

# Major Project

*by* Rhys David Lewis

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The use of Text-based Games on  
Twitter

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Project submitted as part of the requirements for  
the award of BSc (Hons) Software Engineering

April 2016

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## List of Abbreviations

|        |                                                 |
|--------|-------------------------------------------------|
| 2D     | Two-Dimensional                                 |
| 3D     | Three-Dimensional                               |
| API    | Application Programming Interface               |
| CEO    | Chief Executive Officer                         |
| FPS    | First Person Shooter                            |
| MMORGs | Massively Multiplayer Online Role Playing Games |
| RSS    | Really Simple Syndication                       |
| SMS    | Small Message Service                           |
| WoW    | World of Warcraft                               |

## 1.0 Abstract

The title of this project is the use of Text-based Games on Twitter. The purpose or overall aim of this project is to find out if it is suitable to build a simple text-based game that all Twitter users can play on Twitter. The overall objectives of this project are to investigate the background of gaming on Twitter, then to create and test a game on Twitter, and finally to receive constructive feedback from users to improve the game. The research methodology chapter of this report explains the positivism philosophy and the different approaches used during the project. The development method used during the project is Feature Driven Development. The major findings of this project is creating to suitable game playable on Twitter is difficult. This will be explained fully in the evaluation chapter of this report. Conclusions have been drawn up during this project. A conclusion will bring together the literature review, research and development methods, and design and implementation. The recommendation section has been added to this report to say to any future developers how they can improved or develop the project further. This means they may have to fix any problems that have been discovered during this project.

## 2.0 Introduction

This introduction will include the problem area surrounding the project, the main aims and objectives of the overall project and a step through what each section of the report explains.

The problem area that has been investigated is that there are no suitable games that are playable on Twitter.

This project is about designing a suitable text-based game to encourage gamers to play games whilst interacting with friends on Twitter. A suitable text-based battleship game has been created using a programming language C# combined with LinqToTwitter needed to communicate with Twitter's API.

The main aim of this project is to:

- Design a suitable game to be played on Twitter

The objectives of this project are:

- To investigate the background of gaming on Twitter
- To create and test a game on Twitter
- To receive constructive feedback from users to improve the game

Throughout this report, there will be a literature review explaining the background of Twitter including its history, their top competitors, what their market share is regarding social media and the uses of Twitter including how it works.

Also in this report, it will outline the research and development methodologies used to help with the stages needed to complete the project. The research methodology section will include the suitable philosophy, approach and strategies needed during the project. The development methodology section will describe what the relevant development methodology for this project including advantages and disadvantages of it.

A design and implementation section has been put into this report to show the coding and designing aspects of the project. This section will also include the different tests done to the coding and a designed requirements list that the project needed to follow.

A conclusion and recommendation section of this report is needed to suggest any further avenues for any other research and summarising the research that has be done.

A reflection section will include a brief description of what has been learnt during the project.

### 3.0 Literature Review

#### Introduction

The literature review will cover the different aspects of Twitter, which includes the games that have been recently produced for users to play Twitter. The literature review will also include investigations into what makes a game playable on Twitter and enjoyable for users.

#### Background of Twitter

This part of the literature review will entail the history and background of Twitter. Within the background of Twitter, it will include how Twitter works and what is a hashtag. It will also include information explaining the different online or non-computer based games that are available. Also within this section, there will be an explanation of why online games are not suitable to be played on Twitter.

#### Company Overview

Twitter is engaged in providing a real-time platform for people to create, distribute and discover content. Twitter enables users to post a tweet, which is a message of 140 characters or less. The tweet is public to all users' followers unless the person has a private account [1]. A tweet can also include other content such as photos, videos, and links to other websites. Honeycutt [2] says that Tweets can be posted on Twitter.com, text messaging, instant messaging or from third party clients. Third party clients have the ability to post tweets from mobile phones using the Twitter mobile application.

The following are key products and services that Twitter are promoting:

#### Products:

- Tweets-This is where users will express their opinion or current status on Twitter, but they are limited to 140 characters or less.
- Accounts-This is what users have to create to enable them to access Twitter and view all publicly available tweets.
- Trends- A trend on Twitter refers to a hashtag-driven topic that is immediately popular at a particular time.

#### Services:

- Provision of real-time platform (for people to create, distribute and discover content)

[1]

Twitter users can update their posts or information on their Twitter profile page through SMS text messaging, the Twitter Web site, instant messaging, RSS, e-mail, or through other social applications and sites, such as Facebook. [3]

Twitter, as a company, operates in North America, Asia, Europe, Australia and Africa. The headquarters of Twitter is in San Francisco, California [1].

Twitter has over 3,600 employees working for them. Their role is to improve or update the features of Twitter [1]. Figure 1 shows the Welcome Page on the Twitter website. Figure 2 shows when a user logs into the Twitter website.

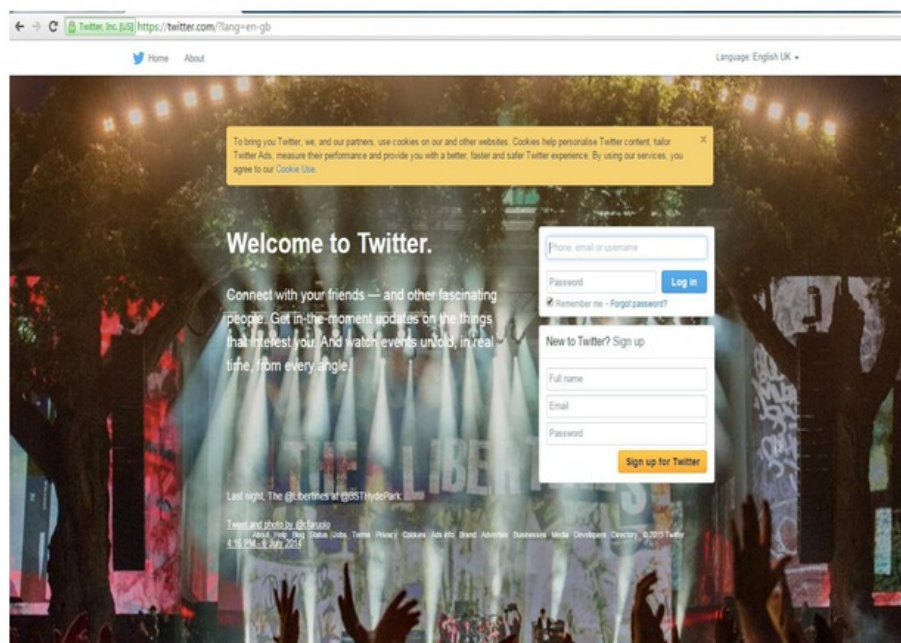


Figure 1: Twitter Homepage [83]

