iPad App for Primary School

Interim Report

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Abstract

The iPad is poised to transform learning as we know it. Many schools are fully aware of the capabilities of the iPad, some studies even show that students who have access to iPads do better in school than kids who don't.

In this project I have set out to develop a custom built iPad app for a Primary School in Penarth.   The headmaster wants replace a paper based reward system and take advantage of the interactivity the iPad stimulates.

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1.Introduction

1.1.Overview
The purpose of this project is to develop a custom built iPad app for St Joseph Primary School in Penarth, which replaces the current system, which centers around each child having a large A3 sheet of paper and a lot of stickers to collect to fill the school image. The problem with this system comes from sorting and storing the children's sticker collection, with the teachers having to agree that it can be somewhat troublesome to organize the sticker collection. Not only that, the entire school felt the sticker system lacked entertainment.

The school has thirty-two iPads being used daily, sixteen first generation and sixteen second generation, each teacher having a 2nd generation iPad. They have been using iPads since May 2011 and have been hugely successful in terms of motivating and engaging children generally, but especially for the younger children with learning phonics and basic maths. In music sessions, the school have been pioneering in the use of Garage Band to compose and learn about all the elements of the music curriculum. They have also created an iPad orchestra which was observed and praised by the head of Cardiff and the Vale music service.

The headmaster believes iPad has taken a significant impact on the way children learn in schools. From this, he wants an interactive application that allows the children to compete and unlock rewards in a fun and exciting way. Each sticker the child collects would represent a house point. The application can manage the house points as well as the child's profile and sticker collection.

There has never been a public iPad app available for schools to teach and encourage the children the schools aims and beliefs. However, some apps adopt a similar reward system but from being well behaved and achieving given tasks.   There's an app called IRewardChart on the app store for iPhone which basically awards children for completing tasks, like eating fruit and being nice to others. Another app on the market that shares a similar motive is 'Kid Pointz'. Kid Pointz is a behavior reward system for kids but not in a school environment, usually for parents to encourage children to behave. These apps, including mine have something in common that encourage the children to complete the task, this relation is rewards. Children just love having rewards[1] for doing the right thing and St Joseph's school is doing exactly that, they want the children keep trying to unlock the rewards and compete with each other, making it a fun interactive and social learning experience. As similar as they may seem, it's still a newly fresh idea that could encourage many other schools to adopt the same app.

1.2.Aims and Objectives
The main aim of the project is to deliver a fully built iPad application for St. Joesph primary school.   Of course, this aim would involve many aims and objectives in order to accomplish this aim. Breaking down the aim into fairly sized aims and objectives will help to measure progress for the project.

One of the biggest opportunities in pursuing the project will be from learning how to develop iOS applications. As a user and a fan of the OSX and iOS, I have been interested in this area since my interest in programming. My interest will give me the enthusiasm for the project.   Objective-C is the core programming language of iOS and OSX, my knowledge in Objective-C is sparse, from this a necessary objective was to learn

Objective-C. Another learning outcome will be to fully operate Xcode and all its development tools, such as the simulator, errors, storyboard and so on. Yet another learning outcome would be from learning how to implement api's and builtin libraries in Xcode, which would be a valuable asset in contributing exciting functionality towards the application.

Another great opportunity will be dealing with a client, giving me a chance to experience how important and extreme from gathering every bit of information available from the client, the reason being that clients are never certain what to expect from a project. This gives me the motivation to gather all the information I can. Obtaining this aim will involve achieving small goals, like communicating in a professional manner will keep the meeting more on topic. Fully understanding what the client wants is necessary to meet the headmaster's expectations. Gathering the appropriate requirements will definitely aid delivering the correct outcome for the project. Recently I have mentioned clients are unsure about what to expect from a project, from this proposing and refining ideas could be a great custom to innovate the project, and introduce new technologies that could benefit the iPad app.

Designing the iPad app will be a challenging goal, because children operate differently to grown-ups, for example children tend to tap buttons accidentally more than grown-ups. This is why an appropriate interface is necessary for the iPad app. This goal is a great opportunity to experience designing apps for children. Most children can get easily frustrated over small things, like long loading times or losing a game. "A splash screen that takes more than ten seconds to load will give rise to comments from kids such as, Mommy, it doesn't work."[6]. Making the iPad app more interactive and dynamic will keep the children less frustrated and entertained. One thing children and grown-ups both enjoy is fancy animations. Giving the iPad app some nice sleek animations make the app feel more polished and interesting.

The main aim in the project is to deliver exciting functionality for the children. If a child has been awarded a ticket, they can redeem the ticket effortlessly through the app. The school only has a limited amount of iPads for the children, meaning each child's profile will need to be updated on each iPad. The teachers may need to remove tickets from the children from misbehaving. An additional goal that could be achieved if theres enough time left before the deadline, would be allowing the children to draw their own picture on the iPad, to fit inside the school's image.

