Lab 2 - Strome Infusion Prototype Specification

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1. INTRODUCTION

Old Dominion University (ODU) believes that students can make a positive impact on the regional economy and have a lucrative career by being an entrepreneur. To support this idea, the Strome Entrepreneurial Center (SEC) was established to enable and encourage students from any discipline to explore a new or existing business venture. The center was made possible by the generous support of Mark Strome who graduated from ODU in 1978 with a bachelor's of science in engineering (Little, 2014). His application for admission to ODU was initially rejected but through some convincing from his father he was eventually accepted (Vair, 2014). He went on to receive his master's degree in economics from the University of Berkley in California (Little, 2014). By 1992, he had started his own business called Strome Investment Management which became a multimillion dollar investment firm (Little, 2014). In 1995, with the help of his wife Tammy, the couple set up the Strome Family Foundation which supports local programs with a primary emphasis on education, arts, and research (Vair, 2014). In 2014, to give back to the University for deciding to accept him, the foundation donated $11 million to ODU to promote the entrepreneurship spirit amongst the campus community (Little, 2014).

1.1. Purpose

The Strome Entrepreneurial Center (SEC) provides guidance to students who need assistance with an existing business or the implementation of an entirely new business idea. They offer the following services to Old Dominion University (ODU) students: guest speakers, workshops, one-on-one consultations, internships, mentoring, and SEC sponsored contests. Communicating these resources to the campus community, however, has been a challenge. Currently, the only methods for reaching out to students are face-to-face meetings, clubs, ODU public relations, and "word of mouth" through faculty and staff. Once students are aware and

engaged with the center, there is no automated way to connect students with the resources they need.

Strome Infusion (SI) was developed by ODU CS411 Team Black to allow ODU students to more effectively connect with the SEC and to connect with the necessary resources (both internally and externally) to meet their entrepreneurial goals. Students with a new or existing business idea will utilize SI to connect with fellow students who possess a desired skill set or with an external company who is providing a needed resource. The connections will be made through a virtual job board where the business, skills, and resources will be easily searched and requested. When students need additional guidance, SI will provide them with the ability to request a meeting with an SEC staff member. SEC staff members will also monitor student businesses in SI to provide guidance as necessary.

1.2. Scope

The first challenge for the SEC is their ability to reach out to students to make them aware of this valuable resource. Some general information and an events calendar are available on the ODU website; however, this has historically been less than adequate for meeting the center's outreach goals. Another challenge is the inability of the SEC to keep track of the students who have requested their guidance. The SEC contracted a third-party vendor to develop a website called Venture Hive to collect student information; however, the registration process is cumbersome and overwhelming. Because of this, there have been limited number of students who have registered (according to Nancy Grden who is the current executive director of SEC).

Another challenge is the ability to connect students with resources, community partners, and investors. Currently the SEC has to manually match students up with other students, mentors, and external resources. These challenges are highlighted in red in figure 1 below.

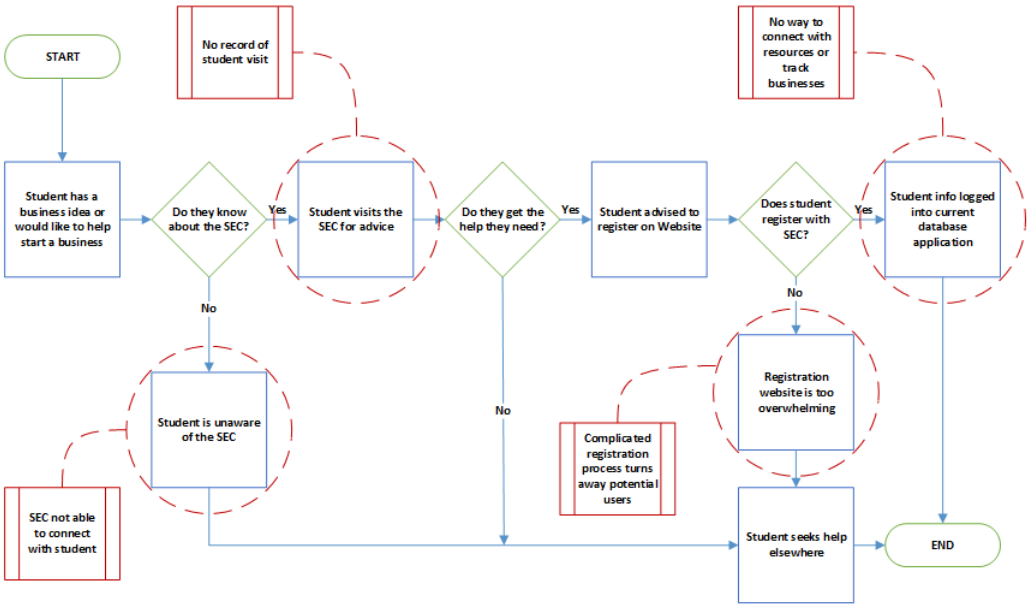

Figure 1. Current SEC Process

SI was developed to address these specific challenges. The SI registration process will be quick and easy. The only information required for initial registration will be a name and a valid email address. Once users are registered, they will receive information about upcoming SEC events, workshops, guest speakers, internships, and SEC sponsored contests via email or notifications on their mobile device.

