	2	Complete
As a Stride team, we want to summarize the PQP sprint review paragraphs so that we have a general overview of what was completed before the project timeline began.	1	Complete
As a Stride team, we need to find data for the tuition costs of the nation, so it can be incorporated into the general dataset.	2	Complete

As a Stride team, we want to clean the Tuition cost, state, and national occupation dataset, so that we can start using this finalized information for the website.	3	Complete
As a Stride team, we need to find data that includes the average salary based on their school, so that we can compare the ROI based on the school.	5	Incomplete
Total Points Completed:	**16**	

Table 7-2: First Sprint User Stories.

7.3.1.2 Sprint 1 Summary

This week our goal was to prioritize cleaning the data so we can finally utilize it within our application itself. We hoped to get clarifying questions from Stride Funding's Data Science team, however we struggled with finding the best time to meet. To save time, we scheduled a meeting with Professor Blais regarding the best data source options we can use. We also messaged Professor Wong about the best approach to combine the multiple datasets we obtained. We found a method of representing our data called the react excel renderer, where after installing a library, we can convert the excel into JSON, allowing us to ultimately render into html. Initially, we decided to focus on 2019 data, as the COVID-19 recent years may present inaccurate data; however, after giving more thought, we realized the incoming data may never return to the rates it used to be. We've decided to portray the entire range of data to the users, so they have that flexibility to compare between the years. During this week, we were able to clean most of the data and research on how to calculate and implement the ROI using our dataset. For next week, we plan to combine the multiple datasets so that we can finally begin rendering the data into our web application and create a table.

In terms of the report, we continued to make great progress. Not only did we continue to solidify the background chapter, completing the Website, Student Struggle with Traditional Banking System, and the Similar Applications and including the citations and relevant figures, but we also created a cover page design draft to engage the readers. We also wrote the acknowledgements and abstract sections of the report. For the Software Development section, we also reorganized the structure to give it a consistent style. Our goal for the next sprint is to make further progress on the application portion of the project.

7.2.1.3 Sprint 1 Retrospective

Over the course of this week, our team made a lot of progress on the report and data. We found most of the required data sources and were able to clean it. This prepares us for the next

week when we will start implementing this data into the website application. There were some things that could have gone better; for example, our team did not get a chance to meet with Stride's Data Science team and get advice from them due to schedule conflicts. We also were not able to find some of the data that we needed, which means that next week we would need to finish data processing before starting on the website. Our team thinks that clearer communication with the Sponsors would help us to resolve some of the issues quicker and lead to a more successful project. We also still need to figure out a way of combining the data, for the table and map visualizations. For next week, our team plan to work on linking some of the data sources that we currently have to the website. We also wanted to discuss with the sponsors to identify the filters that are necessary for the website so we could potentially eliminate some of the data that we did not need to have. We also continued to look for more relevant data that could have been useful for the website.

7.3.2 Sprint 2

7.3.2.1 Sprint 2 Story Report

User Story	Points	Status
As a Stride team, we want to calculate the ROI on education for every state (once data has been cleaned), so users can easily view this information after filtering.	2	Complete
As a Stride team, we want to have a scheduled meeting with the Data Science team from Stride Funding, to get data clarifications and advice for data sources and data incorporation into web application.	2	Complete
As a Stride team, we want to create an ERD so that we can clearly display the relationship between the dataset, and we can understand the Sponsor's criteria for the application's visualizations.	2	Complete
As a Stride Team, we want to create a process model to clearly display the project workflow, helping us better understand the tasks that need to get done.	2	Complete

As a Stride Team, we want to create a critical path so that we can better understand and prioritize the sequence of the tasks that need to be completed for the project.	3	Complete
As a Stride Team, we want to combine the data into one dataset and link the data to the webpage so that we can create a table.	3	Incomplete
As a Stride Team, we want to get a list of the Employer Sponsor Program from Stride Funding, so that we can figure out a way to link the data to the website.	1	Complete
As a Stride Team, we want to update our mockup based on sponsor feedback, so that we can have a better website layout.	2	Complete
As a Stride Team, we want to pick a database to store our data, so that we can access it efficiently for the website. As a Stride Team, we want to pick a database to store our data, so that we can access it for efficiently for the website.	2	Complete
As a Stride team, we want to continue working on the software development portion of the report, so that we can make continuous improvement as we move forward.	1	Complete
As a Stride Team, we want to revise and add to the website subchapter, so that we can make continuous improvement to our report as we move forward.	2	Complete
Total Points Completed:	**19**	

Table 7-3: Second Sprint User Stories.

7.3.2.2 Sprint 2 Summary

Throughout the week, our focus was on refining the data portion of the project. We completed data cleaning for existing sources, as well as the new sources we found this week about the schools' major breakdown. A preliminary table mockup was formulated to aid website coding for linking the data. Our efforts involved consolidating various datasets into one table

with designated fields (e.g., ID, University, State, Type, Cost of Living Index, In State Tuition, CIP, Major, Occupation, Average Salary, In State ROI, Latitude, Longitude). We then created an Entity-Relation Diagram describing the interrelationships among these datasets. This was construction alongside the creation of a Process Model, offering a clear visual representation of our project's workflow, thus enabling effective task organization and prioritization. We began working on the Critical Path Model, which shows the sequence of work that needs to get completed. During this week, we also added more to the websites section of the background to make it complete. We confirmed the Figma mockup style we wanted to keep consistent for the website, and we brainstormed the libraries that could best work for us. We also planned the best way to link our data to the website and decided that we will sort and clean our data through excel, and later use a React library to render the data to the website. To clearly make it accessible for users and the Stride company itself, we plan to update the GitHub read.me file to have instructions on which data sources we used, how we cleaned them, and how to compile it into one data table.

7.3.2.3 Sprint 2 Retrospective

During this week, our primary focus centered on data-related tasks, resulting in significant strides in data cleaning and linking. We successfully completed all our stories. For the missing data, the researchers compiling the dataset are now collecting more data for the suppressed information, hence the label "PrivacySuppressed". We will have to find another data source that can give us more information about the outcomes. For us, the weekend seemed very crammed, because our meetings were shifted one day over. We had our sponsor meeting on Tuesday, and we had our meeting with Carissa on Thursday, which was when we were advised to create a mock table. Because of this we were able to shift some of our focus back to the application and create a table for the users to view. We were also able to organize our weekly task and website structure by creating models.

7.3.3 Sprint 3

7.3.3.1 Sprint 3 Story Report

User Story	Points	Status
As a Stride Team, we want to combine the data into one dataset and link the data to the webpage so that we can create a table.	3	Complete

As a Stride Team, we want to reorganize the website layout through Figma, so that we can resolve the sponsor feedback in terms of website user friendliness.	3	Complete
As the Stride Team, we want to create a sample data to use for mockup code, so that we can start data implementation.	1	Complete
As a Stride Team, we want to create and link the mock-up table to the website, so that we can ensure the code works.	3	Complete
As a Stride Team, we want to start documenting our data sources and method to clean data in Jupyter notebook.	3	Complete
As a Stride Team, we want to continue working on the report, so that we can address the feedback we get from sponsors and advisors.	2	Complete
As a Stride Team, we want to rewrite the Abstract, so that it's more concrete.	2	Complete
As a Stride team, we want to create all filters, so that we can filter the data based on different values.	3	Complete
As a Stride Team, we want to create a higher architectural model in the design section, so that we can display the project flow.	3	Complete
As a Stride Team, we want to create a ReadMe file in our GitHub repository, so that we can note documentation for future work reproduction.	2	Complete
As a Stride Team, we want to address advisor comments on ERD, Critical path, and process model, so that it is most accurate for our project.	1	Complete

As a Stride Team, we want to create Data model and Network model, so that we can elements of data and standardized their relationship.	3	Complete
Total Points Completed:	**29**	

Table 7-4: Third Sprint User Stories.