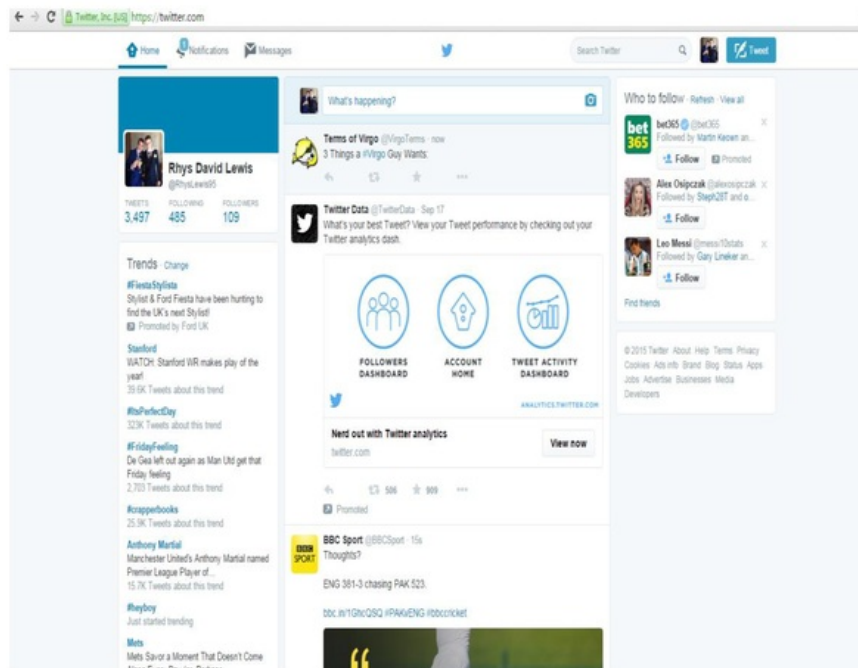


Figure 2: Twitter Wall of Information [83]

## History of Twitter

Honeycutt [2] says that Twitter was created by a San Francisco-based ten person start-up company in 2006. Twitter started when the podcasting company Odeo realised they needed to reinvent themselves and began brainstorming new ideas [4].

Twitter was first called status until a group of employees looked into the dictionary for suitable names for the company and found twitter which fitted perfectly. The original product name was called twttr [4].

The first message was posted onto Twitter back in March 2006, by one of the co-founders Jack Dorsey [5] [6]. Jack Dorsey is the CEO (Chief Executive Officer) of Twitter [6]. Jack Dorsey was also the person who introduced the idea of creating the SMS (Small Message Service). The first message that he posted onto Twitter was "just setting up my twttr".

The prototype of Twitter was tested as an internal service available only to Odeo employees until it was released publicly in June 2006 [4].

Twitter was initially designed as a tool for users to broadcast their lives, and what they are doing at that specific moment, to the universe [5].

In the early stages of Twitter, the site suffered from frequent service outages. This was due to the company having a bad server which was unable to control the websites spam and the large amount of tweets per day users were posting [5].

#### Top Competitors of Twitter

Business analysis company Marketline.com [7] states that Twitter's three main competitors are :

- Yahoo! Inc.
- Facebook Inc.
- Google Inc.

[1]

However, Mead [8] says that in terms of microblogging websites, Twitter does not have many big competitors. Tumblr has been widely recognised as a competitor of Twitter even though it is a more complex microblogging website than Twitter.

There are regular blogging websites that people use to express their opinions. An example of a regular blogging website is WordPress.com [9]. WordPress is super-flexible for anyone whether users are a blogger who writes their opinion on an issue or a photographer who wants to show off their portfolio [10].

#### Twitter's Market Share

Twitter recorded revenues of \$1,403 million in the fiscal year ending December 2014. Its net loss was \$577.8 million in fiscal 2014 [1]. The market share for Twitter, in terms of visits to their website, in August 2015, was 4.7% which is up from the previous month. 4.7% of the market share visits equals about 166.5 million people visiting the Twitter website during the month of August 2015. The market share for Facebook, in terms of visits to their website, in August 2015 was 45.58% which is up from the previous month. 45.58% of the market share visits equals to about 1.6 billion people in the month of August 2015 [11].

### How does Twitter work

Twitter is a popular micro-blogging and social networking service with approximately 7 million members. Twitter is one of the fastest growing sites on the web in terms of usage (one estimate puts year-over-year growth at over 1300%). The dramatic growth has created significant buzz about the site [12].

Users create an account on Twitter with a username. They can then log into their account and post short (140 characters or less) messages to the Twitter server, which will then forward the messages to a publicly available feed. Users are also able to 'follow' people they are interested in such as celebrities or friends. The legal age for children to create a Twitter account is 13.

Twitter has been identified specifically with the use of hashtags. As an important feature in Twitter hashtags (keywords prefixed with # symbols) are widely used to define a shared context for specific events, topics, or memes [13]. Romero [14] discovered that hashtags on politically controversial topics are particularly persistent, with repeated exposures continuing to have large relative effects on such topics as adoption and gay marriage.

Twitter has a server that has the ability to monitor spam and tweets which include certain hashtags. The main server will be stored in Twitter's HQ in San Francisco, California. This server will then communicate with various other servers across the world. This can lead to the server or Twitter itself being down for a period of time. This can be due to users having the ability to tweet their status from their games console, televisions, their mobile phones, and tablets [15]. Figure 3 shows a website where users are able to check the status of the Twitter's server or Twitter.com itself. The website explains when the issues with the server or the response time of Twitter.com happened and if it has been resolved or not.