If a registered user has a business idea or needs help with an existing business, he or she can request a venture. Once the venture has been approved by SEC staff, the venture owner will be able to publicly share information about the business idea to attract investors and/or individuals who are interested in working on it. Some information may need to be private and available only to those individuals working on the venture; therefore, privacy options will also be an included feature.

Venture owners will have the ability to post what resources and skillsets they require on a job board much like the "Help Wanted" ads in a newspaper. Registered skillset users as well as registered external companies will have the ability to search the job board and send a request to the venture owner to join the project. If the venture owner accepts the request, then the user skill or resource will be added to the venture. To expedite the connection process between venture owners, user skills, and company resources, communications will not be limited to a one-way process. Venture owners will also be able to view a list of available resources and user skills and send a request to have them join the project.

SI will give SEC staff a view of all of the entrepreneurial projects that are in progress which will allow staff members to provide guidance to students any way they feel necessary. For example, if staff members see a need to manually make a connection between a venture owner, a user skill, or a resource they will have that ability. If a staff member notices that a ventures is not moving forward he or she can contact the owner and offer their assistance.

SI will measure its success based on how it addresses these issues. One such metric will be the number of users enrolled. If this number exceeds the total number of registered users in the Venture Hive system, it will be a good indicator that the system is reaching more students. Another good indicator will be the number of new ventures that are created after SI is implemented. There is no existing baseline to compare this to so ultimately it will be up to Nancy Grden's expectations to determine if the goals have been met. Lastly, positive user experience with the product can be measured by conducting surveys. It is desired to provide a positive user experience so that users will actually use the product. Figure 2 illustrates the overall process flow for SI.

