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

PROJECT CHARTER
CSE 4316: SENIOR DESIGN I
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TEAM 10
MEDTECH

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Revision History

requests

Revision	Date	Author(s)	Description
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1 Problem Statement

In the medical field, many professionals use Epic EHR as the main software to store and manage data from patients, medicine, and more. The main issue is that it is not user friendly and has a complex user interface where the user can get lost easily, looking at plenty of menus but nothing of use in a bloated interface. The purpose of the project is to simplify the complexities into a user friendly form so that disorganization is kept at a minimum.

2 Methodology

To minimize costs and time, we will be using OpenEMR working as the back end of our project. OpenEMR is an open source software that features electronic medical records, management for medical practices, scheduling, and electronic billing. We are going to build a front-end user interface that will organize the components of OpenEMR that simplifies the workflow and minimizing its usage. One issue noted is that there is no search engine to find all the user interface elements of Epic EMR, such as dates of patient visits, schedules, amounts of medicine administered, and much more. Each of these components have a keyword to them that can be searched. Another issue is that Epic EHR does not have a streamlined process to billing.

3 Value Proposition

Healthcare professional's top priority is and should be patient healthcare. When it comes to human health, various aspects are time sensitive. Digitalising records in several other industries has sped things up and helped workers focus on more important tasks at work rather than mere documentation. Below we have enlisted some of our key features that would help reel in investors and sponsors: By developing this charting software, we hope to assist healthcare professionals with charting activities. Lab work and charts are crucial for patient care to ensure patients receive appropriate care as and when required. Thus by digitalizing the charts and working on deep learning and AI models we hope to provide a quick and efficient solutions to health care professionals where time is of the essence. Doctors also have to follow through with hospital hierarchies and protocols before administering drugs and necessary care activities. We plan on implementing voice authentication on our platform thereby establishing direct contact with the doctor and the patient physician. Technical jargon is common across all industries and hospitals to have their own set of terms that they practice. We hope to bridge the gap between medicine and accounting by helping to translate the dosage of medication depending on patient vitals . This helps nurses safe time and focus on patient care instead of helping with billing and documentation. Our competitors are mainly other EHR systems like OpenEMR and Epic. Our unique selling points that sets us apart from our competitors is our feature that combines charting and billing system. Thus ,building an holistic web application. Our voice authentication also is step ahead towards efficiency and real-time patient and healthcare professional interaction.

4 Development Milestones

This list of core project milestones should include all major documents, demonstration of major project features, and associated deadlines. Any date that has not yet been officially scheduled at the time of preparing this document may be listed by month.

Provide a list of milestones and completion dates in the following format:

- Project Charter first draft - October 2020
- System Requirements Specification - October 2020

- Architectural Design Specification - November 2020
- Demonstration of prototype that implements OpenEMR and Front End Framework - February 2021
- Detailed Design Specification - Month 2021
- Demonstration of lab services - March 2021
- Demonstration of search engine - March 2021
- CoE Innovation Day poster presentation - April 2021
- Demonstration of analytic widgets - April 2021
- Final Project Demonstration - May 2021

5 BACKGROUND

The world has been riding high on a technological wave. It has entered every aspect of our life and also has influenced several life threatening procedures as well. We live in a fast paced world where everything is digitized. From spending hours in the local library to researching, we now have access to several pages of target data in just a click. This has helped us save a lot of time and focus on the vital tasks at hand.

One such industry that is highly time sensitive is the healthcare industry. Taking down vitals on an hourly patients seems like a mundane task. However, even a minute change in dosage or a difference of an hour can drastically effect the patient outcomes. There are several factors that technology could help improve time and efficiency drastically. While talking to several professionals in the health care field, our team realized several factors that shift focus of health care professionals from patient care to administrative tasks that could easily be automated.

Although a noble field, it is important to realize after all hospitals are also a business and administrative are equally important to keep the business running. The medical world definitely has its set of jargon which effect medicine and equipment costs that a non-medical professional could perhaps not interpret. Thus it was important to bridge the gap between medicine and accounting so healthcare specialists are focused on medical duties rather than routine administrative tasks. After talking to professionals at different stages of their career, we reviewed other EHR systems and decided to come up with solutions that help accelerate the process of administrative and management tasks in the health care field.