## Status

MON SEP 14TH

**Twitter.com service impact** 1 month ago  
From 11:22am to 12:16pm PST, users may have experienced issues accessing [www.twitter.com](https://www.twitter.com). Other services including mobile were not affected.  
This issue has now been resolved. We are sorry for any inconvenience.  
292  
 Tweet

MON AUG 31ST

**Service issue** 2 months ago  
Between 16:18 - 16:59 PST today, some users may have experienced issues reaching Twitter services.  
This issue has now been resolved.  
We apologize for any inconvenience.  
220  
 Tweet

Updates on the status of the [Twitter](#) service.

**Related Links**  
[Official Company Blog](#)  
[Official Help Documents](#)  
[Developer Community](#)  
[Archive](#)  


Figure 3: Website to check Twitter's status

Romero [14] also researched Twitter by using their publicly available API (Application Programming Interface). Twitter provides access to only a limited history of tweets through the search mechanism. Twitter uses two RESTful APIs. The Twitter REST API methods allow developers of Twitter to access its core data. The core data will include updates to timelines, the status of data and user information. The Search API method, that is also used by Twitter, will enable the developers the ability to interact with Twitter Search and trends of data [16].

Twitter users can use public and private messaging. Public messaging is when all of the user's followers are able to see their message on the wall or a private message where only one specific follower can see that message.

Individuals who participate in the Twitter community use it for more than providing updates on their current status. In 140 characters or less, people share ideas and resources, ask and answer questions, and collaborate on problems of practice; researchers found that the main communication intentions of people participating in Twitter could be categorized as daily chatter, conversations, sharing resources/URLs, and reporting news) [17]. Figure 4 shows a Twitch streamer promoting himself on Twitter by enabling users to click on the link in his tweet to join his stream which has begun. Figure 5 shows Sky Sports News updating people

about football and on how Aston Villa this season have the fewest points after only 11 games played.

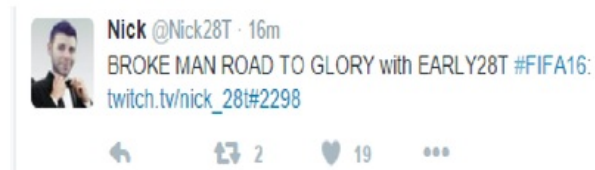


Figure 4: Streamer promoting on Twitter



Figure 5: News updates for Sky Sports News

#### The use of Twitter

There are many different uses of Twitter. Listed below are some of the main reasons why people use Twitter.

- **Communication**-Twitter allows people who have an account with them the ability to communicate with a vast variety of individuals i.e. friends, family, work colleagues, and people of like mind or interests, even future employers [18]. Figure 6 shows how people are able to message or communication with friends, family or followers on Twitter.

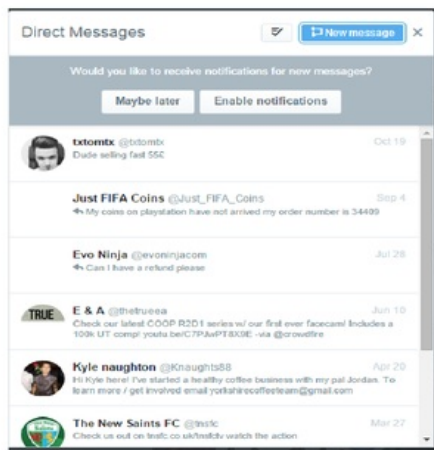


Figure 6: Messages and Communication on Twitter [18]

- **Advertising**-Twitter enables companies from all sections of the selling and purchasing environment the ability to advertise their products or company within 140 characters on their Twitter account [19]. Figure 7 shows a company called Flubit promoting their items and products on Twitter.

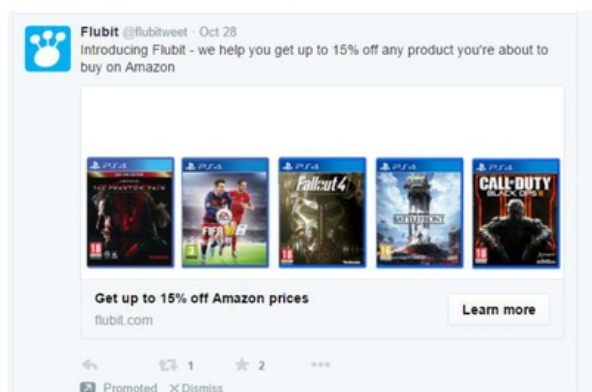


Figure 7: Company advertising on Twitter [19]

- **Finding a job**-Twitter enables the user to pick a specific field of work that they are interested in and get real-time Twitter updates of job listings. TweetMyJobs is a good method, and the user can also search Twitter by using hashtag #jobs [20]. TweetMyJobs has moved their account details to Career Arc. Figure 8 shows Career Arc's Twitter account.



Figure 8: Career Arc to find jobs

- Micro-blogging**-Microblogging is a Web 2.0 technology, and a new form of blogging that lets the user publish online brief text updates, usually less than 140-200 characters, sometimes images. Ebner [21] says that Web 2.0 technology is an emerging catch phrase and the applications associated with it shocked the traditional eLearning world. O'Reilly [22] goes into more detail saying that the concept of Web 2.0 began with a conferencing brainstorming session between O'Reilly and MediaLive International. The posts can be edited and accessed online. This can be compared to Web technology also known as the Semantic Web. The Semantic Web has evolved largely from documents for humans to read to one that includes data and information for computers to manipulate. The Semantic Web is a Web of actionable information. The information can be derived from data through a semantic theory for interpreting the symbols [23]. Vieweg [24] showed in 2010 that Twitter was the most popular microblogging system or website suitable for making people aware of natural events such as earthquakes or hurricanes. Microblogging is one form of social media that is being quickly adopted. It offers ways to retrieve, produce and spread information; the nature of that sharing has a lifecycle of information production and consumption that is rapid and repetitive [2].
- News updates**- Twitter enables users to follow numerous types of new updates as they come in. Updates such as the latest breaking news, current affairs, favourite sports contest, local news updates and the weather etc. [25]. Figure 8 shows BBC Sport tweeting out an update about Tyson Fury's fight will Vladimir Klitschko.