7.3.3.2 Sprint 3 Summary

This Sprint involved receiving valuable feedback from our advisors, particularly on refining our abstract and software development structure. Additionally, we initiated the documentation process, beginning with our GitHub repository's read.me file. Responding to the received feedback, we revised our models and produced a preliminary draft of the read.me file. During our Sponsor meeting, a shift in preference away from the table concept prompted a redirection of focus toward refining the Figma Mockup and implementing filter functionality. Presenting updated Figma Mockup and implementing filter functionality. We presented the Sponsors variations of an updated Figma mockup on Tuesday, which we currently await their feedback on. Focusing back on the filters of the data, we restructure the user interface to resemble a more user-friendly layout, adjusting white-space and proportions for improved visual appeal. The collaboration with Manasi regarding the high-level architectural design diagram provided crucial insights guiding our implementation of necessary changes within the report.

7.3.3.3 Sprint 3 Retrospective

This week marked great progress in both the web application and the filter mockups. We implemented a functional filter feature on our app, where we used an updated Figma mockup. We were given a deadline to present the updated Figma mockup to the Sponsors by Tuesday, which we delivered; however, we are still awaiting feedback. We're hoping that after the next Sponsor meeting, we're given feedback and clarifications on the Figma mockup, so that we can make the appropriate adjustments and move on to the next steps. We also worked on the design subchapter of the report, where we implemented the high-level architecture diagram. In terms of data, we have all our sources combined into one dataset, however the dataset contains many missing values and doesn't include the employer data which we will need to ask our Sponsors for advice on next steps. Next week, we will need to see what our priority will be; based on our Sponsor meeting, we will have to see whether focusing on application, Figma mockup, or data is what our next task should be.

7.3.4 Sprint 4

7.3.4.1 Sprint 4 Story Report

User Story	Points	Status
As a student, I want to see a Map, so I can visually see the filtered programs to my liking.	5	Complete
As a Stride team, we want to display missing data as unavailable, so that we can be as transparent as we can with the users.	3	Incomplete
As a Stride team, we need to create a class diagram that represents our React components, so that we can see the flow of our web application.	2	Complete
As a Stride team, we need to continue updating our Software Development subchapter, so that we can keep track of our progress in each sprint.	1	Complete
As a Stride team, we want to change the UI of the web application, so that it aligns with Sponsors' alignment.	5	Complete
As a Stride team, we want to create a UML diagram, so that it can easily display the design of our web application.	2	Complete
As a Stride team, we want to add all the diagrams to the report, so that it can display our design.	1	Complete
As a Stride team, we want to work on the Business/Risk/Management subchapter, so that we can better understand the company culture and meet the requirements for the paper.	2	Complete
As a student, I want to view more information about each filter, so I can understand what to select.	2	Complete

As a Stride team, we want to create Jupyter notebook, so that we can begin to document our data cleaning process.	5	Incomplete
As a student I want to send the result to my email so I can review the different educational program before making my decision.	3	Incomplete
Total Points Completed:	**20**	

Table 7-5: Fourth Sprint User Stories.

7.3.4.2 Sprint 4 Summary

This week our team worked on implementing the map feature of the application. The feature consists of changing the UI so that the filters are on the left and the visualizations (map and table) are on the right. We were initially planning on using Google Maps, however we felt Leaflet was the better option, as it is completely free and presents a clear image of the world map without it showing too much of the copyright and brand. The map feature contains pinpoint locations of programs across the nation. If there are multiple available majors within the program or multiple programs within the area, the map shows a cluster of how many programs are available in the area. We also continued to work on our report by writing a Business and Risks Subchapter and added more to the Agile Methodology section and the Software Design subchapter, where we implemented the use case and class diagrams into the report. We presented our map feature to the Stride team by creating a video demo, which we received feedback on. We additionally created the Jupyter notebook to document the cleaning of our data. Next week we plan on making appropriate adjustments to our web application, based on the feedback we received.

7.3.4.3 Sprint 4 Retrospective

This week we did a good job with getting most of the stories done and made great progress with the report and web application. We also continuously updated the Sponsors about our progress, allowing us to receive valuable and timely feedback which we can implement in the following sprints. We created a repository for the Jupyter notebook to load the data, but we couldn't get everything to work. Our website is functional however we haven't implemented our actual data yet. We also had some issues with pulling the updates in VSCode from GitHub and running the website code on one computer. We're still unable to add the employer data to the final dataset, so we will talk to the sponsors about that. Next sprint, we are planning on implementing employer data, working on Jupyter notebook, and connecting final data to the web application. Our following sprint will have a duration of 2 weeks, due to Thanksgiving break.

7.3.5 Sprint 5

7.3.5.1 Sprint 5 Story Report

User Story	Points	Status
As a Stride team, we want to display missing data as unavailable, so that we can be as transparent as we can with the users.	3	Complete
As a Stride team, we want to create Jupyter notebook, so that we can begin to document our data cleaning process.	5	Incomplete
As a student I want to send the result to my email so I can review the different educational program before making my decision.	3	Complete
As a Stride team, we want to write our Assessment subchapter, to reflect on what we have learned.	3	Complete
As a Stride team, we want to write our Future Work subchapter, so that we can brainstorm and recommend suggestions on the next steps of the project.	3	Complete
As a Stride team, we want to write our Conclusion subchapter, so that we can sum up the paper.	2	Complete
As a Stride team, we want to continue adding to our Software Development subchapter, so that we have an updated summary of our sprint.	1	Complete
As a Stride team, we want to clean up the citations and references subchapter, so that the structure is more organized.	3	Complete
As a Stride team, we want to implement feedback onto our high-level hierarchy diagram, so that it includes React components.	1	Complete

As a Stride team, we want to update our class diagrams, so that we understand better how the variables are connected between each component itself.	1	Complete
As a Student, I want to compare educational programs so that I can choose the best one.	3	Complete
As a Stride team, we want to add user stories and epics in the methodology subchapter, so that we can explain the concept to the readers.	1	Complete
As a Stride team, we want to incorporate a simpler map, so that we can it more user-friendly.	3	Complete
As a Stride team, we want to implement the final excel data so that we are using accurate information for the map and table.	5	Complete
As a Stride team, we want to investigate converting our excel datasheet into JSON, so that we have another way to access the data.	1	Complete
Total Points Completed:	**32**	

Table 7-6: Fifth Sprint User Stories.

7.3.5.2 Sprint 5 Summary

This week, our sprint goal was to continue implementing feedback from the sponsors and advisors regarding the website and report, respectively. Because of Thanksgiving break, we decided to hold a two-week sprint to have time to thoroughly complete our tasks. We were finally able to successfully input our finalized data into our web application. Though it still included the NaN values, we decided to implement a show/hide feature, allowing transparency between the users and the source of the data. Another map feature added was that the specific program would show its availability of the specific major via a table if the program had multiple majors. We also began to work on solidifying our data cleaning documentation through Jupyter notebook to ensure any developer can clearly understand the source of our data and the modifications we made. With our advisor and sponsor meetings on Monday, we gained feedback on which diagrams and subchapters need revising, as well as any UI adjustments necessary.

Furthermore, we made tremendous progress on our report; not only did we reflect on and share our individual and team learnings, but we also suggested recommendations on how to improve the current project. We additionally made sure our report had a consistent past tense format. Based on additional components that were put into our application, we changed the hierarchy, use case, and class diagrams accordingly. Throughout the week, we updated the sponsors and sent a video demo of the web application to demonstrate a UI improvement. A major feature we added to the web application is an email component that allows users to send their preferred educational programs to their personal email in a table format. We added an AboutROI component below the MapC component, allowing students to understand in detail what ROI describes and how the ROI calculations are being made. On Friday, Casey met with Stride Funding's Chris Llaga to deploy the website through Vercel. With our team's deadline of having our final draft due by Friday, we began applying the given feedback to our report during the weekend. Next sprint, we plan on going into the office on Tuesday.

