
IBM DevOps Pipeline Project

Project Management Report

Software Engineering Project
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1. The Project Planning Process

We were given some flexibility for our project so the first step of the planning process was learning about and deciding on which technologies we will use for the various parts of our pipeline. After our first meeting with Criveti Mihai from IBM we were given some requirements and some suggestions as to how he wanted us to proceed. Early planning was very important in this assignment, as the project required the use of many different technologies that all needed to work seamlessly together.

Once we had decided which technologies we wanted to use, and that we would create a covid dashboard as our testing app, we began creating our requirements document. The purpose of this document was to have a clearly written agreement between our team and the client, as to the scope and expectations of the project.

Once these projects were approved our planning then turned to our scrum sprints. We decided on four sprints that each lasted two weeks.

Sprint 1 would be done in term weeks 3 and 4. It involved setting up communications, the repository, researching and experimenting with the technologies and creating the requirements document. Sprint 2 was over weeks 5 and 6. For this sprint we planned to set up a baseline application to test, and set up the first stages of the pipeline (GitActions checkout and testing). Sprint 3 sprint took place over week 7 and 9. The plan was to set up the containerization process of the pipeline and add the API to our webapp. This sprint went according to plan, however we did end up changing the API we used in the following sprint. The plan for our final sprint was to set up the deployment stage and create some data visualizations for the webapp. We also needed to create our project plan and software design spec document.

Overall, our project planning and controls, such as the Gantt Chart, weekly meetings, and GitHub Project board, were effective and kept us on track. We were able to keep up our quality and communication through these controls while also monitoring our progress. We knew when we were behind schedule and we reacted accordingly. By knowing who is behind schedule with their goals, others were able to step in and provide support for those struggling. Without having a detailed sprint schedule at the start, I don't believe we would have been able to deliver on our objectives by the end of the project.

2. Project Goals and Objectives

2.1. Goals

Describe whether the project goals and objectives changed over the duration of the project . If so, describe and discuss what caused the changes, how were the changes handled and, what impact did they have.

Our goal was to automate the repetitive and monotonous steps taken by developers during the development lifecycle, by creating a development pipeline. Our goal was to automate the following steps: building, testing, packaging and deploying the code. We successfully automated each of these steps in our pipeline, achieving our goal.

Another goal of ours was to ensure that the product we deliver to our client meets the requirements we agreed upon at the beginning of the project. In our most recent meeting with Criveti Mehai from IBM, made it clear he was very happy with the result and offered to write up a post on LinkedIn highlighting our work.

Over the duration of the project our goals and objectives stayed surprisingly consistent. We didn't face any major setbacks and our main focus was always on managing our time sensibly. We needed to pace ourselves carefully, so that we had progress to show at each client meeting, and so we didn't burn-out towards the end of the project.

2.2. Objectives

The clear objectives that we set out in the requirements document are as follows:

- ✓ Create a pipeline using GitHub Actions that will:
 - Build an image of the application using podman.
 - Perform static analysis, unit testing and code coverage on the image using WebDriver.
 - Package our application in the form of a container.
 - Deploy the application to OpenShift.
- ✓ Further develop the application to use a public Covid API.
- ✓ Create more graph and visualisation options for the web application.
- ✓ Create clear documentation of the plan and the process.
- ✓ Have our code available as an open-source project on GitHub.
- ✓ Deliver the code bundle to the client before April 23rd.

3. Project Scope

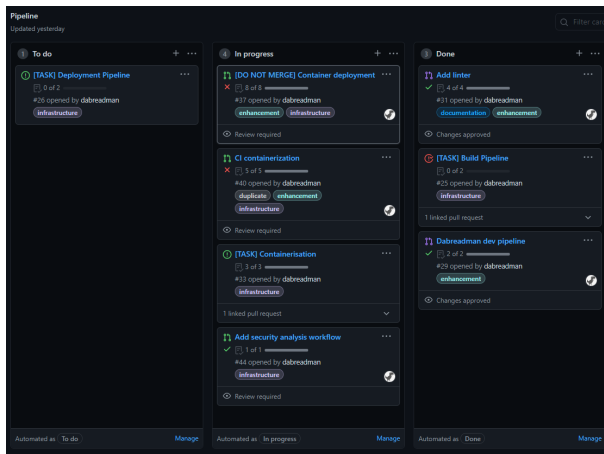
3.1. Product Backlog

We organised our product backlog using GitHub Project.