Figure 9: BBC Sport news update on Twitter [25]

### Online Gaming

Online gaming is an essential component of the variety of virtual behaviours: children, adolescents and (mostly young) adults allocate long time periods to play games online via a PC or a console such as PS3/4 and Xbox 360/Xbox One [26]. However, children can grow up perfectly well without playing online games 24/7.

#### What is play?

Play is a spontaneous and active process in which thinking, feeling and doing can flourish [27]. Play is essential to the social, emotional, cognitive, and physical well-being of children beginning in early childhood [28]. Play can also be known as a way of 'doing things' [29]. There are many characteristics of play. Some of those characteristics are shown in the table on the next page:

| <b><u>Characteristic</u></b> | <b><u>Description</u></b>                                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Active</b>                | Children use their bodies and minds in their play. They interact with the environment, with materials and with other people.     |
| <b>Adventurous and risky</b> | Play helps children to explore the unknown. The pretend element offers a safety net that encourages children to take risks.      |
| <b>Communicative</b>         | Children share information and knowledge through their play. Their communication can be verbal or non-verbal, simple or complex. |
| <b>Enjoyable</b>             | Play is fun and exciting and involves a sense of humour.                                                                         |
| <b>Involved</b>              | Children become deeply absorbed and focused in their play, concentrating and thinking about what they are doing.                 |

*Table 1: Table showing characteristics of play*

#### **Why is play important for children?**

Play is important to all children no matter what their impairments or behaviour [27]. People need to recognise that the importance of play are is the building blocks to children's lives [30]. The importance of play in impacting evolution relates to it being a relatively low-cost way in which to develop alternative responses to new and challenging environments [31].

#### **Why is play important for Adults?**

Play is not just essential for children; it can be an important source of relaxation and stimulation for adults as well. Adult play is a time to forget about work and commitments, and to be social in an unstructured, creative way [32]. The importance of play for adults is that it enables them to interact with their children and wants to make the adults more competitive with their children and feel more relaxed. Play for adults can help them to connect with other adults to enjoy communicate with people.

### Types of Play

There are many different types of play and children can be involved in more than one type at any time. For example, children often pretend they are builders (pretend play) when they are constructing a tower or a road (constructive play) [29]. There are a number of different play types, some of which are listed below:

1. **Symbolic Play** – play which allows control, gradual exploration and increased understanding without the risk of being out of depth e.g. using a piece of wood to symbolise a person or an object, or a piece of string to symbolise a wedding ring.
2. **Language Play**- Language play involves children playing with sounds and words. It includes unrehearsed and spontaneous manipulation of these, often with rhythmic and repetitive elements. Children like playing with language – enjoying patterns, sounds and nonsense words. They also love jokes and funny stories.
3. **Physical play**- this involves children developing, practising and refining bodily movements and control. It includes whole body and limb movements, co-ordination and balance. These activities involve physical movements for their own sake and enjoyment. Children gain control over their gross motor skills first before refining their fine motor skills.
4. **Exploratory play**- this involves children using physical skills and their senses to find out what things feel like and what can be done with them. Children explore their own bodies and then they explore the things in their environment.
5. **Pretend play**- This is where child and adults pretend to do an action e.g. a child being a builder using LEGO bricks or adults pretending to be farmers when they play Farmville on Facebook.

[33]

### Different online games

The rules of online games differ depending on the type of game i.e. the aim of First Person Shooters is for the user to shoot as many of the targets as possible whereas the aim of Massively Multiplayer Online Role-Playing Games is to gather items and complete quests. There are many different online games that could be used to make Twitter more appealing for gamers to use their website.

#### *First Person Shooter*

One of these is a First Person Shooter game. The possible disadvantage of choosing this type of game is that such games like Counter Strike or Call of Duty are often the subject of public concern. The violent nature of these games has been linked to possible increases in violent behaviours of the user [34]. Due to in-depth research, there are many different published journals and articles explaining about the effects of first person shooters on gamers. One of those journals is by Anderson [35] who writes that gamers who have played FPS games have been involved in serious violent crimes over the last 15 years. It may be difficult to create or code FPS games to be suitable for people on Twitter as they are limited to less than 140 characters.

#### *Massively-Multiplayer Online Role-Playing Games (MMORPGs)*

Every day, millions of people interact with each other in online environments known as Massively-Multiplayer Online Role-Playing Games [36]. MMORPGs are also online games that could be accessed by Twitter users. MMORPGs are highly graphical 2D or 3D video games played online. MMORPG is the most prominent game genre in Asia [37]. MMORPGs allow individuals or users to interact not only with the gaming software but also with the avatars of other players through their self-created digital avatars [38]. An example of a famous MMORG is World of Warcraft. World of Warcraft is one of the most popular MMORPG to date, with more than 6 million subscribers worldwide [39]. To create a suitable MMORPG for all users to understand on Twitter will be very difficult.

#### *Brain Teasers*

Another type of online game that could be used to engage gamers into using Twitter are brain teaser games such as Scrabble, Hangman, word search or even chess. Brain teasers have begun to be introduced onto the Internet via websites or mobile phone applications. When producing a brain teaser suitable for Twitter, the graphics aspect of the game is unnecessary. This is because brain teasers could be considered as word games such as crossword puzzles or as memory games such as remembering numbers or remembering country flags, football badges or even countries in Europe.

### Different non-computer games

Sfetcu [40] states that:

“a game is an (often, but not always recreational) activity involving one or more players. This can be defined by either a goal that the players try to reach, or some set of rules that determines what the players can or cannot do. Games are played primarily for entertainment or enjoyment, but may also serve as exercise or in an educational, simulational or psychological role”[40].

This E-Book also explains that games are divided into three different classifications. These classifications are:

- **Games of pure skill.** These include hopscotch and target shooting
- **Games of pure strategy.** These include checkers, go, or tic-tac-toe
- **Games of chance.** These include craps and snakes and ladders.

[40]

In addition to these three basic classifications, there are mixed games. Football is partly a game of skill and partly a game of strategy. Poker is partly a game of strategy and partly a game of chance. Baseball combines elements of all three classifications [40].

