Winter 2021

Appointment Scheduling System

Guzaloi Noori
Central Washington University, guzaloi.rakhimova@cwu.edu

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Guzaloi Noori

Senior Thesis
Submitted in Partial Fulfillment of the Requirements for Graduation
from the William O. Douglas Honors College
Central Washington University

March, 2021

Accepted by:

M. Shawn Reichert, Dr., Faculty, DHC 3-18-21

Thesis Committee Chair (Name, Title, Department) Date

Roslyn Moes, International Student Advisor, OISP 3/17/2021

Thesis Committee Member (Name, Title, Department) Date

Dr. Anne Cubilié

May 6, 2021

Director, William O. Douglas Honors College Date

Abstract

Appointment Scheduling System designed for universities so that students can schedule appointments with their university's faculty and staff regarding academic, employment, immigration, or personal issues. The scheduling system has the ability of being embedded to the Computer Science Capstone project iAcademic, which I took part in as a front-end developer.

Contents

Table of Figures

Acknowledgements

Before diving into the project, I would like to acknowledge the people that were a great help throughout my journey with this DHC Capstone Project – Appointment Scheduling System.

Acknowledgement for my mentor Dr. Shawn Reichert for helping and guiding me throughout the development of this Capstone Project. Dr. Shawn Reichert is the one who gave me the idea of enrolling into Douglas Honors College and expand my knowledge. Additionally, I would like to give credits to all the faculty of DHC, especially Dr. Allyson Rogan-Klyve for helping me to get started with the project process. Thank you for the hard work of Hayley Carter for working on the backend, Ryan Perkins for working on Security and Nisser Aldossary for working on Unit testing of the iAcademic Computer Science Capstone project. Lastly, I would like to thank DHC advisor Christina Denison and my international advisor and at the same time second reader for this project Roslyn Moes, for being available whenever I have academic issues throughout the development of the project. I would like to thank my former coworker Ben Field and Web Developer for Public Affairs at CWU Jonathan Belford who both were able to offer technical help towards DHC final project.

1. Introduction

1.1 Project introduction.

There are a lot of hardware/software tools available to create communication between students and university employees. Nowadays companies like Microsoft and Amazon are creating their own software for their employees' needs. They are using their own custom software and share with other companies as well. Those software are Amazon Chime™, Microsoft Teams™, Microsoft Bookings™, etc. Microsoft Bookings™ is the product of Microsoft that allows people to create a platform designed for a specific company to be able to schedule appointments according to the availability of the employees. Microsoft products come as different types of packages. There are packages for business purposes, universities and for personal use. Package for personal use includes less software in the package therefore the price for the package is less than what it costs for big universities and businesses. With that idea followed, I decided to create a website where students can schedule an appointment with faculty of staff that will be designed only for Central Washington University. During the process of the development, there were a few roadblocks that have made me change the end goal of the project which will be discussed further in the Roadblocks section.

1.2 My motivation.

The departments at Central Washington University have their own way of scheduling appointments. Some created a HTML form that is deployed in their department’s website, some have Microsoft Bookings link in their website and lastly most of the departments are using “appointment by calling” option, which considering the current situation with the pandemic, all

the lines are always busy, and it is more difficult to get in contact with the needed person. I worked as an Office Assistant for the International Office before the pandemic, where I used to schedule appointments by phone, or people used to come to the front desk to schedule appointments, which makes the job harder for both students and the employees of CWU. Additionally, scheduling appointments with faculty is even harder if the student's schedule is not fitting to the office hours of the faculty. Students must go through emailing processes to find a mutually convenient time. If there is a system where students would be able to choose from the available date and time according to the faculties and staff's availability, then it would be much easier. This is the main reason why I decided to come up with a system for a better interaction and communication.

1.3 Why did I decide to create a web platform?

There are certain departments at CWU that have already switched to an online system, but the problem is that each department uses different types of software to do so. Appointment scheduling needs more research towards creating a better single software that the whole university can utilize.

As I am a Computer Science student, we used to have a simple link in the department's website where students could schedule an advising time with the Computer Science advisor Megan McConnel according to her availability shown on the website. It was a basic HTML/PHP website that had HTML forms where students could enter their student ID and a reason for their need for the advising appointment. The submission of the appointment request would go to the front desk of the CS department, and the front desk employee would send an email confirmation if the selected time for the appointment is available or not. The idea of having the scheduling

system came from the existing CS webpage and decided to implement same system for the whole university.

2. Body

Firstly, I would like to introduce certain terms that will be discussed in this paper, so that the reader has the better idea of what a certain term means. Below is the vocabulary of certain terms associated with the current project.

2.1 Vocabulary.

HTML - Hypertext Markup Language is the standard markup language for documents designed to be displayed in a web browser (Wikipedia, 2021).

CSS - Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language such as HTML (Wikipedia, 2021).

