An Investigation into the Role of Choice in Player Experience

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Abstract – *This study was to test the hypothesis "Does choice of aesthetic in a game enhance the player's experience". The reason for doing this study was due to the researcher's interest for video games and visual aesthetics being in video games. Initial data for the study was gathered via a preliminary "monetisation of video games" survey which was posted online to explore the reasons for players buying cosmetic items in video games.*

After the survey data was collected, a game was developed in order to test the hypothesis. Matchymatch is an Android mobile game created in Unity by the researcher as a way to investigate the role of choice in player experience. The game has a core gameplay mechanic is matching three or more objects in a row to score points. This game was developed in order to test whether or not that choice of the visual aesthetics enhanced the player's experience of the game.

The researcher then conducted an experiment in which 12 participants were divided into two groups. The first group were given the choice of in-game aesthetics and the second group did not. The participants played through the game's levels then completed a "Player Choice" survey which involved questions relating to their enjoyment and whether or not they would like to play for longer. Interviews were also conducted after the "Player Choice" survey to gather more detailed data.

Overall the results from the "Player Choice" survey shown that choice is not sufficient to enhance experience. However, the interviews indicated that the player must have choices which are tailored towards their particular interests.

1 Introduction

The role of choice in video games, such as players being able to choose how to play the game or choosing how their avatar looks in the game are examples of the choices which players can make in video games. Recently, game developers have adopted visual aesthetics to be purchased in their games in order to create profit. Games such as League of Legends and Heroes of the Storm have used purchasable aesthetics called "skins" in their game to give players choice of visual aesthetic in exchange for money. These visual themes are applied to characters in the game that the player controls. These visual themes can vary from holiday themes such as Easter and Christmas to themes being based on fantasy and science fiction.

The aim of the project was to investigate whether or not giving the player choice of aesthetic in the game would enhance their experience. The motivation for doing so was due to researcher's interest in games and for the popularity of in-game aesthetics being purchasable in online games. A game called Matchymatch was developed along with visual themes for the game in order to facilitate the experiment.

The researcher conducted an initial survey to gather information about the reasons for players purchasing visual themes. The researcher then designed and carried out an experiment which involved participants playing the game created by the researcher and then taking part in a "Player Choice" survey and an interview.

2 Background

2.1 Mobile Games Research

Video games are a popular medium today's entertainment industry. Games are different to film and books because of the interactive element which allows players to have choices which will change the outcome of the game. Games such as Candy Crush [1] and Bejeweled [2], have been popular with those who play games on mobile. These devices have become popular for playing games on because of the rising popularity of smartphones and tablets such as Google's Android devices and Apple's iPads. While allowing those who do not buy particular devices for games such as a video games console, it allows phones and tablets which are normally used for communication, multimedia and

organisation to be a platform for video games. The large player count of games such as Candy Crush Saga (which in 2013 was approximately 93 million players daily) [3] it shows that the mainstream audience has embraced the platform of mobile games and it has become a very profitable platform for game developers.

Current games with matching gameplay have very simple input methods in order to play the game which are usually by using touching or swiping techniques on the screen. By having simple touch controls which are familiar to the users of such devices, it allows for the players to have a basic understanding of how to input commands to a game without the need of an overly long learning process.

2.2 Game Design Research

"The Art of Computer Game Design" by Chris Crawford [7] explored the difference between video games and other media. Games differ to books because of the different decisions that involve the player which makes the game a dynamic experience. The researcher learned from this that the game needed to have a layer of interaction and allow the player to have decisions while in-game. "Rules of Play" by Katie Salen and Eric Zimmerman [8] explored the fundamentals of game design. The researcher learned that all games need one core gameplay mechanic and to build the game around the mechanic, therefore the game that was developed was based around a swapping and matching mechanic.

2.3 Video Game Visuals & Aesthetics Research

Visuals in games are very important to the player, this is because most of the feedback from a game to its player, is visual. If a player does not enjoy the visuals of a game, it can impact the player experience. Anderson et al (2011) [4] explores changing a game's visuals and sounds to test whether or not it would change player retention. It was indicated that audio and music changes had no change on play time or player return rate, although changes in visual aesthetics showed that players were playing longer and were returning more often. The paper's experiment was conducted in a wild setting with large-scale A/B testing. While the data was very useful it also raised the question of whether or not the players themselves actively acknowledged they were enjoying the game more and that they felt the desire to continue playing. The research in this paper explores it in a more controlled setting where the user is directly participating in an experiment.

2.4 Unity

The Unity engine is a 3D game engine used to develop games for a variety of different platforms such as mobile, console and PC. Unity can also be used to develop 2D games [5]. It has been used for various popular games such as Hearthstone [6] and is an industry standard game engine for many game development companies. Primarily it uses scripts to program towards objects, scripts are usually written in JavaScript or C#, however for this project it was decided that C# was the best language to use for it.

3. Hypothesis & Objectives

The project was focused on the hypothesis that the choice of aesthetic would enhance the player's experience. The aim of creating the game was to test the hypothesis in a controlled environment. In order to satisfy this aim, the researcher identified 3 objectives:

1. Investigate whether or not choice would enhance the player's experience of playing the game.
2. Measure if the player's desire to play longer would increase based on having the choice.
3. Understand why people enjoy different visual aesthetics in video games.

The main stages of the project were creating a hypothesis, development and design of the game, the experiment and then evaluating the results.

4. Project management

MatchyMatch was a game which was developed in order to test whether or not that choice of aesthetics enhanced the player's experience of the game.