A massive opportunity from pursuing the project will be to experience beta testing the iPad app in the fields. The children can take part using the iPad app and giving me feedback.

1.3.Scope
In order to start developing the iPad app to meet the schools expectations, it would be necessary to identify the key requirements for the application. This would involve identifying how many iPads the school retain, along with the model and iOS version. Furthermore, distinguishing how the school maintains the iPads would become very useful for designing the application. Researching the multitude of iPad applications the school favor may become a good inspiration for the project.

The headmaster would like the application to scan physical tickets into the application, then they can redeem the ticket at the end of the day to receive a random sticker. Having said that, he wants to give teachers the power to remove tickets if the child has misbehaved in any way. An additional requirement was for the application to manage the

housing points in the school, as each ticket is worth a house point. Once a child has completed the sticker collection, that child receives a reward and advances to the next level.

The headmaster also mentioned some additional features that can be implemented in the future, such as involving a mini game to unlock a ticket and introducing sticker trading to influence the children to take the game into a social aspect.

2.Background

2.1 The School
This segment holds valuable information about the school, as the project will be deployed in the school, it's necessary to be well informed about the schools system and raise any requirements to work with the schools system.

2.1.1 Structure
The school contains sixteen first generation iPads and sixteen second generation iPads, each teacher having one second generation iPad, this means a child may be on a different iPad per use, meaning the iPads would all need to be aware of changes, such as a child scanning in a ticket. The school has a wireless network, providing the iPads an internet connection, this can help provide solutions to keep the iPads in-sync. Some classrooms have an Apple TV, which allows children or teachers to share their screen on the big TV, maybe the children could share their sticker collection of the TV. The school maintains the iPads by using a device called NoteSync, which clones the iPads and iPods so that all have the same apps and content. iTunes sees the iPads and iPods as being identical and syncs the same information for each, this could interfere with the process required to keep the iPads up-to-date. The school doesn't have a dedicated system admin to maintain the network, however one of the teachers maintain the computers and helps solve general I.C.T problems, which mean the maintenance side to the app needs to be none technical.

2.1.2 Current System
The stickers at St Joseph each contain a statement from the schools image, see figure to the right. The children obtain a random sticker from teachers and stamp them onto their A3 sheet of paper, similar format to the schools image. The stickers can only be stamped at the end of the day, this gives the teachers the ability to confiscate stickers off the children before they attach the sticker to their A3 sheet. All classes participate with this system, and on average, the children usually obtain four tickets daily.
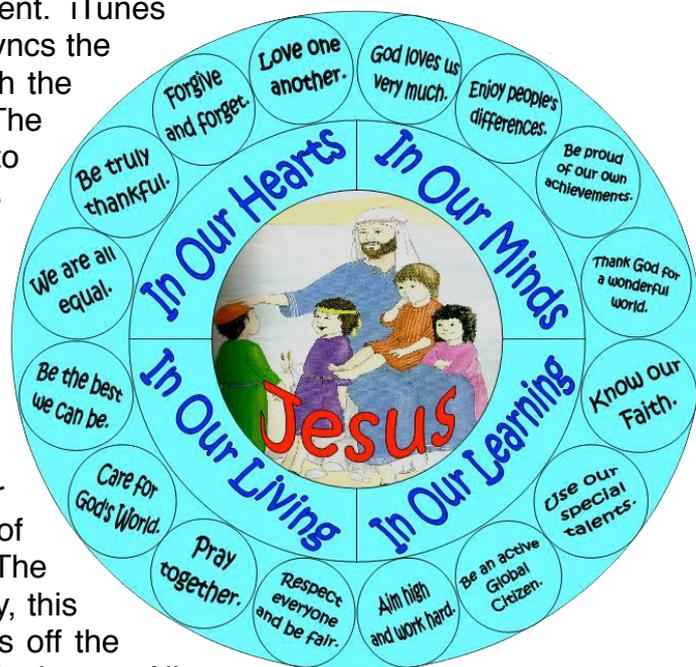
Figure 7-1

When completing the diagram, the child receives a special reward and starts again. In the future, the headmaster wants to introduce levels into the system, that makes stickers harder to come by and amplifying the reward. The school have always preferred the motive of rewards.

The school strongly feels this is an innovative reward system that inspires the children to remember and respect the schools aims.

2.1.3 Children

There are approximately one-hundred and sixty children that attend St Joseph, all of which use the current paper based system, excluding infants. However 2nd year class and above have their own email accounts and passwords. This makes it desirable to use passwords with the iPad app. Children could log into the iPad app and see their profile, using the password as a type of security and privacy.

The headmaster is enthusiastic of introducing a friendly leader board system into the app, each child could see the next child with more stickers and one with less, he's convinced this will introduce a friendly competition between children.