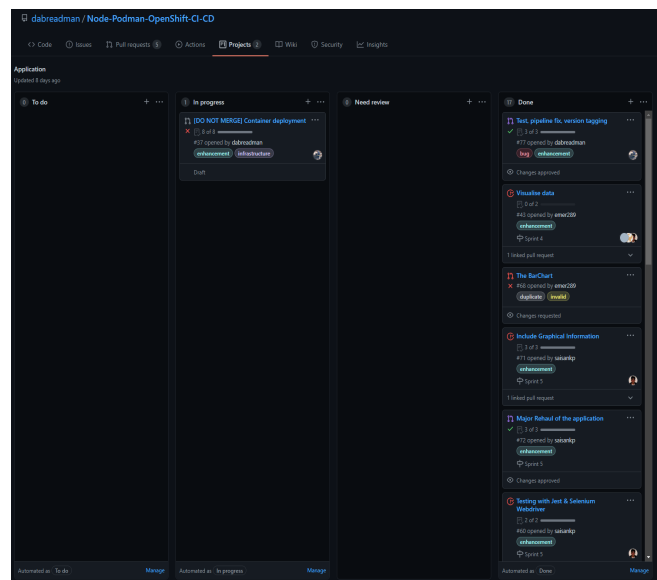
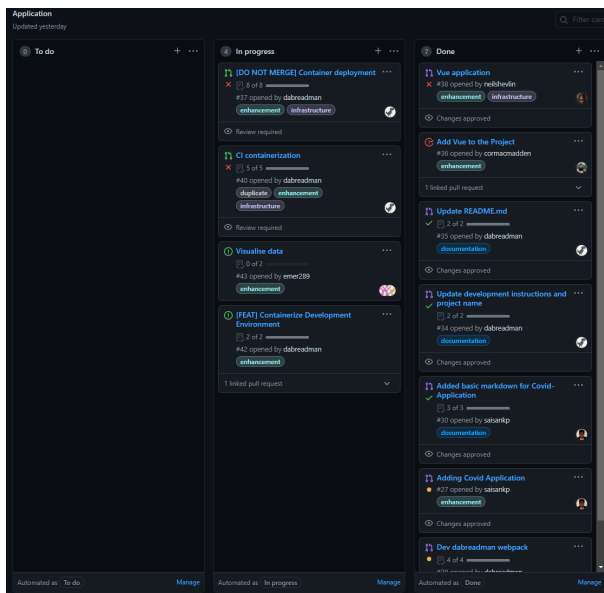
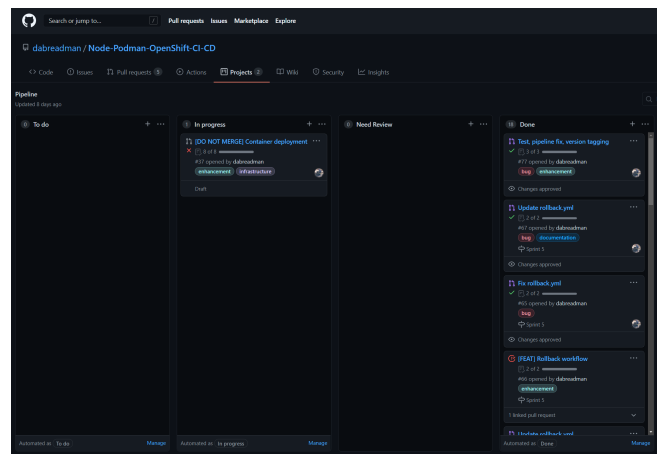
We divided the backlog into two projects, one for the pipeline and the other for the application. We decided to use GitHub Project to keep track of our tasks because of how well it is integrated with GitHub.

Below are screenshots from the [repository](#) backlog on 17/03/2021 compared to 20/04/2021.