4.1 Project Flow

The project had been planned out into several stages such as reading/background research, game design, implementation and eventually evaluation. Figure 1 shows a more comprehensive view of the project's flow.

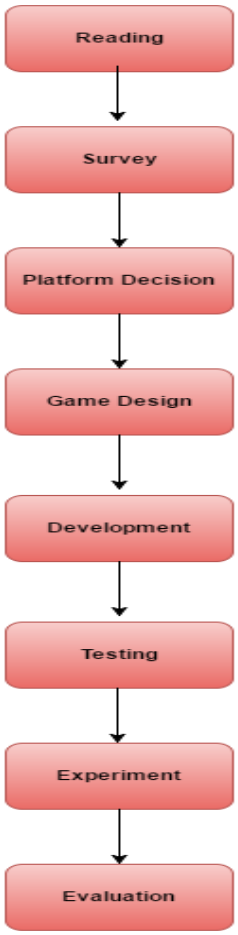

Figure 1- Project Flow Diagram

4.2 Decisions on game platform

The decision to go with a mobile games platform such as Android was based on many considerations. Having the game on PC brought forward the problem that it would be difficult for players due to many people not having the experience playing PC games in comparison to console and mobile games. A console game was in consideration although console game development does not allow for much flexibility in comparison to mobile and showed many complexities such as needing specific development kits or needing to sign up for developer's access which could complicate the process. Mobile games were the most logical and most accessible platform to choose. The choice to select Android platform was due to Android being much more open for developers and allowed for very quick and accessible development in comparison to iOS app development which requires specific developer access. Mobile games are the most accessible and common platform for most people who play video games. It also allowed for a very relatable and familiar game to be created based on popular games already on the mobile game market. These initial design decisions were crucial to the project in order to find the best platform to start development in a safe and orderly manner.

4.3 Game Design

The researcher decided to make the game a "Match-3" style game which can be seen as being similar to other popular games on the mobile game market. The reason behind this is so that players who have experience with mobile games will have some understanding of the basic input commands due to their experience with other mobile games. In **"**Rules of Play**"** by Katie Salen and Eric Zimmerman, it is described as being essential that if you have elements of a game which are relatable to objects or games in the real world. This makes the experience of the game easier to understand because they can understand the context easier. It is also discussed that games should be a circle in which all enjoyment happens by providing entertainment for the player through the meaningful interactions that happen between the player and the game.

4.4 Development

It was very important to have a complete implementation of the game as the entire study depended on the game being complete so that there would be accurate results for the experiment.

4.5 Game Testing

Testing was carried out to ensure that the game was to the standard needed for carrying out the experiment in a very controlled environment and that there would be no issues during the experiment. All logic and graphical issues were fixed due to a large amount of manual black box testing to ensure the game functional and ready for the experiment phase.

4.6 Experiment

The experiment carried out was to retrieve results from participants in order to gain as much information as possible and to find out whether or not there is a difference in user experience when user choice is implemented into the game.

4.7 Evaluation

The final part of the project is where the research gathered all data as well as any thoughts and opinions from the participant's results and considered how the experiment, or the game itself, could be improved.

4.8 Project Supervision:

For this project, a supervisor was allocated to oversee the project and to give advice and guidance to the researcher. There were weekly supervisory meetings that were held between the researcher and supervisor to identify any complications of the project and to update the supervisor on the progress made throughout the project's timeline. **The minutes for these meetings were recorded and can be found in appendix 2.**

4.9 Mid-Progress Report

The mid-progress report is the first proper deliverable for the project and was due on the 30th of January 2015. This was submitted to the project supervisor in order to detail the progress of the project as well as what was currently being worked on and a timeline on what was to be done next. **This mid-progress report can be found in appendix 3.**

4.10 Ethical Approval

Ethics needed to be considered due to there being an experiment. Therefore, there was an ethics form submitted to the School of Computing's Ethics Committee. There were slight changes made in order to bring it more in line with the project's goals but had no significant changes from the original submission. The sheets included were an information sheet and a consent form as well as the application form for the ethics committee. If the committee had not given any approval to this, then no experiment would have taken place. Any experiment that requires participants requires consent from the ethics committee and the participants.

5 Specification

Considering player choice into how it affects user experience, it was very clear that there was a need to find out exactly what changes in player experience when giving a player the choice between different aesthetic themes as opposed to them not having this choice. The game MatchyMatch is used as a platform to test the researcher's hypothesis that choice of visual aesthetic will enhance the player's experience. The game is enjoyable and has no failure state, this means that the player cannot fail a level. This reduces the stress of possible failure and will. The game also provides the user with the choice of aesthetic theme through the use of a theme select option.

5.1 - Tesco Hudl 2 Android Tablet

During the project, many different mobile devices were considered. The main decision came down to whether to use an Apple device such as an iPad or iPhone or to go down the Android route with a device such as Samsung's Galaxy S4 or Tesco's Hudl 2. With a smartphone, it can be very difficult when those with large hands try to use it and be accurate with games, and it could be problematic if anything was changed or if there were notifications pushed to the phone, especially if the test device was a personal device. Considering that in mind, it was decided that a tablet would be the best choice, so between an iPad and an Android tablet was the two options which were most viable, however it was decided that the Android tablet would be much more suitable for this due to it being much more open to development. The Android Tesco Hudl 2 features a high quality 8.3 inch IPS screen with a 1920x1080 resolution and also uses the Android 5.1 operating system. This tablet is big enough to be used by the average user and is compatible with most games on the current marketplace.

