DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON

PROJECT CHARTER
CSE 4316: SENIOR DESIGN I
SPRING 2020

TEAM INGENUITY
STATE FARM FIT

DEVI TRIPATHY
CHELSEA MAY
SUDEEP BHADEL
WEI SHI

REVISION HISTORY

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0.1	02.12.2020	DPT	document creation
0.1	02.22.2020	CM	Vision, Mission, Success Criteria added
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0.1	02.23.2020	SB	Related works, Constraints, Risks added
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0.1	02.23.2020	DPT	Product concept diagram, Cost proposal, Facilities and Equipment added
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0.1	02.24.2020	SB	Related works, Constraints, Risks Modified, 13.2.5-13.2.9 added
0.1	02.23.2020	WS	Documentation & Reporting, 13.1 through 13.2.4 modified
0.2	05.14.2020	CM	Detailed Design Specification, 13.1.4 updated

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1 VISION

Currently, how life insurance rates are determined is not done with a very holistic view of the person's overall health at the present time. Life insurance agents look at many aspects of the customer's health, but not how healthy or unhealthy their day to day lifestyle is. Does the customer exercise? If so, how often? What is the customer's diet like? All of these things are important factors that contribute to a person's health. Our goal is to paint a better picture of the customer's overall health by gathering more information about the person's lifestyle on a day to day basis, rather than just looking at the person's previous health information. This will allow our customer, State Farm, to give their customers more accurate life insurance rates and possible discounts depending on how healthy the individual is.

2 MISSION

In order to accomplish our vision for this project we will be developing an android app. This app work in conjunction with a Fitbit and gather information about the person's everyday life to determine how healthy the individual is. The app will gather information such as the person's amount of exercise, track the person's sleep, etc. The user will also be able to enter information such as the meals that they are eating, their height and weight, along with other health information that is used to calculate a customer's life insurance rate. With this information State Farm will then be able to give their customers more accurate life insurance rates with possible discounts depending on the health of the individual.

3 SUCCESS CRITERIA

Upon completion of the prototype application, we expect the following success indicators to be observed:

- 40% reduction in the amount of information the insurance agent must collect from clients

- 30% reduction in average time the user waits to find out what their rate will be

- 5% increase in number of State Farm life insurance customers

- 10% reduction in average life insurance rates

- 10% reduction in operating costs

Within 6 months after the prototype delivery date, we expect the following success indicators to be observed:

- An additional 10% reduction in operating costs

- An additional 10% reduction in the number of insurance agents needed

- An additional 10% increase in State Farm life insurance customers

- A 10% reduction in insurance rates for State Farm customers

Within 12 months after the prototype delivery date, we expect the following success indicators to be observed:

- Make the application compatible with Android phones

- An additional 5% reduction in the number of insurance agents needed

- An additional 5% increase in number of State Farm life insurance customers

4 BACKGROUND

Before a client's life insurance premiums are calculated life insurance agents gather a lot of information about the person's health. Insurance agents will gather some initial information such as the person's age, gender, and whether or not the person uses tobacco. Then, they will take a look at the client's family medical history. They will also gather more information to determine the individual's overall health which includes their body mass index and a prescription check. Finally, some insurers will require a physical exam which includes a blood test, blood pressure measurement, and a height and weight verification. The problem with this process is that it does not paint a very accurate picture of the person's overall health. Even with all of this information that insurance agents gather, it does not provide the insurance company with information about the person's everyday lifestyle. Does the person exercise and how often? What is the person's diet like? How much sleep does the person get? All of these factors contribute to a person's overall health, but are not accessible to the insurance company. With an application to track a person's sleep, exercise, and diet that will work with a Fitbit the State Farm can take this additional data and give their customers more accurate life insurance rates. Creating an application like this will benefit both State Farm and State Farm's customers. State Farm will benefit because their insurance agents will not have to collect as much information from clients, which will decrease operational costs for data collection and analysis, which save them time and money. And State Farm's customers will benefit by being provided with more accurate life insurance rates and possible discounts depending on how healthy the individual is. Say a person has diabetes in their family history, which would count against them and increase their rates, but if the person maintains a healthy diet and exercises regularly State Farm having access to this information would benefit the customer and lower their rates.