17/03/2021



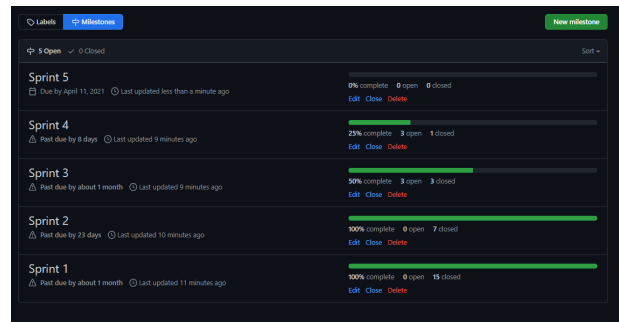
20/04/2021



4. Project Approach

4.1. Scrum Sprints

Each of our sprints lasted approximately **2 weeks**. This meant we had one client meeting and two scrum meetings for each sprint. During our meeting with Criveti (the start of each sprint) we clearly identify the objectives for that sprint. This gave us something clear to focus on for the next two weeks. In our meeting afterward we divided up who would work on each objective. We then used GitHub Milestones to track the sprints and linked the relating issues to each milestone.



Sprint 1 (01/02/2021 - 14/02/2021)	<ul style="list-style-type: none">• Communication setup• Project choices• Repository setup• Meeting schedule• Git/GitHub 101
Sprint 2 (15/02/2021 - 28/02/2021)	<ul style="list-style-type: none">• Trivial Application• Technology Experimentations• Architectural Decisions• Requirements Document• Requirement Presentation
Sprint 3 (01/03/2021 - 14/03/2021)	<ul style="list-style-type: none">• Vue Migration• Data Listing• Continuous Integration Pipeline• Project Documentation• Application Containerisation• Tests Containerisation
Sprint 4 (15/03/2021 - 28/03/2021)	<ul style="list-style-type: none">• Development Containerisation• Continuous Delivery Pipeline• Data Visualisation• Coverage and Unit Tests• Project Plan• Software Design Specification
Sprint 5 (28/03/2021 -23/04/2021)	<ul style="list-style-type: none">• Create Development Report• Create Management Report• Write Reflective Essays• Package and tidy up the code• Handover the code to the client• Do Author Declaration

5. Project Organisation

5.1. Staff

Our team is made up of two third-year and four second-year students. Their prior experience with similar projects and prior technical skills are organised in the table below.

Name	Prior experience in projects	Prior Technical Skills	Acquired Skills
Yi Xiang Tan	<ul style="list-style-type: none">• Summer internship in localisation	<ul style="list-style-type: none">• Web development• Scripting	GitActions, Podman and Openshift skills.
Cormac Madden	<ul style="list-style-type: none">• Developing Hololens Application	<ul style="list-style-type: none">• Photoshop automation script writing,	Management, GitActions and NodeJS skills.
Emer Murphy	<ul style="list-style-type: none">• Programming Project CS1013	<ul style="list-style-type: none">• Java• C	Javascript data visualisation skills.
Tom Roberts	<ul style="list-style-type: none">• Programming Project CS1013	<ul style="list-style-type: none">• Java• C• Python	Javascript data visualisation skills.
Prathamesh Sai Sankar	<ul style="list-style-type: none">• Stock Market Visualizer using the Processing Java Library	<ul style="list-style-type: none">• Java• C	APIs calls with HTTP requests, Javascript, data visualisation, Vue/Node JS framework skills.
Neil Shevlin	<ul style="list-style-type: none">• Stock trading Application	<ul style="list-style-type: none">• Web development	Vue web development.

5.2. Staff Chart

Below are the planned sprints from the beginning of the project.

Following that is what was recorded at each scrum meeting every week. You can see how our objectives became more specific and we were able to properly allocate the work once we knew exactly what needed to be done.

