

IM²C NZ – International Mathematical Modelling Challenge Website

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Client: Kerri Spooner

AUT

Background

The purpose of the project was to develop a New Zealand based website that will be used for the New Zealand International Mathematical Modelling Challenge. This is a competition for secondary schools to complete and submit a mathematical modelling solution to compete for a chance at becoming New Zealand's team representatives for the International Mathematical Modelling Challenge.

Objective

The goal of this project was to simplify the process of the registration and submission for teams competing in the New Zealand section of the IMMC competition. Registration and handling of data currently occurs manually through emails and there was an opportunity to streamline this process by allowing teams to sign up and submit their solutions online. This would also enable the use of automation to allow judges to upload feedback to the site and have this sent to the team automatically. This provides the benefit of increased efficiency and the use of a website provides the additional benefit of potential for greater exposure, bringing more attention to the competition. An important consideration for this project was the requirement for future updates and alterations to the site to be made possible. This required the development of a dedicated Admin control panel and our code needed to be clear and well documented.

Acknowledgements

We would like to thank our mentor, Ahmed Al-Sadi for his advice and assistance throughout the project. His guidance helped to keep the project on track to completing on time at a high quality. We would also like to thank our client, Kerri Spooner, for giving us the opportunity to undertake the project and for her co-operation in helping us identify and refine the requirements for the website. Thank you, all the participants, in our usability tests which helped to ensure the site was simple for teachers and judges to use. Thanks to ICT for their efforts to host the site. Finally, we would like to thank Sarita Pais for acting as a moderator for our project.

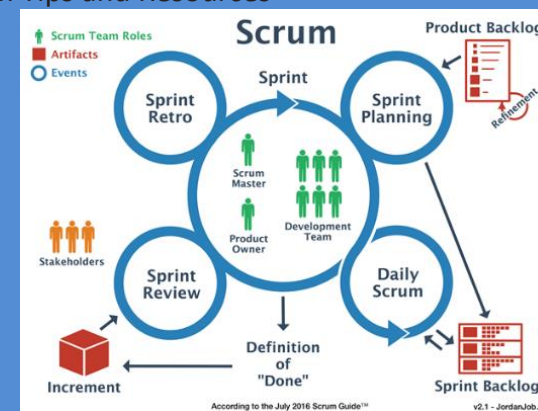
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Methodology

We used the Scrum methodology to manage our project due to the ability to account for the possibility of changing requirements and this is listed as a major benefit of the agile methodology by Jamie Cooke (Cooke, 2011). To properly undertake this, we held regularly scheduled meetings such as the Sprint review and retrospective at the end of each sprint to receive feedback from the client and to identify improvements to our process.

Figure 1. Scrum Tips and Resources

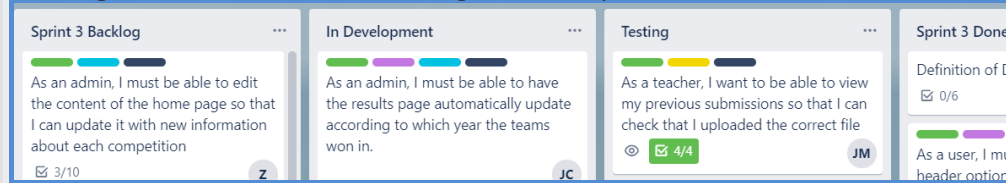


Note. Scrum Tips and Resources. (<https://jordanjob.me/scrum/>) Copyright n.d. Jordan Job

We also held weekly stand up meetings that provided an opportunity to ensure that all team members were up to date on the current work and could voice any problems or concerns (Cooke, 2011). Sprint planning meetings were undertaken at the beginning of each sprint to re-order our product backlog and user stories.