5.2 Target Audience

This project is mainly focused around those who are experienced in playing games and therefore it would be most relevant to experiment on those who play games on a regular basis. Because of the popularity of mobile games across a large age range and with an even split on gender, it was decided to focus on an age range of over 18 as well as having a somewhat even split between male and female participants. [9]

5.3 Final Specification

The final product for the project is a game application for the Tesco Hudl 2 android device and is built within the Unity game engine and coded in C#. Programming in Unity has allowed for a lot of flexibility in how the game is presented and how the game logic works. Making a mobile game allows for a simple game which is familiar to other games within the genre and it will be easier to play and understand than games on another platform such as a console or PC due to the fact that touch controls feel much more natural than learning how to use a mouse and keyboard or a console controller.

6. "Monetisation of Video Games" Survey

The researcher posted a survey out to various social media platforms such as Facebook and Twitter as well as forums such as Reddit which were focused on a community of players who were interested in the popular video game called League of Legends - an online PC game with a large player base.
The main motivation for creating the survey was to gain an understanding of why those who play League of Legends enjoyed purchasing cosmetic items for characters. League of Legends' main monetisation model is based on In-App purchases known as micro transactions. Micro transactions are a very important part of making profits in video games and many games use micro transactions in order to gain profit. League of Legends uses in-game aesthetics known as "Skins" as purchasable themes which replace the in-game characters' original look with something more personalised towards particular themes such as Easter, Christmas, football and so on. This survey gained a response of 247 participants, the demographic for the survey was 37.7% were between 18-21, 26.7% were between the ages of 22-25. The gender distribution was very heavily male, with 91.5% being male and 7.3% being female. The results of this survey gave a strong indication that in-game aesthetics were very valuable to the players, 25.5% of all players had spent between $200-$500, 19% spent between $100-$200 and 13.4% had spent between $500 and $1000. 81.8% of all money spent by players goes directly towards buying cosmetic items such as character aesthetics. The survey also asked the players what their main reasons for buying cosmetic items were. 77.3% of players enjoyed the visual look of the skin, 59.9% of players enjoyed the character and felt that the cosmetic item enhanced their enjoyment of the character. These statistics indicate that there's a large amount of value on having aesthetic items or aesthetic themes within games and that players are willing to invest money into customising and personalising their experience. **See Appendix 1 for the full results**.

7. Implementation and Testing

7.1 Design of MatchyMatch

MatchyMatch went through several design decisions before the idea of MatchyMatch was finalised.

7.1.1 The Game Genre

The genre that was most logical for a mobile game was to pursue a game which was very simple to understand and learn the rules of. The game itself had to have simple input and a clear defined goal in which to reach, the two genres that were explored for this were "Casual" and "Arcade" games.
Casual offer players easily accessible games with simple controls and introduced those who were not previously playing games to a genre which they could enjoy. While the term "Casual" may sound like it's an easy genre to get into, the difficulty, as in many game genres will increase the further the player progresses as there always needs to be some challenge or else the player will get bored and move onto another game.
The "Arcade" genre was also explored as a possible genre for the game, this genre is inspired from older games from the late 80s when arcades were in prominence and held games which were single player and multiplayer, with very simple goals and had very old graphical representations. This genre is one of the oldest genres in existence although for this game, it would not have any gameplay that was akin to the games that were made in the late 80s era of video games. Overall it was decided that casual games would be the best route as it is currently the most popular genre on the mobile video game market and it commonly seen as a genre which is simple and easy to pick up [10]

7.1.2 The Gameplay

Among all casual games there are a few games which stand out as being the most popular. "Clash of Clans" is a strategy game by Supercell and as of April 2016 is currently the highest grossing game on the Google Play store [11], it features building forts and battling with friends online. This game is more a social game with multiplayer elements and therefore was not suitable for implementing a game based on that due to these features. "Crossy Road" [12], a game based on Atari's "Frogger" [13] is an endless "Frogger" game, what is meant by this is that there's a player avatar which must be through the map and must avoid hazards such as cars. The gameplay mostly revolves around timing and position on the map. "Crossy Road" is very popular due to it being free to play with no real need to pay any money. The payment model in this game is buying in-game aesthetics which can also be unlocked for free. It was considered that this type of game could be very simple to implement and would be interesting, although it was decided that it would be better to have some more in-depth mechanics and it would be too difficult to animate all the different elements of the game.

Lastly is "Candy Crush Saga" by King. Candy Crush Saga has been one of the most popular games on mobile for many years [14], it is a clone of the popular game Bejewelled. The gameplay revolves around matching three objects in a row by swapping objects in a grid. The grid is two dimensional and all objects are represented as chocolates/sweets. The input method used is what is called "Swipe to Swap" which is where the user swipes

an object in one of the four directions, up, down, left, right, and that will attempt to swap that object with another object and check for a swap. When swapped, the game will check for a 3 or more match and if so, will destroy the objects, replacing more onto the game board and will award the player with points. This game has a very defined goal, it is single player focused and has a very heavy visual theme used throughout, which made it a prime candidate to build a game based on match-3 games similar to Bejeweled and "Candy Crush Saga".