7.3.5.3 Sprint 5 Retrospective

This sprint went relatively well for us. We're almost done with the website: new feature email, new section about ROI, and other small fixes. We were able to deploy our website through Vercel and give Stride Funding ownership of the repository, which still allows us to write edits, however we'll need to ask for permission. We also made great progress on the report, and we were happy with what we turned in as our final draft. The feedback we received since then has been minor, such as stylistic and diagram-related comments. For this week, we still need to complete our Jupyter notebook documentation of our data cleaning, which we are planning to focus and finish when we go into the office on Tuesday.

7.3.6 Sprint 6

7.3.6.1 Sprint 6 Story Report

User Story	Points	Status
As a Stride team, we want to create Jupyter notebook, so that we can begin to document our data cleaning process.	5	Complete
As a Stride team, we want to implement all of our feedback into our report, so that we have a finalized draft.	3	Complete

As a Stride team, we want to implement our website/UI feedback, so that we have a more visually appealing web application.	3	Complete
As a Stride team, we want to create a presentation, so that we can show our project to our sponsors and advisors.	5	Complete
As a Stride team, we want to go work in the Stride Funding office, so that we can work in person and meet our Sponsors.	3	Complete
Total Points Completed:	**19**	

Table 7-7: Sixth Sprint User Stories.

7.3.6.2 Sprint 6 Summary

This week, the team went to the Stride Funding office to meet the Sponsors and present a website demo to them. Valerija gave us feedback on the UI, which we implemented to have a more visually appealing web application that corresponds with the company's needs. As the last sprint, most of our effort contributed to the report to ensure it is finalized and that we have implemented all the feedback. We fixed the authorship table, wrote the excel and Jupyter sections, wrote a context paragraph for the software development, and updated the use case diagram and critical path model. As more feedback is given, we will be ready to submit the report by the end of the week. We also created a final presentation, which we thoroughly and successfully presented on Tuesday December 12th. After the presentation, we met up as a team, to go over any final feedback given to ensure we have a clear report to submit. We have set up a meeting with the advisors for Monday December 18th to submit our eCDR.

7.3.6.3 Sprint 6 Retrospective

This sprint was mostly focused on finalizing our report. With eCDR deadline coming up, our team implemented all the feedback given by sponsors. We set up a team meeting to go through the entire report and its feedback, which was productive. We were able to meet the sponsors at their office, as well, which was good as we were able to give them a website demo and connect with them in person. We also did a good job with implementing UI feedback onto our website, so it aligns with the company's needs. With our final presentation on Tuesday, we created a presentation and split our speaking roles, allowing us to have time to receive any feedback and to practice what we want to convey. After the presentation at the office, we were asked questions and received good feedback overall.

7.4 Project Charts

A Cumulative Flow Diagram shown in Figure 7-1 is a visual representation of the flow of work items through different statuses in a project. It aids in identifying potential bottlenecks as well as how fast items are moving through each status: To Do, In Progress, and Done. In the case of our project, the slope for our done items is usually steep, meaning that our team did a great job completing tasks on time and moving to the next objectives.

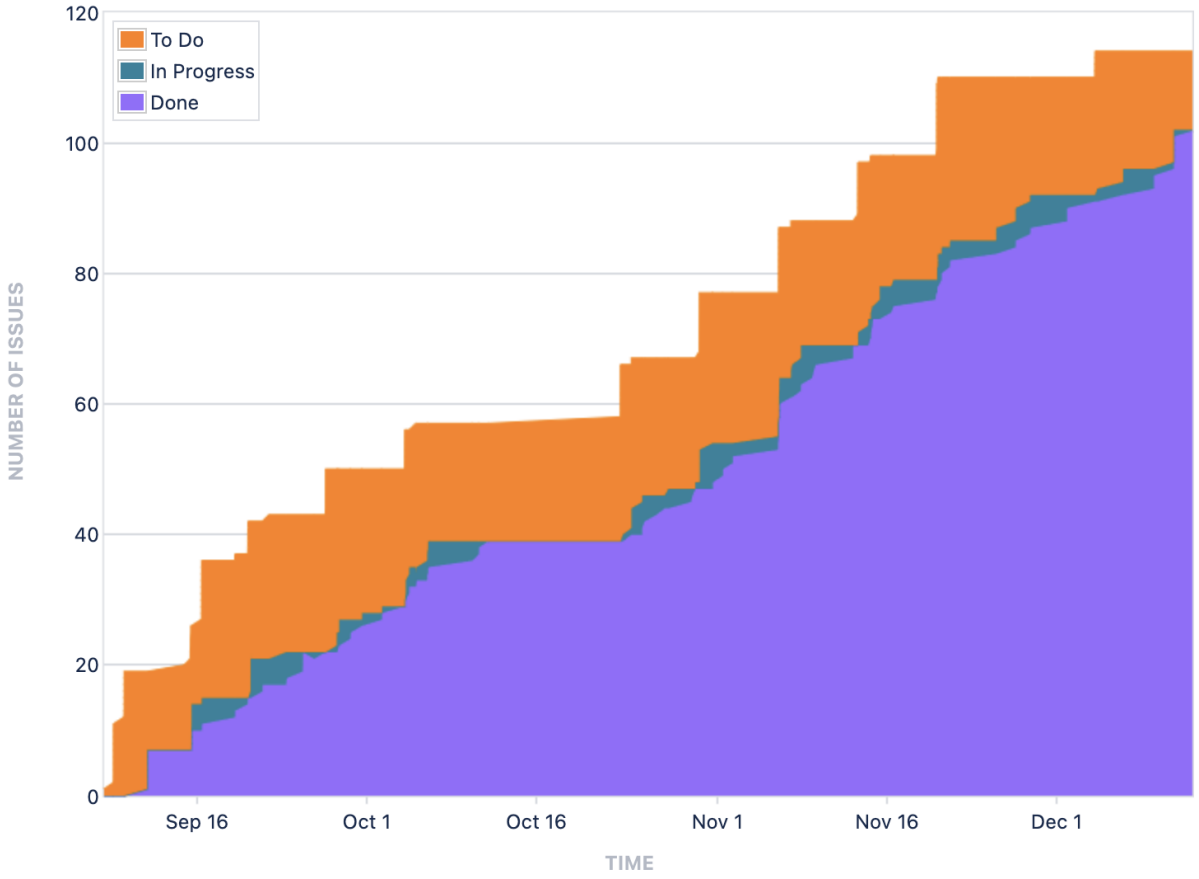

Figure 7-1: Cumulative Flow Diagram describing the status of the issues over time.