Weeks	Sprint Date	Objectives	Dates Set
1,2	1st - 14th Feb	<ul style="list-style-type: none">• Meet the team• Choose project• Decide time for a weekly team meeting• Contact Client• GitHub set up	<ul style="list-style-type: none">• 3rd Feb - project picked• Weekly meeting: Wednesdays 7 p.m.
3,4	15th Feb - 28th March	<ul style="list-style-type: none">• Research• Requirements document and presentation• Architectural decisions made	<ul style="list-style-type: none">• 16 Feb - meeting with client• 26th Mar - Requirements' Document signed off
5,6	1st - 14th Mar	<ul style="list-style-type: none">• Node js set up• Express set up• Build pipeline• Requirements presentation done• Basic application done• Basic pipeline done	<ul style="list-style-type: none">• 1st Mar - meeting with client• 2nd March - Requirements' presentation
7,8	15th - 28th Mar	<ul style="list-style-type: none">• Software design specification document done• Project plan done• Extended application• Extended pipeline	<ul style="list-style-type: none">• 15th Mar - meeting with client• 22nd Mar - Software design specification document• 22nd Mar - Project Plan
9,10	29th - 11th Apr	<ul style="list-style-type: none">• Extended working pipeline• Extended application	<ul style="list-style-type: none">• 29th Mar - meeting with client
11,12	12th - 23rd Apr	<ul style="list-style-type: none">• Finished project• Final presentation and project demo ready• Development plan finished• Management report finished• Client Handover and approval• Author declaration	<ul style="list-style-type: none">• 12th Apr - meeting with client• 23rd Apr - Software system (Project code bundle)• 23rd Apr - Development plan• 23rd Apr - Management report• 23rd Apr - Individual reflection essay• 23rd Apr - Client handover proof• 23rd Apr - Author Declaration

The scrum meetings (In real time):

The scrum master role is rotated through the team for every scrum.

Product owner	Mihai Criveti @ IBM
Team Leader	Yi Xiang Tan

Week 1	Completed	Ongoing
Yi Xiang Tan [Scrum master]	<ul style="list-style-type: none">Team organizationProject choices	<ul style="list-style-type: none">GitHub repository creation
Cormac Madden	<ul style="list-style-type: none">Project choices	<ul style="list-style-type: none">Technology researchContact client
Emer Murphy	<ul style="list-style-type: none">Project choices	<ul style="list-style-type: none">Technology research
Tom Roberts	<ul style="list-style-type: none">Project choices	<ul style="list-style-type: none">Technology research
Prathamesh Sai Sankar	<ul style="list-style-type: none">Project choices	<ul style="list-style-type: none">Technology research
Neil Shevlin	<ul style="list-style-type: none">Project choices	<ul style="list-style-type: none">Technology researchSystem proposal documentation

Week 2	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none">GitHub repository creationGitHub messaging to Discord with webhook	<ul style="list-style-type: none">Requirements document
Cormac Madden [Scrum master]	<ul style="list-style-type: none">Technology researchContact client	<ul style="list-style-type: none">Contact clientTechnology research
Emer Murphy	<ul style="list-style-type: none">Technology research	<ul style="list-style-type: none">Solution technology research
Tom Roberts	<ul style="list-style-type: none">Technology research	<ul style="list-style-type: none">Requirements document
Prathamesh Sai Sankar	<ul style="list-style-type: none">Technology research	<ul style="list-style-type: none">Requirements document
Neil Shevlin	<ul style="list-style-type: none">Technology researchSystem proposal documentation	<ul style="list-style-type: none">Architectural decisions documentation

Week 3	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Creating backlogs
Cormac Madden	<ul style="list-style-type: none"> Contact client 	<ul style="list-style-type: none"> Requirements Presentation
Emer Murphy [Scrum master]	<ul style="list-style-type: none"> Solution technology research 	<ul style="list-style-type: none"> Requirements document
Tom Roberts	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Requirements presentation
Prathamesh Sai Sankar	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Requirements document
Neil Shevlin	<ul style="list-style-type: none"> Architectural decisions documentation 	<ul style="list-style-type: none"> Creating backlogs

Week 4	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Creating backlogs 	<ul style="list-style-type: none"> Build pipeline
Cormac Madden	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Requirements presentation
Emer Murphy	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Project plan
Tom Roberts [Scrum master]	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Requirements presentation
Prathamesh Sai Sankar	<ul style="list-style-type: none"> Requirements document 	<ul style="list-style-type: none"> Project initialization Self-introduction research
Neil Shevlin	N/A	N/A

