Lab 1 - Strome Infusion Product Description

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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).

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 ODU students: guest speakers, workshops, one-on-one consultations, internships, mentoring, and SEC sponsored contests. However, communicating these resources to the campus community has been a challenge. Currently, the only methods the center has 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 to achieve their business goals. Team Black of CS411 will attempt to resolve these challenges by developing a product called Strome Infusion (SI) which will provide the tools necessary to connect students and the SEC through software.

2. PRODUCT DESCRIPTION

SI will allow the SEC to easily connect with students by having a very basic registration process. Once users are registered they will receive updates and announcements from SEC. SI will facilitate the collaboration between students and internal and external resources. The system will consist of three main entities: venture owners, company resources, and user skills. Venture owners will be the individuals with the business idea. They will essentially be project managers who will initiate, coordinate, and guide the project to completion. User skills will be the individuals who will assist the venture owners with their registered skillsets. As an example, a student who has web development experience can register and post on SI that he or she is looking to work for a venture. Company resources will be items offered by external companies. The items can range from financial support to office space; anything that the company is willing to donate to make the venture a success.

2.1. Key Product Features and Capabilities

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 making it a success. 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.

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. Figure 1 illustrates the process flow for the proposed solution.

Figure 1. Product overall process flow

2.2. Major Components

SI will be a web-based software system that will consist of the following software components: a web application, a mobile application, and a database as illustrated in Figure 2. 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 which 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

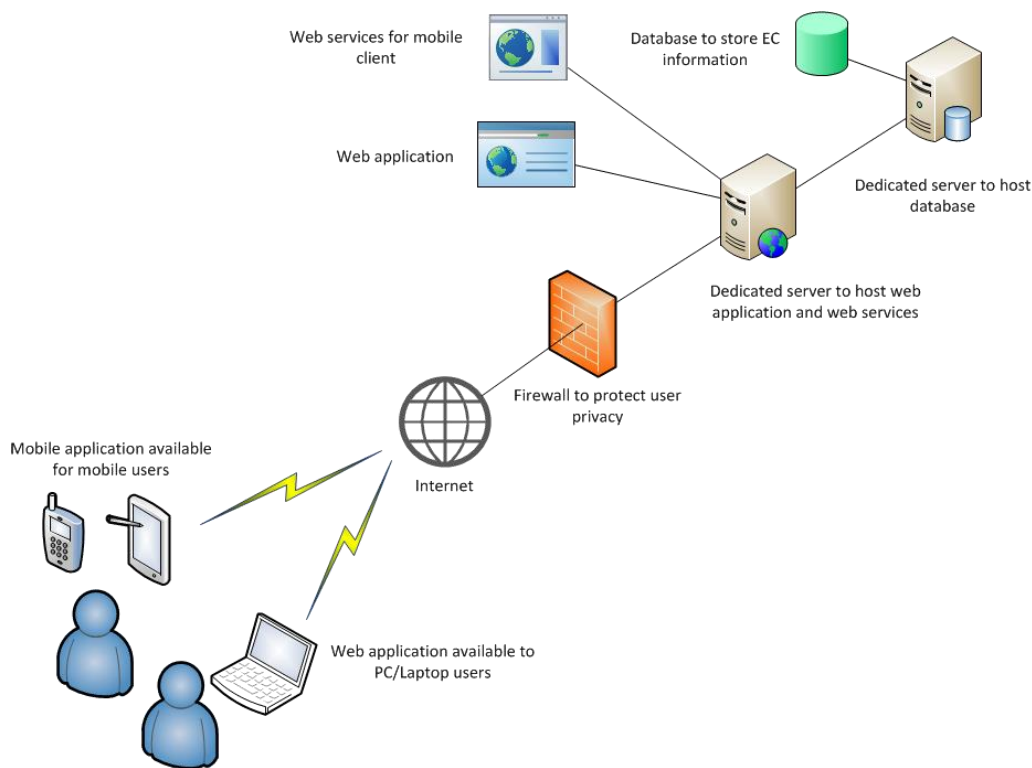application, a firewall is recommended to filter all incoming requests.