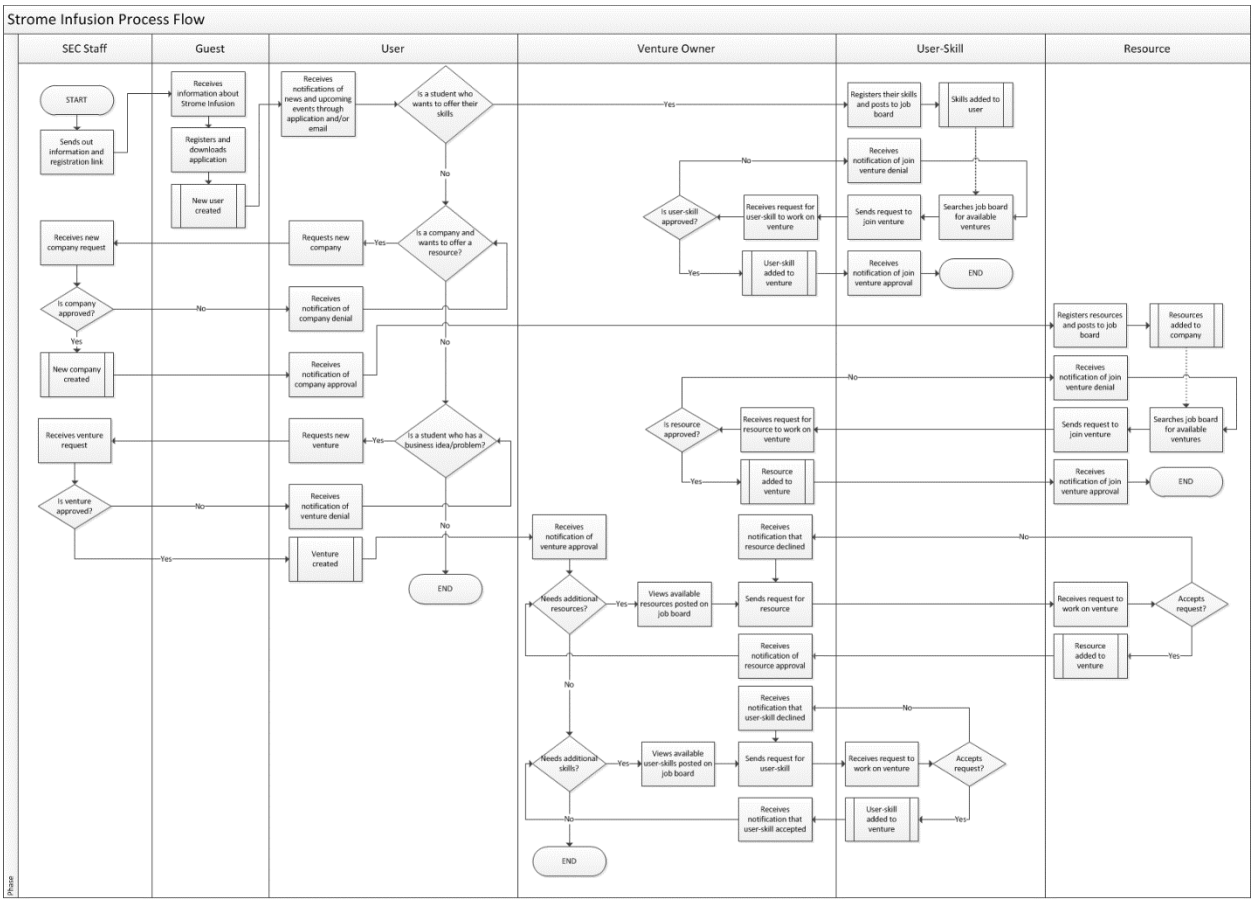

Figure 2. Prototype Overall Process Flow

1.3. Definitions, Acronyms, and Abbreviations

ACID compliance: Atomicity, consistency, isolation, and durability are the properties that guarantee that a database transaction is processed reliably.

Agile (Software Development): A group of software development methods in which solutions evolve through collaboration between self-organizing, cross-functional teams. It promotes adaptive planning, evolutionary development, early delivery, continuous improvement, and encourages rapid and flexible response to change.

AngularJS: A structural framework for dynamic web applications, based off of JavaScript.

Apache Cordova: A set of device APIs that allow a mobile application developer to access native device functionality.

Application Programming Interface (API): An application programming interface is a set of routines, protocols, and tools for building software applications.

Application server: The middleware of a server centric architecture.

Backend: The server, the web application, and the database.

Company: Any business that is owned or operated outside of ODU.

Company resource: A resource an external company registers in Strome Infusion to assist with student ventures.

Concurrency: Allowing multiple processes to go at once.

Cordova: An open source project that provides a set of device APIs that allow a mobile application to utilize native device functions from JavaScript.

CSS: Cascading style sheets, gives form to the HTML page.

Data integrity: The accuracy and consistency of data stored in the database.

Database: A structured set of data held in a computer, especially one that is accessible in various ways.

DOM: The document object model is a logical structured document applied to HTML, it represents separate and distinct browsers and interfaces to view and interact with the web application.

Encryption: Encoding information in a way that is not readable except by authorized entities.

Entrepreneur: A person who organizes and operates a business or businesses, taking on greater than normal financial risks in order to do so.

Firewall: Software that prevents hackers from gaining access to systems with sensitive data.

Flask: A python web application framework.

Frontend: The HTML, CSS, and JavaScript of a web page.

GUI: The graphical user interface, is an interface that allows the user to interact with the application.

Horizontal Scaling: Expanding a system's capcity by adding servers to a cluster on the fly.

HTML: Hypertext Markup Language, a standardized system for tagging text files to achieve font, colour, graphic, and hyperlink effects.

JavaScript: An object-oriented computer programming language commonly used to create interactive effects within web browsers.

JSON: JavaScript Object Notation is a minimal, readable format of structured data.

Linux: An open sourced operating system based off of UNIX.

Linux distributions: Operating systems based off of the Linux kernel.

Load balancing: The distribution of processes across multiple available systems to improve performance.

Mobile application: An application developed to be operated and interacted within a mobile operating system.

MVC: Model view controller is an architectural pattern for building applications.

Native application: An application that has access to system functionality (i.e. the camera on a cell phone).

Nginx: A web server.

Object-relational database: Is a database that uses an object-oriented model: objects, classes, and inheritance are directly supported in the database schema and in the query language.

Object-Relationship Mapper (ORM): A programming technique for converting data between incompatible type systems in object-oriented programming languages.

ODU: Acronym for Old Dominion University.

Open source: Software where the source code is freely available.

Operating system: The software that supports a systems basic functions (i.e. launching applications and handling peripherals).

PostgreSQL: An open sourced, object-relational database system.

Python: An object oriented programming language.

Representational State Transfer (REST): Software architectural style of the World Wide Web.

RESTful framework: Representational state transfer is an architectural style framework for the development of web services.

Reverse proxy server: A server that can retrieve resources from one or more servers.

SEC: Acronym for Strome Entrepreneurial Center.

SI: Acronym for Strome Infusion.

SDKs: Software development kits are sets of software development tools that allow the creation of applications for a certain piece of software.

Server: A computer system that manages access to a central resource or service.

SQL: Structured Query Language is used to communicate with relational databases.

SQLAlchemy: A Python SQL toolkit and Object Relational Mapper that gives application developers the full power and flexibility of SQL.

