INSTITUTE of TECHNOLOGY CARLOW

Institiúid Teicneolaíochta Cheatharlach

BAINISTEOIR BEAG MOBILE APPLICATION

PROJECT REPORT

BY

FRANCIS HALL

Student Number: C00220910

Supervisor: Paul Barry

Submission Date: 20/04/2020

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Introduction

The purpose of this document is to provide a reflection on the project as a whole. It will document the process of developing the Bainisteoir Beag mobile application and accompanying web application. This document will discuss a description of the project and the final product along with its purpose and goals. This document will also discuss any problems encountered throughout the project cycle and how they were solved. It will describe how the application has changed from and how it conforms with the initial design proposed.

Learning outcomes will be discussed, reflectively, from a technical point of view and a personal one, including any changes that would be made to the process if the project were started again.

The document will also provide a review of the project and process, its successes and failures, and proposed future improvements.

Project Description

Bainisteoir Beag is a pupil-led activity programme that encourages children to partake in fun and healthy exercise regimes. It was developed by the Kilkenny Recreation and Sports Partnership and had existed as a paper-based form only prior to the project. It is intended to be used in primary schools, primarily, during break times or P.E classes. Bainisteoir Beag involves a set of activity cards, each with a game and instructions for setting up the game, and the purpose is to influence leadership by encouraging the older classes to organize these games, using the cards, with the younger classes. The programme has seen some success on a small scale and has been rolled out to several primary schools in the Kilkenny area.

The programme in its current form is quite restricted in a number of ways. Firstly, it requires the owner of the programme to travel to a primary school and spend the day teaching the students how the programme works in person and may not be viable on a larger scale. This fact also means that to expand the game outside of the local Kilkenny area to the rest of the country would increase monetary and time costs for what is intended to be a free initiative.

Aside from the issues with expansion, the fact that the programme exists in a tangible, paper-based, form means that wear and tear will require the necessity for sets to be replaced over time. Given that the cards are to be handled outdoors, by children, wear and tear of cards is quite common.

The purpose of this project is to create and provide Bainisteoir Beag in a digital form, as an alternative to the tangible form. The conversion from a paper-based to a digital system may ease distribution and reduce printing costs and allows for updates to the existing set of cards at any time.

The digital version of the programme was to be a mobile application, intended for tablets, which most primary schools have been issued with in recent years. Given that schools often have a choice between Android and IOS tablets, it was decided that the application be built as cross-platform.

Given that the project deals with a third-party client whom the application is being built for, it was important to make contact as soon as possible to find out more about the client's vision for the application, any requirements that they had, and what to prioritise. This also included observing the paper-based version of the programme and how it was used in its intended practical setting, most importantly, to see how the children interacted with and responded to it. This was an important step in understanding how to approach the development of the application from a user experience standpoint.

After spending the day at a Kilkenny primary school observing the programme and discussing the project with the client, a project plan was solidified with a view towards developing an application that suitably fit the requirements. It was also intended that once the application was in a working state, that it could be taken back to the same school, installed on the local tablet and observed in its digital form in the hands of the same children who had previously been observed with the paper-based system.

Due to the simplicity of the core functionality of the app, which was to provide the activity and exercise cards in a mobile app, a list of possible features was proposed which could make the application more engaging, and that could solve some of the problems that the paper-based system had. One of these features in particular became a top priority to the client, which was the ability for the client to add new activity cards to the set, in case any new cards were to be created later. Other proposed extra features were compiled into a prioritised list so that in the case that not all features could be implemented, that the most important features would be implemented first. Top priorities in this list included implementing a ROTA system where each child in the class could have their names entered into the application and chosen at random to aid in choosing a “leader” to organise each activity.

Conformity with Original Design

Overall, the application as a whole was in keeping with the original design for the most part. The original planned database schema remained largely the same, with some minor tweaks to certain documents, including adding the “chosen” entry to the “rotaNames” database collection which allowed for the random selection of a Leader to be less chaotic and each Leader to get a turn before a previously chosen leader is chosen again.

In terms of the UI design, the final product is in keeping with the original design quite well. This may be due to the fact that Flutter is heavily UI based and comes with many powerful and useful UI elements, and it was easy to translate the mockup designs to UI elements within Flutter.

Changes from Original Design

Teacher Login

One of the biggest changes from the original design for the application was the ability for teachers to sign up and log in to the application to manage the ROTA system. This feature was removed completely for a couple of reasons. Firstly, although the application’s primary intended use is to be within primary schools on school-issued tablets, having a sign up feature for teachers may imply that the app is only intended for primary schools. In fact, Bainisteoir Beag need not be restricted to primary schools.

