Lab 1 - Strome InFusion Product Description

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1 INTRODUCTION

The Monarch family is a large and diverse entity. One of the strategic goals for Old Dominion University, is entrepreneurship. As defined by Merriam-Webster, an entrepreneur is, "a person who starts a business and is willing to risk loss in order to make money" ("Entrepreneur"). The Wikipedia article on entrepreneurship is a bit more extensive, stating that "Entrepreneurship is the process of starting a business, typically a venture company offering an innovative product, process or service" ("Entrepreneurship"). Innovation is important, as society and the technology industry are changing at a rapid pace.

To help rising Monarch entrepreneurs, the Strome Entrepreneurial Center was founded to assist them with starting a business, existing businesses, and to take over businesses. To accomplish this, the Strome Entrepreneurial Center builds connections within the Monarch family and community. The center brings in speakers, host workshops, and guide students through the process of becoming an entrepreneur.

The Strome Entrepreneurial Center was founded as part of an $11 million donation made by alumni, Mark Strome. To paraphrase Mark Strome, Old Dominion University took a chance on an unremarkable person which allowed him to do remarkable things (Wright, 2014). Mark Strome is a man that took a personal risk but used the work ethic he developed as an only son on a farm that he learned from his father who had been an only son of a one armed farmer, he was able to innovate and succeed.

His success and support from Old Dominion University is what allowed and motivated him to donate to the school.

Old Dominion University, under President Broderick's leadership, has "created an entrepreneurial ecosystem that nourishes the innovative spirit of future teachers, nurses, engineers, scientists, and artists by helping them convert their passions into new enterprises" (Broderick, 2015). Old Dominion University's goal for the Strome Entrepreneurial Center, to help students of all disciplines become successful entrepreneurs, is well grounded and supported.

The Strome Entrepreneurial Center is unable to meet these demands, due in large part to the lack of connections it is able to make between rising Monarch entrepreneurs, students interested in joining ventures, and outside individuals and companies interested in helping these Monarch startups. Customer relationship management programs are not designed with students in mind, social media lacks the administrative tools to manage users and companies, and accelerators and incubators are often too far advanced for Monarchs at this stage.

To improve Strome Entrepreneurial Center's ability to make these connections, Strome InFusion will need to address several points: ease of registration, tracking student ventures, distinctive connections between students, awareness of Strome Entrepreneurial Center events and activities, tracking student visits to the Strome Entrepreneurial Center, improved digital communication between students and the Strome Entrepreneurial Center, ease of digital communication between students and the Strome Entrepreneurial Center. The best toolkit for the Strome Entrepreneurial Center would address these issues while being fast, efficient, and secure. Utilizing scalable technologies to allow for usage

by students who are forming their business idea or just want to work with ventures to students with existing businesses that are actively serving customers.

2 STROME INFUSION PRODUCT DESCRIPTION

Strome InFusion is a web-based, digital tool designed to augment and facilitate connections between Monarch entrepreneurs, the Strome Entrepreneurial Center, and companies and individuals in the community. Student and faculty started ventures will benefit from the availability of individuals on campus with needed skillsets. The staff of the Strome Entrepreneurial Center will be able to directly monitor the progress of these ventures. Companies and individuals in the community that want to be involved will be able to directly interact with those ventures that could benefit from their resources.

2.1 Key Product Features & Capabilities

The most prolific interface of any digital tool would be the website. This provides an outward facing digital portal of the Strome Entrepreneurial Center, allowing them to advertise events, features, and resources available to Monarchs. The website would allow students to work on their ventures, advertise themselves to ventures, and see what resources are available for them. The web application needs to be mobile responsive and account for modern build and design practices.

To improve access and mobile usage, the digital solution needs to be available as a mobile application and need to provide the same functionality as the website, while maintaining a UI that is cohesive with the web design. An additional feature a mobile application adds to a digital tool, is adding popup notifications to the Strome Entrepreneurial Center’s communication kit.