Toolkit: A set of software tools.

Ubuntu: An open source operating system based off of Linux.

User experience: The overall experience of a person using a product.

User skills: Skills a user registers in Strome Infusion to assist with ventures.

uWSGI: Deploys the application server and implements WSGI protocols.

Venture: A student run business enterprise with a dedicated profile within Strome InFusion.

Venture Owner: student with a business idea that needs to connect with resources and user skills to achieve their goals.

Vertical Scaling: Adding resources to a single node in a system, typically involving the addition of CPUs or memory to a single computer.

Web application: Client-server software application in which the client or GUI runs in a web browser.

Web application framework: A framework for software that supports web applications, services, and resources.

Web server: Systems that deliver web pages.

WSGI protocols: The web server gateway interface, it is a specification on how a web server communicates with web applications.

1.4. References

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1.5. Overview

This product specification provides a description of the overall components of the Strome Infusion prototype. This includes the software and hardware components, the features and capabilities, and the external interfaces.

2. GENERAL DESCRIPTION

Since SI was developed specifically for the SEC, the skinning and branding of the application will incorporate SEC related themes. This will include various photographs of the inside and outside of the SEC as illustrated in figure 3.

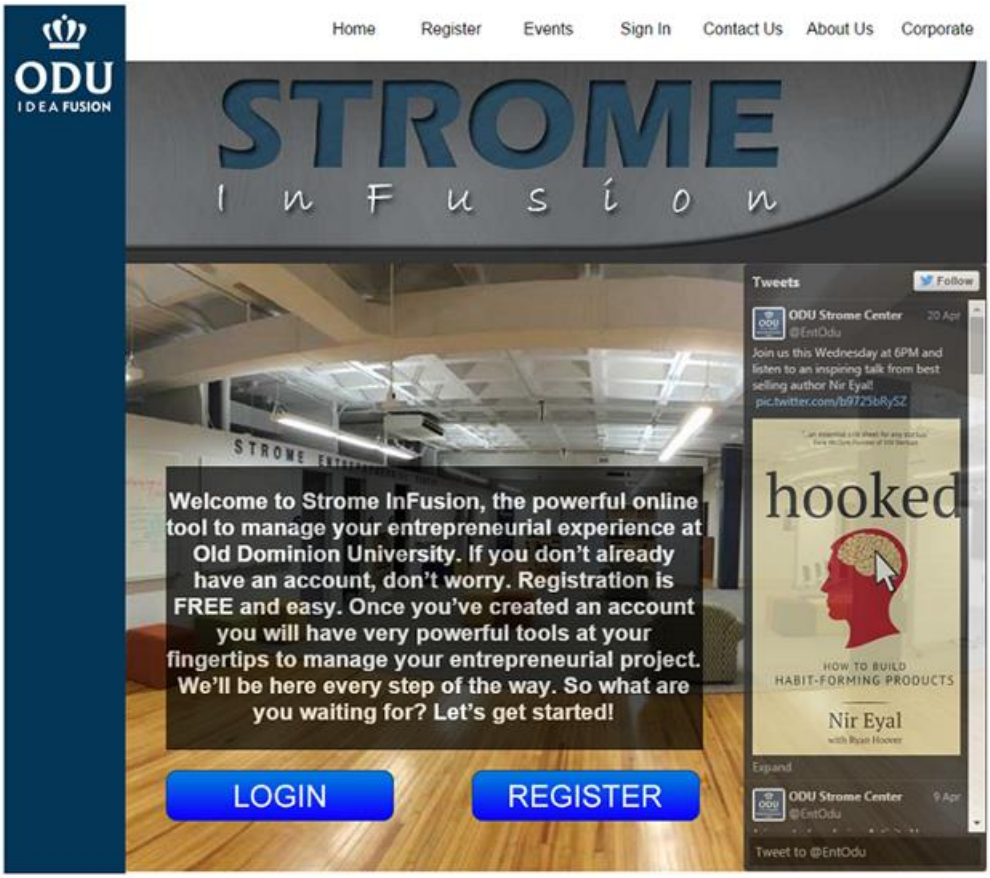

Figure 3. Prototype Landing Page Mock-Up

2.1. Prototype Architecture Description

For the prototype, the architecture will basically mimic the real world product with a few exceptions. Table 1 shows the differences between the real-world product and the prototype.