Another idea, which could be implemented if there was more time allocated for the project, would be to introduce a trading game element within the app, this could motivate the children to converse about trading stickers and requesting trades through app. The headmaster thinks it can encourage children to be more familiar with the school's statements.

2.2. Corresponding Reward Apps

There has never been an app to meet this problem, however there's two general reward apps on the market. IRewardChart[4][11] is a popular iOS app that allows parents to track and manage their child's behavior. It uses a star system, when your child does an assigned task they get a star. These stars are the app's currency, children can redeem stars for a reward like one hour of television. However, it's not feasible to launch this app in a school environment, because it requires too much management. See screenshot below:
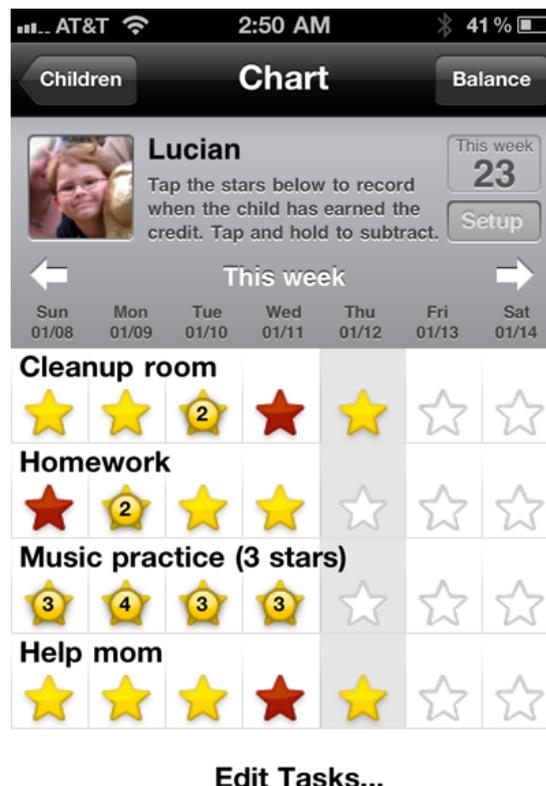

Figure 8-1

From Figure 8-1, the interface looks very smart, the efficiency of the week layout with the stars is a nice addition and you can easily notice where the child has failed some tasks. The colour coordination is really nice, nothing too bright. Nice location to leave a description to let the user what to do. However, the app looks like the usability has been tailored to meet an adult, so it would be redundant to style the iPad app similar to this.

The next app called is ChoreMonster[9] uses an entirely new approach where the parent and the child uses different systems. The parents logs into a website and sets scheduled chores with point values, then they approve them if they've done it, they can also add, remove and change rewards. The child uses the app or the website to review all the possible rewards they can get, they are able to look at the chores, set by the parents to start saving up.
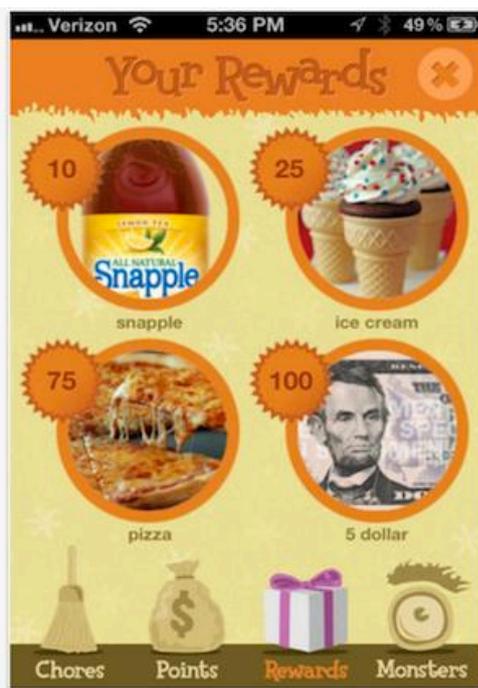

Figure 9-1

Figure 9-2

Figure 9-3

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From Figure 9-1, Figure 9-2 and Figure 9-3, the interface design is really intuitive and takes advantage of the screen, without comprising usability. The art on the design is very nice, really effective for children. The colour coordination is a nice touch and I know children will love the overall layout. Quite possibly the best idea about this app is that it's dedicated towards children, nice innovation and flawless design ideas.

Overall, there are more reward apps on the market, but nothing useful to the project, but the ChoreMonster app really did have some nice design ideas that could be a good inspiration for the project. IRewardChart having a nice layout, but the interface is tailored for an adult not specifically for the child. Moreover, as this is a new idea to a new problem, it's something fresh and new, and if successful, many schools may want the same thing.