2.2 Major Components

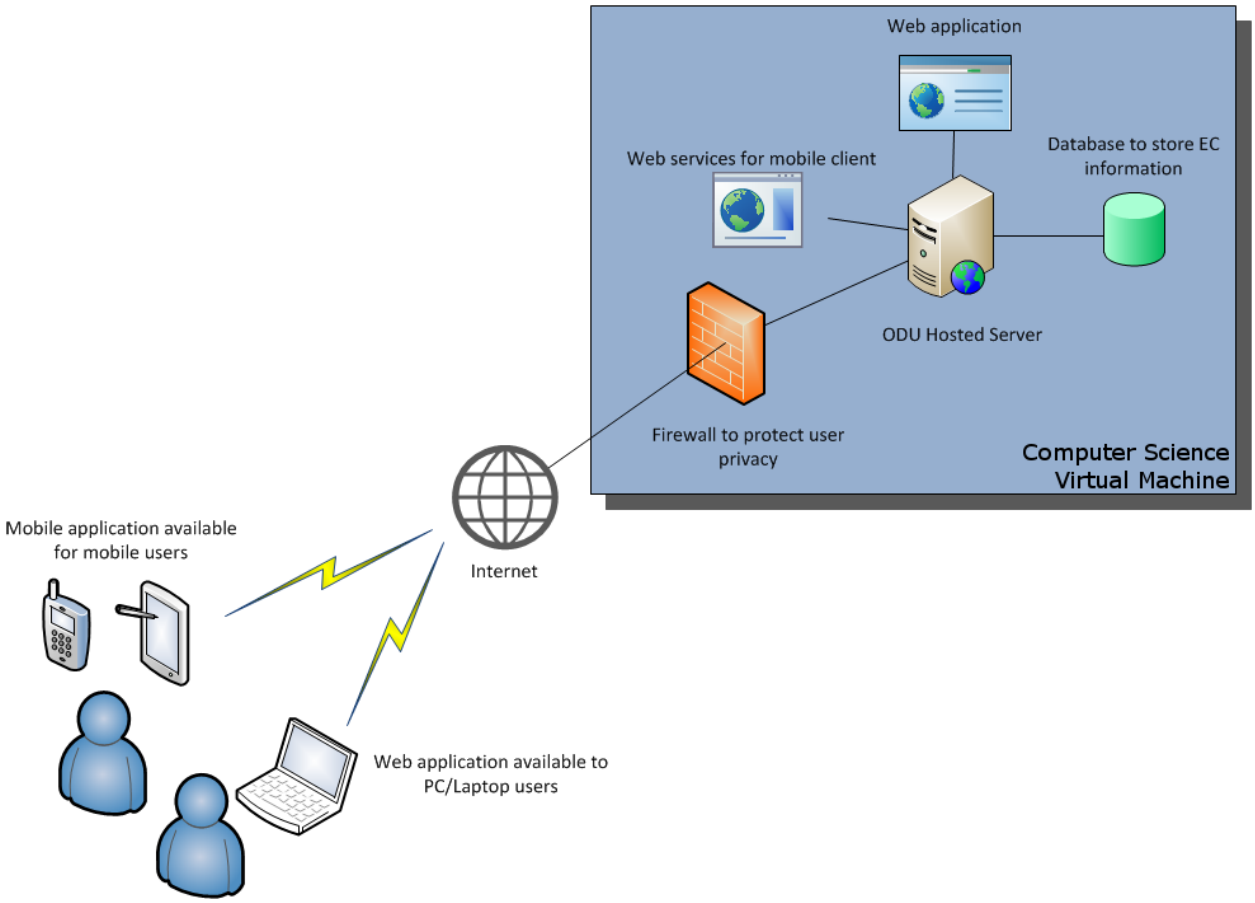

Figure 1. Major component diagram.

The server for Strome InFusion is an Ubuntu server to host the database and site API, as shown in *Figure 1* computer science virtual machine. Ubuntu provides an open source server operating system that offers customizability and scalability. The platform is also compatible with all technologies chosen for this product, which is why the Ubuntu was chosen over other Linux distributions.

For the web server, Nginx was chosen for its high concurrency, which is necessary as it will be handling calls from both web users and mobile users through load

balancing. Nginx also offers the ability to act as a reverse proxy server, which offers scalability and integration.