For this project State Farm is our customer that we will be delivering a prototype of the application to. State Farm has had this in their product backlog for awhile, however it is pretty low priority for them, but they would like to have a prototype of the product. They want us to build a prototype for them, but also want input as to how ethical a product like this would be. As of right now our team is still working on getting in contact with State Farm. Once we get in contact with them we will know more about the features that they want to be implemented in this app.

5 RELATED WORK

John Hancock Vitality program is one that is commercially available life insurance that uses Fitbit or Apple watch to track the regular health activities of its customers and offer rewards points [1]. Based on the reward points, on the yearly basis it gives certain status to the customer that will determine the yearly premiums of their life insurance. Customers can earn Bronze Status - 0 points, Silver Status - 3,500 points, Gold Status - 7,000 Points and Platinum Status - 10,000 points. The status and premiums rate annually are Bronze - $1388, Silver - $1262, Gold - $1021 and Platinum - $964. And a little sight on how you earn your points works as, you earn 10 points daily for 5000-9999 steps you take and maintaining Blood Pressure â Reading of <= 120/80 will get you points too. As of now this plan is also not completely based on the data that is collected by using the Fitbit or Apple watch, as it shows that the customer should get Glucose Check, Cholesterol Check, Dental Screening, etc. to earn points and increase status [3]. The other insurance firm, Humana have also purposed this project but is not commercially available yet [5]. The research made by the RGA on this topic shows that there are many ways that the wearable device can be made even more effective to collect the user's data to accurately maintain his/her fitness metrics. Some of the metrics are - steps, physical activity, inactivity, resting heart rate, sleep, pulse wave velocity and detecting illness [2].

Being a new concept in the life insurance, the John Hancock Vitality program is new and does not have enough data yet to consider this program successful or reliable [4]. Also, glancing at the plans looks like it may take years for the customer to reach at Platinum status and get the best possible premium rates as the rewards are calculated on yearly basis. Due to this, customer may end up paying high premium rate for years,in some cases more than the regular premium rates. With the advancement in the technology, the ability of the watch to collect data increases which increases the opportunities for the company in this field.
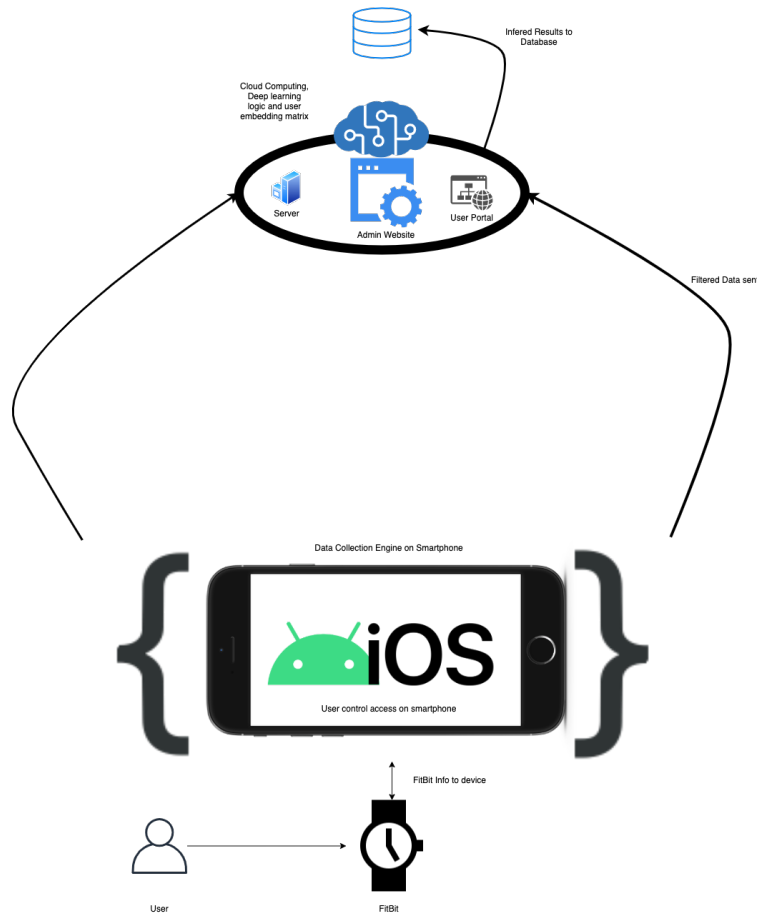
6 SYSTEM OVERVIEW

Figure 1: Product Concept

System will comprise of smart watch geared for health activity. The smart will provide access to user health data like number steps taken, dietary intake etc. The smart phone will house an app that will access the health data by requesting from the smart watch provider. The app will use location information to analyze how frequent the user visit places like bar, restaurant for analysis purposes. The app will allow users to access the information being collected in a user friendly way, and will give user an option to opt out of the data collection of specific data points. The app will also feature health analysis via a photograph.