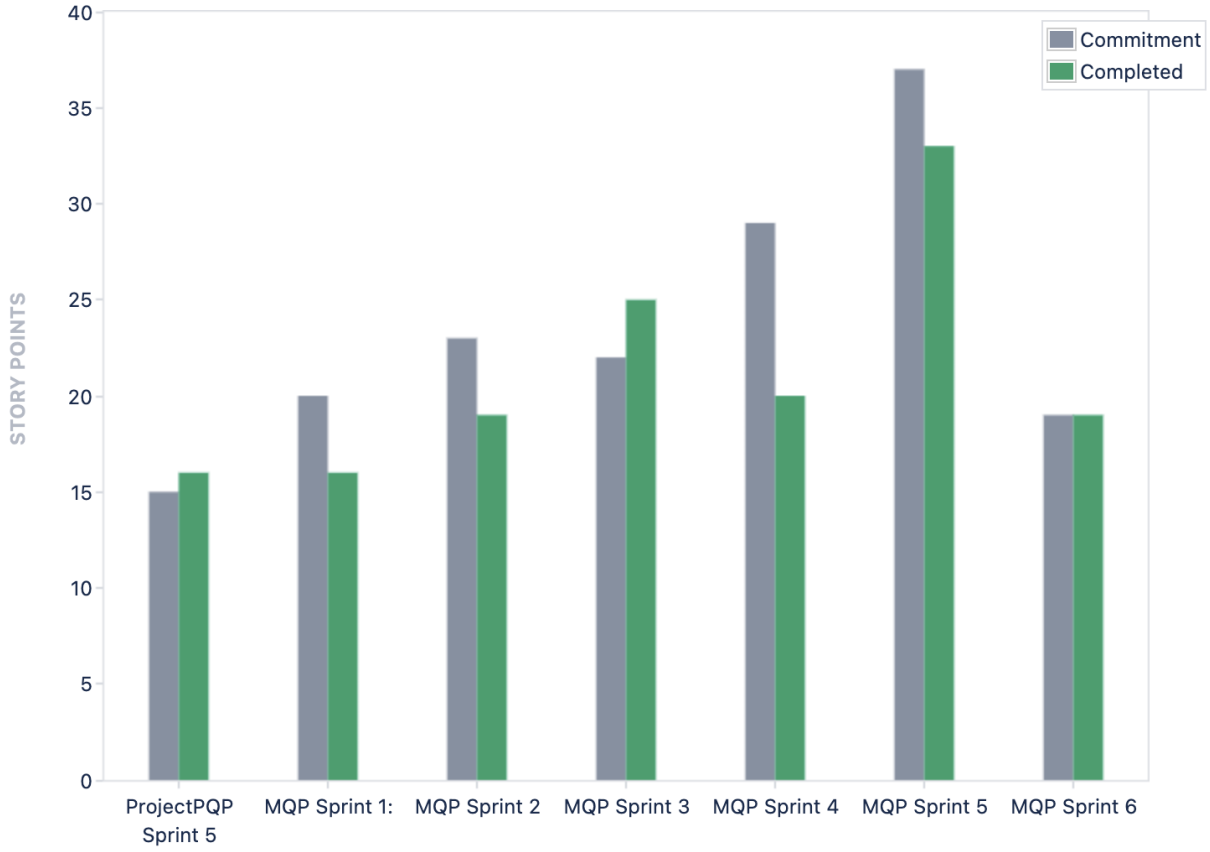

Figure 7-2: Velocity Chart describing the amount of work completed.

Figure 7-2 demonstrates the velocity chart of our project by contrasting the committed tasks for each sprint against the accomplished tasks by the sprint's conclusion. This chart serves as a tool for teams to make realistic estimations regarding future sprint workloads and achievements. In our scenario, our team consistently performed well in task completion across sprints. We set realistic story point goals corresponding to the project stage, occasionally surpassing or falling short by approximately five story points.

8. Assessment

8.1 Team Goals Accomplished

Over the course of 14 weeks, collaborating with Stride Funding on the assigned project allowed our MQP team to dive into the realm of corporate finance, education, and technology. We were given a unique learning opportunity, allowing us to glean insights and enhance our project based on valuable feedback from advisors and Stride's sponsors. Through this collaborative process, we not only gained a comprehensive understanding of customer needs but also aligned our approach with the overarching goals and desires of the company.

Initially, our team outlined a set of objectives aimed at leveraging our existing skill sets in project management and agile scrum methodology. Our goals included fostering transparent task progress tracking to highlight our scrum productivity, while also implementing strategies geared towards improving our team's professional development. Through our partnership with Stride Funding, our agenda extended beyond providing recommendations to boost customer engagement; we aimed to comprehensively grasp and address the company's desires for augmenting their brand image.

The project significantly deepened our engagement with Agile Scrum Methodology, yielding clear organizational benefits. Consistent adherence to weekly scrum planning and retrospectives, coupled with daily scrum meetings, provided heightened visibility into task progress, and facilitated the achievement of project goals. These regular interactions allowed us to promptly address blockers, as well as plan meetings with advisors and sponsors throughout the week. In the remote setting, we extended our communication efforts by conducting regular meetings with advisors, sponsors, and team members. This proactive approach fostered a marked improvement in our collaborative skills, thereby contributing to a more accelerated trajectory of progress.

A significant portion of our technical growth centered around the benefits of React, a powerful JavaScript library. We delved into its intricacies, understanding its core principles, and gaining proficiency in crafting dynamic and efficient user interfaces. The exploration of additional libraries, such as Leaflet for mapping functionality, broadened our toolkit, enabling us to implement features like interactive maps with markers and popups. Our data acquisition involved sourcing information about colleges from government public databases, followed by cleaning process using Excel and Jupyter Notebook. Collaboration was streamlined through GitHub, where we maintained a well-documented Read.me file to ensure transparency. With the overarching goal of creating an exemplary website, we actively sought and implemented feedback from sponsors, resulting in the successful implementation of an interactive map featuring markers and popups—a testament to our technical proficiency and achievement of our

website creation goal. Along this journey, we also created multiple mock-ups to receive invaluable feedback, refining our design iteratively and ensuring a user-centric approach.

8.2 Individual Experience

8.2.1 Dang Nguyen's Experience

The MQP provided me with valuable insights that are highly applicable to professional settings. Through tight collaboration with advisors and the project team, I have acquired a multitude of technical and interpersonal skills that I can effectively utilize in the future. Through adopting the Agile framework, I have acquired a deeper understanding of Scrum and its pivotal role in project management. Furthermore, my proficiency in data handling was enhanced by practical exposure to data cleaning and manipulation techniques. In addition, I acquired practical knowledge by actively engaging in the development of a Jupyter notebook for the purpose of documenting my project-related activities. This endeavor provided me with insights into the underlying technical aspects undertaken by my colleagues specializing in Computer Science. Importantly, I had the opportunity to gain firsthand experience in the process of constructing a web application from the start and to understand the extensive effort involved in its development. Despite encountering several challenges throughout the project, it is worthwhile to retrospectively examine the way our team successfully addressed the obstacles that impeded progress.

8.2.2 Kseniia Romanova's Experience

Working on the MQP with Stride Funding sponsors was an enriching experience, allowing me to both showcase and expand my skills as a full-stack developer. The collaboration within our diverse team enhanced my understanding of effective communication, collaboration dynamics, and leveraging each team member's strengths. Interacting with sponsors further enriched my experience by providing valuable insights into the broader context for my technical work, proving essential in aligning technical solutions with business goals. The adoption of Agile methodologies offered me a hands-on project management experience that covered sprint planning, task prioritization, and the ability to adapt to evolving requirements. As the main website developer, I got exposed to a multitude of various React libraries, broadening my technical horizons. Simultaneously, I seized the opportunity to refine my presentation skills, effectively conveying intricate technical concepts to a non-technical audience. Throughout the project, our team faced multiple challenges, but our collective resilience and effective problem-solving skills ensured the successful delivery of a high-quality product. This experience not only sharpened my technical abilities but also honed my collaborative and adaptive skills in a real-world project setting.

8.2.3 Pooja Kawatkar's Experience

These past 14 weeks working with my team and Stride Funding have been a rewarding experience. Not only did I gain experience from a technical aspect, but I also attained collaborative experience from cross-functional communication with my team, the company, and our advisors. As Scrum Master, I spearheaded Agile Scrum Methodology within the team, by running the daily scrum meetings and weekly retrospectives, as well as reporting our sprint summaries and task progress. With our weekly updates with our sponsors and advisors and with our daily updates within our team, I recognized the value of check ins to communicate any issues and successes, allowing for full transparency and continuous, steady improvement every Sprint. As most projects involve, we ran into a few obstacles which we overcame during our group meeting discussions, testing our resilience and determination. When needed, I learned how to form assertive yet professional emails to communicate suggestions we had for the project. As a React novice, I grasped the understanding of how to define attributes, methods, and classes, while also enhancing my GitHub familiarity. I was also able to enhance my ability to independently research to find appropriate packages and tutorials that I can incorporate into projects, which is beneficial in a real-life project setting. Ultimately, this MQP offered me valuable takeaways, both technical and soft skills, essential in the working world.