JavaScript - is a high-level programming language that is used to create the backend process of each action taken on the website or a software (Wikipedia, 2021).

Bootstrap - frontend CSS framework that contains CSS and JavaScript-based design templates for typography, forms, button, navigation, and other interface components. For this specific project, Bootstrap 4.0.1 version was used (Wikipedia, 2021).

Figure 1. Frontend structure and styling languages towards the project

Java - is a set of computer software and specifications that provides a system for developing application software and deploying it in a cross-platform computing. In this project, Java is used as a backend programming language to make the website live (Wikipedia, 2021).

UI - User Interface is the space where interactions between humans and machines (computers) occur (Wikipedia, 2021).

REST API (Outlook) – Representational state transfer is a software architectural style which uses a subset of HTTP. It is commonly used to crate interactive applications that use Web services. A Web service that follows these guidelines is called RESTful. The purpose of the REST is that it is the most logical and efficient way of creating APIs for Internet services. As an example, REST is an interface between using HTTP to obtain data and generate operations on those data in all possible formats such as XML and JSON (which are the types of file that the programming languages can read and embed) (Wikipedia, 2021).

Google App Engine - is a platform as a Service and Cloud Computing Platform for developing and hosting Web Applications in Google managed data centers. In this project, Google App Engine was used to host the website locally as well as in the server as needed (Wikipedia, 2021).

Figure 2. Google Cloud tool used for backend/security purposes

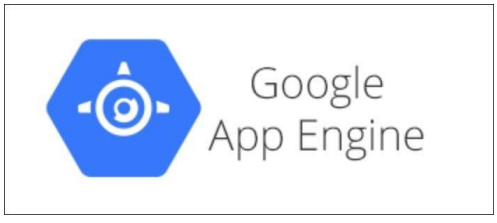

Figure 3. Google Cloud App used for hosting the website

Agile Project Management - is the application of the principles of Agile software development to various management processes, particularly project management (Wikipedia, 2021).

Figure 4. Overview of Agile Development

User Story - in software development and product management, it is an informal, natural language description of features of a software system. They are written from the perspective of an end user or user of a system, and may be recorded on index cards, post-it notes, or digitally in project management software. In the case of this project, Clubhouse project management tool was used to develop various user stories that are going to be implemented towards the project (Wikipedia, 2021).

SQL Injection – code injection technique, used to attack data-driven applications, in which malicious SQL statements are inserted into an entry field for protection

2.2 Initial Research Questions & Answers.

While planning the development project, there were research questions and hypotheses set. The following are the list of questions that were answered during the development:

1. Is the calendar-based appointment system better than availability-based appointment system?

I conducted a survey to help decide which system would best serve the university's needs. According to the survey results, 38.5% of the people who responded would prefer the system with the list of available time and date to choose from and the confirmation email is not required. 34.6% of the people who responded said that they would want the system with the invitation to be sent through the Shared Calendar where appointment confirmation would be required through email.

I decided to proceed with the system that most people voted for. The website I designed would have the availability of the faculty or staff, and the confirmation of the appointment would be required through email in case the appointment has to be cancelled due to the availability of the faculty or staff. The reason I did not proceed with the Shared Calendar option is because of the privacy issues. According to the survey, a lot of people responded that they would not want their private stuff to be shared with the students. Additional information can be provided after the appointment is confirmed. Due to the privacy issues, I decided to proceed with the system that will have the availability shown on the Calendar. The manner is which the website determines availability is because the website will be connected to Outlook using Outlook REST API.

The following is the Chart from the survey:

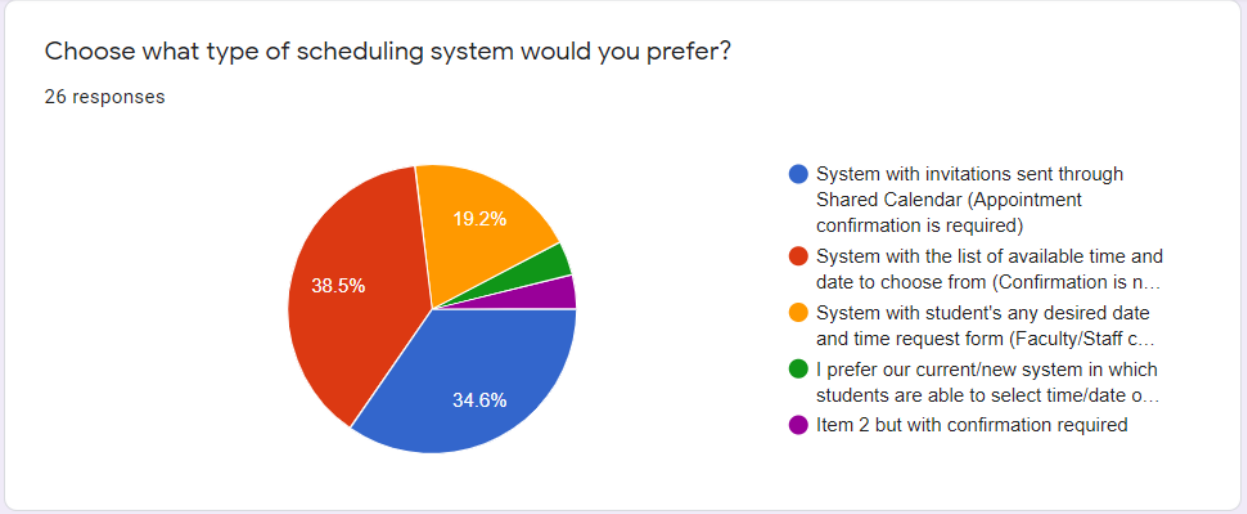

Figure 5. Analysis chart for one of the questions conducted using Google Forms survey system.

2. Is it necessary for the website to require authentication for each student and faculty for protecting the students', faculty, and staff's privacy?

FERPA (Family Educational Rights and Privacy) is an important aspect to take into the consideration in all the universities (Wikipedia, 2020). It is important to have authentication to protect the data of each user of the website. The way it works is that only students and employees of Central Washington University would be able to register using their unique university given ID. Verification of the registration would be sent to CWU email address for security purposes. More details on security and authentication will be discussed below.

2.3 Initial planning.

In this paragraph, the initial planning will be discussed, as the end goal of the project changed due to lack of permissions and time.

The initial goal was to develop a separate website that will be linked through the myCWU portal. By that means, the authentication would be done the same way every student logs in to any other CWU website. For example: CWU library, resources and any other websites that are associated or partnering with CWU. As I have proceeded with the development of the website, the CWU IT professionals pointed that the university is no longer using any websites created by students due to the need of maintenance of the website after students graduate. Due to this fact, the idea of the project changed and I came across an idea of creating a PHP webpage that is embedded to every department's page. As the idea of the project was to have the one single system designed for the whole university, I decided that creating a webpage for every department would require a lot of communications, permissions, and specifically time.

As some of the department at CWU are already using Microsoft Bookings, I presented to my mentor the idea of creating a single Microsoft Bookings that will work for all the

departments but found out that this project has already been implemented by the General Advising Department. The way it works is that the link to the Microsoft Bookings Scheduling page is linked to the General Advising class on Canvas where a student can easily meet with the General Advising only. This process is optional and not all the faculty or staff implemented this system. Therefore, some students are still not able to reach out to the person that they would like to meet with.

Below is the diagram that was planned for the project before the end goal has changed:

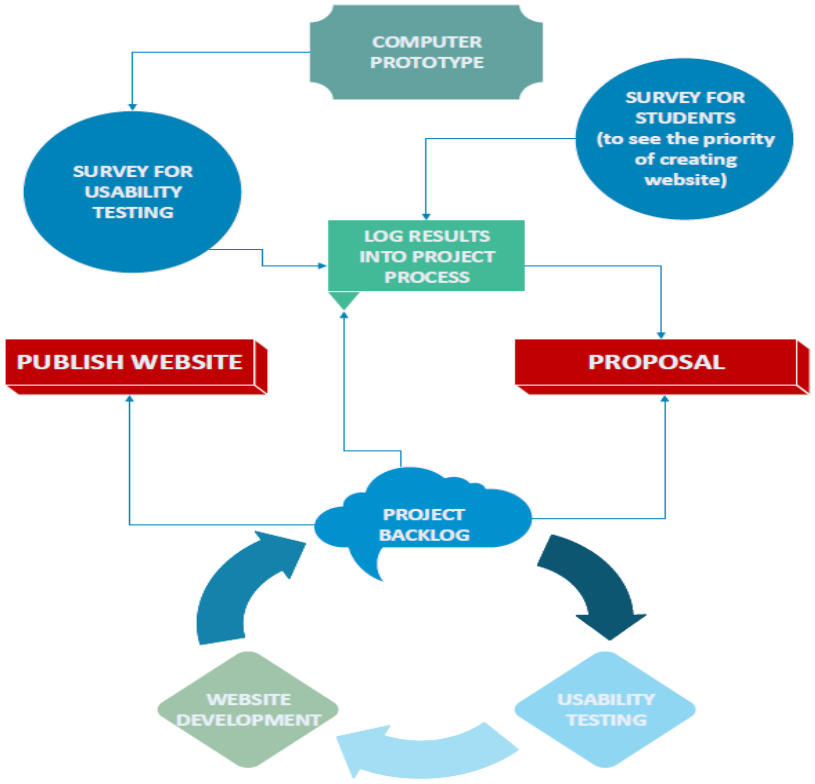

Figure 6. Visio diagram for the development process of appointment scheduling system.