The app will request these information periodically to save battery life of user's phone. The app will then filter the data using on board machine learning model to create an encrypted model and send the data to a back end system.

The back end system will house another machine learning model trained to perform analysis on the received data and periodically update user's health score in the database.

The back end will also be the backbone system of Admin portal for State farm to check and see what data points are affecting the user's score. The system will also afford user web portal for users to see what data is being collected and how its is affecting their health. Users would be able to control what data points they want the system to still collect and also be able to enable collection of a disabled data point.

7 ROLES & RESPONSIBILITIES

The Project has five stakeholders:

- State Farm is the largest property, casualty and auto insurance provider in the United States. In this Project, they are our customer. State From provides the original requirements and responds for checking out our works can fulfill their needs. They also need to provide some example data when the senior design team test their machine learning or data mining program test.

- Team Ingenuity: The senior design team has four members, Chelsea May, Wei Shi, Devi Tripathy and Sudeep Bhadel. All of team member are Computer Science major. Base on the system we will build, the team will separate to two subgroups. One subgroup will focus on front-end to build the app run on IOS platform. One subgroup will take care of back-end to analysis data and provide a output. All of team members respond for the requirements, design, implementation, testing and documentation.

- Dr. Gieser and TA, the instructors for CSE4316, provide consulting service if the team has a question or problem. Also, respond for checking the teamâs works and the grades.

- CSE department, provides the lab space and the necessary equipment for the team. for example, provide an MacBook to the team.

- Product owner: we will rotate the position so that everyone can have different experience in this project. The rotation will be determined by tram members during the project.

- Scrum Master: we will rotate the position every three weeks.

8 COST PROPOSAL

float To build the proposed system our team will need access to a smart watch like FitBit, cloud server to host the backend and perform analysis. To train our machine learning model our team will need access to a GPU based machine.

8.1 PRELIMINARY BUDGET

Item	Budget ($)
Smart Watch (With replacement)	800
Cloud Server	300

Table 1: Project Budget

8.2   CURRENT & PENDING SUPPORT

It is unclear how much of money state farm is providing but there is a potential for of funding by state farm. We also have funding from CSE department.

Organization	Funding ($)
State Farm	Unknown
CSE Department	800

Table 2: Funding Sources

We do not have any other source of funding other than the funding sources mentioned above.

9   FACILITIES & EQUIPMENT

Since our team want to develop for iOS we will need access to a Mac Computer with xcode and sudo access. Already two of our team member have access to a Mac based computer. We will also need access GPU machine to train our Machine Learning Model. Our need to might extend for external sensor and hardware development space like makerspaces if State Farm requires us to built custom hardware but as of now we don't require it. We don't require any additional test grounds or equipment to complete our project.

10   ASSUMPTIONS

The following list contains critical assumptions related to the implementation and testing of the project.

- The requirements from State Farm will be two parts. The front-end will focus on an app run on IOS to collect usersâ health records, and back-end part will focus on the analysis of the data and outputting a result.

- Our team members can meet with State Farm at least twice a month to ensure that our works fulfill their requirements.

- State Farm will use apple watch or Fitbit as a personal wearable device.

- State Farm will use Amazon cloud to store the data collect from the users.

- CSE department will provide at least one MacBook for the teams.

11   CONSTRAINTS

The following list contains key constraints related to the implementation and testing of the project.

- Final prototype demonstration must be completed by July 31st, 2020

- The app should have low power usage.

- The app should be able to run in older versions of iOS/Android devices.

- Total development costs must not exceed $1200

- The app should not access any data without getting user permission.