There are many different non-computer based games that could be interpreted onto a computer system which can be used to get gamers more interested in playing games on Twitter.

### Board Games

A board game is any game played on a board (that is any pre-marked surface) with counters or pieces that are moved across the board [40]. Simple board games are often seen as ideal ‘family entertainment’ as they can provide entertainment for all ages. Board games can be traced back to as early as 2500 B.C. Despite the fact that games were played throughout the centuries, it was not until the 20<sup>th</sup> century that board games gained popularity [41].

Monopoly is the best-selling board game in history and is available in localized versions across the world [40]. Another example of a popular board game is Risk. Risk is one of the most well-known of thousands of games attempting to simulate warfare and geo-politics. A modern example of a board game is a game called Pandemic. Pandemic is a collaborative

game in which 2-4 players share a common goal and either collectively win or lose the game [42]. The top 5 board games of 2014 according to The Independent Paper [43] are:

- Trivial Pursuit Family Edition- Trivial Pursuit has sold 100 million copies since its release in 1979.
- Dixit- Dixit offers something different. Choose one of the beautifully-illustrated cards to describe, with enough creativity that someone will get it, but not so simple that the whole table guesses.
- Scrabble Original- Scrabble is available to be played by all ages. People put words down on the board to gain points to beat members of the family.
- Electronic Battleships- The nice thing about Battleships is that it is basically chance, so even younger children can get involved.
- My Monopoly- The much-loved property trading game takes a 2014 twist: it can be personalised. Using the Monopoly app or site, users can print photos on the sticker sheets and then add them to tiles and cards.

#### *Card Games*

A card game is any game using playing cards, either traditional or game-specific. A card game is played with a pack of cards intended for that game. The pack consists of a fixed number of pieces of printed cardboard known as cards [40]. Card games are considered by many to be educational, stimulating, and exciting social activities [44]. There are numerous card games involving one or more decks of playing cards and incorporating gaming or gambling with tokens. Some of those types of card games are:

- FreeCell
- Patience
- Klondike
- Poker
- Blackjack
- Bridge
- Magic: The Gathering- This is a card game where players purchase packs of randomized cards and assemble decks used to compete against other competitors.

The first trading card game of its kind in the world, it sold more than 10 million cards in just six weeks.

- Fluxx- Fluxx is a card game that players win by meeting goals. Rules, goals, and activities constantly change based on the cards players draw and play. It is competitive and chance-based, with relatively fewer strategies [45].
- Do You Worship Cthulhu?-This is a fun party game for a group of 5-30 people to play, and the rules can be learned in less than 3 minutes. One person acts as a moderator overseeing a village of people one (or more) of which are secretly Cthulhu worshippers! The worshippers begin sacrificing other villagers one by one. Deceive friends and the users will lie through their teeth while experiencing a truly unique game [46].

[40]

#### *Word Games*

A word game or word puzzle can be of several different types: Letter arrangement games, where the goal is to form words out of given letters: Anagrams -- both a simple game of rearranging letters and a linguistic recreation of making anagrams that seem to illuminate something about the original word, such as dog for God [40]. Here is a list of some word games examples:

- Hangman
- Crossword puzzles
- Scrabble
- Boggle

#### *Dice Games*

Dice games are quite universal. Though they are clearly games of chance, for example in casino games, they are also used under the hood for interpersonal interactions [40]. Dice also appear as a random device, for example in games of status. Some of those dice games include:

- Craps
- Yahtzee

- **Zombie Dice**-Zombie dice is a press your luck dice game wrapped around a zombie theme [47].
- **Pirate Dice**- Pirate dice can be known as Liars Dice. This is where players each have five die and one dice cup. They can bid to see if the other players are lying or bluffing. A player who loses will then lose one dice [48].

#### *Educational Games*

Educational games are games, including video games of this genre, designed to teach people, typically children, about a certain subject or help them learn a skill as they play. There are many educational games. Games that parents and teachers play with children usually have some educational value. Here is short list of examples:

- **eduProfix**-This game helps children to improve their spelling and grammar while they race against friends around a track [49].
- **Zoombinis**- Zoombinis is a series of educational puzzle computer games designed suitable for children [50].
- **Pelmanism**- Pelmanism is a training system which helps people to improve the way in which the mind memorise pieces of information[51].

[40]

#### *Casino Games*

Games available in most casinos are commonly called casino games. A casino game typically provides a predictable long-term advantage to the house while offering the player the possibility of a large short-term pay-out. Casino games often offer the player the illusion of control in which the player is given choices [40]. Some examples of casino games are:

- Poker
- Roulette
- Blackjack

#### *Comparison between Facebook and Twitter game*

There are many different games that users can play on Facebook. Figure 9 shows a game called Pyramid Solitaire Saga on Facebook. This game is designed by King.com [52].

In Pyramid Solitaire Saga, the goal is to remove cards from the pyramid by matching them with the card on the deck, which has to be one higher or one lower [53]. Another game that

can be played on Facebook is Hollywood Spins shown on Figure 10. Hollywood Spins is a simple game to understand because it is similar to regular slot machines in Las Vegas. However, unlike the slot machines in Las Vegas, Hollywood Spins allows the user to put simulated money into various slot machines and earn more depending on the pattern of the slots.

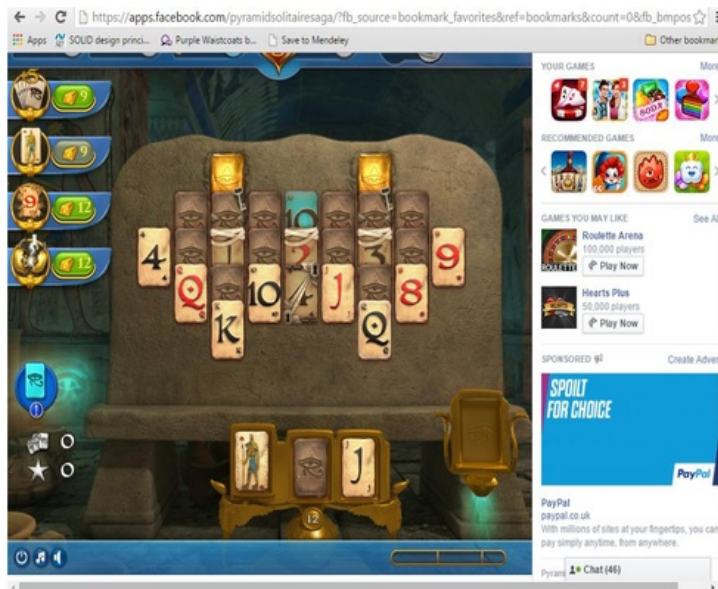


Figure 10: Pyramid Solitaire Saga (Facebook game) [84]