7.1.3 Swipe Input Vs Tap Input

Match 3 games have one of two different input types. These can be coined "Swipe to Swap" and "Tap to Swap". Swipe to Swap is essentially by swiping in one of four directions and the object which they started their finger one, will then swap with an object of the direction which they swiped to. This is used in Candy Crush Saga and has been used by many other Match 3 games in recent times. Tap to Swap is where you tap the first object and then select another object which is adjacent to the first object and the game will perform the swap, while this input type is not as natural, it's an older input type that's been used in many Match-3 games such as Bejewelled. In MatchyMatch, it was decided that Tap to Swap would be the better input method as it allowed the game to handle all of the complicated game logic and prevents many different errors by tying the game to the highlighting logic therefore would be much safer and would result in less errors throughout development.

7.1.4 Game Engine & Language

While deliberating over which engine to use to develop the game or any engine at all, there were a few options which were considered. Unreal Engine 4 is a very powerful engine that is mostly based in C++ and has become industry standard for many high quality games on multiple platforms. The problem with Unreal Engine 4 is that it is mainly for games that are for consoles and PC as it allows for a complex lighting system and complicated gameplay mechanics which can all be prototyped very quickly. This engine is much more intensive than Unity in terms of resources required to run it and has not been proven as of yet as an engine which could be used by many companies to create mobile games, therefore it was seen as a risk to develop the game using this engine and therefore was not used.

The Unity engine is a game engine which uses JavaScript and C# as its main programming languages. Unity has been used by many development studios for mobile game development, in particular it has been used by Blizzard for the popular game Hearthstone [15] Unity allows for quick mobile game development prototypes to be made, the engine uses scripts and objects in order to program games. Prototyping, testing and evaluating a game's build is quicker and easier to do than attempting to develop a game without using a game engine. It also allows the developer to skip past some of the small intricacies that could slow them down if the development was done without a game engine such as setting up the environment variables for Android which can be complicated and take up a lot of time to calibrate correctly. It was selected as the game engine of choice because of these features and because it allowed for the researcher to focus more on developing the game and design rather than being slowed down by the small intricacies of the Android platform.

7.1.5 Usability

MatchyMatch is designed to be for users who have experienced games such as Candy Crush and Bejewelled, although being in the Casual genre, the game is very accessible for players of all skill levels, the game is simple to pick up and play without much instruction. The game being on tablet limits the inputs that the player can use in comparison to a console controller which has a variety of different buttons which can be very difficult for someone who has not used the controller before due to the amount of options open to them.

The game contains a very simple user interface which has visual changes when a player selects any option on the screen to communicate to the player that there has been a change in the game. When an element on the game screen has been selected, the element will be highlighted as expected and every swap is animated so that the user can clearly see the results of their actions. MatchyMatch's graphics are simple and do not have any complicated animations or intricacies as the game is supposed to be simple in nature, both in its gameplay mechanics and its visual representation.

7.2 Unity

The researcher, having decided to use Unity, had to learn how Unity worked and had to learn the C# language as a result. Unity is somewhat complicated as it's a complete package as a game engine which the researcher had not had experience using beforehand. Instead of there being classes and a huge amount of code, all the classes are split into scripts which worked very similar, however these scripts were attached to game objects. For example, there is a game manager which had a script attached to it which controls all game logic such as swapping the game objects as well as the detection algorithms for looking for matches and handling the gravity system in the game, for when matches were made and the objects have to cascade into the empty cells on the grid. While the researcher had experience using Unreal Engine 4, Unity has a different user interface as well as accommodating developers who want to create 2D games. Unity may not be a focused 2D

game engine, however it is still possible to make games in 2D by changing the perspective of the game to only use the X and Y axis and ignore the Z axis.

Another feature of Unity is that the engine allows for developers to switch between different development platforms somewhat easily as there are several different platforms that developers can develop for such as mobile devices, both iOS and Android, PC as well as Consoles such as Sony's PlayStation 4 and Xbox One. While the researcher may have only targeted Android development, it was possible to target other platforms if needed without drastically changing the development of the game.

Unity also allowed for the researcher to set up variables such as the game icon, game's package name and the orientation of the game very easily as these were all part of the game engine's "Player Settings". This allowed the researcher to prioritise a "Portrait" orientation and to disable screen rotation so that the researcher would not have any problems with the experiment if the participant moved the tablet around or rotated it.

7.3 The Game Aesthetics

For this experiment and research, the researcher had to develop visual themes which the participants would choose from. these visual themes are essentially sets of 5 sprites which will appear in-game.

The researcher learned how to use Adobe Photoshop as the software for creating these visual sprites. The themes created were Easter, Gem, Cake and Retro Gaming, all themes featured 5 different sprites in each set. The Easter theme was selected due to the experiment being around the time of Easter and would be relevant due to it being topical. The gem and cake theme were chosen as they are very common themes in casual mobile video games. The retro gaming theme was chosen due to the survey indicating that visual themes which represented older games were popular among the player base.

Figure 2 - Easter Theme Sprites

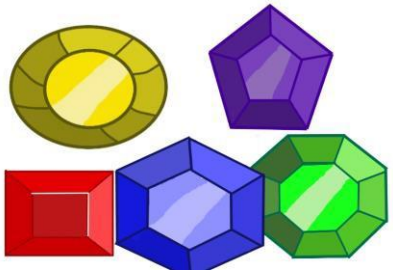

Figure 3 - Gem Theme Sprites

Figure 4 - Cake Theme Sprites

Figure 5 - Retro Game Theme Sprites

All of the user interface visuals were also created using Adobe Photoshop and with the use of a graphics tablet for accurate drawing as it would have taken much longer and would have been much more difficult if only a mouse was used. While the researcher does not have any background in art, it was important that the researcher created all of the sprites personally to ensure there were no complications with the idea of the game and how it should be displayed.