Risk description	Probability	Loss (days)	Exposure (days)
Availability of Fitbit due to shipment delay	0.20	10	2
Enough health related data not available	0.50	20	10
Mac Computer not available or accessible in lab	0.10	10	1
No availability of GPU machine	0.15	12	1.8
Miscommunication between team and sponsor	0.20	10	2

Table 3: Overview of highest exposure project risks

12 RISKS

The following high-level risk census contains identified project risks with the highest exposure. Mitigation strategies will be discussed in future planning sessions.

13 DOCUMENTATION & REPORTING

13.1 MAJOR DOCUMENTATION DELIVERABLES

These deliverables are major grade components of the course. Completing these documents should generally be the sprint goal during the applicable sprint period. Refer to current and previous course syllabi and schedules to estimate the due dates of these items. Remove this explanatory paragraph from your draft, but leave the heading.

13.1.1 PROJECT CHARTER

The initial version of the project charter will be available at FEB 24. This version is a temporary version since we still could not meet with our customer this week. We will update the document after we meet with State Farm. We also consider update the document if the content of the document is out of date. The final Version will be available at the end of this semester (MAY 08).

13.1.2 SYSTEM REQUIREMENTS SPECIFICATION

We will analysis the original requirement to build the system requirements specification. The initial version of the system requirements specification will be available at MAR 23. we will update the document if our customer, State Farm want to change their original requirements. The final Version will be available at the end of this semester (MAY 08).

13.1.3 ARCHITECTURAL DESIGN SPECIFICATION

We will create Architectural Design Specification base on our system requirements specification. The initial version of the system requirements specification will be available at APR 13. we will update the document if the SRS is changed. The final Version will be available at the end of this semester (MAY 08).

13.1.4 DETAILED DESIGN SPECIFICATION

After we deliver our project to State Farm they will be in charge of maintaining and updating the application how they see fit. Our progress is delivered to State Farm at weekly meetings. The final version of our application will be delivered at the end of the summer semester.

13.2 RECURRING SPRINT ITEMS

13.2.1 PRODUCT BACKLOG

For this semester, our product backlog will have many contents from the class documentation requirements. For example, the SRS, ADS or DDS. We will add all SRS to the list after we create the SRS.

However, the implementation of the SRS will have very low priority in the first semester. Our team will determine the priority base on the due day and group vote. We used Jira to maintain and share the product backlog with team members and the stakeholders.

13.2.2 SPRINT PLANNING

We will build a sprint plan base on the remain of the previous plan and the job need to be done for the next sprint. For this semester, we have 4 sprints.

13.2.3 SPRINT GOAL

Our team members decide the sprint goal. Before we set a goal, we talk with our customer to understand their requirements. We also need to consider the class requirements.

13.2.4 SPRINT BACKLOG

Our team members (product owners) will decide which product backlog items should put into sprint backlog. We use Jira to maintain the backlog.

13.2.5 TASK BREAKDOWN

For the task breakdown, it will be up to each member to voluntarily claim a task, which helps to build up team accountability. Time spent on tasks will be documented in the sprint backlog on daily basis.

13.2.6 SPRINT BURN DOWN CHARTS

The Scrum Master for that sprint will be responsible for generating the burn down charts. Everyone in the group will update the time taken to do certain task in the collaborative Jira account accessible to all the members. The sprint burn down chart would be represented in a graph with x-axis being working days, y-axis as story points, the red plot represents the ideal effort whereas the black plot represents the real progress.
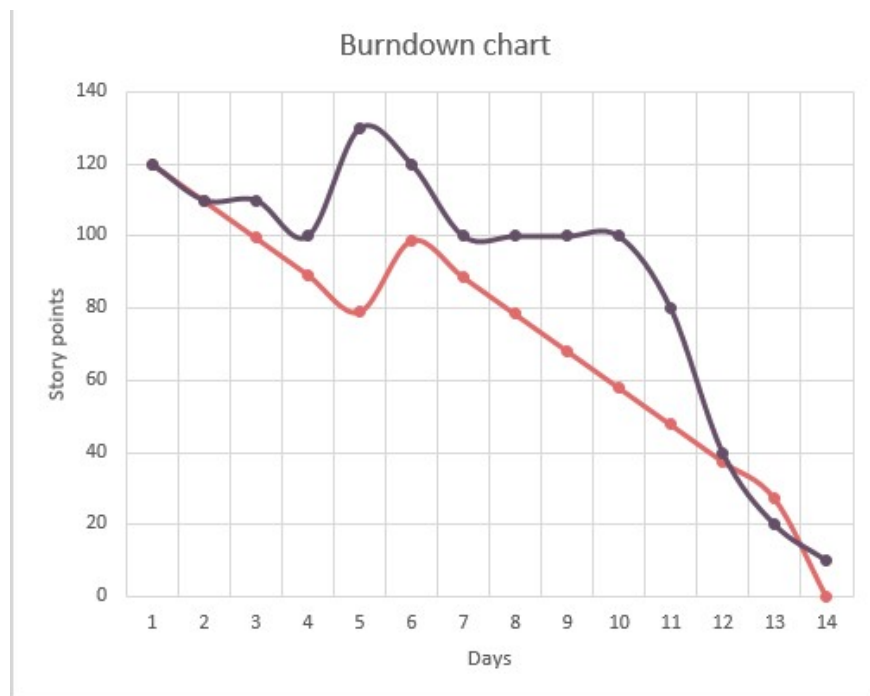