9. Business and Risk Management

9.1 Project Risk vs Reward

The project's success carries substantial ramifications for Stride Funding, and it is imperative to comprehend the trade-off between risk and return. One of the key business risks entails the possibility of falling behind other firms. In the event of a poor deployment, Stride Funding may experience a decline in market share and a decreased position compared to its competitors, as the app is an important element in providing a competitive advantage. The presence of this competitive disadvantage could potentially have an adverse effect on the company's capacity to both recruit and retain customers, thereby impacting its overall standing within the market.

Furthermore, the potential for decreased user involvement is a significant issue. If the application does not match the expectations of users or demonstrate effectiveness in meeting their needs, it could lead to diminished interest and reduced levels of engagement. The potential consequences of this scenario include a decrease in user satisfaction, which may impede the adoption of the app and restrict its potential impact on Stride Funding's business objectives. Furthermore, there exists the potential for limited engagement with prospective clientele. If the application fails to establish a strong connection with the intended demographic or is unable to attract new users, the organization may potentially forego prospects for expansion and the increase of financial gains. The acquisition of new customers and the expansion of Stride Funding's market presence heavily rely on the effectiveness of outreach efforts. If the app fails to do this, it could potentially hinder the company's overall growth trajectory.

9.1.2 Project Bottom Line Improvement

It is expected that the successful completion of this project will yield favorable outcomes for Stride Funding in terms of financial performance, manifesting through many channels. The primary objective of the project is to enhance consumer engagement. Stride Funding aims to improve the entire customer experience and promote greater engagement with its services through the provision of a highly efficient and user-friendly application. Increased customer involvement could enhance client satisfaction and loyalty, hence resulting in the possibility of recurring business and a prolonged customer lifetime value.

Additionally, the project has been strategically developed to enhance the company's consumer base by reaching out to previously untapped markets. An app that is positively welcomed has the potential to function as a powerful tool for expanding the target audience and enabling the engagement of those who were previously uninformed about or uninvolved with the products and services provided by Stride Funding. The expanded outreach facilitates the

exploration of novel avenues for client acquisition, so enabling the organization to access previously unexplored markets and broaden its customer demographic. Furthermore, it is anticipated that the app's popularity will indirectly lead to a rise in revenue for Stride Funding. The development of an app that is both user-friendly and successful has the potential to significantly increase the adoption rates of Stride Funding's lending services, hence attracting a larger user base. By broadening its customer base, the corporation possesses the capacity to generate a greater number of loans, thereby augmenting its overall revenue. The increase in revenue can be attributed to the app's effectiveness in expediting and optimizing the loan application process, hence enhancing its accessibility and attractiveness to a broader range of users.

9.1.3 Project Value and Benefits

This project has the potential to provide numerous values and benefits for Stride Funding, spanning both operational and strategic advantages. One of the notable advantages is the expected enhancement in loan performance. The project aims to promote academic success by providing students with the opportunity to select educational programs that fit with their interests. The alignment between academic outcomes and loan payback rates can have a positive impact on overall loan performance. Consequently, Stride Funding has the potential to gain advantages from a stronger and more dependable collection of loans. Moreover, the project offers the potential to generate important data insights and analytics obtained from user engagements with the application. The acquisition and examination of this data could provide Stride Funding with a more profound comprehension of user behavior, preferences, and trends. These insights have the potential to be utilized to enhance marketing efforts, optimize loan offerings, and make well-informed business decisions. The adoption of a data-driven approach has the potential to improve operational efficiency and effectiveness, enabling the organization to maintain agility and responsiveness in the face of market fluctuations.

Moreover, it is anticipated that the project will make a valuable contribution to the augmentation of Stride Funding's brand and standing, thus bolstering its market position. The perception of a firm by both current and prospective consumers can be significantly impacted in a positive manner through the development and implementation of a successful and user-friendly application. The enhanced reputation has the potential to foster greater trust and credibility, thereby establishing Stride Funding as a dependable and customer-driven entity within the financial services industry.

9.2 Project Team & Stride Risk Culture

There were several notable similarities observed between our project team and Stride in terms of the risk culture that permeates both respective initiatives. The development of a positive risk culture holds significant importance within Stride's project teams and overall corporate

philosophy. Our team places a high priority on the proactive identification of risks through the implementation of regular evaluations and brainstorming sessions. This approach facilitates open communication and enables the early awareness of potential risks throughout the project lifecycle. The adoption of this proactive strategy establishes the fundamental basis for the implementation of effective risk management strategies. Furthermore, Stride has successfully implemented comprehensive risk mitigation techniques. This entails the explicit allocation of responsibility for the management of risks, the formulation of contingency plans, and the periodic evaluation and revision of those plans throughout the project. Throughout the project, our team was able to eliminate a lot of risks through active communications with sponsors. This has positively impacted us as we could quickly make changes to areas of the application that needs improvement, allowing us to move from one phase to the next more smoothly. Our objective is to mitigate the possible impact of identified risks on project results through proactive risk management.

Furthermore, Stride places a strong emphasis on continuous improvement within its organizational culture, as seen by implementing post-project reviews and lessons-learned sessions. This enables the team to evaluate effective risk management procedures and areas that may require development, contributing to the continuous improvement of Stride's risk management operations. The corporation also places emphasis on transparent and collaborative risk communication, including providing clearly defined channels for reporting and addressing issues across different levels within the organization. The practice of inclusion guarantees that perspectives from a wide range of team members are considered, hence promoting a collaborative endeavor to identify and alleviate risks.

From a technological perspective, Stride carefully identifies third-party dependencies and exhibits selectivity in choosing vendors or open packages, with a particular emphasis on safeguarding data privacy and ensuring system security. The company's dedication to ensuring high availability and dependability is clearly demonstrated in its fundamental business processes, which are reinforced by Service Level Agreements (SLAs) and a DevOps culture that fosters a collective responsibility for testing, integration, and deployment. Blameless Postmortems are utilized to handle incidents, while regular retrospectives are employed to facilitate the ongoing enhancement of our development processes.

9.2.1 Additional Risks

Furthermore, apart from the issues mentioned above, there are additional risks that must be duly considered. Regarding operational concerns, the adoption of the application may result in a modification of the day-to-day functioning. These challenges may include difficulties in the routine operations of maintaining the application, such as system failures or problems with the app's performance. Given that the project involves the introduction of an original application, there are potential risks related with the innovative components of the technology, possible resistance to change, and unforeseen obstacles in deploying new features. Although the project's

financial risks primarily focus on improving the bottom line, there may be other financial risks that are not expressly specified, such as exceeding the budget, unforeseen expenses, or volatility in the cost of implementing technology. In addition to the listed competition threats, the success of the application could be influenced by broader market dynamics, changes in customer behavior, or alterations in industry rules. Insufficient training for users or internal staff may prevent the proper utilization of the application and, consequently, its success.

9.3 Project Management

In order to effectively plan the completion of necessary tasks and account for various project risks, our team has created a project management charter. This charter will assist us in managing the project scope and minimizing possible risks. The project management charter is an essential document that plays a pivotal role in the success of a project. It provides a concise and thorough description of the project's purpose, objectives, scope, and stakeholders (Panell 2023). An essential role of the project is to create a shared comprehension among all project participants, including team members, sponsors, and stakeholders, of the project's objectives and anticipated outcomes. The charter establishes the project's scope and objectives, delineating the limits of the project and safeguarding against scope creep. It also ensures that all project activities are in line with the overarching goals. Moreover, the charter functions as a guide for making decisions at every stage of the project, offering a structure for evaluating and ranking tasks.