The Visio diagram has been created as it is considered one of the processes of web development - development life cycle. The order of the diagram has changed, and prototype has been done along with the web development itself. The proposal has been written and the web development started right after the proposal was accepted. In further paragraphs, the changes to the project and the process of the new development will be explained in more details.

During initial planning, after I conducted survey for the faculty and staff, I concluded how the website will be developed and what functionalities it is going to have. The website will be written using UI frameworks following with programming languages like HTML, CSS and JavaScript (the terms are defined in the Vocabulary section). The planning always changes as the project progresses which is why I have been using the Agile Development technique. It is reliable in a sense that I could get back on track if there would be changes and roadblocks occurred during the development. Below are the User Stories that have been created during the initial planning for the project.

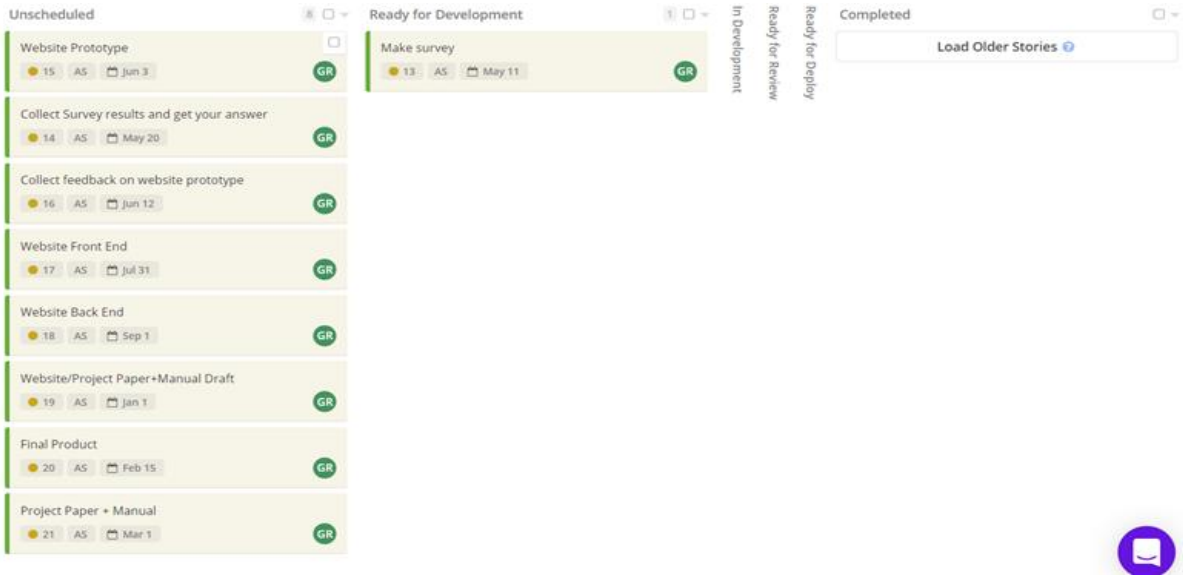

Figure 7. User stories created in Clubhouse platform used towards the Agile Project Management process and development of the project.

The Visio diagram above is implemented using Agile methodology especially the Website Development, Project Backlog and User Testing. It is a circular motion that consists of multiple Project Backlogs. After the User Testing is done, the next process is a Project Backlog where the feedback is taken from the previous web development process, certain changes and decisions have been made and returned back to the Web Development process. Until all the requirements are met, then the final step is to publish the Website. In the functionalities

subsection, the delivered functionalities that have been planned and implemented will be discussed in more depth.

2.4 Roadblocks.

There have been roadblocks that led to the change of initial plan. As mentioned in the beginning of the paper, I have talked to the Web Developer of CWU Jonathan Belford and asked for advices on how I can proceed with getting permissions to host my website on myCWU or obtain the database of Student and Faculty IDs so that the website that I am building belongs solely to CWU. The Web Developer of CWU mentioned that there are no permissions given to students neither to access the Student/Faculty Data nor to host websites within CWU portal for certain security reasons. He advised us to proceed with a generic website idea that plays the role of scheduling appointments for any businesses like salons, private businesses, or other non-profit organizations. After talking with my mentor, it was decided that I will go forward with my initial idea of creating a website to schedule appointments without needing the actual data. Creating the User Interface of the webpage was the goal to demonstrate the opportunity and possibility of the scheduling system without actually needing the third-party software created by other companies. The website was created using Squarespace.com that has the possibility of being embedded to the iAcademic Student Cloud Portal that I with my Capstone Project team worked on towards our Computer Science degrees.

2.5 Functionalities.

Current website that I have designed have functionalities that were initially planned using User Stories. This paragraph will list the functionalities along with the manual for the website.

The website has the option of signing in and registering which only the students who have their IDs provided by the university can create an account and sign in along with the CWU employees.