7.4 Game Implementation

Once the researcher was familiar with Unity and C#, the researcher began to develop the Match 3 game known as MatchyMatch.

The game itself is split into several "Scenes". These scenes are essentially different screens which the user

will traverse between. The first of which is the main menu screen which shows the level selection as well as the theme selection. The player is able to select any of these levels by touching the button, the game will then display the level and the gameplay for that level will commence. In the background the game before displaying the level will look for what theme has been selected and display the appropriate theme, if no theme is selected, then it will display a random theme and then the gameplay will commence.

Figure 6- Level Select Screen

Figure 7 - Theme Select

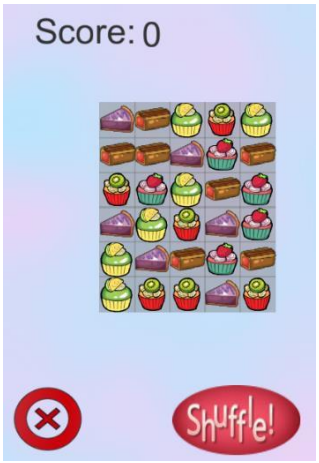

Figure 8 - In-game Screen (Level 1 with cake theme)

The gameplay for MatchyMatch is similar to other match-3 games which has been described before. The game uses "Touch to Swap" and basically allows the play to tap two adjacent objects and then they will swap. To go into more detail about the game logic, the game will detect the player's touch on the screen, it will then detect on the screen where the player has touched and will then highlight that particular object if it is a game object within the grid. If it is the first object they have touched, the object will be highlighted with a "Selector" graphic which is a white square which will appear around it. Once this has been highlighted, the game then awaits the player's second input which should be to select an adjacent object to the first object tapped on. If the second object is not adjacent to the first, it will cancel the first object being highlighted and will not swap. If the object is adjacent, it will transition object A to object B's location and will put B to where A is, it will then detect whether or not a match has been made by way of linear searching. If the match is not made, then they will revert back to their original position within the array.

To have fluid animations and transitions between locations, the researcher used a free library called "HOTween" [17] which allows any object which is transitioning between two locations to "tween", this creating a delay in the transition of an object between two locations to create an animation and visual transition so that the player can see the transition between locations like an animation. This HOTween library is also used to move user interface elements across the screen, for example when the user selects the theme select in the main menu, it will tween the theme select into the camera's view and then transition it out of the camera's view once the user has closed it.

The game also features linear searching for both detecting whether matches have been made and whether or not there is no potential matches on the board. These two algorithms are very similar, although the potential match detection algorithm had to be disabled and

replaced with a button which "shuffles" the board due to it causing a few errors which impacted gameplay. The game will only check for matches once all movement has ceased such as cascading. The HOTween library works into this as it has the ability to check whether or not an animation has been completed or not therefore it was in its own way helpful to keep game logic very stable. Once the user has reached the level's goal, which is of a certain score which is not known by the player, the game will disable all input except from the pop-up which will inform the player that they have succeeded in completing the level and will be taken back to the level select on pressing continue.

Using scenes in Unity allowed for the researcher to manipulate the objectives as well as the different arrays without manually assigning new scripts to new levels. The researcher also stored the preference for what theme was selected in a specific library called "Player Preferences" which essentially is data which can be saved and grabbed in any scene and will be constant throughout the game, this allowed for the player to select a theme and regardless of what level they were in, it would then use that theme unless the player decided otherwise.

7.5 Testing

All testing was done manually through constant incremental implementation and testing of the game during development and constant deployment to the Android device that the researcher used for both development and the experiment.

7.6 Complications and Problems

The biggest complication in development was around the potential match algorithm. This essentially checks each cell in the array and looks for a possible match from 4 different types of matches which would make the gameplay more dynamic and would not hurt the player's experience if no match could be found. To overcome this, the researcher created a shuffle button which the player was allowed to use freely in order to shuffle the board in the event that there were no matches being seen. This did not seem to harm the experience of the player in any significant way although it would have improved game flow if the algorithm had worked properly without any errors.

Another significant complication which arose during development was that the Hudl2 device had stopped communicating with the USB port on all PCs and therefore the researcher had to load in all builds via FTP which slowed down the incremental updates of the game.

7.7 Description of the final product

MatchyMatch is a mobile video game designed and developed for Android tablet devices. The game aims to play similar to other games in the casual game genre and uses the function of a theme select menu in order to give the player the choice of visual aesthetic so that they can customise their experience of the video games to measure that there is a possible increase in user experience. The game initially starts off in the level select menu which has five levels and has a theme select menu button which will open up a new menu allowing the player to choose a theme if they would like to choose a visual aesthetic. The player can then go into any of the five levels and initiate gameplay, the game play is similar to that of games such as Candy Crush Saga and Bejewelled, and has a simple core gameplay mechanic of matching three or more objects together in order to gain score. The game's input is based on tapping to swap two objects, this is done by highlighting one object by touching it, then tapping the adjacent object in order to swap them, once the object swaps, the game will check to see if a match of three or more occurs, if so the game will reward the user with points and will destroy the objects on the board which will then cascade and put objects into the empty slots much like gravity. Once the user has reached the score objective, the player will be rewarded with the level complete screen and will be moved back to the level select where they can select another level in order to play the next level.

8 Evaluation

This section highlights the evaluations of the study and the results. All data in this evaluation section was gathered from the "Player Choice" survey and the interview, which were both conducted after the players had played the game.

