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Senior Design

Writing Assignment 3

Business Plan and Social Impacts

The collaborative student lab manual is poised to redefine the way that University and secondary school science labs are implemented. This product exists as a standalone application running on Windows technology and entirely replaces the current paper lab manuals. The typical science lab manual exists today as a paper document which is completed individually by students and then refactored into more meaningful data sets through the use of computers and calculations. The collaborative student lab manual streamlines the entire process of acquiring and aggregating data. This product takes data aggregation one step further and enables the students to dynamically add to a broader data set than they are currently able to access using traditional pen and paper lab manuals. This access is granted through the applications innovative data aggregation feature where students are able to access class averages and other crucial pieces of information pertaining to the specific task they are completing.

The collaborative student lab manual leverages a variety of technologies which make the application extremely marketable and appealing to the target consumer. The collaborative student lab manual exists as a Windows Presentation Foundation standalone application which is compatible with a variety of Windows technologies running the .NET framework. As a native Windows application, the collaborative student lab manual has the capability to imbed into the operating system as any native Windows application such as Microsoft Office. Additionally, the application enjoys the stability in deployment and updating that is provided by leveraging professional proprietary technology.

The methodologies employed in developing a Windows Presentation Foundation application lend themselves well to a high value system. What that means is that the application is highly adaptable to different environments and after the value of the initial standalone application is realized, it will be a seamless transition to expand the environments on which the application is run to mobile and/or web. Again, this is a feature that the application can take advantage of due to its integration with an industrial grade Microsoft technology stack.

The actual construction of the application is highly modular and value oriented as well. Instead of writing an abundance of front end logic into one window, the application exists as a large number of independent windows that help the user navigate the application intuitively. For example, once the user logs in with valid credentials, the login page itself disappears and a new landing page for the specific user is brought to the focus of the screen. This architecture serves two purposes. First off, the windows themselves are individually adaptable to client preferences. It is easier for an implementation team member to configure individual windows for different requirements than it would be to reconfigure pieces of a much larger and bulkier window. Additionally, these windows are interchangeable. If a specific institution requires a certain module to serve a specific purpose then the application is able to hot swap these windows in a rapid time frame. Now that the front end construction has been discussed, the back end’s innovation deserves some attention.

The collaborative student lab manual utilizes a cutting edge database system called MongoDB to store and access all of it’s information. This database platform has a vast number of technical advantages that may only become apparent to the developers of the system, but there are two major advantages which drive the marketability of the product. These two advantages are scalability and flexibility.

MongoDB is highly scalable. A traditional relational database operates like a gigantic Excel spreadsheet where data is organized by rows and columns in individual tables. This enables fast search and store times because logic can infer where a specific element is located at any time. However, what happens if the data gets so big that more than one server is required to store the information? All of the great search and store times are ruined because the application needs to search each server to check for the proper element. MongoDB does not have this constraint. There is virtually no disparity in performance between hosting the database on one server or multiple servers. This enables the application to use a hosting company called MongoLab, which takes care of all of the scaling requirements and allows the user base of the product to grow seamlessly and painlessly.

Flexibility is the other major advantage of using MongoDB instead of the traditional relational database. Developers are able to add features to the collaborative student lab manual without having to worry about the schema of the database, which would be a large concern if the application employed a relational database. Many software applications that leverage relational databases require full time staff to work as “database administrators” and enforce protocols that prevent the database from breaking. This is not the case using MongoDB and regular software developers can dictate their own database protocols. This not only cuts down on the amount of staff required to support the application but also reduces the amount of time necessary to implement additions and customizations. As one can clearly see through this technical description, the collaborative student lab manual employs some of the most effective and innovative technologies available to deliver a cutting edge product for the classrooms of tomorrow.

The most impressive technical application has no hope of success if there is not a market for its services. Fortunately, the collaborative student lab manual is filling a much needed gap in the education system. Science labs in today’s school systems stand out as a last bastion against technological advancements and the collaborative student lab manual is designed as the perfect entrance into this depleted market.

Many students report that the only class where they need to maintain paper documents is a science lab class. Students in this day and age take notes on their computers, their textbooks exist online, and assignments are provided and submitted online. However, students find that a lab period associated with a standard science class requires them to visit the school bookstore and procure a paper lab manual which they will be responsible for over the course of the semester. This document is prone to loss, damage, and separation (individual pieces of the lab need to be submitted separately). All of these risks mean that by the time a test or other assessment comes around, the student likely doesn’t still have all of the materials they need to study and review. Additionally, if a test takes place before the teaching assistant has graded any particular lab, the students will not have access to this document. The collaborative student lab manual solves all of these issues. There is a centralized location for all of the work each student has done and is expected to complete that is in line with the technologies students are used to using for the rest of their coursework. Additionally, there is virtually zero down time for the accessibility of a document in between a student’s completion of that document and a teacher’s grading of that document.