Figure 2. Hardware and software diagram

3. IDENTIFICATION OF CASE STUDY

Figure 3 illustrates the current SEC process and highlights the challenges in red.
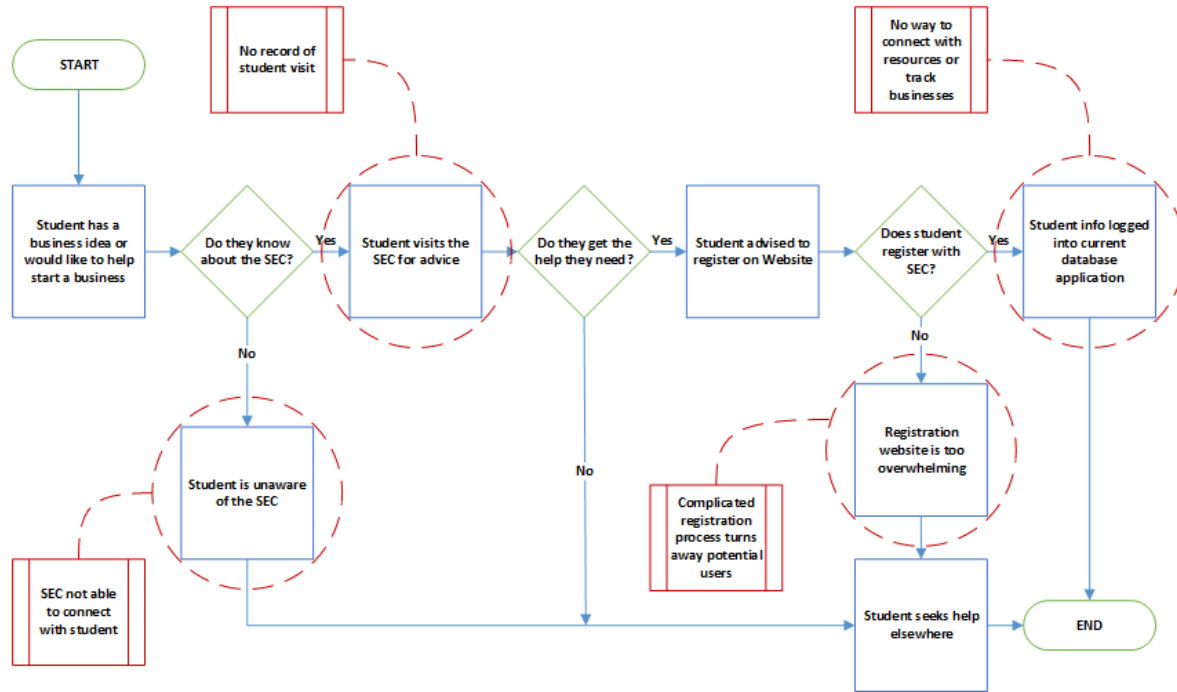

Figure 3. Current SEC process

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, these items have been historically less than adequate for meeting the center's outreach goals. To address this issue, SEC will send out an email informing all ODU students about Strome Infusion which will include a link that will allow students to register so they can receive notifications about upcoming SEC events.

The next challenge has been the inability of the SEC to keep track of the students that need the assistance of the SEC. The SEC contracted a third-party vendor to develop a website called Venture Hive to collect student information; however, the registration process was

cumbersome and overwhelming. Because of this, there have only been a low number of

registered users according to Nancy Grden, who is the current executive director of SEC.   The

initial SI registration process will only require a name and valid email address.

Another challenge is the ability to connect students with resources, community partners,

and investors. Once users are registered with SI, they will have the ability to create individual

and venture profiles. Users who do not have a specific business idea can register a skillset and

contribute their knowledge and prior experience to the venture. External community partners

will be able to create a company profile and register specific resources they are willing to

contribute.

SI will measure its success based on how it addresses these issues. One such metric will

be the number of users enrolled. If the number of SI users 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 will be no baseline to compare to so ultimately it will be up to Nancy

Grden's expectations to determine if the goal has been met. Lastly, positive user experience with

the product can be measured by conducting surveys of user satisfaction. Based on the feedback,

adjustments can be made to enhance the product further.

4. PRODUCT PROTOTYPE DESCRIPTION

The purpose of the prototype is to demonstrate how SI will enable students to connect

with the SEC. It will also show how students can request the required skills and resources to

make their business ideas a reality.