Feature	Real-World Product	Prototype
Authentication	Integration with third party schemes such as shibboleth	Custom authentication
Client Testing	Testing across a large variety of mobile and desktop web browsers	Mobile testing on only the devices that our team members own. Full support only for modern browsers
Customer Support	Telephone and email support for problems or questions using the application	Not simulated – Customer support is a common need for software applications.
Events	Ability to list events and add events to a calendar view for individuals and companies	Eliminated from prototype
External Resources	External investors and mentors who are willing to contribute to the success of the venture.	Test data provided by Director Grden and the Strome InFusion team
Internal Resources	Students who want to utilize their skills to work on a business venture.	Strome InFusion team members connecting as a venture to test functionality
Mobile Application	Mobile application will be available natively for all major mobile OS platforms	Will only be available natively for Android devices
SEC Staff	SEC staff and mentors who will provide guidance for the project.	Director Grden as well as Strome InFusion team members simulating Strome Entrepreneurial Center staff
Security	Audited to confirm the security of proprietary data	Not reviewed
Service	Support for scaling to multiple servers and other environments	Limited to the capabilities of a single virtual machine
Service Integrations	Integrate with existing software and services used by universities such as Microsoft Lync	Integrated with email
Students	Students at ODU who wish to collaborate on a business venture	Actual student and Strome InFusion team members using virtual machines using Strome InFusion team data along with special test functionality

Table 1. Prototype vs. Real-World Product

The real-world product will include integration with third party authentication mechanisms; however, for the prototype native authentication will be used instead. Since

authentication is a basic requirement for most applications there will not be a heavy emphasis on it for the prototype. Since the client application will be web-based and written in JavaScript, it should run on a variety of web browsers; however, the testing of multiple browsers will be limited by the type of hardware utilized by the development team. The same holds true for the mobile application. The real-world product will run on all major mobile operating systems but the prototype will be limited to the Android operating system.

Customer support is a common feature of most software applications but there will be none provided for the prototype. The development team will support the users with any issues they may experience. A calendar view will be provided in the final product but since most calendar applications operate in a similar manner, the functionality will not be included. The prototype will contain most of the real world product functionality but it will not be used by actual students. Instead it will be SI team members demonstrating the functionality. Similarly, external partners will not be entering data into the application; simulated data will be provided by SEC staff.

The SI prototype will consist of the following software components: a web application, a mobile application, and a database. The front-end web application will be written in Javascript and leveraging the AngularJS framework for most of the components, such as buttons and textboxes. This will expedite the development process by not having to code the GUI components from scratch. The API services will be developed with Python leveraging the Flask framework. This approach will also reduce the development time because both the web application and the mobile application can utilize the same API. The mobile application will be developed with Apache Cordova. Both the mobile and the web applications will have the same functionality but will give users the option of accessing the system from a computer at home or a

mobile device on the go. PostregSQL will be the database technology used to store information such as user profiles, venture profiles, user skillsets, company resources, and messages. The software chosen for the application was based on the fact that they are open-sourced and do not require any licensing fees. For hardware requirements, a web server running NginX will be required to host the web application and API calls. Another component called uWSGI will be installed to load balance the API calls which will make the application more responsive to the end-users. A database server will also be required to host the database. Since user privacy is a concern and SI will be a public facing application, a firewall is recommended to filter all incoming requests. Figure 4 illustrates the hardware and software components for the prototype.