Both the students and teachers get more value of out of science labs utilizing the collaborative student lab manual. From a teacher’s point of view, there is much less paperwork and administrative overhead. There is no need to specify which particular parts of each lab needs to be completed by classes because they are able to customize the modules of the lab on the fly. Additionally, the teacher is not burdened with providing as much insight during the completion of the lab. This is because of the ability for the teacher to input a range of results that they declare as being “acceptable” for any particular module. The students can see while they complete the module whether or not their result is within the range of acceptable results. This will eliminate the need for students to constantly ask the teacher to verify their work at each step.

The student enjoys many of the same benefits as the teacher when it comes to the unique features of the collaborative student lab manual. Students have an increased level of confidence in their lab results not only because the ranges which teachers can provide, but also because of the collaboration allowed between students. Students are able to see an aggregation of the results provided by other students who have completed the module and verify that their results make sense in comparison to similar results that are being discovered in the same environment. These two features ensure that students are getting the most out of their lab experience.

Estimations regarding market size and growths opportunities are based off of statistics at The George Washington University, which is a mid sized University with an undergraduate population of 10,000 students. Between students in STEM fields and student’s who are not in STEM fields, each student takes an average of two science courses with attached lab sections throughout their four year college degree. In other words, in any given semester there is an average of 1250 students enrolled in lab science courses. Lab manuals currently average around $50 in their paper format, and the collaborative student lab manual is designed to deliver increased value at the same cost. Therefore, at The George Washington University undergraduate program alone, the collaborative student lab manual is looking at a $125,000 annual market. These figures clearly illustrate the potential profitability of this application.

The largest risk facing this application’s success is complacency with the current paper lab manuals. The current solution for providing and maintaining coursework in the lab environment leaves much to be desired, however there are more factors than pure educational merit that go into whether or not a new product is brought into circulation within courses. For example, many professors choose to write their own lab manuals in an effort to profit off of its purchase as part of the lab. In order for the collaborative student lab manual to succeed, this monetary gain will have to be translated into an activation fee as part of using the application (which is used commonly in homework completion systems today). As demonstrated when calculating the market value present in a University setting for an application such as this, it is apparent that the cost comparison will be quite favorable to the student user.

The best selling point of the collaborative student lab manual is without a doubt the social impact that is apparent when science labs integrate with the application. The increased student involvement due to the collaboration features of the lab combined with the ability to maximize retention of lab materials are the bread and butter of this application. The collaborative student lab manual has the capability to reshape student perceptions towards lab work by both enabling the use of technology and enabling collaboration.

Students in today’s classroom want to work with technology. From Smart Boards to Classroom Remote Systems (“clickers”), proprietary classroom focused technologies have proven to be capable of increasing student participation as well as facilitating new types of learning. The collaborative student lab manual is the next big name in this list of products. The science lab environment is vastly behind other classroom settings in terms of the use of technology and this product is a perfect fit for that gap.

In addition to working with technology, student’s in today’s classrooms want to work together. This not only applies to classroom exercises but applies to the real world as well. Students are no longer leaving Universities to work jobs where they are assigned a cubicle and a stack of documents. They are instead finding themselves in collaborative work environments where facilitating technologies such as Trello and JIRA enable open communication and collaboration. Why should this not be the way that student’s learn as well? The collaborative student lab manual provides a new way for society to educate the youth in ways that are directly applicable in the professional world that is awaiting them.

This explanation of the business validity and societal impacts regarding the collaborative student lab manual has thus far been void of one key component: me. What makes myself the best person to deliver this groundbreaking product? I am in a unique position as a young professional to deliver this technology completely and with minimal development cost as a student. In fact, I will have a fully functioning beta version of the software available before any cost is incurred at all. I have had the foresight to leverage technologies that are both effective and highly scalable. If this product takes off and we have 100,000 users tomorrow, my database will automatically scale to seamlessly meet that client base. If this product meets new deadlines and we need to bring on a team of developers to help finish the software, we can do that because I have developed this software thus far on an industrial level framework utilizing paradigms that are designed for the facilitation of effective team work. This project proposal is unique for these reasons. All said and done, I have the unique capabilities to bring this highly innovative software to front lines of today’s STEM field education and I encourage you to help me along the way.