EMR, Electronic Medical Records, had slow adoption in the US in 2009 [2]. This was due to the fact that it lacked efficiency and usability of EMRs currently available. This can increase time and costs, hampering productivity. For one specific example, Epic EMR is known to not be user-friendly and requires training. Medical professionals noted that it takes a long time to bill or fill out information, which cuts time for the patient care. Epic EMR also held 54% of patients in the US in 2015 [4]. If the time it takes for a doctor to enter medical records is effectively shortened, he/she would be able to visit more patients and improve health overall. On the business aspect, more patients go through, which means more money is spent either from them or from insurance companies, which adds to the business's profit.

Dr. Shawn Gieser, our sponsor, outlined this inefficiency and selected our team to work on this project. Currently, we do not have a customer, but we are communicating with medical students and medical professionals to aid us in this project.

6 RELATED WORK

According to Capterra, a software research group, 30% of unsatisfied users noted that their EHR software was difficult to use [7]. This stems from navigation issues where the user has to actively find what he/she is looking for, looking into menus, tabs, and often for a long period of time. This has been an issue because they lack specialty specific interfaces. Current EHRs attempt to combine multiple professions into one, which can put stress on one profession to navigate through to find relevant information. [6]

One solution that was considered was data visualization. In a 2017 study from the University of Illinois at Chicago, they were determining if data visualization benefits healthcare since it is a complex field with many specializations. They do not have an explicit solution, since they concluded that data visualization is in its infancy in healthcare. By having the users interact with visualizations, they create new knowledge applicable to them. From their example, a patient's pain score from 1 to 10 could indicate many things. For a physician, additional medicine may be needed. For a nurse, this may register as a failure in pain management. For a physical therapist, this may indicate the pain came from a therapy session. Either all, some, or none could be correct. By visualizing this through glyphs, colors,

and shapes, it could portray more information than data values. [3]

In a study published in the Journal of the American Board of Family Medicine, they compared different physician EHR note designs to determine which design is most efficient for physicians. "Cluttered documentation may contribute adversely to physician readersâ cognitive load, inadvertently obscuring high-value information with less valuable information", researchers noted [5]. They discovered that physicians did not like the traditional SOAP EHR note design, SOAP standing for: Subject, Objective, Assessment, Plan. Simple modifications, such as using colored text and bold fonts or reorganizing Assessment and Plan to the top, could be used to highlight important information. Hiding irrelevant data also avoids overwhelming physicians with clutter. [1]

These studies are explaining high level concepts and there is also the factor of company licenses and privacy, so finding specific solutions that EHR software implemented can be difficult to find. However, the studies will aid us in the design of the user interface.

7 System Overview

Medtech will integrate OpenEMR, a server and web application that will serve in back end operations. Since the problem is UI related, the solution is to simplify it into a usable product. We will use React to serve as the User Interface and redesign the UI into a user friendly interface. For users, they will be able to register and upon login, they will be displayed an overview with menus that can navigate to other tabs. To mitigate the problem of abundant tabs, a search engine will be implemented to be able to search for individual tabs or by category. The users will also be able to set their preferences on what they want to see upon startup, and set their own "category" view of what they want to see by selecting which tabs they want to see for one specific category, then can call up that category for calling up multible tabs.