Week 5	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Creating CI pipeline 	<ul style="list-style-type: none"> Project containerization and CD pipeline
Cormac Madden	<ul style="list-style-type: none"> Requirements document & presentation 	<ul style="list-style-type: none"> Vue migration
Emer Murphy	<ul style="list-style-type: none"> Project timeline 	<ul style="list-style-type: none"> Data visualisation
Tom Roberts	<ul style="list-style-type: none"> Requirements presentation 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar [SM]	<ul style="list-style-type: none"> Project initialization 	<ul style="list-style-type: none"> Vue migration
Neil Shevlin	N/A	N/A

Week 6	Completed	Ongoing
Yi Xiang Tan [Scrum master]	<ul style="list-style-type: none"> Altering CI pipeline 	<ul style="list-style-type: none"> Building CD pipeline
Cormac Madden	<ul style="list-style-type: none"> Vue setup 	<ul style="list-style-type: none"> Project plan
Emer Murphy	<ul style="list-style-type: none"> Learning technologies 	<ul style="list-style-type: none"> Data visualisation
Tom Roberts	<ul style="list-style-type: none"> Learning technologies 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar [Scrum master]	<ul style="list-style-type: none"> Project initialization 	<ul style="list-style-type: none"> Vue migration
Neil Shevlin	N/A	<ul style="list-style-type: none"> Project follow-up

Week 7	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Application and development containerization 	<ul style="list-style-type: none"> Project plan
Cormac Madden [Scrum master]	<ul style="list-style-type: none"> Project plan 	<ul style="list-style-type: none"> Project plan
Emer Murphy	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Tom Roberts	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar	<ul style="list-style-type: none"> Vue migration 	<ul style="list-style-type: none"> Test suite design
Neil Shevlin	<ul style="list-style-type: none"> Vue migration 	<ul style="list-style-type: none"> Application development

Week 8	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Application and development containerization 	<ul style="list-style-type: none"> Project plan
Cormac Madden	<ul style="list-style-type: none"> Project plan 	<ul style="list-style-type: none"> Project plan
Emer Murphy [Scrum master]	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Tom Roberts	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar	<ul style="list-style-type: none"> Vue migration 	<ul style="list-style-type: none"> Test suite design
Neil Shevlin	<ul style="list-style-type: none"> Vue migration 	<ul style="list-style-type: none"> Application development

Week 9	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Application and development containerization 	<ul style="list-style-type: none"> Looking into service configuration
Cormac Madden	<ul style="list-style-type: none"> Catch up & client communication 	<ul style="list-style-type: none"> Management Report
Emer Murphy	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Improving and Merging the chart
Tom Roberts [Scrum master]	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar	<ul style="list-style-type: none"> Jest (Test suite design) 	<ul style="list-style-type: none"> Continuing with Jest
Neil Shevlin	N/A	N/A

Week 10	Completed	Ongoing
Yi Xiang Tan	<ul style="list-style-type: none"> Fixed Pipeline Bugs 	<ul style="list-style-type: none"> Presentation & Pipeline
Cormac Madden	<ul style="list-style-type: none"> Demo Video 	<ul style="list-style-type: none"> Management Report
Emer Murphy	<ul style="list-style-type: none"> Improving and Merging the chart 	<ul style="list-style-type: none"> Presentation
Tom Roberts	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar [Scrum master]	<ul style="list-style-type: none"> App Improvements & Fixed Pipeline Bugs 	<ul style="list-style-type: none"> More Final touches on App
Neil Shevlin	N/A	N/A

Week 10	Completed	Ongoing
Yi Xiang Tan [Scrum master]	<ul style="list-style-type: none"> Worked on Podman Layer Caching 	<ul style="list-style-type: none"> Write Management Report
Cormac Madden	<ul style="list-style-type: none"> Demo Video & Presentation 	<ul style="list-style-type: none"> Management Report
Emer Murphy	<ul style="list-style-type: none"> Presentation 	<ul style="list-style-type: none"> Personal Essay
Tom Roberts	<ul style="list-style-type: none"> Data visualisation 	<ul style="list-style-type: none"> Data visualisation
Prathamesh Sai Sankar	<ul style="list-style-type: none"> Work on Application 	<ul style="list-style-type: none"> Project Dev Report
Neil Shevlin	N/A	N/A

6. Risk Analysis

6.1. Risk Analysis

Risk Element	Impact (1 to 5)	Likelihood (1 to 5)	Risk Factor (I*L)
Unfamiliarity of technology	4	4	16
Excessive planning of architecture	3	5	15
Errors due to different development environment	3	5	15
The result is different from the requirements	5	2	10
Progress stall due to miscommunication	4	2	8
Poor code quality	2	4	8

Most of the risks outlined above materialised to some degree, but our preparation for those risks allowed us to mitigate their impact.