Secondly, another for allowing teachers to log in to manage the ROTA system was that when a name was added to the database, it was too be added along with the teacher’s user id in order to ensure that each account would only have access to their own list of names. It was later discovered that Firebase Auth allows an anonymous sign in feature, where an anonymous user is created and issued a user id based on the device. It was decided that this would work just as well for adding names to the database and that signing up with email and password was not necessary.

Register New user on web app

Although the original intention for the web application regarding administrator authentication was that only one user was to be created for this purpose, it was later decided that an admin may also want to share admin privileges. What this eventually became is a register page that is only accessible to an admin where they may create other users which may log in to the web application. Whether this feature ends up being used or not is still not known, but it may provide some future proofing to have implemented it just in case.

Problems Encountered

Initial Meeting

Early in the project cycle, it was decidedly prudent to contact the client and discuss their vision for the application and its requirements. As mentioned, it was decided that this meeting would take place at a primary school in Kilkenny. Due to unforeseen circumstances on the day, the meeting did not go ahead and needed to be rescheduled. The only available date for this meeting to take place was three weeks later, which consequently halted progression of the project until the meeting could take place, as it was decided that no development should occur until after this meeting.

In terms of coming to a solution to this problem, although nothing could be done to help the setback to development, I was able to use the allocated project time to research and practice with some of the considered cross-platform mobile frameworks in an effort to remain busy.

Add Cards Feature

Working with the chosen technologies to implement features posed an interesting challenge at times, however, one of the larger unforeseen problems with a prioritised feature resulted in a greater loss of time than was desirable. Specifically, in attempting to implement a feature which was to allow an administrator to add new cards to the game, Google Firebase's storage service was chosen, to allow card images to be uploaded to the cloud from the web application, and subsequently downloaded on the mobile application from the same cloud storage directory.

Owing to a lack of prior knowledge on how Flutter handles assets, specifically that the local assets directory may not be altered after build time, it became evident that the plan for how this feature was to be implemented would simply not work.

Because of the decided importance to allow as much of the functionality of the application to be available offline, there was a large amount of time spent in an attempt to implement this feature in this way. The persistence to have this feature working the way it was intended offline resulted in the feature not being ready for the work-to-date demonstration.

Eventually, it was decided that it would be possible to implement the feature with one compromise, that the new cards uploaded by an administrator would require an internet connection to view them from the mobile application. Despite the loss of time, the feature was implemented with this compromise.

Time Management

Making timely progress with the project posed a challenge, as apart from the project and its various deliverables and milestones, the academic year was busy with regular large assignments. It was easy to lose sight of the higher priorities with concurrent assignments and close deadlines.

Balancing workloads was challenging, as it was desirable to give as much time and attention as possible to every module and assignment, and difficult to see when one may suffer over another if time was not managed correctly.

Lockdown and Working from Home

From a personal point of view, scheduling of time to study and work on certain assignments and most importantly, this project, needed to be quite meticulous. The time spent working in Carlow IT during the day was very valuable as it was much more difficult to work at the same level at home. This is due to a very slow rural internet connection, and my duties at home as a parent to a four-year-old girl.

Due to the emergence of an unprecedented global pandemic and subsequent closure of the institute, and consequently, the requirement to work from home during a critical time in the project cycle, progress was being made noticeably slower. This meant that the time spent on the remaining planned features and elements did not go as planned.

Making further compromises and trying to keep to the schedule in order to adapt to this unforeseen change was challenging, however, a final product was produced and is hopefully in a state that will be deemed adequate in the hands of the target users.

Planned Visit to Primary School

During the initial visit to the primary school to see the paper-based version of the programme in action, it was agreed that a second visit may be made once the application was in a workable state. The purpose of this visit was to allow the same class to try, and give feedback on, the application. This visit would have been extremely valuable as it would indicate the success of the product in its intended environment and give an indication on any tweaks or changes that may be necessary to improve the application.

Unfortunately, due to the Covid-19 outbreak and subsequent closure of schools, this visit was simply no longer possible, and this phase of the project cycle was therefore dropped.

Despite this, a demonstration of the application will be sent to the manager of the Bainisteoir Beag programme, and hopefully this visit may still be made in the future.

Learning Outcomes

Technical

Google Flutter and DART

Learning new technologies, while challenging at times, is exciting and valuable. Having the opportunity to build an application with Google Flutter and DART is no exception.

While I was familiar with the fundamentals of mobile application development from a previous project which involved native Android application development in Java, the approach to developing an application with Flutter was quite a bit different. It was interesting to work with Flutter and DART in contrast to native android development and use a framework that was much more UI focused than the latter.