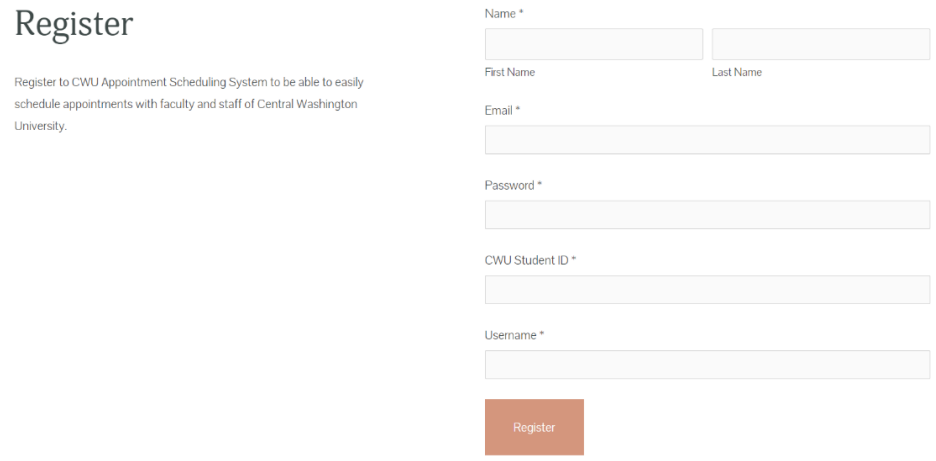

Figure 8. Registration Page

Below is the Sign in page where it has the Register link, in case the user is not yet registered.

Figure 9. Sign In page

The website shows the number of services it offers such as: Academic advising, On Campus/Off Campus employment consultation, International student advising and lastly Personal issue advising.