4.1. Prototype Architecture

For the prototype, the architecture will mimic the real-world product with a few

exceptions. Figure 4 shows how the dedicated web server and database server will be replaced

by a virtual computer provided by ODU Computer Science department running Linux based

Ubuntu 14.04 as the operating system. The database technology used to store the data for will be

PostgreSQL. It will be pre-populated with test data specified by SEC staff. Both NginX and

uWSGI will be used to host the web application and web services. The client application will be

developed using AngularJS and the web services developed using Flask. The mobile client for the

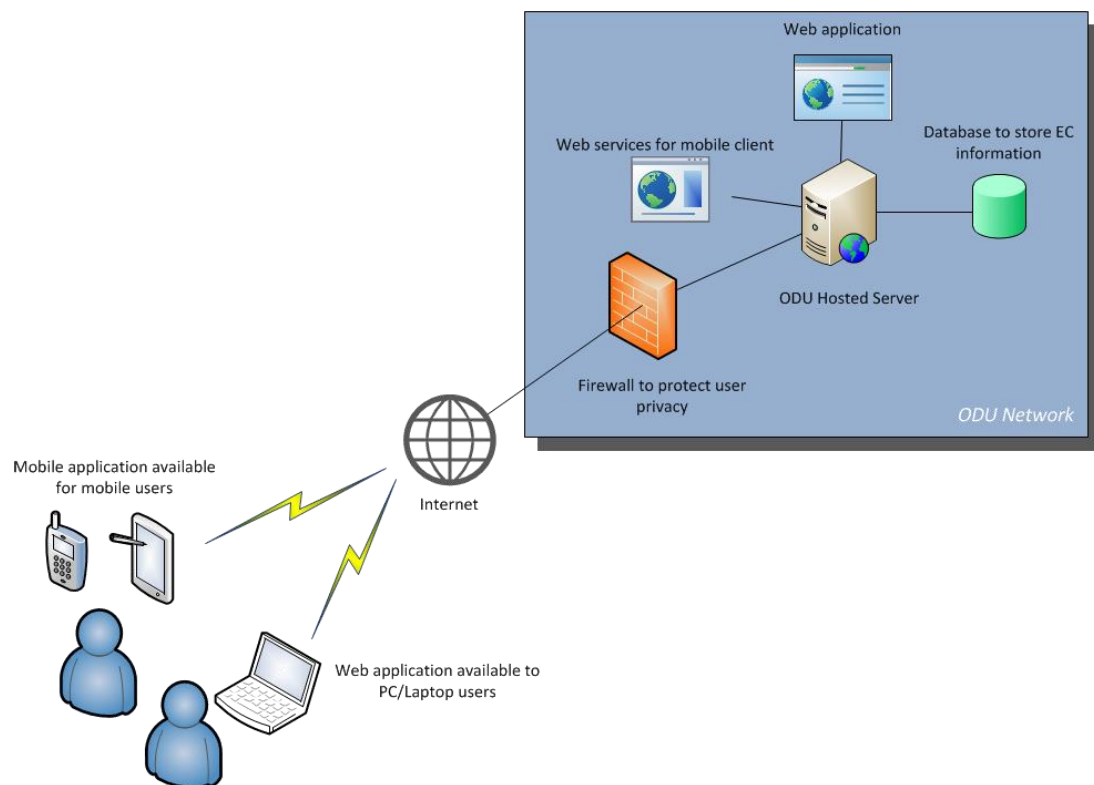prototype will be Android based.

Figure 4. Prototype architecture

4.2. Prototype Features and Capabilities

Table 1 highlights the differences between the prototype and the real-world product.

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 and real-world product comparison

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.

4.3. Prototype Challenges

The primary concern with the prototype is the ability to develop an operational version of it by the specified deadline. Initially, there were some inconsistencies among the team members for how the process flow should be for the actual product; therefore, there was a delay in finalizing the requirements. Now that they have been finalized, hopefully development can proceed smoothly and efficiently to meet the deadline. Another potential challenge may be the chosen platform for development. Most of the development staff is not familiar with Python, Flask, or Cordova so there will be a bit of a learning curve. The development staff hopes to remedy this concern through knowledge transfer and online tutorials to bring everybody up to speed with the technologies.

Since the product is a multi-tiered application (mobile client, web client, API, and database), there could potentially be some issues with getting each of the levels integrated. For

example, since the prototype will be hosted on the ODU Computer Science network, there may

be network or firewall settings that prevent the mobile client with communicating with the API.

Interoperability between the tiers is also a concern for the API communicating with the backend

database. Since the web server and database server will both reside on the same server, this item

will not be as much of a factor but should still be considered. Both of these concerns can be

addressed by working with the Computer Science staff; however, this may cause some additional

delays that could affect the overall project.

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.

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.

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