Given that Flutter is a relatively young technology, recommended IDEs lacked the same level of quality-of-life support for Flutter development, for example, a drag-and-drop UI builder that exists in Android Studio for native Android development (xml). While this can make the initial setup of screens quite a bit slower than the alternatives, I feel that it encourages a more in-depth look at the documentation and learning resources, as well as experimentation with UI elements.

As for DART programming language, when it came to creating functions and algorithms, it felt familiar despite being completely new to it. I found it to be simple and robust, and working with DART didn't feel unlike working with some other programming languages which I am more familiar with.

Google Firebase

Before starting the project, it was clear that Google Firebase's rich suite of features would be useful as a cloud back-end to the web and mobile applications. Setting up a project was straight-forward and the documentation for using each of the services was extremely informative.

Setting up a Firebase project and linking it with both the web app and the mobile app was quick and simple, and allowed me to get to work on planning the implementation in no time.

There's no doubt that for an independent developer, familiarity with a cloud service such as Firebase is very valuable as they offer many powerful features, possibly even for free based on the scale of the project. Getting to work with some of the popular services that Firebase offers like its databases and cloud storage was certainly something that will continue to benefit me in the future as much as they were a benefit to the progress made on this project.

Personal

From a personal perspective, getting to work on a project of this scale was definitely a highlight of my time spent as a Software Development student. Like no other assignment to date, this project has encouraged a sense of drive and dedication to seeing a project through from inception to deployment. Even with the challenges that this brought, some greater than others, I view the experience, as a whole, as positive.

Some valuable lessons were, of course, learned in failings, like the need to accept that compromises must sometimes be made in part for the good of the whole.

During this project, I learned, more than ever, the importance of scheduling and the quality of study. Experiencing, out of necessity, the contrast between planned, focused work and chaotic, intermittent sprints helped to solidify this lesson.

When I was given the opportunity to accept a project that was intended for a third-party and which would be put to use upon completion of the project was exciting and interesting to me. Given that I was unable to secure work experience for third year, this opportunity seemed to be the next best thing. It was encouraging to know that I may be providing a product that would be used in a practical setting, and I certainly benefitted from the level of drive that this gave me.

What was achieved

The final product, despite any compromises made during development, is very much in line with what the client has requested from the application. The core functionality, a total digital conversion of the Bainisteoir Beag programme is ready and usable for the client and their target users, pending the client's approval.

Aside from the core functionality being complete, I was also able to implement some of the features proposed that would help to improve the application. These include the ability for an admin to add new activity cards to the set and a tutorial section on how Bainisteoir Beag is organized, which will aid in the distribution process of the programme.

What was not achieved

Due to time constraints, some unforeseen, not all of the proposed features made it into the final build. These proposed features included a search and filter function so that the list of cards may be narrowed down based on what equipment was necessary or how many players an activity may need, and a reward system built around the concept of "gamification" whereby Leaders would be incentivized to choose a random activity or an activity that is played least often.

It was also initially planned that I would, during the project cycle, build and test the IOS version of the application on an institute-provided Mac computer (with iPad emulator). However, owing to the recent Covid-19 outbreak and institute closure, I was unable to test the IOS version of the application in time for the final deadline, due to a lack of necessary resources.

Acknowledgements

Firstly, I would like to thank my project supervisor, **Paul Barry**, for his continued support throughout the year and for recommending this project to me in the first place, instead of some crazy thing about birds. His encouragement and enthusiasm towards this project and my progress has been an inspiration.

I wish to thank **Pat Power** of the KRSP for allowing me to take on this amazing project and aid in his vision for the Bainisteoir Beag Playground Leaders Programme.

Thanks to everyone at **Coon National School**, Kilkenny, for allowing me to join in on the fun of Bainisteoir Beag and see the programme in action.

I would also like to thank my wife, **Victoria**, for her unwavering support and encouragement from day one, not to mention her patience in dealing with me throughout the stressful periods of the project; And my daughter, **Belle**, for giving me the drive to continue when the going gets rough, and for trying her best to understand why I sit at the computer quite as much as I have done this year.

Finally, thanks to everyone who has been subjected to my musing, complaining and despairing about the workloads necessary to see this through.

Declaration

- I declare that all material in this submission e.g. thesis/essay/project/assignment is entirely my/our own work except where duly acknowledged.
- I have cited the sources of all quotations, paraphrases, summaries of information, tables, diagrams or other material; including software and other electronic media in which intellectual property rights may reside.
- I have provided a complete bibliography of all works and sources used in the preparation of this submission.
- I understand that failure to comply with the Institute's regulations governing plagiarism constitutes a serious offense.

Student Name: Francis Hall

Student Number: C00220910

Signature: 

Date: 20/04/2020