An open source, object-relational, SQL based database was chosen for storage and ordering of the datasets. PostgreSQL, as shown in *Figure 1*, was chosen for reliability, data integrity, and the fact that it integrates well with other technologies chosen for this product. ACID compliance allows for not only data integrity, but ensures user experience.

The Flask API, as shown in *Figure 1*, offers a good backend platform as RESTful framework. Flask will host the generated AngularJS web application, by taking user requests, from either the web or mobile application, and then either generating the webpage or retrieving data from the database and returning it in a JSON format. The use of Flask also offers built in authentication for data security.

To supplement Nginx and Flask, uWSGI is being integrated in to the architecture. This platform offers both WSGI protocols and an application server. The WSGI protocols make communication with Nginx simpler and the application server will host Flask.

The website environment will use AngularJS, as shown in *Figure* 1, to supplement the HTML and CSS to create a dynamic web application. AngularJS web applications translate well into the MVC build practice for ease of build. This JavaScript framework provides a better manipulation of DOM and also integrates well with the Flask API to provide a better user experience.

The mobile application will be developed with Apache Cordova, as shown in *Figure 1*. Cordova packages web applications with SDKs to allow for use as a native

application. This allows for concurrent native development of a mobile application for multiple devices across multiple mobile operating systems. With AngularJS's ease of use with MVC build, the GUI for mobile applications will also provide similar user experience to that of the web application.

3 IDENTIFICATION OF CASE STUDY

Strome InFusion is being developed to assist the Strome Entrepreneurial Center with helping students, alumni, faculty, and staff become entrepreneurs (and with existing business ventures). The success of Strome InFusion can be measured by usage: number of users, ventures and connects. Other metrics to be followed would be within the ventures; number of customers, income, have they broken even, and the number of taxed employees.

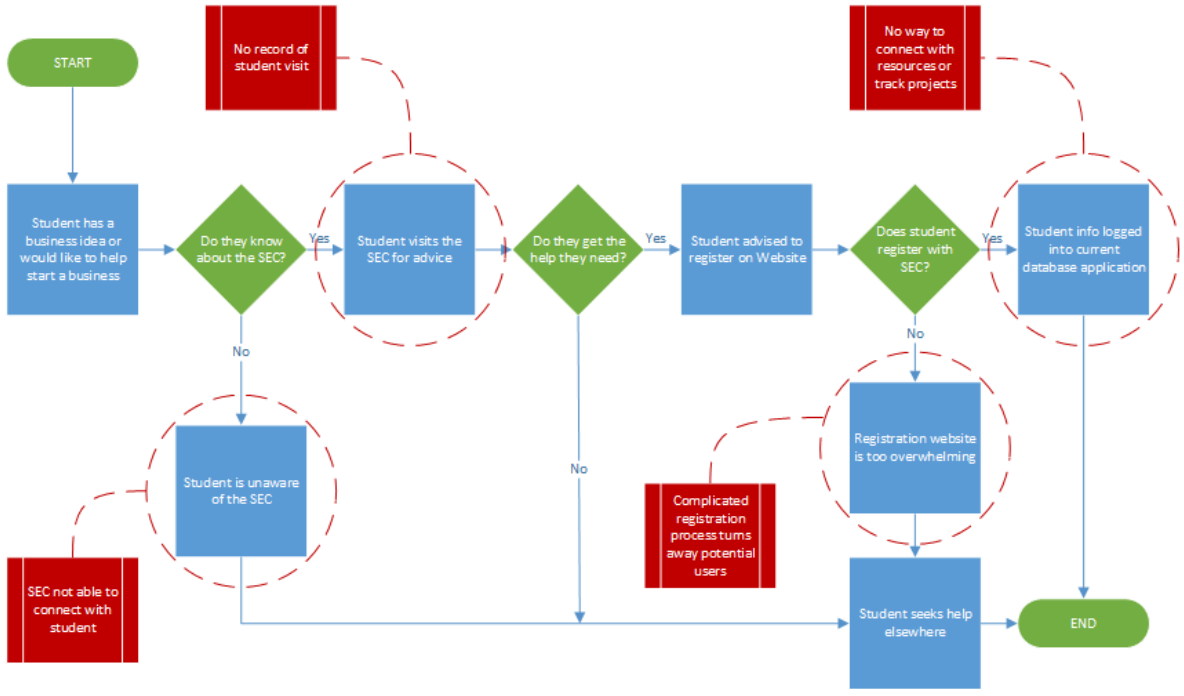

Figure 2. Work flow diagram.