8.1 Participants

This project's experiment split the participants into two groups as an A/B test. The first set of participants were not given the choice in which aesthetic theme to use.

The second set of participants were asked to go into the theme selection and choose a theme of their choice, at any point they are allowed to choose a new theme after each level if they so choose. Each of these choices were noted down as they were being made.

All participants were recruited from E-mails and word of mouth. Due to time constraints there were only 12 participants in total, which made it 6 in the control group and 6 in the "choice" group. These participants were used in the evaluation study. All participants took part in the experiment within a week of the experiments starting and

there were no changes in the environment that they were in nor were there any circumstances or variables that would affect the experiment nor the participants.

8.2 Player Choice Study

The participants would play through all five levels of the game, then the participants took part in a survey which recorded their enjoyment of the game and their desire to play longer. Once the survey was complete, they took part in an interview. The interview allowed for more detailed input from the participants and gave more detailed information about their choices and why they buy in-game visual themes.

The researcher contacted each participant individually and each participant was assigned a grouping of either A or B, being typical of A/B testing. Players who were A would be not be given the choice of aesthetics, whilst B group would be given choice of aesthetic theme. The themes that were created changed the sprites of the objects within the match-3 grid. There are 4 themes in total: Retro, Easter, Cake and Gem. These themes all have their own sprites but they were visual changes only.

The first set of participants were given the instruction, once they signed the appropriate forms, they would go directly into level one without any choice of theme. They would then complete level one and then continue to play through the game until they have completed all levels with 5 in total. They were then asked to participate in a survey and then in an interview to gain more detailed responses to questions asked by the researcher.

The second set of participants were given the choice of which aesthetic theme to choose by going to the theme selection part of the game. Once the participant had chosen the theme, the researcher noted what had been selected and then the participant would be instructed to start at level one and complete the game. The participant was instructed that after every level they would have the choice to change the theme that they chose, if any change was made, it would be noted by the researcher. Once they had complete all five levels, they would then be asked to fill out a survey and then take part in an interview.

8.3 Player Choice Survey Evaluation

Firstly, the ages and gender details are included in figure 9 and figure 10 which details that there's an overwhelming majority of male participants and all participants are between the ages of 19 and 29.

	Frequency	Precentage
Male	8	67%
Female	3	25%
Prefer Not To say	1	8%
Total	12	100%

Figure 9- Gender Distribution – majority male (Both groups)

Age Range	Frequency	Percentage
18-20	3	25%
23-26	5	42%
26-29	4	33.33%
Total	12	100%

Figure 10 - Age Distribution among both groups

Figure 11 demonstrates that all participants have some interest in mobile games and play them on a regular basis, almost all participants play mobile games every day.

Frequency of playing mobile games	Frequency	Precentage
Every day	9	75%
Every couple of days	1	8%
Weekly	1	8%
Less than weekly	1	8%
Total	12	100%

Figure 11 - Frequency of playing video games (Both groups)

It's been established so far that all participants are more male than female and that they are varied between the ages of 19 and 29. Almost all participants play mobile games daily, therefore have experience in using mobile devices and playing games on mobile devices. Figures 12 and 13 shows the split between the A group and B group for their enjoyment of mobile video games in general, to give a good idea as to if they find mobile games enjoyable.

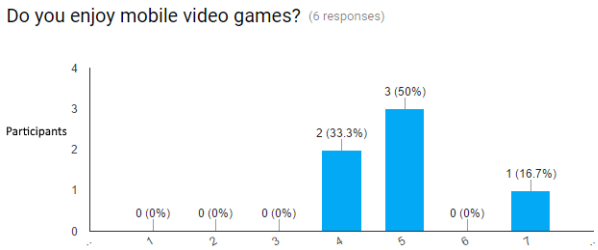

Figure 12 - Enjoyment of mobile games in general on (Likert scale) (Group A)

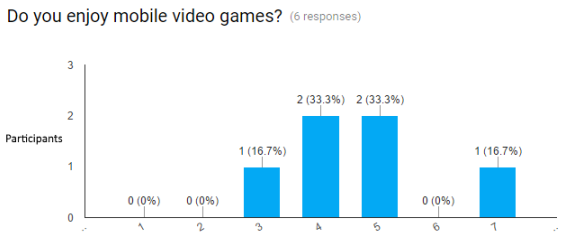

Figure 13 - Enjoyment of mobile games in general on (Likert scale) (Group B)

The figures show that both groups have a very similar enjoyment level of mobile video games with a slight difference in group B being slightly lower, although it's not significant enough in order to have any real change in the outcome of the results. It does show however that all participants find mobile games enjoyable to a somewhat high level.

Figures 14 and 15 details the two groups and their enjoyment of playing MatchyMatch.

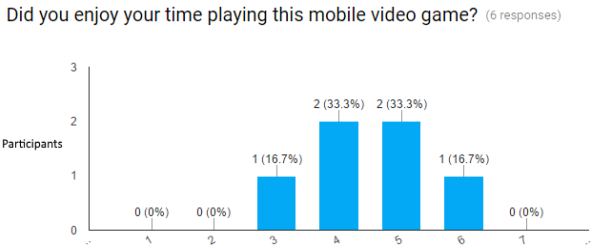

Figure 14 - Enjoyment of Matchymatch (Likert scale) (Group A)

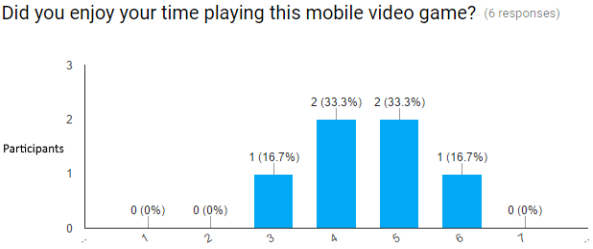

Figure 15 - Enjoyment of Matchymatch (Likert scale) (Group B)

Shown from figures 14 and 15, it shows that there is no difference between the levels of enjoyment between having choice and not having choice with the game's aesthetic themes. This was different to what the researcher expected, although in figure 16 it was asked whether or not the players, if given the choice, would want to play more.