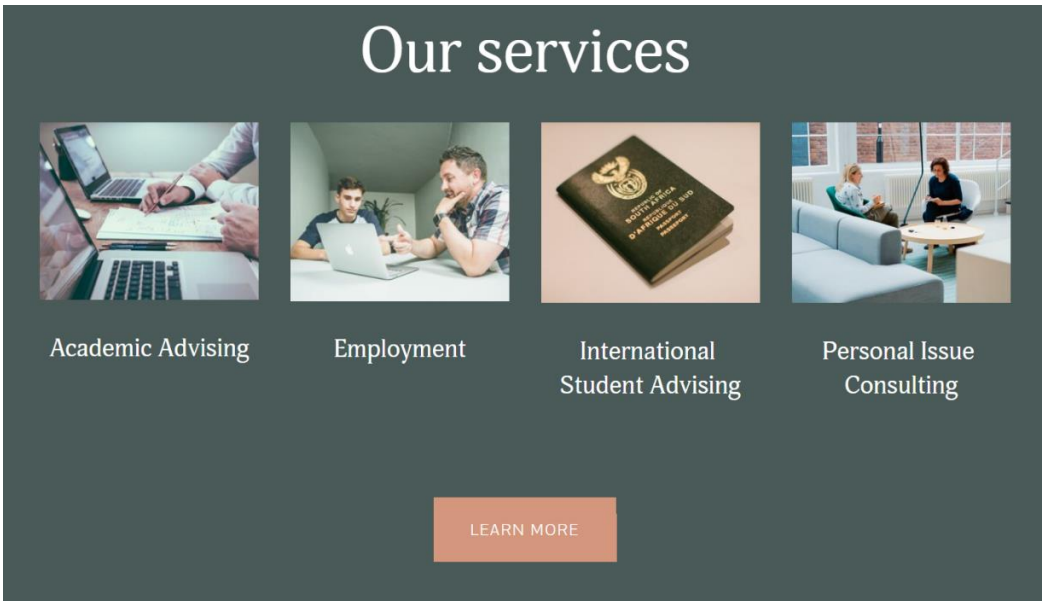

Figure 10. Services Offered display on the main page

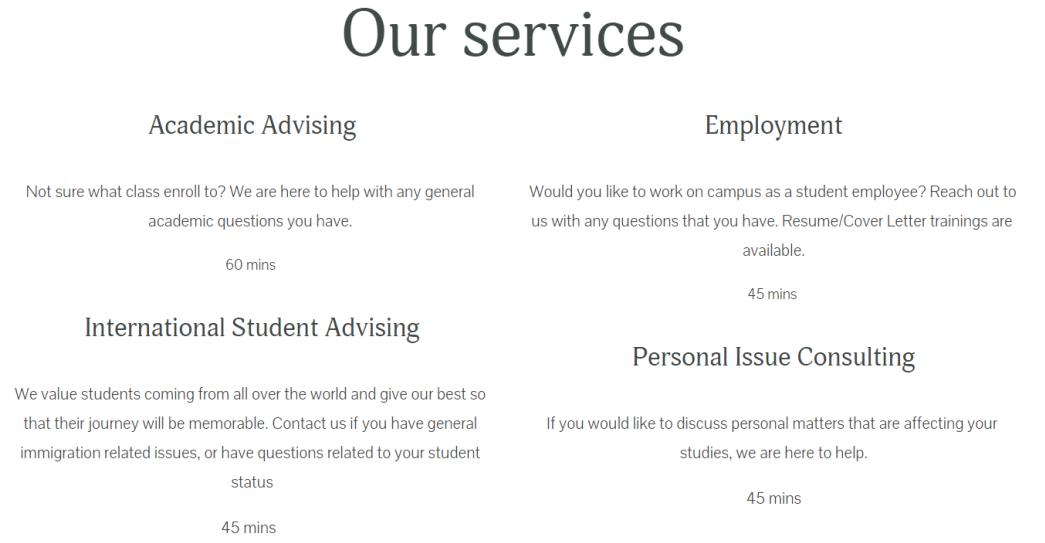

Figure 11. Services Offered through Services tab on the navigation bar

There are two different directions on the website separated into Faculty and Staff. A student can select if they are going to schedule an appointment with either faculty or staff.

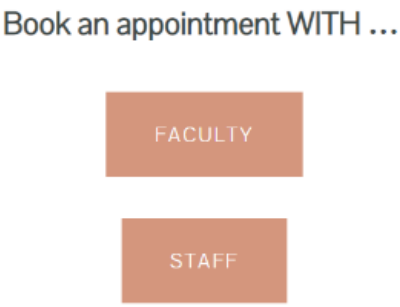

Figure 12. Platform selection (Faculty or Student)

Selection leads directly to the scheduling part where a student must choose the appointment reason among the following choices provided: Academic Advising, Employment Consultation, International Student Advising or Personal Issue Advising.

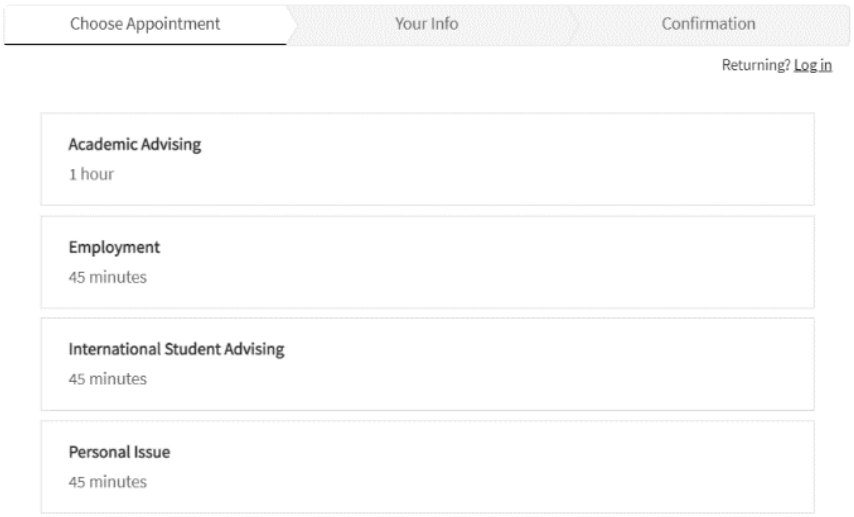

Figure 13. Scheduling - Appointment type selection

Next step is choosing the date from the Calendar according to the availability of the faculty or staff. Once the date is selected, there is an option of selecting the time preferred and continue.

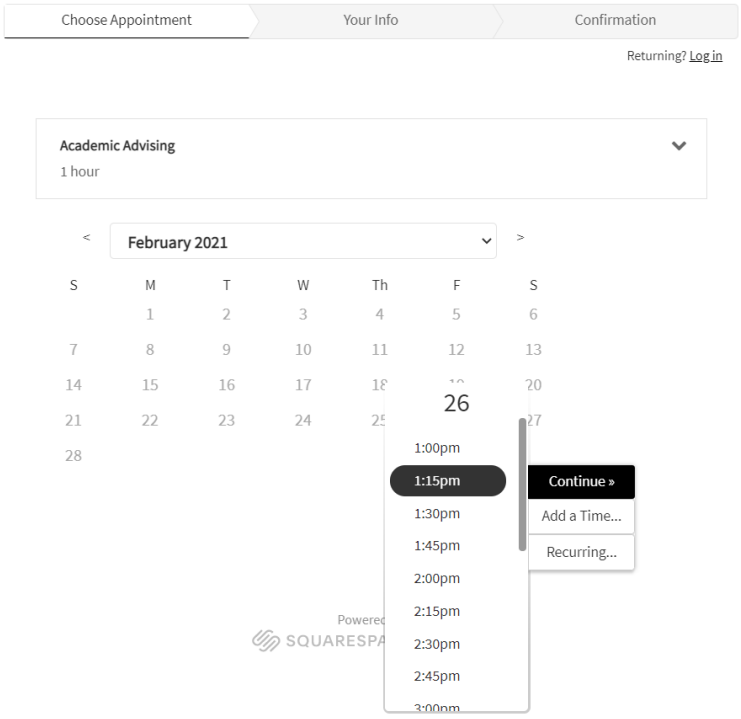

Figure 14. Scheduling - Appointment Date/Time selection

The student input portal follows where the student's information who is trying to schedule an appointment should be entered and continue with the next step - which is confirmation.