There are four major points where the Strome Entrepreneurial Center is failing to make the necessary connections, as seen in Figure 2. The center is unable to accurately record and make connections with students, faculty, and staff that visit the center; to directly connect students that have the desire and skills to work with ventures with those ventures that would need the students; and the Strome Entrepreneurial Center's current platform is overly complicated in its registration process.

Strome InFusion would (through its ease of access and use) allow the Strome Entrepreneurial Center and students that visit the center to maintain that connection. The product would also allow the users or Strome Entrepreneurial Center staff to network between users and ventures. The center itself could associate student ventures and students, as well as connecting ventures with outside resources such as mentors, investors, and goods and services. The registration process for Strome InFusion would be streamlined to allow for quick access by visiting students and the creation of accounts by the center staff to increase use by outside visitors.

4 STROME INFUSION PRODUCT PROTOTYPE DESCRIPTION

The goal for the Strome InFusion prototype is to prove that an efficient system of organized and monitored networking of Monarch entrepreneurs will provide more connections and more sustained connections. Metrics and surveys of user experience will be collected and reviewed by the director of the Strome Entrepreneurial Center for future iterations of the platform.

The main function of Strome InFusion is to allow for efficient and easy connections between Monarch ventures and the skills and resources that they need from

the Strome Entrepreneurial Center and the community. These connections will allow Monarch ventures to develop and, by reviewing connections between ventures and companies, provide the Strome Entrepreneurial Center data on who is interested in entrepreneurial endeavors and who lacks assistance.

To accomplish that function, two datasets need be developed. The first is a list of skills possessed by Monarchs and those in the community willing to assist Monarch ventures, while the second is a list of resources that companies and individuals in the community are willing to contribute to assist Monarchs with their ventures. The Strome Entrepreneurial Center needs to connect these groups for the development of Monarch ventures.

The third function is a profile of Monarch ventures, where the ventures can upload business plans, marketing strategies, and a list of resources and skills that the venture is utilizing. The profile allows the Strome Entrepreneurial Center to assist these ventures in their development. By this, staff of the Strome Entrepreneurial Center can access a venture, check progress on their business canvas, pitch deck, et cetera.

4.1 Prototype Architecture

The prototype of the Strome Entrepreneurial Center toolkit is being developed to share the same functionality as the real-world product. A comparison between the developed prototype and the real world product can be found on Table 1. The biggest difference is that the servers for the web application and the database will be hosted on Old Dominion University Computer Science department's virtual machines. The prototype will use data that is primarily simulated to test the system, fabricated for generalities, or supplied based on the members of the Strome InFusion team. The

prototype software platform will only be developed to run on Android OS devices, not as a universally available mobile application.

The Strome InFusion web application and database are being hosted on a virtual machine within the Old Dominion University Computer Science department versus private hosting or within the Old Dominion University Information Technology Services department. Testing of the web application and the mobile applications will be conducted by Director Grden and the team members of Strome InFusion on their privately owned machines or Old Dominion University systems.

The Strome InFusion database will be stored on the virtual machine and will host the schema and the operations to update the tables. Flask will retrieve information and translate it between JSON for the web application and SQL for the database. The web and mobile application front end will be written in HTML, CSS, and AngularJS. The back end will be uWSGI to handle API calls to Flask. These calls will populate tables in the database, as well as populating the web or mobile application.

4.2 Prototype Features and Capabilities

The primary feature of Strome InFusion prototype is its ability to demonstrate the functionality of the software platform, Strome InFusion. Through web and mobile interfaces, users will be able to: register themselves, request meetings with the staff at the Strome Entrepreneurial Center, their skills, their ventures, and connect with other users. Outside companies can use the platform to become involved with ventures by volunteering their resources. While the Strome Entrepreneurial Center can track venture progress by reviewing their profiles.