3.Approach
3.1.Research and Inspiration
Researching for the project was exceptionally beneficial. The school supplied me with a few of their most loved apps, which helped me analyze and inherit lots of design ideas used in other apps. Not only did I research those apps, I researched lots of apps on the market that gave me lots of ideas to include in my app. Aside from apps, articles became extremely useful[8][3], because they helped me understand how iPads are impacting on education in Primary Schools. Reading these articles helped me derive design elements for children, like for example majority of children press on the iPad's home button, causing the app to exit, and then look for its icon and launch it all over again[6].

The schools favorite iPad apps are Pages, Garage Band, Hairy Letters and Cover Orange HD. Pages is a word processing app, which provides stylish templates, word processing tools and media integration, the school thinks its a considerable app to allow children to type away and write stories. A great addition to this is that children can add images and camera shots to their story. Garage Band is a musician app, that allows children to compose music and learn instruments together. The school has a music teacher that comes in regularly and makes great use of the app in addition with Apple TV. Hairy Letters is an education app that teaches children the alphabet in an entertaining way, that allows children to interact with the alphabet and learn to write letters. Cover Orange HD is an exciting puzzle game for all ages. The aim of the game is to protect the orange from the terrible rain cloud, using objectives as a cover source or moving the orange to a safe location. The children love the puzzle challenge and bright colours.

3.2.Requirements
My general approach to the project was always thoroughly planned. The first approach to the project, was gathering the requirements from the school. Requirements gathering is possibly the single most critical foundational activity for apprehending the problem.[6] The school wants the app to:

Functional Requirements:

• Scan tickets
> The system needs to scan a ticket to award a child a single ticket value, the child can use this ticket at the end of the day.

• Redeem tickets
> The app will need to redeem tickets and unlock a random sticker, however the child can unlock a sticker they all ready have. Upon collecting all the stickers, the

teacher is notified that this child has completed the collection and will be rewarded, then the collection will reset.

- Teachers can remove tickets
  The school needs the ability to remove ticket values from a child if they misbehaved in class

- Teachers can add and remove children of the app
  Teachers need to maintain the app, as children tend to join the school and sometimes leave.

- Manage housing points
  The school needs a more efficient way to manage housing points.

- Leader board system
  The children can compare their collection to others, but only one child high rank and lower rank will be shown. This functionality could be implemented, if within the timeframe.

- Teachers changing passwords
  Teachers will at some point need the ability to change or look up a child's password.

Non-Functional Requirements:

- Usability
  Appealing to the kids, as well being usable for kids.

- Synchronization
  In order to take advantage of the iPads St Joseph hold, the iPads may possibly push information to the other iPads, such as a child redeeming a sticker.

- Security
  The headmaster wanted verification for the children from year two onwards, as the children already have an email account and a password, he is certain introducing passwords into app is perfectly fine.

- Structure
  The school uses a NoteSync system to clone their iPads from one iPad, this ensures all the same apps will be consistent on every iPad, however this might collide with the app in terms of data integrity.

- Maintainability
  The app needs to be easily maintained by non-IT experts.

3.3.Development
In this segment contains the approach to personal development and project development, such as learning outcomes, tactics, raised issues and route planning.

3.3.1.Learning Objective-C

One of the most challenging aims from this project was definitely learning Objective-C. The way I approached learning Objective-C was suited to my best learning style, which is visual. I benefit hugely from watching someone demonstrate what I need to do. This type of learning style convinced me to use online tutorials[2] at first. However, I soon realized that I didn't fully understand or appreciate the code I was learning, the reason was I didn't have an introduction to Objective-C, there was a lot of things I did not know and I needed a better way to start off.

I found a book available in my University library called - 'Cocoa and Objective-C Up and Running' written by Scott Stevenson[10], the book gave me a clever establishment to Objective-C, it's a very clear book and only took me a few days to apprehend Objective-C. Afterwards, I returned to the online tutorials where everything made a lot more sense. The tutorials taught me a multitude of different tools to apply to my own app and were very useful when I started development on the app.

Objective-C is great, my first impression of the language was that it was complicated compared to Java, which I've been using for over two years. Although being object oriented and deriving much of its syntax from C and C++, both languages are still different in their own ways, I found that the biggest difference is that there are 2 files for each class, a header file (.h) where you declare instance variables, properties and methods. The second file is the implementation file (.m), where you create your methods.

The alteration between the two wasn't too difficult, they both follow similar object models and syntax.