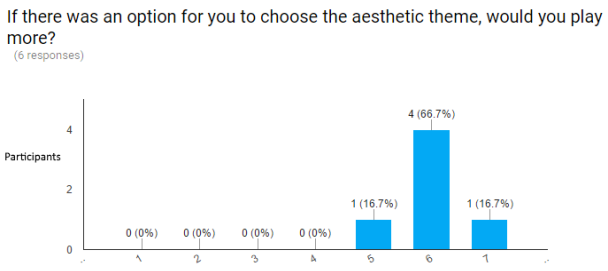

Figure 16 - Perceived player retention on choice of aesthetic (Likert scale) (Group A)

As shown from figure 16 there's a consensus that the players value the concept of choice in the context of having the say over the visual aesthetic of the game and are willing to state that they would indeed play more if given the choice of theme.

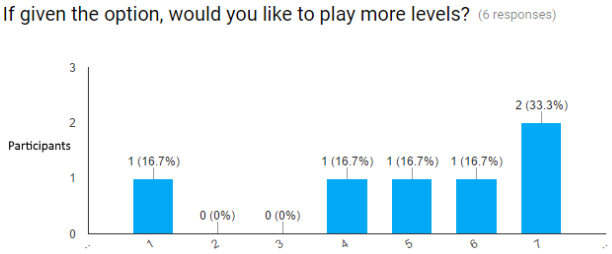

Figure 17 - Perceived retention after playing being positive towards playing more (Likert scale) (Group A)

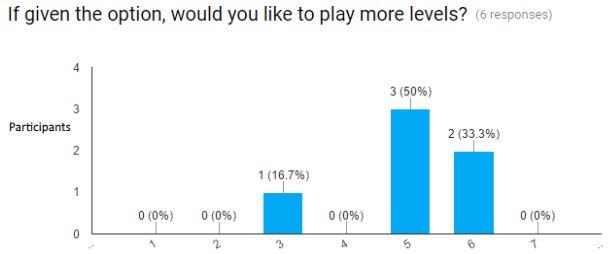

Figure 18 - Perceived retention after playing (Likert scale) (Group B)

Figures 17 and 18 show that in group A and B have a median of 5. This shows that the player's intended retention is somewhat equal.

Bought an aesthetic item in a video game? (Skin, theme etc)	Group A	Group B
Yes	6	5
No	0	1
Total	6	6

Figure 19- Participants who have bought in-game aesthetics

From figure 19, it can be seen that out of all the participants, only one of the participants had not bought an aesthetic item in a video game. This shows that the participants have felt first-hand the experience of buying and using a cosmetic item in a video game. Due to the participants already experiencing the effects of buying

cosmetic items, it shows they will know first-hand that there is somewhat of a change in enjoyment levels, which can be shown in figure 20:

(Scale 1 to 7) Did buying an aesthetic item enhance your experience of the game	Group A	Group B
1	0	0
2	0	0
3	0	2
4	0	0
5	0	2
6	4	1
7	1	1
Total	5	6

Figure 20- Perceived enhancement of experience on buying in-game aesthetic item

Participants shown that there is a significant opinion that these aesthetic items enhanced their experience of the game, especially those in group A, although the groups do not have any strong bearing on this result.

8.4 Interview Evaluation

Interviews were conducted directly after the "Player Choice" survey. They were asked questions based on their experience with cosmetic items in video games in general and how it may have impacted their experience. Many participants stated that the games had to hold their attention over a long period of time and that they would only invest money into aesthetic themes if it was an item in which changed the overall visuals in a significant way. A few examples brought up was from Heroes of the Storm, they have various skins/cosmetic themes for their characters which they themselves control within the game. These skins/cosmetic themes are mostly in the form of themes such as Sci-Fi, Fantasy, Christmas, Easter and other various themes based on well-known pop culture. A specific example is the character "Jaina" [16] who, in the game is a character who can cast spells. Normally this character wears robes which can be very similar to those seen in many forms of popular media, although some of her cosmetic purchases can involve her wearing a Christmas outfit. All interviews in which the participants gave examples, were in games where the game had them play a specific character for which they bought cosmetic items. This raises the possible hypothesis that it is more important to customise a specific playable character rather than the visuals of the game itself. Revisiting the hypothesis,

8.5 Discussion

Overall these results show a few things. Firstly, that this experiment did not produce enough results due to a lack of participants and secondly it is observed that there possibly was not enough of a change in the game's visuals to warrant an enhancement in the user experience by giving player choice. The participants in the first group who were not given the choice were very vocal in the survey about placing a strong value on having the choice on what theme they could use as well as there being a very strong indication that they would indeed play for longer based on having the choice of aesthetic theme. However, the results from the surveys from both groups are almost identical in the overall experience ratings and the retention, therefore the researcher believes that more research would need to be done in order to gain more accurate and conclusive results. Overall the results did not support the hypothesis that choice of aesthetic enhances player experience in video games.