/Components	Real World Product	Prototype
Students	Actual students at ODU who wish to collaborate on a business venture	Actual student and Strome InFusion team members using a virtual machine with Strome InFusion team data along with special test functionality
SEC Staff	Actual 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
Internal Resources	Actual students who want to utilize their skills to work on a business venture	Strome InFusion team members connecting as a venture to test functionality
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
Mobile Application	Mobile application will be available natively for all major mobile OS platforms	Will only be available natively for Android devices
Web Server	An independent web server hosting Strome InFusion web application	Virtually hosted server at ODU
Database Server	An independent database server hosting Strome InFusion database	Virtually hosted server at ODU

Table 1. Feature comparison between real world prototype and the prototype

Another major feature of the Strome InFusion prototype is the way in which it allows Monarchs to connect. The Job Board feature of the prototype will allow ventures to post their needs and users to post their available skill sets. This will allow ventures to search for users to fill skilled positions within their startup and users to search ventures that could use their skills. Users can search at their convenience and are not dependent on Strome Entrepreneurial Center staff to assist them in filling out the necessary roles within the ventures.

Another component that will be demonstrated by the Strome InFusion prototype is the ability for companies and individuals in the Monarch community to post their available resources for ventures to use. The Strome Entrepreneurial Center staff will also be able to view those connections between a Monarch venture and outside resources, and to create connections where needed.

A necessary feature of the prototype of Strome InFusion will be internal messaging, notification, and system emails. To assist in making those connections of ventures and users, the ability to internally communicate and know you have communications is important. Push notifications also allow ventures to contact the Strome Entrepreneurial Center for assistance. System emails will notify users of unread emails, either by number of unread or having had unread emails for some arbitrary time, as set in the user's settings.

The Strome InFusion mobile application prototype will be able to demonstrate further communication through pop-up notifications. This feature will also be adjustable through the user's settings, but will be used to notify them of communications, requests, and Strome Entrepreneurial Center messages.

The database schema will have tables for individual users, Monarch ventures, outside entities (companies and individuals offering up their skills and resources), and a list of skills and resources. These tables will provide data that can searched and aggregated as necessary by the job board and by the Strome Entrepreneurial Center staff.

These features will be tested by existing Monarch ventures within the Strome Entrepreneurial Center, as well as by the Strome InFusion team and the Strome Entrepreneurial Center staff.

4.3 Prototype Developmental Challenges

There are a few challenges that the Strome InFusion team will have to account for when building the prototype. One of the largest is the inability to test scaling capabilities. The end goal is for a product that can be redeployed as a platform and will have sustaining capabilities to match the growth of the center using it. The use of an Ubuntu server, PostgreSQL, Nginx, uWSGI, and Flask with AngularJS will address scaling growths, as these technologies are inherently scalable.

Another challenge the prototype is facing would be the scope of the mobile application testing. The Strome InFusion prototype will be built on Apache Cordova, which allows for the building of iOS applications with SDK packaging. The lack of access to specific hardware platforms limits the ability to deploy and fully test an iOS application, while all team members possess at least one Android device. Other mobile OS platforms represent to small a percentage of the market to be viable for prototype testing (“Smartphone OS Market Share”).

As a platform, the Strome InFusion prototype faces the challenge of having been developed for the Strome Entrepreneurial Center specifically, with the centers needs and desires being the focus. A lack of available data on the needs of collegiate entrepreneurial centers at large is a hurdle, because it represents the lack of knowledge in the needs of a new niche market. The product was developed to address issues as broadly as possible, with a focus on future integration and scalability. The open source technologies and platforms chosen for this prototype, were picked because of their documentation and their ability to integrate with each other.

The last two challenges faced are addressed by the Strome InFusion team affects development of the prototype would be time frame and knowledge. While two separate challenges, they are compounding. The use of documentation, online resources, and Old Dominion University faculty and peers will address these challenges.

GLOSSARY

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.

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 capacity 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.

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.

uWSGI: Deploys the application server and implements WSGI protocols.

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

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.

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