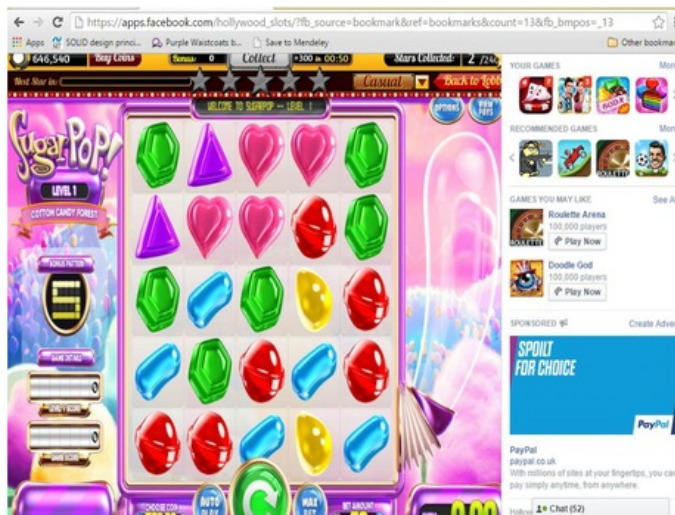


Figure 11: Hollywood Spins (Facebook game) [84]

### Current Twitter games

There are many Twitter games that have been created for users of Twitter to play. Some of these games are:

- **TwitBrain**-This is a Twitter game for math and engineering nerds. Twitbrain will post a math problem (i.e. 1 -minus- 35 +plus+ 41). The game then becomes about speed – how fast can the user calculate the answer and reply it to Twitbrain. TwitBrain can be classed as a strategic, an educational game and a puzzle game. This is because the users need to be quick to work out the sum before everyone else. Figure 12 shows how TwitBrain works.

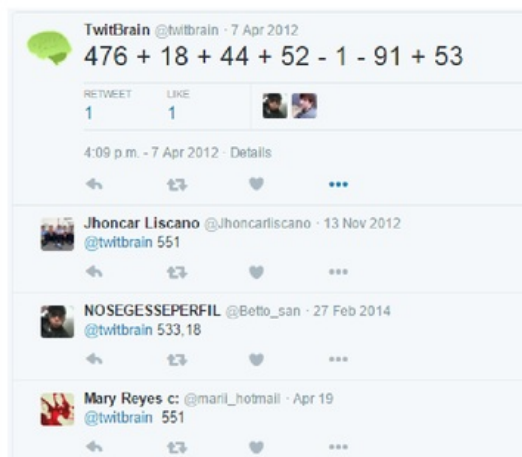


Figure 12: Example of how TwitBrain works

- **BeatMyTweet**- BeatMyTweet is similar to TwitBrain, except that instead of questions or math problems, it sends out head-scratching word scrambles every hour. BeatMyTweet can be classed as a puzzle game because users are able to unscramble a word from a tweet and give an answer. Figure 13 shows an example of a tweet that @BeatMyTweet posted to users to unscramble the word.



Figure 13: Example of how BeatMyTweet works

- Tweet140- Tweet140 will track the user's tweets to see how close to 140 characters each one comes. This game is no longer exists for users to play. Figure 14 shows the tweets by Tweet140.



Figure 14: Tweet140 tweets

- Tweefight- If a user wants to have a brawl with an enemy, do it on Tweefight. The user needs to make sure that their *TweeRank* is right up there because the game calculates that when it pits them against their arch enemy. This is a fighting type of game which can be used via Twitter tweets. Figure 15 shows users who have won on Tweefight.



Figure 15: Tweefight winners

However not many people are following these particular Twitter games. These particular Twitter games use Twitter as a platform to distribute a particular person's game [54]. This

means that Twitter is the facilitator of this games which is then connected to their server. This can be compared to Facebook games where some of the most popular games get over 50 million views and users. Figure 15 shows the most popular games on Facebook.

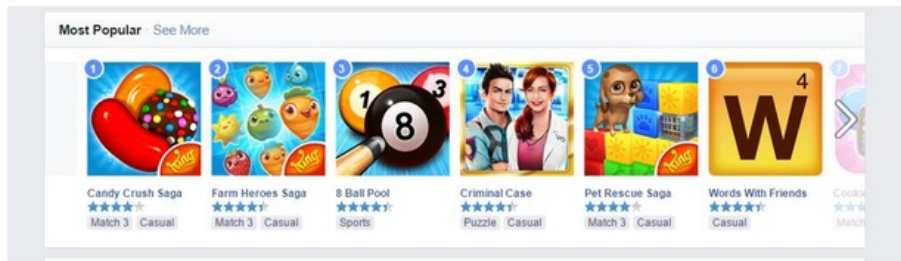


Figure 16: Most popular games on Facebook

The security aspects of gaming on Twitter are that people trying to build games on Twitter are restricted to 140 or less. Users will need to make sure that they have a secure Twitter account so that people are unable to hack the account. Also, Twitter has a number of qualified independent security researchers who volunteer their time to help spot potential issues that can affect Twitter such as hacking and any racist abuse.

#### Hashtag games

Hashtag games on Twitter can depend on the trends of hashtags on a specific occasion or day. An example of a hashtag game is that users need to explain their opinion of paradise in just four words and tweet it using the #ExplainParadiseIn4Words. Figure 16 shows a user tweeting out how they would describe their paradise in just four words.



Figure 17: #ExplainParadiseIn4Words example

### Play by Electronic Mail Games

The history of play by mail games started with the creation of Diplomacy. This has been played by mail since the 1960s, starting with a printed newsletter (a fanzine) written by John Boardman [40].