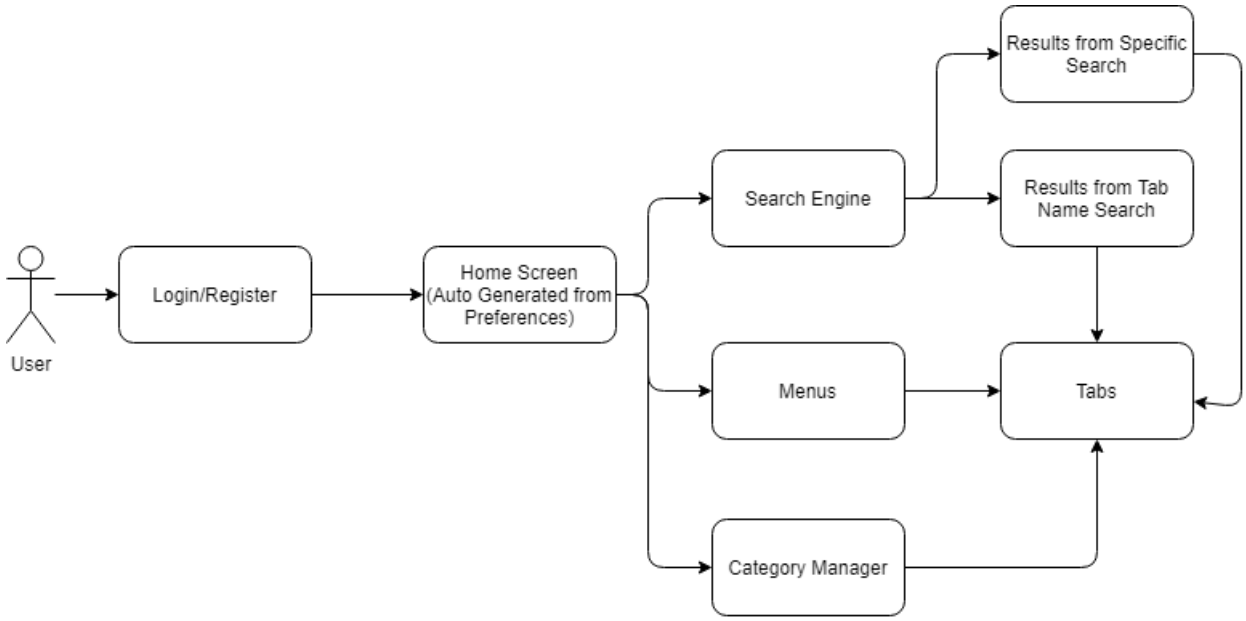

Figure 1: Use Case showing interaction between user and application

For this application to be useful, we are planning on integrating a calender view for all the users. For nurses and docters, this will help plan out their work shift and for patients, it will keep track of all their appointments and potentially have events on calender when they have to take medicines when they are not at the hospital, to ease out the process.

This web application also needs to have a database that keep tracks of all patients and their individual profiles and health records. We are also planning on integrating a smart suggestion tool for medicine

which medical professionals can use when prescribing medicines which will further cut their time spent on the computer. One of our main goals in this project is to help reduce the mental stress that medical professionals might experience in their initial practicing days by reducing the amount of information displayed at once and instead develop a smooth experience by giving only the information that they need.

We plan to integrate data from lab services as well through which labs can automatically send the reports through one email address and out product automatically attached that to its correct patient which prevents any further human intervention and help save time.

One of the pivotal feature of this product will be its analytical widgets. This will give doctors and nurses options to generate different helpful reports with a wide ranging spectrum starting from printing reports of how many on patients they need to perform medical check-up to their appointments. It will also have a feature that can generate graphs on different vitals of patient, like blood pressure and sugar level which can help identify trends and can lead to better patient care

8 Roles & Responsibilities

The stakeholders in this project will be medical professionals and Dr. Shawn Gieser from the University of Texas at Arlington. Our team consists of four members; Hemantha Govindu, Maxwell Pham, Nikita Menon and Nisarg Shah. For the purpose of this project, we have assigned the roles as follows;

- Hemantha Govindu - Scrum master
- Maxwell Pham. - Team Leader
- Nikita Menon - Sponsor contact and Documentation Head
- Nisarg Shah - GitHub manager

We intend to keep this roles as they are for the entire duration of the project. We divided this work based on each team members ability and interests.

Scrum master, Hemantha Govindu, will have the responsibility of maintaining all the scrum-related tasks ranging from deciding who will be assigned what tasks and maintaining the scrum board on Trello, an online scrum-website.

Our team leader, Maxwell Pham, will have the responsibility of diving all the SRS into sprints and making sure we stay on track for the project deadlines.

Our Documentation Head, Nikita Menon, will be responsible for maintaining all the documentation of code and other tasks and will also be out groups's point of contact to the sponsor, Dr. Gieser.

Out GitHub manager, Nisarg Shah, will be responsible of integrating different features and SRS from branches that other team-members have created into master branch to make sure that the master branch works as planned.

9 Cost Proposal

Our project is software based.The major expenses we will have to undertake for our project will be application programming interfaces (API) for speech recognition technology, 3D human anatomy, and renting a domain to host our website in the spring of 2020. Our project is sponsored by the University of Texas at Arlington and our current budget is USD 800.