We used Trello to create and manage user stories so that discussions could be focused on the user's perspective based on the client's knowledge (Meyer, 2014). User stories were identified through meetings with the client during the enablement sprint as well as sprint planning meetings prior to each sprint. User stories were created and placed in the product backlog, before being selected for the next sprint backlog during planning meetings. We used the MoSCoW method of ranking importance of user stories from "Must Have" to "Won't Have".

Figure 2. Trello Board showing User Story Flow



Old user stories were placed in the product backlog at the beginning of each sprint along with newly created ones with which we used planning poker to agree on their effort without anchoring. We each estimated our available time to work on development each sprint and used this to find a sprint velocity. We then added user stories into the next sprint's backlog based on their level of importance decided by the client until we reached the sprint velocity. This helped to ensure we were accomplishing a realistic and productive amount of work each increment.

Design and Usability

Our client wanted us to design the website with structures like Australia IMMC website (<https://immchallenge.org.au/>). From this site, we have constructed a frontend design for our site and for the backend, we came up with our own design.

- Demo
We created a demo design using WordPress to show the client and see whether the design would fit in New Zealand scheme. Then we took her feedback to prepare our product design.
- Backend/Framework

We decided to create everything from scratch using our own server so we can understand how the system works without having to learn about other framework (for example, WordPress with plugins) in order to find and fix bugs.

For our framework, we wanted to follow MVC design, we created different classes such as Account, Submission and Team so we can interact with them easily with our Handler classes.

Handler classes are made to control objects and interact with the database more efficiently and consistently.

- Server and domain
We have been running on our own server and domain to develop the site. The client wanted to use AUT domain and server, however, we were having difficulties trying to set them up because this required us to contact with AUT ICT and we had slow responds leading to not having enough time to set up for the new server.

- Usability Testing
We undertook usability studies with participants identified by the client as likely to act as users for the site to ensure the quality and usability the system for teachers and judges.

Lessons Learned

- Learned skills in new software – PHP, JS, CSS, GitHub, WordPress, database management

During the development, we planned to learn how to use GitHub, WordPress and database management, that help us to share the code in repositories and have initial design of website by using WordPress.

- Learned to work in an online environment (working from home) due to Covid-19, we needed to know how to work online with other team members, we used Microsoft Teams which is a collaboration tool provided by Microsoft, which helped us more efficiently work from home.

- Working with a client
We used Teams to contact the client; online meetings were very helpful to show our work and get more response from her by email.

- Importance of identifying requirements
Identify requirements was crucial for our understanding our client needs and project development, so we created requirements documents where we recorded the requirements decided with the client, so that we can understand them anytime

- Adjust to change throughout the project
During the development, the client regularly gave new requirements and suggestions. We recorded major changes in the change log and kept track of user stories so that we could follow these to change our project. This helped us to maintain the project more precisely and efficiently

Challenges

Technical

- Our knowledge in the required programming languages and skills was not at the right level. Therefore, we spent the most of R&D Part 1 to up skill in the required skills, using weekly team meetings to keep track of everyone's progress.
- Having one of our group members working with us internationally restricted the applications and website used due to the access being blocked. Hence having to find a way to communicate with everyone.
- Finding a domain and server to host the website as the budget of the project was not enough to use a paid domain. Therefore, we moved from our team member's domain over to AUT's domain which required a change request to be submitted.
- The design of the user interface of the website as our client was not highly experienced with technology.
- Setting up usability tests to improve interface/functionality was difficult due to COVID-19, having to do this online and not in person.

Non-Technical

- University being closed and everything moving to online learning.
- Client being unable to meet as often as expected, working with less feedback.
- Team members availability affected by time zone, work and other courses.

Final Product

The final product allows users to view the website and register for the IM2C Competition. Once registered users can access their details, competition when available and submit their solutions. Judges of the site can access a Judge's only page where they mark the solutions assigned to them and provide any additional feedback. Admins can access the "Admin" feature of the website, enabling them to perform tasks such as modifying and making changes to competition dates, teams and judges registered, as well as content on the site's pages.

Figure 3. IM²C NZ Homepage