The project management charter plays a crucial role in identifying and addressing potential risks right from the beginning of the project, thereby helping us to mitigate those risks. It enables the development of risk management strategies, which involve identifying, evaluating, and planning responses to risks. The charter facilitates the proactive identification of risks that may affect the project's success by explicitly delineating project goals, limits, and assumptions. By adopting a proactive strategy, the team was able to devise strategies to mitigate risks and create contingency plans, effectively reducing the probability and consequences of potential crises. The project management charter functions as a proactive risk management instrument, bolstering the project's overall resilience and improving the probability of successful and timely project completion.

9.3.1 Project Management Plan

Project's Objective: Build the Stride Tool app for Stride Funding to help students determine an educational program that best matches the student interest based on a variety of app filters.

Filters included in the app include Educational program, Location, School, Tuition, Program outcome, Cost of Living, and ROI.

Project's Scope: Build the Stride Tool app that includes all the app filters listed above. The application displays an interactive map of the U.S. for users to filter and drill down based on their interested school or educational program. The app also displays a table with an important filter listed as a field on the table for easier comparison between different educational programs.

Project's Duration:

- Project Prep Work: 8/24/2023-10/13/2023
- App Development and Report: 10/23/2023-12/15/2023

Project's Team:

- Dang Nguyen - Product Owner
- Kseniia Romanova – Developer
- Poojah Kawatkar - Scrum Master

Stakeholders:

- Stride Team Sponsors - Harsh Rana, Morgan Viehman, Andrew Henney, Carissa Zukowski
- Stride CEO - Tess Micheals
- Project Team
- Project advisors
- Users(students)

Cost: N/A

Project Scope:

- Interactive map with filters
- Table with filters
- Results export

Prep work:

- Identified data sources that are necessary for the project.
- Built a Figma mock-up for the website.
- Built a website template.
- Work on the MQP report

Weekly Tasks Breakdown

- Week 1:
    - Clean available data.
    - Finalized Background and methodology chapters.
    - Update on the website template.
- Week 2:

    - Continue cleaning data.
    - Identify more data sources that can be useful.
    - Create a mock-up table for sample code before adding finalized data.
    - Document process to find, retrieve, and clean data.
    - Create ERD, process model, and critical path.
    - Finalized Software development environment and software requirements chapters.
- Week 3:
    - Create network model.
    - Start linking sample data to the app.
    - Review the app filters and functionality.
    - Review and update UI layout.
    - Finalized Design and Software Development chapters.
- Week 4:
    - Make improvements to website filters and functionality.
    - Review and update UI layout.
    - Create Jupyter notebook.
    - Business and Risk management chapter.
    - Combine data sources.
- Week 5:
    - Assessment, Conclusion and Future work chapters.
    - Create Presentation.
    - Add map and load data to application.
    - Check the website for bugs and continue making changes to improve the website functionality and appeal.
- Week 6:
    - Executive Summary and Final edits on paper.
    - Update UI design and add favorite/send result.
    - Finalize presentation.
- Week 7:
    - Finishing touches on the website, report, and presentation.
    - Final presentation and project handover.

9.3.2 Critical Path Model

The Critical Path Model (CPM) is a project management technique used in the field of Management Information Systems (MIS) to assist in the planning and scheduling of tasks within a project. The visual representation of the sequence of activities and their interdependencies assists project managers in identifying the critical path, which is the sequence of activities that must be completed on schedule for the project to meet its deadlines (Landau 2022). From a MIS standpoint, the Critical Path Model is a beneficial framework for organizing and evaluating

information pertaining to project schedules, resource allocation, and task interdependencies. Project managers can utilize it to optimize resources, efficiently deploy people, and identify any bottlenecks or delays in the project timeline.

The Critical Path Model is essential for app development projects because of the intricate and interdependent nature of the jobs involved. App development necessitates collaboration among teams, including design, development, testing, and deployment. The Critical Path Method facilitates the visualization of interdependencies across tasks, hence ensuring seamless progress and adherence to the project timeline. Through the identification of the critical path, we were able to concentrate our efforts on the tasks that are most time-sensitive, thereby minimizing the possibility of delays and enhancing the overall efficiency of the development process. Furthermore, it establishes a foundation for efficient communication among team members, stakeholders, and decision-makers, promoting cooperation and increasing the likelihood of successfully finishing the project within the designated timeframe.

Evaluation and Review Technique (PERT) is also a project management method employed to examine and depict the activities and tasks required to accomplish a project. From a Management Information Systems standpoint, PERT primarily emphasizes the visualization of workflow, identification of task relationships, and estimation of time necessary for each action. PERT utilizes a network diagram to depict the interconnections between jobs and offers a method to effectively handle uncertainty in project timetables (Landau 2022). The PERT model in MIS is especially beneficial for projects that have intricate interdependencies and unknown durations of tasks. Its integration with the Critical Path Method (CPM) is noteworthy, as both methodologies share the objective of optimizing project schedules. CPM, being more deterministic, enhances PERT by placing emphasis on identifying the critical path - the series of jobs with no room for flexibility in scheduling that ultimately defines the total project duration. PERT and CPM provide a thorough method for organizing, timing, and overseeing projects inside the MIS framework. Refer to figures 9-1 and 9-2 below for more information on the models.

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Predecessors	-	A	B	C	D	E	-	G	N	I	O	K	-	M	N
Time (Week)	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2

Table 9-1: Tasks Predecessors.

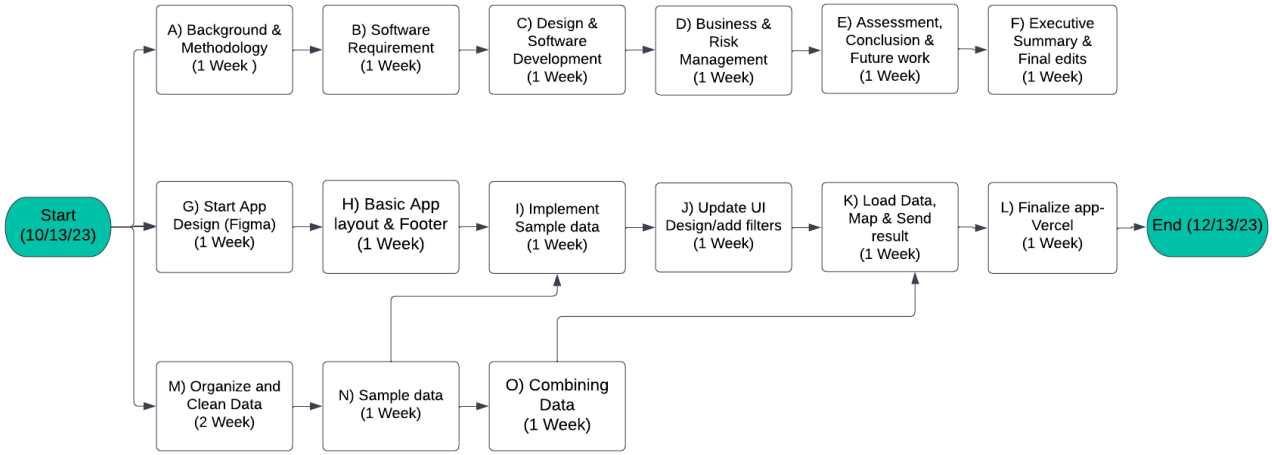

Figure 9-1: Critical Path Model (CPM)