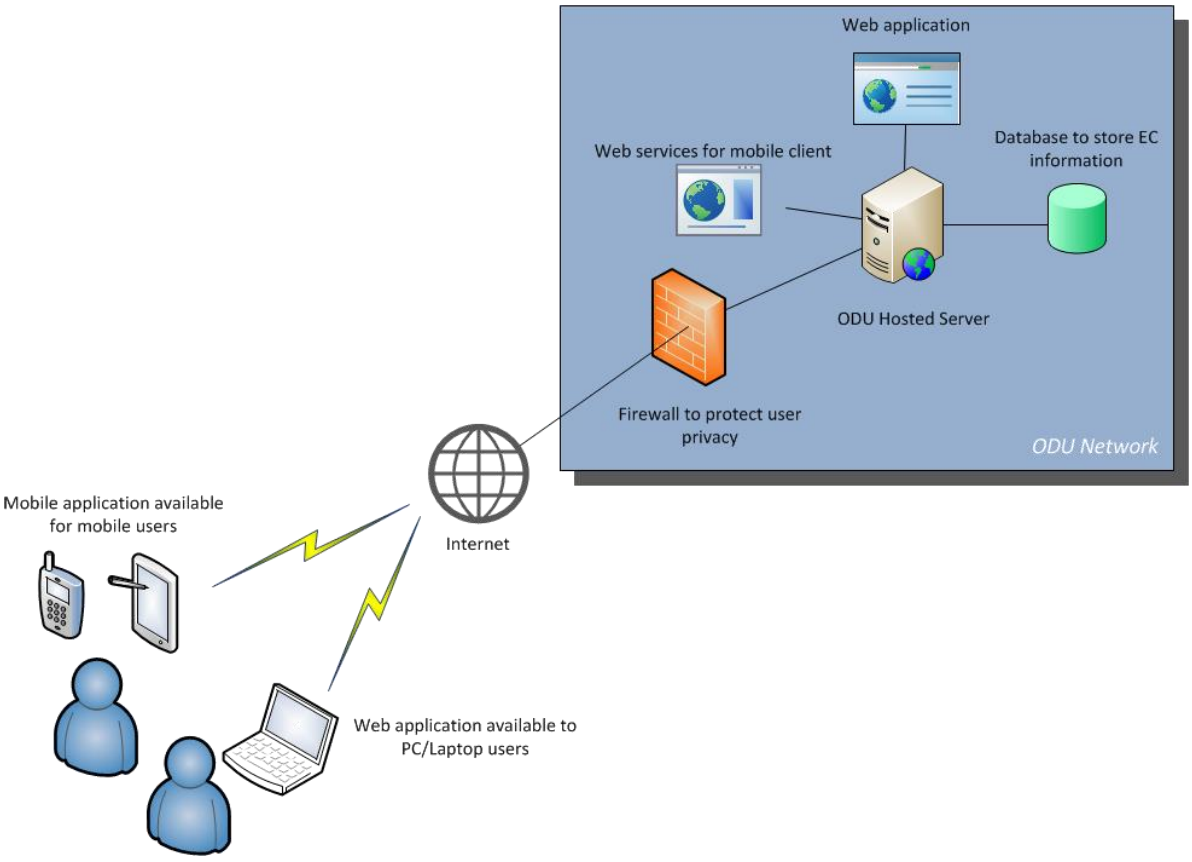

Figure 4. Prototype Major Functional Diagram

2.2. Prototype Functional Description

The first step required to use the prototype will be the registration process. A simulated student will fill out the registration page and submit it, which will result in the receipt of an email containing a verification link. Clicking the link will verify the student's email and will direct them to a page to set the password for the account. Once a valid email is entered the user will be directed to the profile page.

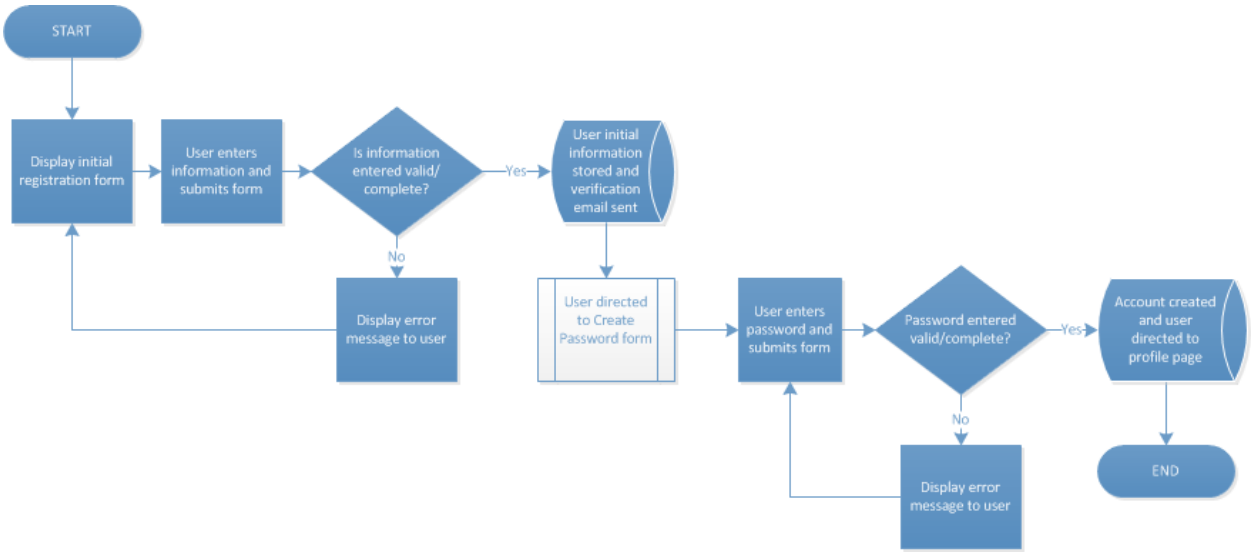

Figure 4. User Registration Process

After registration is successful, a test message will be sent out and the student will promptly receive it both via email and on the mobile device. This test message will simulate the notifications that will be sent out by the SEC informing students of upcoming events and news.

Once a student is registered, he or she will have the ability to request a venture. Once the required information is filled out and submitted, the request will be sent via email to a simulated SEC staff member. The SEC staff member will approve the venture and notification will be sent to the requesting user. The venture owner will then proceed to the venture profile page and fill

in any relevant information regarding the business proposal. The next step for the venture owner will be to search the job board for available user-skills and resources. Once selected, a request will be sent to the simulated user-skill and company resource to join the venture. The user-skill and resource will approve the requests and be added to the venture.