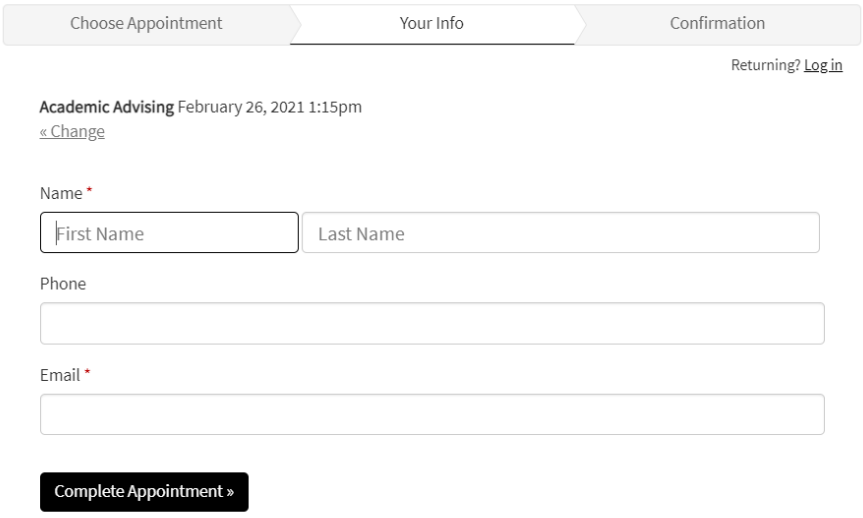

Figure 15. Scheduling - Student information

Confirmation page lets you to either cancel or reschedule the appointment that you have scheduled. Once the appointment is completed, an email gets sent out to the General Advising Department according to the reason of appointment the student has chosen. Initially, the purpose was to send the appointment request directly to the person that the student is trying to schedule the appointment with, but with the reason that I do not have the database for the faculty and staff available, it was decided that only the idea of the process is shared. General advising will forward the appointment request accordingly. In the confirmation page, there is a QR code available which if scanned, the Outlook or Google Calendar will recognize and place the appointment on the calendar desired accordingly.

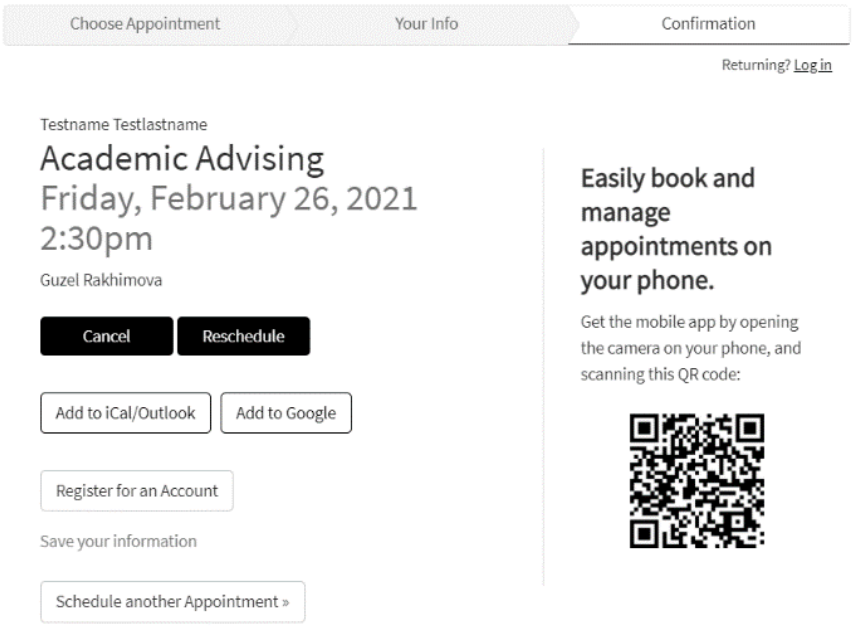

Figure 16. Scheduling - Confirmation

2.6 iAcademic Student Cloud Portal project introduction.

The Academic Cloud Platform is a web-based academic portal that can be used by the students or faculty. The name of the website is iAcademic and it is a Cloud Computing Project

for Computer Science Capstone Project. The idea of the project is to create an academic platform using the Cloud Platform of Google.