Figure 2: Sprint burn down chart

13.2.7 SPRINT RETROSPECTIVE

As a team, we will held a meeting to go through the things that went well and the things that we need to improve on after each sprint review and before the next sprint begins. For the documentation, we will individually go one by one on the things we need to start doing, stop doing and continue doing. After that, the things that are common between all the team members would be documented as team and others individual.

13.2.8 INDIVIDUAL STATUS REPORTS

Each individual member will report the task completed, remaining task, problems encountered and personal questions every two days.

13.2.9 ENGINEERING NOTEBOOKS

Engineering notebook will be updated on each team meeting , so at minimum 2 for each sprint. It would take minimum 1/2-1 page for each interval. Team will keep each member accountable by distributing task equally, providing feed backs on each others work, and establishing clear communication bridge. Everyone will be signing their own engineering notebook as a witness.

13.3 CLOSEOUT MATERIALS

13.3.1 SYSTEM PROTOTYPE

System Prototype will include iOS swift language based user end app, Tensorflow based on device machine learning model. At the backend side the prototype will include Web server, Admin portal frontend, user portal frontend and Machine learning model that performs analysis on the data.

13.3.2 PROJECT POSTER

Project Poster will talk about how data is collected, will have information regarding local differential privacy and how user data is being stored. It will contain information related to Deep Learning models that performs analysis of the data.

13.3.3 WEB PAGE

The project web page will have links different parts of project like Mobile app development, Backend server What will be included on the project web page? Will it be accessible to the public? When will this be delivered? Will it be updated throughout the project, or just provided at closeout (at a minimum, you need to provide a simple web page at the end).

13.3.4 DEMO VIDEO

Demo Video will be of 5 min long. Explaining use case and work flow of the project and small percent of the video will include B-reel footage.

13.3.5 SOURCE CODE

Git will be use to as our version control of choice. Then entire code base will provided to the customer along with compiled binaries for deployment. The license of the project will depend on our sponsor and will be made clear after our first meeting. As of we are assuming that project will be open source and licensed under GNU license.

13.3.6 SOURCE CODE DOCUMENTATION

Doxygen will be used our primary source of code base documentation.
Code base will include project description. Each file in the code base will have its own description of purpose, each function in the file will have documentation of parameter, return type and brief description of the work it performs.

13.3.7 INSTALLATION SCRIPTS

Swift code with coco pods will include list of all installed components. Mac Docker container will be handed over for recreate the production environment.

For the Machine learning models python enviroment will be exported as an anaconda yml file and be prodived with optional python Docker.

For the back end server the entire code base will be provided as a Docker container. This will include web server code (Admin Portal, User portal, Database, and Machine Learning based analysis code).

Any other support for smooth transition will be provided.

13.3.8 USER MANUAL

The customer will need to use the provided digital user manual to install all dependencies and recreate our docker environment. If need we will also include video instruction of setting up App development environment, Server environment and Deep Learning Environment.

REFERENCES

[1] Vitality Program.

[2] Wearable Technology in Life Insurance.

[3] Product Review â John Hancock Vitality Program, April 2015.

[4] Enrique Dans. Insurance, Wearables And The Future Of Healthcare.

[5] PYMNTS. Insurance Embraces Wearables, Fitness Trackers, November 2018.