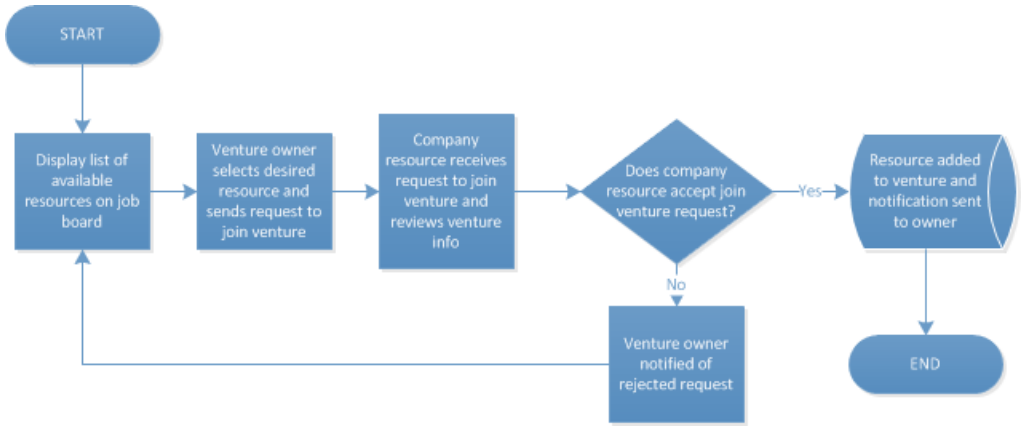

Figure 5. Requesting Resources Process

Students who do not have a specific business idea but want to contribute to other ventures can register their individual skills. For the prototype, there will be a limited number of predefined skills by category but there will be enough to demonstrate the functionality. If a specific skill is not available, there will be a function to create a new one. Skills registered to individual users are known as user-skills and will be posted to the job board. Skill registration will be confirmed by performing a search of available skills on the job board and verifying that they appear.

Another function of the prototype will be the ability to request a company. A simulated external user will first register with SI then proceed to fill out the required fields to request a company and submit it. A simulated SEC staff member will receive the notification by email and log into the system to review the request. Once the request is approved the external user will receive confirmation via email. Next, the company will register the resources they are offering.

Similar to user-skills, company resources are posted to the job board once they are registered. Companies will also have to ability to view the job board and request to join a venture that it is interested in.

Students who need additional guidance from the SEC will have the option of requesting a meeting with a mentor. He or she will navigate to the meeting request page, fill out the necessary information and send the request which will go to a simulated staff member. The staff member will receive the request and send a notification mock-up of the meeting time, place, and mentor.

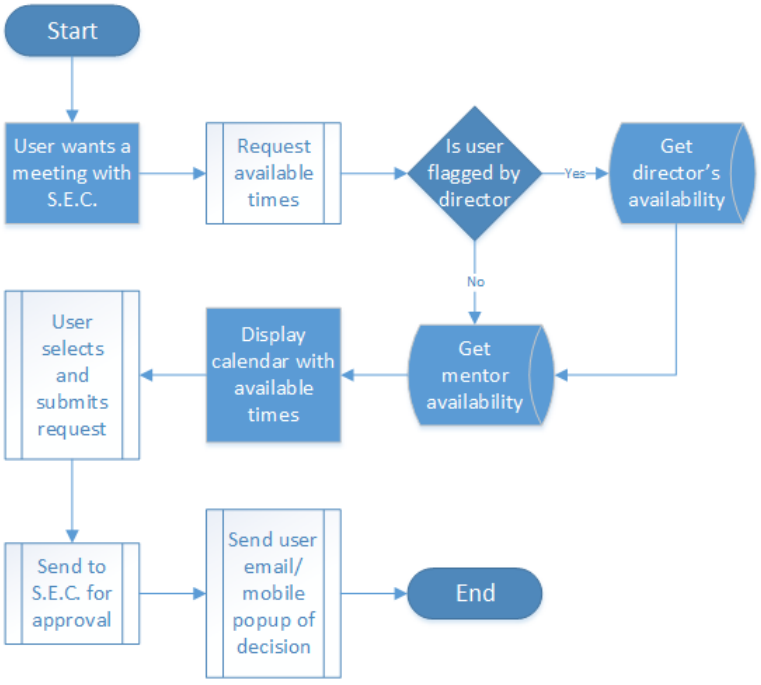

Figure 6. Requesting a Meeting Process

The mobile component of SI will give students the flexibility of receiving notifications on the go. One type of notification will include information about upcoming events sent out by the SEC. Other notifications will include requests and approvals for ventures, user-skills, and

resources. Once the notification is read, it will be flagged so users can distinguish new notifications from old ones.