9. Future Work

There are many recommendations that would be considered for future work for MatchyMatch, these recommendations are a result from evaluations of the project.

Having a variety of different levels rather than having slightly different grids would be a very important change as it would allow for a deeper level of engagement from the player and would make the game have a more interesting feel to it. If a player is more interested in the game, they would have more willingness to play the game further and would enjoy it more. Additional gameplay mechanics such as special gems or new rules to the levels would also be very beneficial as it would result in more engaging gameplay. When players are more engaged they generally care more about the game, so it would result in players enjoying the game more and as a result, the project would be more fleshed out.

A difficulty and/or fail state could be added in future in a more detailed study as it engages players more and would allow for their experience to have some stress involved which would make the game much more engaging and compelling to complete. Players who are engaged and feel the game is more memorable will be more likely to give more detail in surveys and interviews.

Another improvement would be to increase the graphical fidelity of the game. It has been shown that aesthetics is very important to players and that the quality of the aesthetics is also important. By increasing the graphical quality of the game and its presentation would in theory motivate players to appreciate the game more and would have them feel more engaged.

There were far less participants than the researcher would have liked. So in future it would be much better to have a larger experiment with more participants and to be more focused on the choice of aesthetics. This would allow for a larger data sample size along with more in-depth

interviews with participants to gain a more accurate data set.

Interviews also shown that games that have characters who the users play as can cause affinity to occur, which makes the player have a larger interest in the game. Next time it would be under consideration that it would be best to create a game which had a playable character which the player could customise, this would in theory create a better basis as the player would have a higher amount of interest in having a more personalised avatar in comparison to a visual theme for a game.

10. Appraisal

This project has been very challenging for the researcher, both from learning new skills such as programming in C#, using Unity as a game engine and even creating graphical assets for the researcher's game. During the project, the researcher learned many lessons about designing games and what it means to create a game that people will enjoy while also creating a product which could be used for research. The game itself was a success, as the researcher fulfilled the requirements of the game and successfully implemented all the mechanics that were required for gameplay. The researcher has a deep interest in games and questions what makes players enjoy games more as well as whether or not in-game aesthetic purchases increase the enjoyment of a game. Throughout the project, the researcher gained valuable experience by creating an experiment to test whether or not choice of aesthetic would enhance the user experience. While the study didn't bring forth conclusive evidence to support the hypothesis, it is still valuable to have done the study because it can be used as discussion for future research.

The evaluation study showed that participants enjoyed the game and that they, overall wanted to play more levels if they were available. The game was easy to play and that it was simple to understand the rules surrounding how the game worked. There was many comments and compliments towards the work and detail put into the aesthetic themes that were implemented into the game. There was a clear indication that the study shows that player choice will improve the player's retention. The game itself was seen as very enjoyable to play as seen from the results of the survey, so it was seen as a successful project in terms of overcoming obstacles of learning new development techniques and new technologies. The results may have not been as conclusive as the researcher would have liked, but it allows for even more research to be done in the field.

While there were many strengths that came from this evaluation, it is clear that there weren't enough participants to have a more detailed evaluation and that it seems that it would have been much better to have expanded this over a larger audience as the audience was mostly students and people who were in the games/software industry, more variety of participants could have given a more varied data set, especially if it was tested on people who were outside the ages of 18-30. It would have also been better to have conducted more detailed interviews to gain a deeper understanding of why people enjoy games more when choice of aesthetics is involved in their experience.

Another weakness of the project would be that it would have been beneficial to have had a small tutorial or information button to educate the players on how the game works, to allow them to understand the game better. The reason for this would be to make the game easier to pick up for players who are not experienced with mobile games. There is also a clear indication that due to the small sample size that the evidence given for a possible change in user experience and enjoyment was inconclusive and would need to be experimented on in a larger sample size.

11. Summary and Conclusions

To summarise the study, the hypothesis was that choice of aesthetic would enhance the player's experience of the game. This was not supported by the data gathered by the researcher's "Player Choice" survey and interview. The survey indicated that player choice alone did not change the enjoyment level of the players and the desire to play for longer did not increase for those who had choice of aesthetic theme. The interview however indicated that visual aesthetics are important to players and their enjoyment but in only when the aesthetic changes on the character that they are in control in. This would suggest that it may be more effective for the visuals of a playable character to be changed rather than the overall visuals of a game itself.

To review the objectives of the study, the objectives were:

1. Investigate whether or not choice would enhance the player's experience of playing the game.
2. Measure if the player's desire to play longer would increase based on having the choice.
3. Understand why people enjoy different visual aesthetics in video games.

The study did not provide data which supported the hypothesis that player choice would enhance player experience. The desire to play longer did not change for those who had choice over those who did not. Finally, it

was discussed in interviews that it seems to be that those who buy cosmetics are usually buying them for in-game characters rather than cosmetic themes for the overall game. This can also be supported by the "Monetisation of Video Games" survey which was done prior to the experiment as the majority of purchases for League of Legends were for visual aesthetics for characters that the players control in the game. From the interviews and the "Monetisation of video games" survey, there was an indication that people enjoy different visual aesthetics mainly due to the feeling that the game allowed for personalisation and to have the game's visuals catered to wards their liking.

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Appendices

1.Survey Results
2. Supervisor meeting minutes
3. Milestone Document
4. Mid-Progress Report
5. Information Sheet
6. Consent Form
7. Interview Questions
8. Transcribed Interviews

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