There are Play by Electronic Mail Games that can be played on the Internet. A Play by Electronic Mail Game is a kind of game where the players use electronic mail to communicate between themselves. These types of games can only be used on the internet via mail. Users are unable to use Play by Electronic Mail Games on social media sites like Facebook and Twitter. A gaming site that has created Play by Electronic Mail Games is Flying Buffalo.

Next are four example of games that Flying Buffalo have created.

### StarWeb

StarWeb is a game of 15 stellar empires clashing over 255 worlds. Everyone starts out equally, each with one home world. The object of the game is to be the first to get approximately 10,000 victory points. At the start of the game, the user is able to pick one of 6 different "character types", each of which gets victory points for different things.

- The EMPIRE BUILDER gets points for owning worlds, industry, mines, and population.
- The APOSTLE gets points for converting the population to his religion. Just by having a fleet at one of your worlds, he converts some of your population, and if he converts the entire population of the world, he captures the world without firing a shot! But if you shoot at the converted ones, he gets, even more, points for the 'martyrs'!
- The PIRATE gets points for owning fleets and for plundering worlds. He is the only player who can capture your fleets from you instead of destroying them.
- The MERCHANT gets points for carrying metal for people to their home worlds.
- The ARTIFACT COLLECTOR gets points for accumulating the various artefacts that are scattered throughout the game.
- The BERSERKER r gets points for killing thing and a bonus for destroying an entire planet!

The player can then perform each action that their character type requires.

[55]

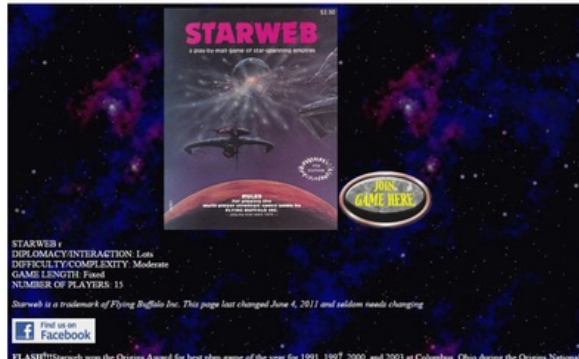


Figure 18: StarWeb Website [55]

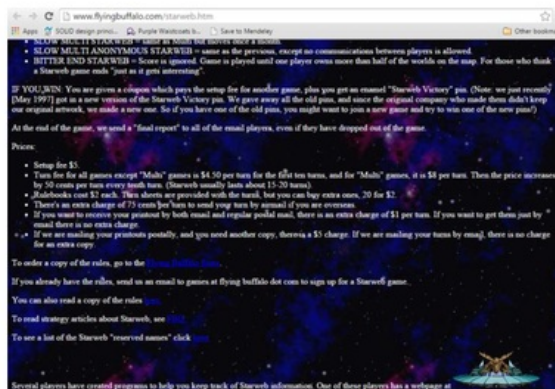


Figure 19: Price of the StarWeb game [55]

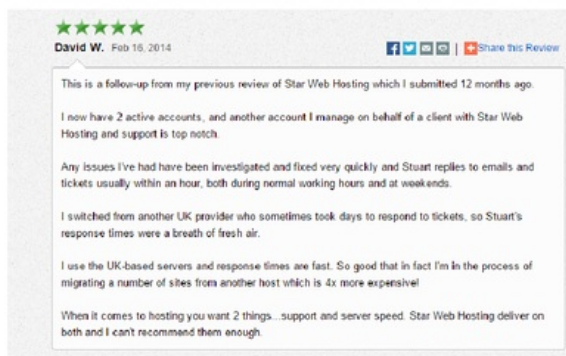


Figure 20: Review of StarWeb

## Illuminati

ILLUMINATI starts with this simple fact: ALL of the really paranoid conspiracy theories you have ever heard are true. The rules are that the users are the Illuminated Ones. These are masters of the 24 great conspiracies which are struggling for control of the Earth. Using their power, influence, and agents, the user can probe, infiltrate, and subvert, adding groups to their power structure, destroying organizations and whole nations. The user will then need to conspire with fellow Illuminati to dismember another's empire - and then move swiftly to block the knives of their friends. Only the strong will survive. Only the strongest and cleverest will reach the ultimate goal: WORLD DOMINATION. The different variants of the Illuminati play by mail game are:

- EMAIL ILLUMINATI (the "regular" game- every two weeks),
- INTERMEDIATE ILLUMINATI (only for those who have already played basic Illuminati),
- SNAIL-MAIL ILLUMINATI (moves every three weeks),
- ANONYMOUS ILLUMINATI (an intermediate game where no contact or diplomacy is allowed. Players are on their honour not to get together and cooperate).

[56]



Figure 21: Illuminati website [56]

For now, anonymous and intermediate Illuminati will be email only, every two weeks games.

Rules cost \$2. Setup fee is \$5. Turns are \$4.75 each.



Figure 22: Price of the Illuminati game [56]

### Heroic Fantasy

The rules of Heroic fantasy are that the players direct a party of up to fifteen fighters and magic users (humans, elves, dwarves, fairies, gremlins, leprechauns, hobbits, goblins, even a troll, ogre, or giant) through a dungeon maze killing monsters, gathering treasure, and hunting for magical prizes. The players will also get to decide what kind of adventuring party they want to go with. The maximized constitution and strength would be a party of five human magic users and five human fighters. This game has been extensively play-tested and has been running since 1982 [57].