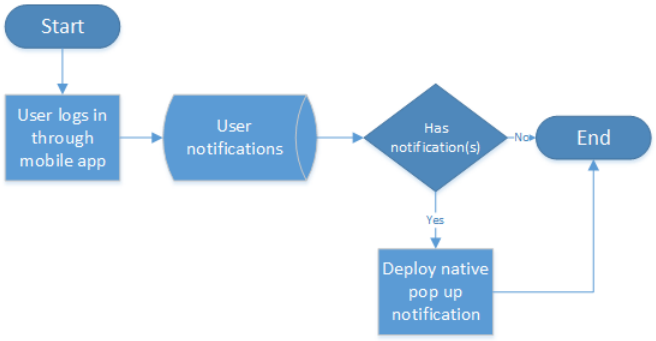

Figure 7. Push Notification Process

Figure 8 shows the various user interfaces for the prototype and the logical way that they are accessed.

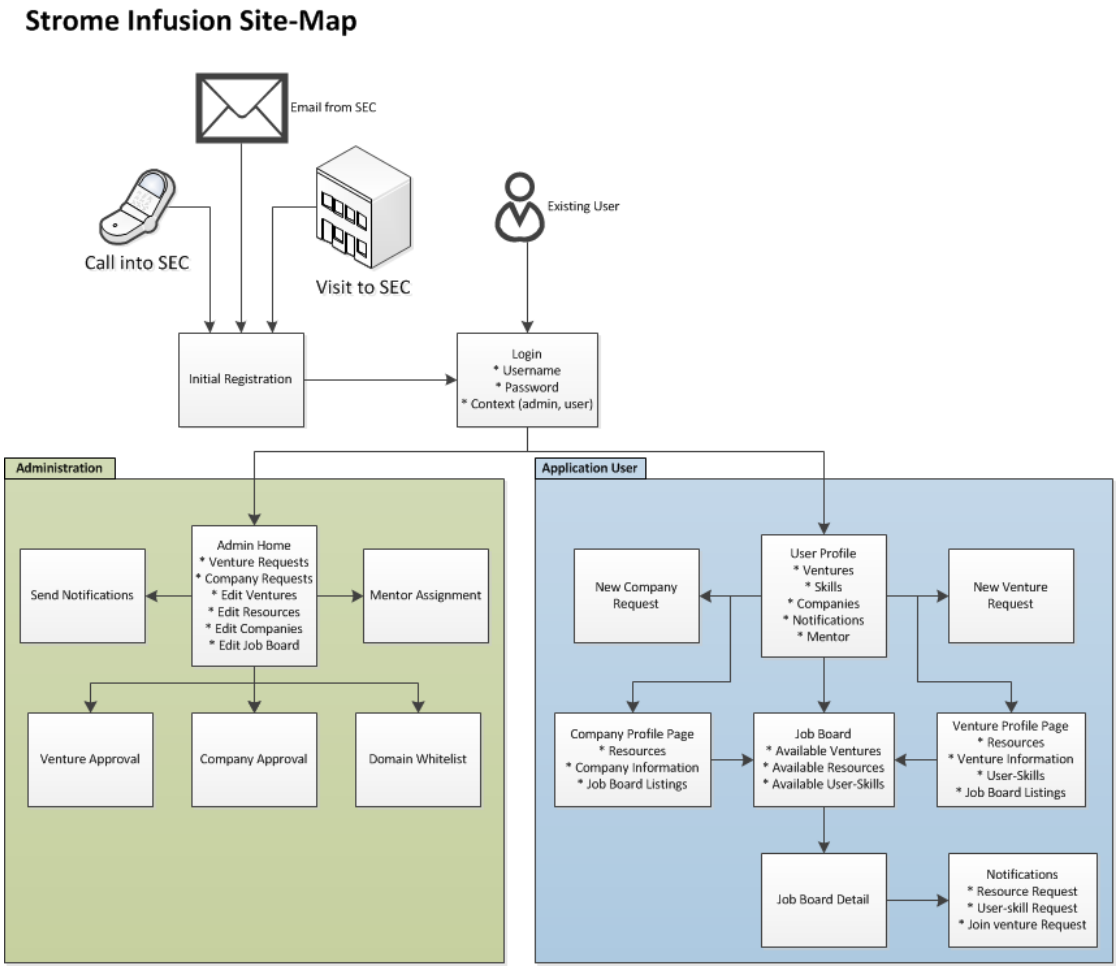

Figure 8 Prototype Site Map

2.3. Extended Interfaces

Since SI will contain some potentially sensitive data, an authentication mechanism will be implemented that meets today's standards in web security. The system will have the option of integrating with existing authentication systems, since most companies already have them in place. In ODU's case the final product will integrate with Shibboleth and be available from the student's personal portal. However, for the prototype, a built-in authentication will be used therefore there are no external interfaces required for the prototype.