9.1 Preliminary Budget

Number	Description	Approximated Cost in USD
1	Domain Hosting for Web	25.00
2	API for 3D Human Anatomy	30.00
3	API for Speech recognition software	100.00

Table 1: Overview of preliminary budget

9.2 Current & Pending Support

The funding source is from the Computer Science department of the University of Texas at Arlington. There are no other funding sources or potential funding sources secured as of yet. The funding provided by the university is USD 800.

10 Facilities & Equipment

Due to the nature of the project, it will be software heavy and will not require a specific facility to create or host it. All of our productivity depends on using a computer with network connections that allows us to use development tools of libraries, frameworks, code editors, and GitHub. For our equipment, we will only be using open source software that is free to use. Our purchases will be only on a need basis depending on what is required to complete this project, and otherwise will use resources that are available to us free of cost as students at the University of Texas at Arlington.During the requirements stage we plan of meeting medical professionals who have experience working with the billing software that is being used currently.In order to test the system, we may ask medical professionals or similar to use the application. This application will be hosted online for proper testing which may require spending depending on the resources website hosts can provide.

11 Assumptions

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

- All team members have web design experience
- The application will be testable by the 5th sprint cycle
- The $800 funding will be satisfactory for the project's purchasing needs
- The application will be hosted on web and can be tested online
- The end user will be a medical professional with privileges given to doctors and nurses only.

12 Constraints

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

- Final prototype demonstration must be completed by May 1st, 2021
- Time to work on the project is limited due to the full-time course load
- Team is limited to 4 people developing the project
- Total development costs must not exceed $800
- Product must have OpenEMR working for back end operations
- None of the developers have any experience in using the software and are dependent on user experience provided by interviewed professionals.

13 Risks

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

Risk description	Probability	Loss (days)	Exposure (days)
Sponsors and Customers (Medical Professionals) meeting delays	0.50	20	10
Time Zone conflict for overseas members	0.20	10	5
Loss of internet or power while working	0.05	2	0.1
Loss of code stored locally that is not pushed to repo	0.1	10	1
Availability of team members staggered due to differing schedules	0.75	5	3.75

Table 2: Overview of highest exposure project risks

14 Documentation & Reporting

14.1 Major Documentation Deliverables

14.1.1 Project Charter

After submitting the initial project charter on 10/5/20, changes will be made in the cases where it is necessary, for example if new constrains are identified, budgetary changes take place, any developments that might take place to the system overview during the following sprints. The document will be reviewed, updated and maintained at the end of every sprint.Each member of the team will be responsible for the maintenance of the document.The final version of the project charter will be delivered in May of 2021.

14.1.2 System Requirements Specification

The initial system requirements specification document will be delivered in the week of 10/12/20. This document will be maintained as we work our way through the sprints and develop a better idea as to which of our requirements are realistic and can be delivered upon.Also,during our meetings with our sponsors or medical professionals if a necessary feature is brought into our attention, the document will be appended accordingly.Each member of the team will be responsible for the maintenance of the document.The final version will be delivered in May of 2021

14.1.3 Architectural Design Specification

The document will be updated(if need be) at the end of every sprint in the case that any developments are made to the initial design specifications or a new specification has to be added to the original list.Each member of the team will be responsible for the maintenance of the document. The final version will be delivered in May of 2021.

14.1.4 Detailed Design Specification

The document will be updated(if need be) at the end of every sprint in the case that any developments are made to the initial design specifications or a new specification has to be added to the original list.Each member of the team will be responsible for the maintenance of the document. The final version will be delivered in May of 2021.

14.2 Recurring Sprint Items

14.2.1 Product Backlog

Each SRS will be given a unique ID and will be added in a team-maintained sheet. Each SRS will be given a priority category, based on sponsor's preference and its important towards building the final

product. The estimated cost will be decided by the team members who will be working on that branch of the product.

14.2.2 Sprint Planning

Each sprint will be geared towards adding more functionalities based on the SRS list and the priority given to us by the sponsor. We will have in total of about 7 sprints.

14.2.3 Sprint Goal

The Team leader will decide on how the sprint will be planned. This will be based on their planning along side inputs given by our team mates. We will be presenting our progress to the sponsor after every sprint to keep them updated and also to take valuable inputs from them.

14.2.4 Sprint Backlog

The Scrum master decides which product enters the sprint backlog based on the priorities. Out team will be using, Trello, an online software, to keep track of our backlogs.