3.3.2.Scanner
The iPad needs a way to inspect a ticket, so that a child can be awarded a physical ticket point inside the app. During the design phase, I have considered achieving this usingRFID tags and QR codes. RFID would require additional devices that connect to the iPad via Bluetooth. The ticket from the teacher will be a RFID tag which the iPad will pick up from the device. Though with that many iPads it could be troublesome in the scale of devices and setting up the devices when you actually want to read an RFID. Not to mention the additional cost and maintenance. The alternative would be using QR codes, now QR codes can be scanned by using the iPad's built-in camera, this method already suffices than RFID. Even so, if this would be used it would require software built into the app to scan and decode the QR code. It requires no additional hardware cost and no maintenance, making the QR codes simple enough by using free online tools. But, in spite of all these additional benefits, the school hold sixteen first generation iPads, which mean those models don't have built-in cameras. The headmaster's response was that the QR code reader, was clean, no wires, no hardware cost, no maintenance and was worth sacrificing half the iPads to not scan QR codes, yet they will still be able undertake other functionality, such as to redeem their tickets at the end of the day, where it's peak time and necessary to have all the iPads ready to use.

3.3.3 Synchronization
The iPads at St Joseph could be taken advantage of if the iPads had some way to let the other iPads know about a child scanning a ticket. As this is a low priority in the requirement, this has only briefly been considered so far. A possible approach, which seeks further investigation would be using iCloud to inconspicuously push changes to the iCloud server and to all the iPads in the school, however this approach may overly complicate things given the timeframe for the project, as the school doesn't use iCloud and may collide with the NoteSync system. Another possible approach could be a database

push system, similar to the previous approach but more internal, using the school's network, the iPads push any changes to the database to all the iPads on the network, yet this may possibly be something out of my reach and requires further investigation and might still collide with the NoteSync system.

3.3.4.Strategy

Developing the app could have been approached in many different ways. I used the waterfall software development methodology for a rigid step-by-step approach to creating the prototype, but the prototype fits as an incomplete system, but in the next installment the prototype will be developed further, until reaching the final app state. Now the prototype is ready, the next stage is to revert back to the design stage and finish designing the app, then continuing down the waterfall. I chose the waterfall model because it is simple to implement and each stage is a conspicuous milestone.

It's rather obvious that splitting any task into a number of smaller tasks, which can be completed individually, then the management of the larger task becomes easier. However, we need a formal basis for partitioning our large task into smaller ones[5]. The smaller tasks are called 'hello world' programs. The intention of this strategy helped me maintain an error free program and easily reviewing my progress, from this I discovered that when working on a single program, a lot of errors would form when evolving the program.

During development, I made a suitable amount of hello world programs. I made the following hello world programs:

- TableViewStory
    This program was responsible for the sticker collection, here I was testing different data types to hold the sticker collection and different animation techniques to represent the random sticker that is about to be unlocked.

- TableView
    This program was meant to manage the children table, where the children select a name and are taken to a dynamic page depending on the one they selected. This used an advanced feature that allowed passing information between classes.

- QRCodeReader
    This program was allocated to control the QR code reader. This is where the child wants to scan a QR code, once scanning the code, the page pushed to a blank one representing a QR code being scanned.

Building the prototype using these split tasks helped me maintain less constraints and less code to manage when working on a particular area, from this it was much easier to develop and test the programs. Yet without the idea of splitting the task into smaller ones, I may not have completed the prototype on time.

4.Prototype

4.1.Specification

The prototype was planned to provide the core functionality to the app, which is the selecting a child's profile and scanning a QR code, which is a ticket and redeems the ticket, unlocking a random sticker. See the comparison between the prototype and the final app below:
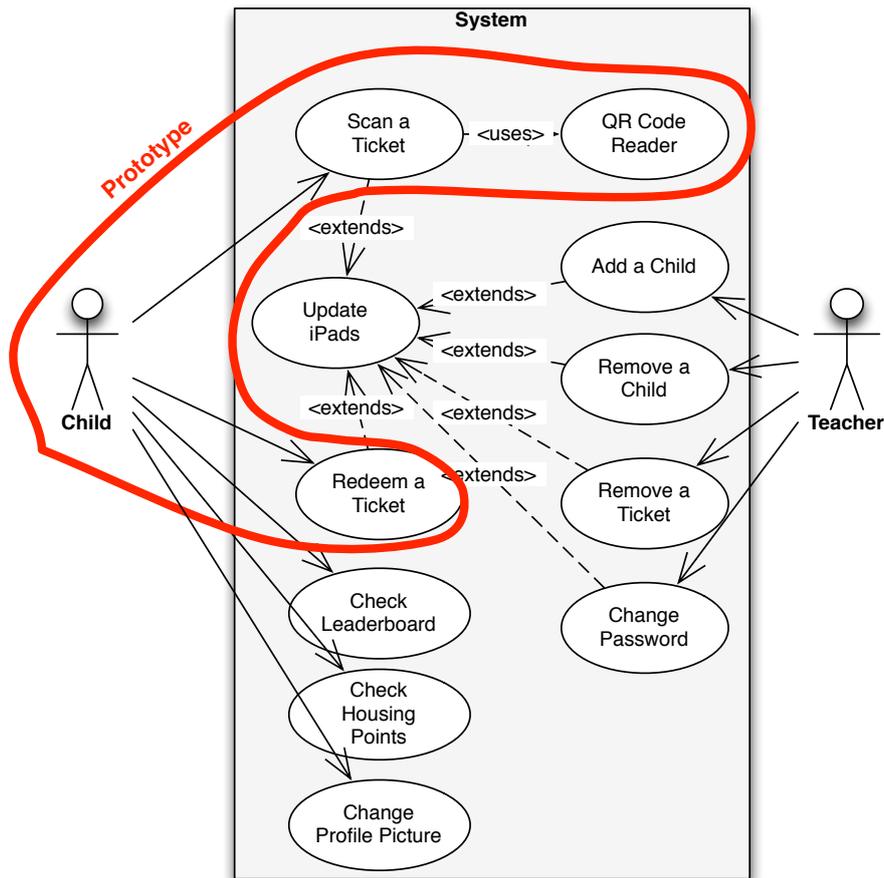