Our unfamiliarity with the technology was definitely our biggest struggle and cost us most of our time, but being prepared for that meant we could heavily focus on research early on, and saved us making mistakes later in the project. The same applies to planning the architecture.

We did run into an issue with one of our team members working on a Mac but she quickly resolved this by doing her programming work on the remote college computers.

Our client was happy with our result so thankfully that risk did not materialise.

We ran into some issues with one or two team members not being contactable during their working hours but this didn't seem to cause any noticeable harm to the project outcome.

7. Project Controls

Below are the mechanisms and tools used to control all aspects of the project execution, progress, and quality, deliverables, deadlines and communication.

Tools	Functionality
Git	Source control
GitHub	Code hosting platform
GitHub Projects	Outline of tasks
Discord	Structured communication and video conference
Jist Meets	Recording of video conference
Google Meet	Video Conference with client
Google Drive	Collaboration of documentation and storage solution of said documentation

In practice we didn't have any major surprises when using any of these tools. One comment worth making is how tasks on GitHub Projects were too easy to ignore and forget about. The weekly scrum meetings made up for this, as everyone could quickly say what they were working on and how work was progressing.

8. Communication

8.1. Client Communication

We communicated with our client Criveti Mihai over email and through our biweekly meetings on Google Meet. We have set up a calendar event so that he can reschedule it if needs be, and so that we are all sent a reminder shortly before each meeting.

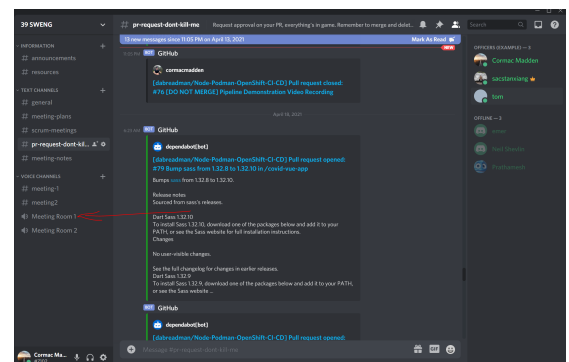
Criveti was brilliant for replying to emails and giving great guidance and inspiration. We really appreciated the time and energy he put into this project.

Client Meeting Schedule:

Meeting	Date	Outcome
Introductory Meeting	15/02/2021 @ 15:00	<ul style="list-style-type: none">• Learned the expected result from this project and Criveti's main priorities.• Received a useful list of learning resources from Criveti.
Requirements Sign Off	01/03/2021 @ 15:00	<ul style="list-style-type: none">• Set expectation of minimal viable product
Progress Demonstration	16/03/2021 @ 15:30	<ul style="list-style-type: none">• Get feedback on the demonstration• Assured progression and direction• Received Suggestions for further development
Final Code Presentation	30/03/2021	<ul style="list-style-type: none">• Criveti was happy with the code we presented him with.
Plans for future: Giving Talks & Social Media references	13/04/2021	<ul style="list-style-type: none">• Learnt about using this project to get hired in the real world• Discussed LinkedIn endorsements and possible future speaking events.

8.2. Project Team Meetings

Our main method of communication is through our Discord Server. This is an informal place that allows us to ask questions at any time and **receive a quick response**. It is beneficial when it comes to scheduling impromptu meetings or notifying others of changes regarding the project.



Finally, one of the most important methods of communication is our weekly scrum meetings. Here we can work together, ask questions, air out any issues, and plan for the next week.

Communication is key to keep the project running smoothly and remaining on track.

8.2. Demonstrator and Team Meetings

Our demonstrator was Evelyn Nomayo and we had a meeting with her every Tuesday at around 2:45pm. We shared with her our progress and she offered her assistance with any issues we had. Luckily we didn't need her to step in and we managed to resolve our issues either amongst ourselves or directly with the client, but the meetings were good for us to keep track of deadlines.