14.2.5 Task Breakdown

The individual tasks will be decided on team members strength by the Team leader. The time spent on a particular task will be decided based on the input received from the team member who has be assigned that particular task.

14.2.6 Sprint Burn Down Charts

The scrum master will be responsible to generate the Burn Down charts. After every sprint, we will report the time spent on each tasks.

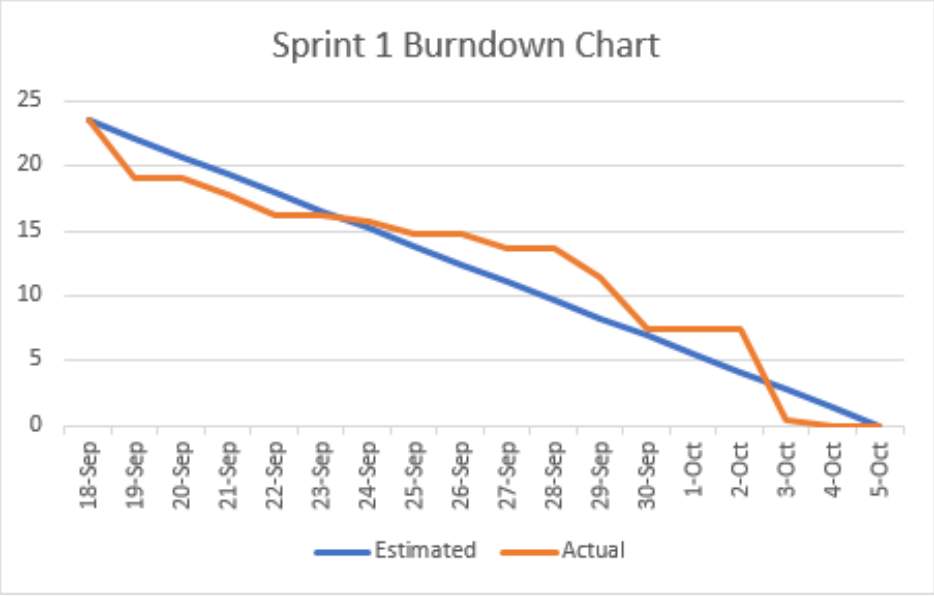

Figure 1: Sprint 1 burn down chart

14.2.7 Sprint Retrospective

The Scrum master will be responsible for the sprint retrospective. We will be meeting every week as a part of out touchbase meeting to discuss what we did for the previous week and any difficulties that we faced during that. We will be documenting our progress as a group and also individual milestones that

everyone can set on their own during the meeting. Everything we do on a sprint will be due when the sprint ends.

14.2.8 Individual Status Reports

Each individual will be required to submit all the SRS they worked on and their progress on it. The key items that will be discussed in this report will be any difficulty that they faced and if we found any limitations which can delay our sprint progress. And this will be reported after every sprint.

14.2.9 Engineering Notebooks

All engineering notebooks will be updated at least once every week during our sprint meeting or if any one of the team members have any idea for the project. We will be doing peer-reviews of our Engineering notebooks every week to keep each team member accountable. We will be doing peer reviews of out engineering notebook and thus the peer will be signing the witness box

14.3 Closeout Materials

14.3.1 System Prototype

Our final system prototype would include a demo of our web app.

14.3.2 Project Poster

The project poster will have snippets of our working demo and will be delivered on the project demo day at the end of Spring 2021 semester. The dimensions will be approximately 1280*800px in size

14.3.3 Web Page

We will be having a website through which customers and medical professionals can access the project and log in. I will be open to all and will be updated after every sprint once we start coding.

14.3.4 Demo Video

We will be showing a demo video for our customers in which we will going over how to use the software.

14.3.5 Source Code

We will be using git version control for the product and the project will be a MIT license. The Source code will be maintained in a public repository on GitHub. Customers won't need to be supplied with either the code or the binary files, the whole project will be hosted on cloud services. Customer can access the product from there.

14.3.6 Source Code Documentation

We will be using Doxygen for our documentation and it will be delivered in a PDF format. If the time permits, it will also be available in a HTML format.

14.3.7 Installation Scripts

The project will be hosted on a cloud service so users can just create accounts.

14.3.8 User Manual

Even though we will try to make things as simple as we can, the users will still be provided with a User manual and a demo video for better understanding.

REFERENCES

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