Figure 14-1

4.2. Implementation

This section contains screenshots of the prototype.
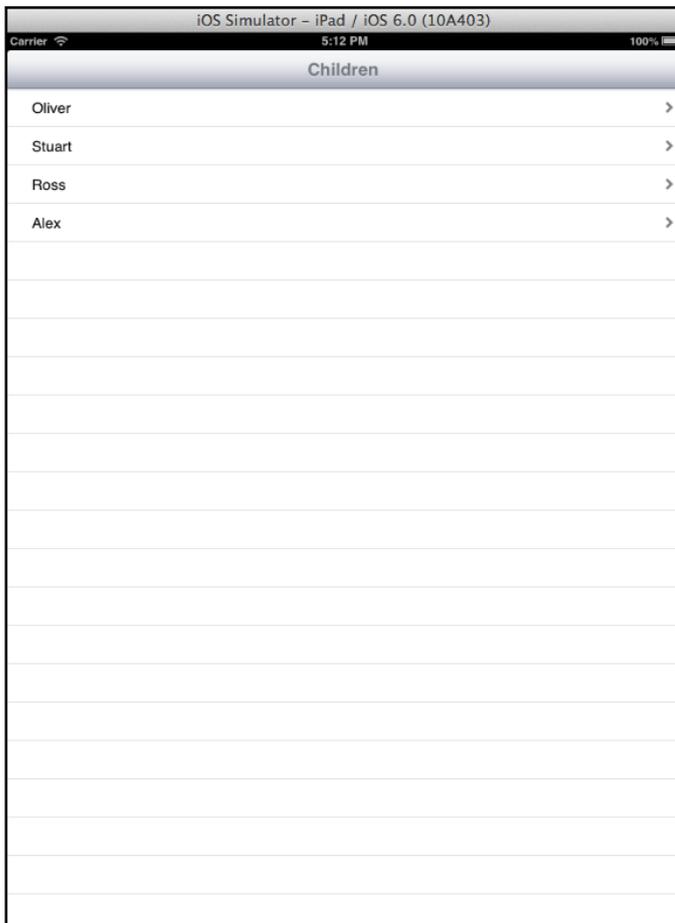

Figure 15-1

This screenshot represents the list of children in a class. Upon selecting a child will take them to a new view with their name on it, but in this demo we are selecting 'Stuart', which will take you to Figure 15-2.

Future development with this part of the prototype will improve the security for the children's profile and allow the classes to change to view different children. This will be in the final app.

However, still being a prototype, one big criticism for future development is the design aspect, it doesn't fully utilize the iPad's large display. The colour coordination is bland, looks smart but not tailored for a child. In the final app this will be solved.

Figure 15-2

This screenshot holds the sticker collection and the ability to scan tickets and redeem them. When selecting the 'Scan your Ticket' button it'll take you to Figure 16-1 . Pressing the back button will return to Figure 15-1.

Final app would involving much more functionality, such as a leader-board system, housing points viewer, change their profile picture.