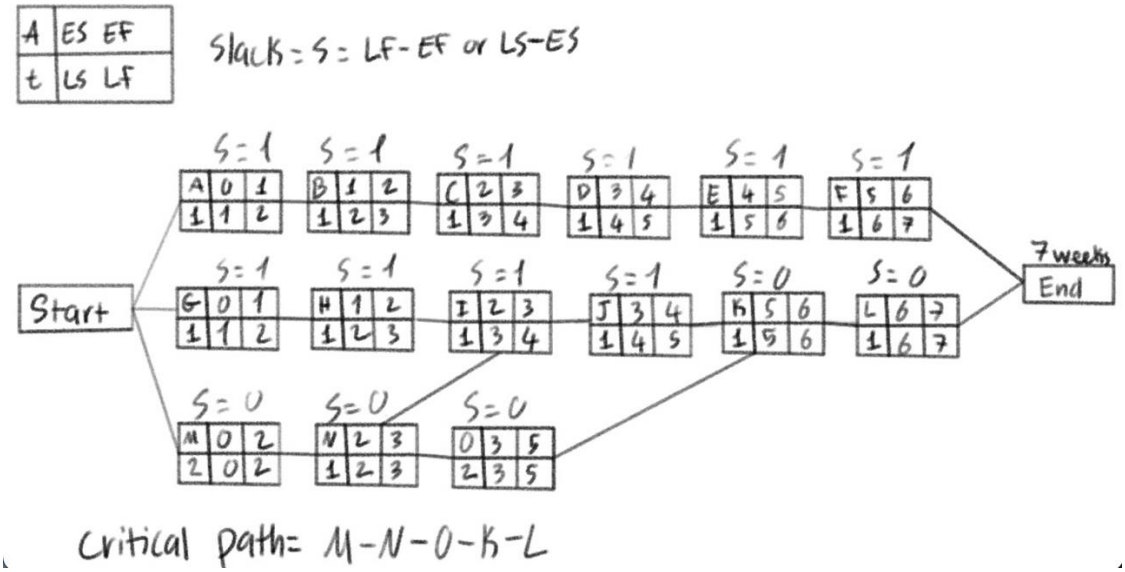

Figure 9-2: Program Evaluation and Review Technique (PERT)

10. Future Work

Looking ahead, our team has a comprehensive roadmap for future work that aims to expand the overall functionality and user experience of our application. One crucial initiative involves conducting user surveys to gain deeper insights into user perspectives on the app and its effectiveness. To enhance accessibility and user satisfaction, Stride Funding can plan to prioritize improvements in website performance, ensuring faster loading times for seamless navigation.

Surveys are a vital research tool employed to gather structured information and insights from a targeted group of individuals. In the context of app development, conducting surveys before releasing an app to the public enables researchers to collect valuable data regarding user preferences, expectations, and needs, offering a quantitative understanding of potential users' opinions and requirements. This data-driven approach allows developers to make informed decisions about the app's features, design, and functionality, aligning them more closely with user desires. By leveraging surveys, developers can identify potential pain points, usability issues, and areas for improvement that might otherwise go unnoticed. In essence, surveys serve as a strategic compass that guides app developers in tailoring their products to meet the diverse and evolving demands of their target audience, ultimately increasing the app's chances of success in the competitive digital landscape. Survey questions should be formatted as “questions about attitude,” which seek to learn more about what people feel about a topic (Kasunic, 2005), which is the app functionalities and layout. When constructing the questionnaires for the survey, Stride should apply both structured and unstructured questions to obtain results. Most of the questions should be close-ended or structured questions with multiple choice and options ranking from most agree to most disagree, but also open-ended or unstructured questions that allow the respondents to elaborate further on the topic without constraint (Kasunic, 2005). The responses obtained from the respondents allow Stride to generalize what the users wanted and better understand the underlying problems we should try to fix.

Security remains paramount, prompting the development of a secure database to fortify the protection of user data. One way of doing so would be to create a POST API route to store the Excel file in the local directory with Multer, then parsing the file attached to the request body with read-excel-file and running insert statement in the database.

In terms of user interface and experience, the team’s focus can extend to creating additional user-friendly features, including new filters and a revamped UI to enhance overall usability. To address the issue of blank values, explore and integrate better public data sources, specifically those providing more comprehensive information about educational opportunities. Furthermore, code refactoring should be performed to enhance readability and maintainability, ensuring a cleaner and more efficient codebase.

Considering the potential for enhanced functionality, the team can investigate alternative map libraries, such as Google Maps, which offer additional features, albeit paid services. The

integration of the Lighthouse, an open-source automated tool for improving the quality of web pages, is also on our agenda to further improve the website's overall performance. Keeping efficiency in mind, we suggest using a package that allows to send an email of the user's favorites selection formatted as an excel sheet rather than an html-styled table. This will provide a more user-friendly approach to accessing and editing their preferred educational programs. Lastly, recognizing the global reach of educational opportunities, Stride Funding can expand our application to include Canadian universities, broadening the impact and user base. These future endeavors collectively reflect our commitment to continuous improvement and innovation in providing a robust and user-centric platform.

11. Conclusion

Stride Funding stands out as a pioneer in the field of educational funding, tackling the monetary obstacles that frequently impede students' aspirations for advanced education. Stride was established with the goal of transforming education accessibility. What makes Stride distinct is its provision of adaptable and cost-effective repayment plans that are determined by income. This approach eliminates the obstacles created by conventional banks, which heavily rely on credit scores and co-signers.

After spending over seven weeks working on web application development as well as getting to understand Stride better, it is apparent that Stride is committed to helping students from diverse backgrounds explore possible educational programs before deciding. The platform we created using React offers a user-friendly interface for students to explore, and access individualized educational programs. Features such as institution, location, tuition, cost of living, and ROI were some of the main factors that are viewable on the site, which is supported by public data sources that were compiled and transformed by our team. Through these features, students can filter based on the criteria they look for and choose the educational program that they find most fitting. The filters are displayed on an interactive map in which students can see where each of the education programs is located on the map and save the one, they are most interested in. This enables students to evaluate multiple possibilities and determine the most suitable path for themselves.

Our team actively engaged with various stakeholders and incorporated their feedback throughout the process. Our team had a daily meeting schedule for progress updates, along with other meetings that we had with the sponsors and advisors. We used Jira as the primary project management tool to help prioritize and keep track of the tasks we need to get done each sprint. The app leverages React, known for its component-based architecture, enabling the creation of reusable and modular UI elements. This choice was complemented using Microsoft Visual Studio Code as the development environment due to VS Code’s versatile and powerful features, making it the preferred tool for the project. GitHub Desktop was another tool that our team utilized for collaborative coding and project management task control when it came to software development.

With their forward-thinking strategy and creative methods of funding, Stride is leading the way toward a future where education becomes a universally accessible pathway to success. This will promote upward economic mobility and enable individuals to achieve their career goals.

References

"About Us." Stride Funding. Accessed October 25, 2023. https://www.stridefunding.com/about-us.

Al-Hawari, Feras, Mai Al-Zu'bi, Hala Barham, and Wael Sararhah. "The GJU Website Development Process and Best Practices." Journal of cases on information technology 23, no. 1 (2021): 21–48.

Atlassian. "Agile Project Management [What Is It & How to Start]." Atlassian. Accessed November 16, 2023. https://www.atlassian.com/agile/project-management.

Atlassian. "Epics, Stories, Themes, and Initiatives." Atlassian. Accessed November 26, 2023. https://www.atlassian.com/agile/project-management/epics-stories-themes#:~:text=Stories%2C%20also%20called%20"user%20stories,smaller%20tasks%20(called%20stories).

Bidwell, Allie. "Report: Low-Income Students Cannot Afford 95 Percent of Colleges." NASFAA, March 23, 2017. https://www.nasfaa.org/news-item/11623/Report_Low-Income_Students_Cannot_Afford_95_Percent_of_Colleges.

