



The following report will discuss the methods and tools that we as a team have used throughout the project. I have organised this into tabular form for easier reading. For each method and tool below the report will also outline why each tool was used and whether the tool was in continuous use until the end of the project and our management technique for dealing with a tool should it become no longer effective. The report will also summarise how our team management and structure evolved over the project, including how our team adapted the change in requirements and risks, our updated understanding of team member's skill sets in addition to a greater understanding of good software management techniques.

Method or Tool used	Why we used this tool, and whether the rationale held until the end
Trello	Trello is a project management application for web and mobile devices. Trello is based on a card based system to organise tasks. The best way to think of it would be as a virtual to do list organised into cards [1]. We found that being able to see when certain tasks where due on a multitude of devices helped organise the team and perform more effectively. We used this tool from the first assessment until the end of assessment four as it suited our needs perfectly in giving members of the team a way to track which part of the assessment they should be working on.
GitHub	As our project progressed from the design stage into the implementation stage we needed software to assist us in version control [2] and source distribution. For this we decided on GitHub. GitHub being an industry standard meant users in the team were familiar with it, had a large amount of documentation and a variety of user information [3]. We have utilised the GUI version of GitHub extensively within our project as version control is a vital part of any project. We however did not use the same management software for our documentation as we felt it was necessary to keep the documentation and code as separate as possible in case of any failures or contaminations and to also enforce good software practices with version control. We have used it up to the end of the project as it was always effective and provided a benefit to our team in code management.
Google Drive	The very nature of this project meant that there would be a large amount of collaboration and teamwork. This means that we would need some form of central repository to store, share and collaborate on documents. As all members of the team had experience of using the Drive, [4] and that it is a widely used and highly regarded product, with an easy to use and intuitive interface we selected this as our repository and continued to use this until the end of the assessment. We utilised the drive to only store documents and art assets, storing no code on the drive. This was to enforce the separation of documentation and code, and to make sure that if anything happened to the drive we would still have the code and vice versa.

Facebook Messenger	<p>To be an effective team we needed to be able to effectively communicate with one another. To do this we could either communicate via e-mail or by an instant messenger. We decided on an instant messenger and one that we were all familiar with was Facebook Messenger [5]. Again it can be used on both mobile applications as well as through the web. In addition it lets the user see who has and hasn't seen their messages. This robustness as well as the familiarity and ease of communication kept us using this application until the end of the project.</p>
Test Driven Development	<p>During the first stage of our implementation (during assessment two) we utilised a form of Test Driven Development [6] alongside our scrum methodology. We felt originally this was a good fit for the project as we would be able to cut back on our testing time[7]. Our methodology was that during sprints we would utilise Test Driven Development. We found this suitable during assessment two. We found test driven development to be effective as it allowed us to conduct testing at the same time as development meaning there was less need for dedicated testing, it could be conducted parallel to development. However for the changing nature of assessment three and the fact that we were working with a different codebase we needed to streamline development and felt that it was no longer effective to attempt both Test Driven Development as well as Scrum. Therefore we implemented regular testing and dropped Test Driven Development during our sprints.</p>
Scrum	<p>To be able to effectively work as a team during the projects implementation phases we needed to have an effective development methodology. We settled upon an agile methodology and settled upon Scrum [8]. Scrum allowed us to analyse risks and requirements in real time which was especially helpful during assessment three, where we were using an unfamiliar codebase. Also because of the fast paced nature of game development we needed to easily adapt to changes, which SCRUM allowed us to [9]. As discussed above we initially merged Scrum with test driven development but replaced this with pure scrum during assessment three no longer having test driven development within our sprints. However we continued to use it all the way up to assessment four as we felt it was a necessary and useful tool to support our development.</p>

Team Structure

During the course of our project we have always utilised a single team leader. This leader was voted in on during our first meeting and had remained the same until the end of the project. We found that a single team leader was useful as it provided a single unified vision and could keep the team on target. This leads into the fact that a team leader and the leader of the sub teams provides a hierarchy, this means everyone knows where they stand and who they are working with. In addition it provides means for addressing problems as you can pass problems up the hierarchy to be dealt with. Finally it provides a unified front for the team. When interacting with other teams, it provides a direct means of communication rather than passing message to the entire team.