Even though this is a prototype, the design looks simple, but not completely tailored for a child, it doesn't use the entire screen, the colour chosen is plain. This will be solved in the final app.
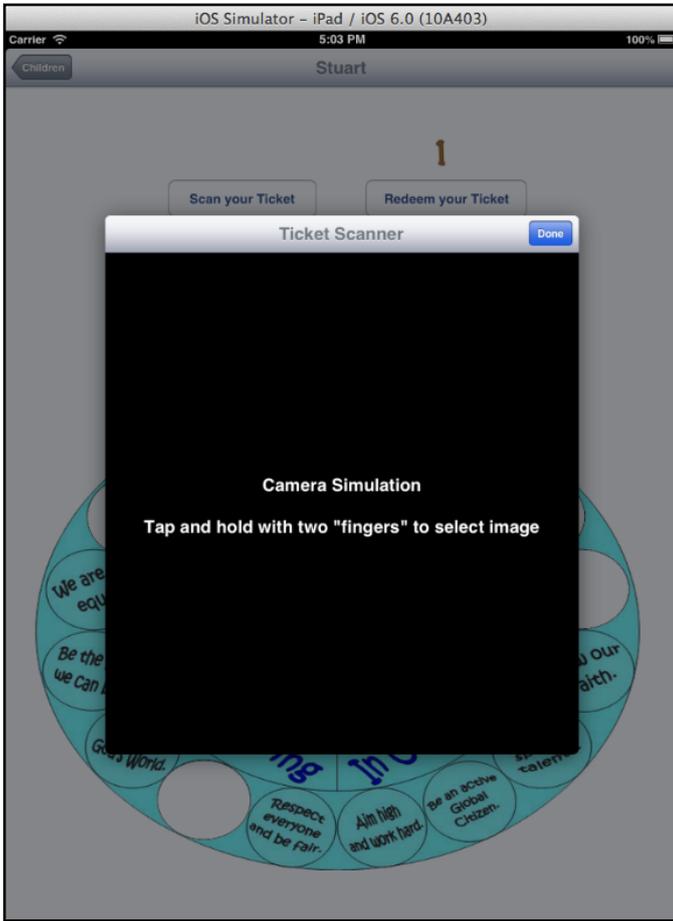
Figure 16-1

The following screenshot shows a camera simulation, once opened, it plays a soothing camera lens opening sound. On a real iPad it will show the camera feed, It acts like an ordinary camera, except it doesn't take photos. Once the camera notices any QR code it makes a camera shot noise and removes the camera window and back to Figure16-2, where the ticket counter is incremented. but pressing the done button will just make the window go away and return to Figure 15-2.

Figure 16-2

This screenshot is just to show the ticket value incrementing from 1 to 2.

In terms of design, it could be a more noticeable and a more reward feeling to scanning a ticket, after all they are given the ticket after doing something worth rewarding.
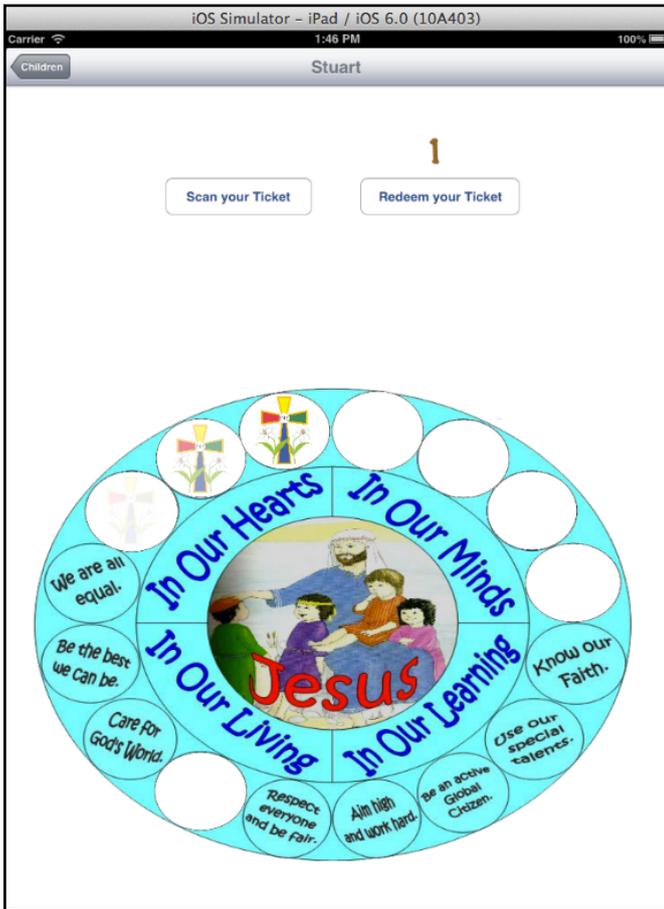
The subsequent screenshot demonstrates the process of redeeming a ticket. Notice the ticket's value has decreased and the school's image acts like a roulette wheel, where the other school icon flashes inside each sticker space and making a short arcade noise, then move to the next space, until it randomly stops on a sticker space, if the sticker is already unlocked it will play a faint "no" noise, yet which is not unlocked will play a quick faint "yes" noise and reveals the sticker.

Figure 17-1

5. Conclusion and Reflection

Though the current paper based system is easy to set up, it is very bland and static, and using out-of-date materials makes teaching much more difficult. The way children are taught has evolved from chalkboards, to smart boards and now iPads, which allows users to be immersed into more interesting content, if it stimulates curiosity, you've got the spark for learning.