There are three main functionalities of the iAcademic platform which are: class enrollment, grade view, and schedule management for both faculty and student. The student has permission of enrolling to the classes and viewing the history of classes taken along with the quarterly and cumulative GPA. Faculty has the permission of adding students to their class, see their class schedule and submit a grade for student. iAcademic has only a login page where a student or faculty can login using the university given ID along with the password that was assigned for them. There is only one database that holds the data of both faculty and students. There is no registration page or create account page because there is already an account created for the user by the university. In the future when the appointment scheduling system will be embedded to the iAcademic website, then there is a registration page would be available where a user can create an account only if the user is a student, a faculty, or a staff at CWU. For example, the iAcademic portal does not have a staff platform since staffs are not academically related, however there are departments that students schedule appointments with the staff. Therefore, the account needs to be created for staff as well in iAcademic portal using credentials given by CWU. Luckily, appointment scheduling system that I have built has the option of registering or creating an account, which should not be a huge deal if both systems are going to be combined.

2.7 Tools Used.

There are multiple software and programming languages used to create both platforms. The appointment scheduling is created using Squarespace.com platform along with the Scheduling functions embedded to the website. There is a monthly fee for Squarspace.com for using the web platform as well as additional fee to host the website in the platform. The website

is not hosted on the server because the goal for the website was changed and CWU has no use for the website. The purpose of the website hosted locally is to present ideas so that it can be implemented according to the university's needs. With the reason that Squarespace.com needs a monthly fee, I used the free trial of the website and created the content and took screenshots of the webpage to have the overall look of how the website will approximately look. The screenshots are placed into the PowerPoint and guided through which page has what kind of functionality.

iAcademic platform was written from scratch based on Google App Engine. In this Capstone Project (iAcademic project), I was responsible for the Front End of the website which means designing how the website is going to look like. The Back End and Security is taken care of by the other teammates of the Capstone class which I will touch base on in the further paragraphs.

Google App Engine is defined in the vocabulary section of this paper. Front End is written using HTML, CSS, Bootstrap and JavaScript. The structure is mostly written using HTML and Bootstrap along with CSS were used to design the HTML structure of the website. The sources used to develop both websites will be cited in the Resources page of this final paper. Google App Engine library was downloaded locally and plugged in to Eclipse IDE along with the Google App Engine which will make the developed website perform operations locally.

2.8 Security

Google App Engine, Squarespace.com and Scheduling built in system has many security features built into the platform, including SSL certification and SQL injection protections. SQL injection protections are necessary for private login information in the iAcademic portal. Using the cloud-based platform has a lot of privileges such that the security is taken care of and it is

flexible throughout the development and deployment. Security features have been included although for both website there is no reason to have it unless the actual private data is being used. The data that is being used for iAcademic Portal are the data that were randomly generated by the data generation tools, that a lot of developers use to manual or unit testing. It is done to assure that the websites are functioning correctly before testing on the actual data. When it comes to the appointment scheduling platform, the data that students have used to register and sign in are imaginary data that are being stored in my Google Drive and my Google Drive is working as a database for scheduling. In the future, a server would be created and secure to host an actual data.

3. Conclusion

3.1 What did I learn?

I learned that it requires a lot of time and effort to develop the whole different system. The trickiest part is to start the planning of the project and to be ready for possible contingencies that interfere or substantially alter the development process. If the website is being developed for a company, then all the permissions to the staff information would be required. The Information Systems department does not permit students to access protected information regardless of purpose. If the website is going to be developed there should be an agreement made between the developer and the requestor that the privacy of the information gathered would be kept safe and not used for any other purposes.

3.2 Final deliverable

Since hosting the website in the server requires a monthly/annual fee, the websites have not been published but available locally. Here is the link for the github.com source code for the front-end project that I have worked for the project as well as the demo done by Hayley Carter (Capstone Project teammate for Computer Science class) as well as the presentation for the iAcademic portal that was done by my CS classmates Nisser Aldossary, Ryan Perkins, Hayley Carter, and myself. Along with this paper, PowerPoint presentation will be provided to serve as a Demo for the Appointment Scheduling System that was developed by me using Squarespace.com web builder platform.

https://gnoori.github.io/iAcademic/ - Front-end code for iAcademic portal (Developer: Guzaloi Noori)

https://youtu.be/IIyoTlcus6M - iAcademic Cloud Computing Demo (For Computer Science Project)

https://www.youtube.com/watch?v=zJV9GOpEycg – iAcademic Presentation link (For Computer Science Project)

https://github.com/gnoori/iAcademic/blob/main/Website%20Presentation.pptx - Presentation for the Appointment Scheduling System - Demo (For DHC Final Project)

3.3 What will be done in the future?

Currently there are two websites available that eventually can be combined, to create one single website that will have both academic portal and appointment scheduling portal. At the end of the project, I have the User Interface designed for appointment scheduling as well as the academic student/faculty portal. This is to present that there is possibility of creating a university owned portal that does not come with any package purchases from other companies that offer the ready system. There is a charge to host the website on the server and to keep it secure using built in Google Cloud features, but it is going to be totally independent and maintainable according to the university's needs.

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