Underneath our team leader we initially had two teams. The coding team and the documentation team. During the first assessment, as the assessment was almost entirely documentation based the coding team worked on the architecture and requirements sections as these were more programming orientated. This worked well for this assessment it gave us time to get used to working in our separate teams, get used to working under leadership and reporting progress to the overall leader. It also gave the team time to figure out if they liked the leadership style and if something needed to be changed for the next assessment. During the second assessment the structure remained the same with the same teams with the same members. However a necessary measure at the end of the assessment was to bring some of the members of the coding team to the documentation team to increase the speed of documentation creation once we were approaching the deadline. This approach worked well for our project. Initially we made good strides with the code, giving the documentation more to write about. Once the code was completed to a good standard the documentation could then be polished with the additional experience provided by the coding team giving greater guidance to the documentation team.

During the third assessment we restructured the team. We split the coding team into two separate teams an art team and a separate code team. We decided on this division of labour due to the changeover process required. As two other teams had also selected the same project to carry on we felt that we needed some way to distinguish our project from theirs. To do this we decided on replacing their maps, player sprites/animations and enemy sprites/animations. This was a large amount of work and needed a dedicated and concentrated effort to complete. Therefore needing a dedicated team that could operate without having to worry about implementing art and code at the same time. They were under the management of the lead developer as the art team needed to pass assets and receive feedback from the coding team. This worked effectively as the teams had some independence and could work separately but could still communicate effectively and pass feedback and ideas where necessary.

For the fourth and final assessment, we again restructured the team, due to the large amount of documentation needed for this assessment we moved a member of the art team to the documentation team. In addition to this we kept the stronger member of the art team working on any necessary art assets (but once these were finished would move to the coding team) and moved the stronger member of the team to work on documentation. We kept the original coding the team as they had proven experience working on a similar codebase (we chose a project to continue that was the based off the same code we received in assessment 3).

Bibliography

- [1]K. Gray, "How we effectively use Trello for project management - WP Curve", WP Curve, 2015. [Online]. Available: <http://wpcurve.com/trello-for-project-management/>. [Accessed: 28- Mar- 2016].
- [2]P. Louridas, "Version control", IEEE Softw., vol. 23, no. 1, pp. 104-107, 2006.
- [3]"Why use GitHub as a Content Management System?" Just Write Click, 2015. [Online]. Available: <http://justwroteclick.com/2015/12/17/why-use-github-as-a-content-management-system/>. [Accessed: 28- Mar- 2016].Drive
- [4]"Introducing Google Drive... yes, really", Official Google Blog, 2016. [Online]. Available: <https://googleblog.blogspot.co.uk/2012/04/introducing-google-drive-yes-really.html>. [Accessed: 28- Mar- 2016].
- [5]"Messenger - Business", Facebook, 2016. [Online]. Available: <https://www.messenger.com/business>. [Accessed: 28- Mar- 2016].
- [6]L. Madeyski, Test-driven development. Heidelberg: Springer-Verlag, 2010.
- [7]T. Dogša and D. Batič, "The effectiveness of test-driven development: an industrial case study", Software Qual J, vol. 19, no. 4, pp. 643-661, 2011.SCRUM 1
- [8]"Agile Methodology", Agilemethodology.org, 2016. [Online]. Available: <http://agilemethodology.org/>. [Accessed: 28- Mar- 2016].
- [9]"Scrum Methodology", Scrummethodology.com, 2016. [Online]. Available: <http://scrummethodology.com/>. [Accessed: 28- Mar- 2016].