Bodycomb, Aphrodite, M.B.A., and Del Baglivo, Megan D, MLS. 2012. Using an automated tool to calculate return on investment and cost benefit figures for resources: The health sciences and human services library experience EC. *Journal of the Medical Library Association* 100, (2) (04): 127-30, http://ezproxy.wpi.edu/login?url=https://www.proquest.com/scholarly-journals/using-automated-tool-calculate-return-on/docview/1011119534/se-2 (accessed October 25, 2023).

"Build Your Pipeline, Solve Retention." Stride Funding. Accessed October 25, 2023. https://www.stridefunding.com/healthcare.

"Code Editing. Redefined." Visual Studio Code, November 3, 2021. https://code.visualstudio.com/.

Conner, Patrick. "FinTech Disruptor Stride Funding Secures Venture Funding: Stride Funding Offers Income Share Agreements to Fund Higher Education." Stride Funding, October 25, 2019. https://www.stridefunding.com/post/fintech-disruptor-stride-funding-secures-venture-funding.

Cost of living index by State 2023. Accessed November 30, 2023. https://worldpopulationreview.com/state rankings/cost-of-living-index-by-state.

"Data Home: College Scorecard." Data Home | College Scorecard. Accessed November 30, 2023. https://collegescorecard.ed.gov/data/.

DesignRush, "The 5 Best Website Elements That More Than 90% of Consumers Want - Plus, the Top 25 Web Design Agencies of 2019: 95 Percent of Consumers Say the Most Important Aspect of a Professional Website Is a Positive User Experience." DesignRush Rounded up the Top Website Features That Foster Excellent UX and Strong Conversions, and the Best Website Development Companies Who Can Build Them. PR Newswire. New York: PR Newswire Association LLC, 2019.

Evergreen. “5 Key Benefits of Web Applications for Business.” Evergreen. Accessed October 30, 2023. https://evergreencomputing.com/blog/5-key-benefits-of-web-applications-for-business/.

“Free Online Spreadsheet Software: Excel: Microsoft 365.” Free Online Spreadsheet Software: Excel | Microsoft 365. Accessed December 9, 2023. https://www.microsoft.com/en-us/microsoft-365/excel.

GitHub Desktop. Accessed December 9, 2023. https://desktop.github.com/.

Hahn, Alicia. “2023 Student Loan Debt Statistics: Average Student Loan Debt.” Forbes, July 16, 2023. https://www.forbes.com/advisor/student-loans/average-student-loan-debt-statistics/.

Hanson, Melanie. “Average Cost of College by State [2023]: Tuition + Fees.” Education Data Initiative, April 28, 2023. https://educationdata.org/average-cost-of-college-by-state.

Hanson, Melanie. “Financial Aid Statistics [2023]: Average Aid per Student.” Education Data Initiative, February 15, 2022. https://educationdata.org/financial-aid-statistics.

Hutsulyak, Oleksandr. “Why Use React for Web Development: 10 Reasons to Apply.” TechMagic, October 19, 2023. https://www.techmagic.co/blog/why-we-use-react-js-in-the-development/#:~:text=React%20can%20be%20used%20to,desktop%20applications%20using%20web%20technologies.

“Index Match Formula.” Corporate Finance Institute, November 22, 2023. https://corporatefinanceinstitute.com/resources/excel/index-match-formula-excel/#.

Ip, Winnie, Jennie Gober, and Walt Rostykus. 2016. Ergonomics return on investment: Show me the money. Professional safety 61, (4) (04): 48-52, http://ezproxy.wpi.edu/login?url=https://www.proquest.com/scholarly-journals/ergonomics-return-on-investment-show-me-money/docview/1781203608/se-2 (accessed October 25, 2023).

Juviler, Jamie. “9 Guidelines & Best Practices for Exceptional Web Design and Usability.” HubSpot Blog, August 11, 2022. https://blog.hubspot.com/blog/tabid/6307/bid/30557/6-guidelines-for-exceptional-website-design-and-usability.aspx.

Kafafian, David. “Fintech Disruptor Stride Funding Breaks Barriers as It Closes $12M Series A.” Cision PR Newswire, December 2, 2021. https://www.prnewswire.com/news-releases/fintech-disruptor-stride-funding-breaks-barriers-as-it-closes-12m-series-a-301436154.html#:~:text=Stride%20was%20founded%20by%20Tess,Holdings%20and%20other%20impact%20investors.

Landau, Peter. “PERT and CPM: Their Differences and How to Use Them Together”. Projectmanager, December 27, 2022. https://www.projectmanager.com/blog/pert-and-cpm

Lasater, Miles. “Tess Michaels, Founder and CEO Stride Funding.” Startups for Good, December 28, 2020. https://www.startupsforgood.com/tess-michaels-founder-and-ceo-stride-funding/.

“Oes Home.” U.S. Bureau of Labor Statistics. Accessed October 30, 2023. https://www.bls.gov/oes/tables.htm.

“One Platform to Connect.” Zoom. Accessed December 9, 2023. https://zoom.us/.

Pato, Maria Lúcia, and Ana Sofia Duque. 2021. "Sustainability Communication in Rural Tourism: Website Content Analysis, in Viseu Dão Lafões Region (Portugal)" Sustainability 13, no. 16: 8849. https://doi.org/10.3390/su13168849

Panell,Reagan. “Why are project charters important and how to build a project charter”. Leanscape, March 24, 2023. https://leanscape.io/why-are-project-charters-important-and-how-to-build-a-project-charter/#:~:text=A%20project%20charter%20is%20an%20important%20formal%20document%20that%20includes,budget%20and%20other%20relevant%20data.

Project Jupyter. Accessed December 9, 2023. https://jupyter.org/.

Reinicke, Carmen. “54% of Teenagers Feel Unprepared to Finance Their Futures, Survey Shows.” CNBC, June 1, 2022. https://www.cnbc.com/2022/06/01/54percent-of-teens-feel-unprepared-to-finance-their-futures-survey-shows.html.

“Roi Calculator.” Stride Funding. Accessed October 27, 2023. https://www.stridefunding.com/roi-calculator#calculator.

Rothstein, Robin. “Examining the Cost of Living by State in 2023.” Forbes, August 25, 2023. https://www.forbes.com/advisor/mortgages/cost-of-living-by-state/.

“Solve Nursing Retention With Stride.” Stride Funding. Accessed October 25, 2023. https://www.stridefunding.com/roi-calculator.

“Stride Funding Partners with FinWise Bank to Expand Affordable Access to Education.” FinWise Bank, October 24, 2022. https://www.finwise.bank/news/stride-funding-partners-with-finwise-bank/#:~:text=About%20Stride%20Funding&text=In%20the%20past%20year%2C%20the,Law%20School%20to%20General%20Assembly.

Taherdoost, H. (2022). How to Conduct an Effective Interview; A Guide to Interview Design in Research Study. International Journal of Academic Research in Management (IJARM*), 11*(1). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4178687

“Talent Pipeline Solutions for Healthcare.” Stride Funding. Accessed October 29, 2023. https://www.stridefunding.com/healthcare.

Tretina, Kat. “How Do Student Loans Work?” Edited by Kaitlin Mulhere. Money, June 27, 2023. https://money.com/how-do-student-loans-work/.

“Undergraduate Business Global Programs: UNC Kenan-Flagler Business School.” Undergraduate Business Global Programs | UNC Kenan-Flagler Business School. Accessed October 29, 2023. https://www.kenan-flagler.unc.edu/programs/undergraduate-business/global-programs/.

“Virtual Dom and Internals.” React. Accessed October 25, 2023. https://legacy.reactjs.org/docs/faq-internals.html#:~:text=The%20virtual%20DOM%20(VDOM)%20is,a%20library%20such%20as%20ReactDOM.

“Where Work Happens.” Slack. Accessed December 9, 2023. https://slack.com/.