5.1. Achievements

With only two months of tackling the project, the prototype is very promising. It almost completes the use case for a child and meets the aims and objectives promised in the initial plan, it has an appropriate interface, interactive, the child can redeem tickets effortlessly. Successfully determining the right requirements for the prototype have been a great achievement. Developing the prototype was a very challenging task, the strategy I used by breaking the prototype into smaller tasks helped me measure my progress and develop the tasks faster without unnecessary errors.

My first impression of my personal aims and objectives for the project was that it would be a challenge. Learning Objective-C and operating Xcode was definitely the most inspiring of my personal aims and objectives, from being a fan of the iOS and OSX platform, bestowed a leap of inspiration to engage and master this area. Dealing with the client was another motive, because I felt it's an area where I sometimes struggle to make a good impression by not communicating in a professional manner, nonetheless I'm confident I approached the school and made contact in a non-amateur manner. Another consideration could be the importance of gathering the appropriate requirements for the

project, my opinion on the matter would be that I've looked at the problem at every angle to find any incompatibility with the schools system and was very confident to the requirements gathered. In addition to that, I proposed and refining ideas to maximize the projects ability, without making the client optimistic about something that could not be done outside my capabilities.

If I was to amend my aims and objectives at this present time, I wouldn't remove any of the aims and objectives I set at the beginning of this project, yet I would add a few additional aims and objectives after engaging the project, one objective coming under functionality would be an administrator side to the app, this is allocated for the teachers to maintain the system and see overall scores. Another objective would be to abide the schools current system under dealing with a client. Overall the biggest misconception inside the aims and objectives, was the failure to include a prototype, because it was always a main aim from the very beginning.

Gathering the requirements was a new experience, by understanding completely what the headmaster wanted was crucial and determines whether the project will meet the schools standards. The requirements given from the headmaster were clear, however the school environment added more requirements which could only be spotted when taken a further step in investigating the school. The additional non-requested requirements was keeping the iPads synced and making sure it doesn't collide with the NoteSync system. In addition to this, I'm satisfied I investigated the other requirements, because the project would never fit into the schools structure if the requirements weren't met.

Before learning Objective-C, I imagined it would be like C and C++, but with some additional features. I didn't think it would be difficult to convert to Objective-C, figuring they follow similar syntax and object oriented model as Java. However, it did involve a little more effort than imagined, but C and C++ is very similar, in fact you can actually code C and C++ inside Objective-C. Another aspect to learning Objective-C was from using Cocoa Touch, which is a UI framework for the iOS devices. Overall, I think Objective-C is a great intuitive programming language and works very well with Xcode, that is just fabulous to programming in, the storyboard editor is great to help connect view controllers together, but the best feature is the error helper and the support files for developers.

However, I'm not particularly expressive in Objective-C as much as Java. Although, the more I pursue this project, the more I grow knowledgeable about Objective-C and the more I look forward to reflecting it in the future.

The project so far has been on track, the timeline objectives have been completed before the deadline and no problems have risen with the project so far. Designing the interface was a little tricky because I needed to implement it into the app, but i still completed it before the deadline. Building hello world program helped me utilize and learn Objective-C but went through development at this stage as well and created hello world programs that each possess relevant functionality for the app.

Nevertheless, if I was to amend the timeline, I would of learnt Objective-C before designing the interface, to the extent of knowing what tools are available to me and whether they are possible. I found that, some of the design plans could not of been implemented because the timescale of the prototype was too short. I would of also implemented the functional requirements first, before designing and implementing the interface. Also, the timeline didn't state building multiple hello world programs to represent the functionality, this is something read upon when reading programming guides when learning Objective-C.[5]

In addition to that, located in the appendix lies an updated version of the timeline.

Final word of my achievements would be that I'm delighted with the progress so far and very certain the remaining part of the project will be equally as expressive and reflective.

5.2.Future Work
In terms of disturbances, the project hasn't seemed to be delayed by anything. However the project still has a few complications in the next installment. Problems such as, a method of keeping the iPads in sync without being affected by the note sync system.

In the next installment, clients impression on my prototype, the investigation into the iPad synchronization problem, a necessary asset to the iPad app, which would be the teacher use case. The teacher would need to add, remove, update children records and view a summary of the sticker collection in the class. The app needs to manage housing points, children would need a leader board system and change their profile picture. The beta test will be in the next installment, containing any interface, design issue, bugs and overall happiness from the school. The tools and SDK used with the app. Improvement on Objective-C and overall satisfaction from the school.

Possible improvements to the prototype design would be, that each child uses the same resource, such as the ticket counter and sticker collection, no database system has been assigned to handle this problem yet, in correlation to the iPad sync problem the structure of the database is critical as the method used to keep integrity in all iPads is dependent on the style of the database, from this I decided to leave the database from the prototype until a route has been planned.

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