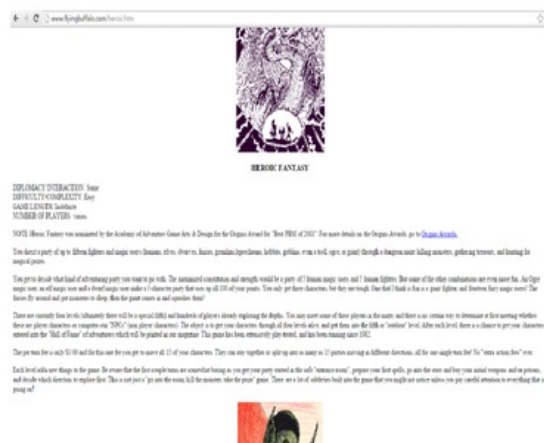


Figure 23: Heroic Fantasy Website [57]



Figure 24: Review of Heroic Fantasy [58]

### Feudal Lords

The Play by Mail Game Feudal Lords simulates the struggle for kingship in a mythical period of English history. Feudal Lords allows between 8 and 17 players to play it where each of them are representing the head of one of the more active noble families, vying for the throne which has been left vacant by the death of King Arthur. Players must feed their peasants, tax townsmen, train and pay knights, hire mercenaries, buy and sell livestock, improve their castles, dabble in foreign trade, and go on military campaigns. They may conquer neighbouring fiefs, forcing them to swear fealty to another player. Names and addresses of all players are given at the start of the game for easier diplomacy. The object of the game is to get a minimum number of other fiefs to swear fealty to the user (at the same time) by force of arms, persuasion, or bribery. When that happens, the user can become king and win the game [59].



FEUDAL LORDS

DIPLOMACY/INTERACTION: Lots  
DIFFICULTY/COMPLEXITY: Easy  
GAME LENGTH: Fixed  
NUMBER OF PLAYERS: 8 to 17

Designed by John Van De Graaf, this game simulates the struggle for kingship in a mythical period of English history. Up to seventeen players, each representing the head of one of the more active noble families, vie for the throne which has been left vacant by the death of King Arthur. Only by building both economic and military strength can one prove himself worthy of the mantle of King (or Queen).

Players must feed their peasants, tax townsmen, train and pay knights, hire mercenaries, buy & sell livestock, improve their castles, dabble in foreign trade, and go on military campaigns. They may conquer neighboring fiefs, forcing them to swear fealty to another player. Names & addresses of all players are given at the start of the game for easier diplomacy.

The object of the game is to get a minimum number of other fiefs to swear fealty to you (at the same time) by force of arms, persuasion, or bribery. When that happens, you become king and have won.



VARIANTS AVAILABLE:

Figure 25: Feudal Lords Website [59]

## Algorithms of Games

### *What makes a good game?*

Bond [60] says that the most important features that make a good game are:

- **Gameplay**-The way in which gameplay is good is that it ensures that the gamer finds it easy to play through a campaign mission. For experienced gamers, the gameplay needs to be hard to master. Games need good gameplay because it can set gamers with suitable objectives to complete and also give them the freedom to roam around the map of the game.
- **Game Environment**- An interactive and colourful gaming environment will be needed to make a good game; this will enable gamers to view eye-catching scenery, good music, and good sound effects when swords clash together or when a character dies.
- **Game Storytelling**- Good storytelling will mean that the game will be progressive, tense and will be embedding into the gameplay.
- **User and Social Interaction**- Good user interaction will allow gamers to give constructive or critical feedback on the game and will enable the game to become more realistic. To achieve good social interactions, the game will need to include good online co-op competition and the game should have the ability for gamers to share their achievements to with their friends via their console.
- **Price**- The price of a good game will need to make gamers think is this game value for the money. This will include a combination of good gameplay, graphics, and the gaming environment.
- **Prior Franchise**- A good game needs to be designed in an established genre, for example a FPS (First Person Shooter) game.

### *What makes a good board game?*

A good board game such as Monopoly has become a tradition for many families up and down the United Kingdom. Monopoly has been classed as a good board game because it is simple to understand, people of all ages can play it, and the whole family can have a laugh and enjoy moving pieces (e.g. dog, hat, etc.) around the board and buying houses as they go round. Figure 18 shows an example of a Monopoly board:



Figure 26: Monopoly board game

However, Monopoly can also be classed as a bad board game. One reason why Monopoly is a bad board game is because it takes too long to finish the game. Another reason is that it can lead to arguments between the families on which piece they want to be. Also, some people may bend the rules for example people collecting rent for a property while in jail.

#### *What makes a game playable on Twitter?*

There are not many games that can be played on Twitter. A game that is playable on Twitter must be restricted to 140 characters or less. A game on Twitter also cannot be too difficult to build; otherwise, players will be unable to understand how to combine the game with the hashtag #twittergames. Gamers that are interested in playing games on Twitter need those games to have some visual effects and the similar concepts to games such as hangman or chess. Gamers need visual effects when on Twitter as it will keep their interests and enthusiasm otherwise they might as well go to paper-based versions and move on from Twitter.

#### *Can graphics be used on Twitter?*

Graphics will be very difficult to produce on Twitter and then combine those graphics with a suitable game that can use the hashtag #twittergames. Regarding console gaming, according to Wiemer-Hastings [61] three-dimensional (3D) graphics are starting to become popular with gamers on consoles. However, 3D graphics would not be suitable to produce a text-based game on Twitter to enable people to communicate with their friends while playing the game.

### *Turn-based games*

A turn-based game is a strategy game where players can take turns when playing. This is different to real-time games where all of the players will play a game simultaneously. The most popular PC turn-based strategy game from MetaCritic.com [62] in terms of users giving the games a score out of 10 is Sid Meier's Alpha Centauri, which was released in February 1999. The games average user score is 9.2. Sid Meier's Alpha Centauri is a strategy game which has the most addictive and compelling gameplay [63]. However, the least popular turn-based strategy game according to MetaCritic.com [62] in terms of user score is Warhammer Quest. This is because users have been saying or complaining that they have to pay for the privilege to complete the game or improve their character [64]. However, there are many non-highly graphical turn based games. These can include any board, card and puzzle games. This is because these types of games can have more than one player taking in turns to perform an action.

## 4.0 Research Methodology

This chapter will give an explanation of the main philosophy, approach and the three strategies needed to decide on a research methodology suitable for design games on Twitter.

### Philosophy

The main philosophy that will be used within the research methodology is Positivism. This is because Positivism is where knowledge has been based on observations or experience of a real-time phenomenon in the real world. This means that using the experience of having a Twitter account and a large amount of followers will enable users to give opinions on whether there needs to be suitable games for people to play on Twitter.

### Advantages

An advantage of using a positivism philosophy for a major project about Twitter Games is that it can rely on using or collecting quantitative data. Quantitative data is considered to be more specific in its methods compared to collecting qualitative data [65].

Another advantage of using a positivism philosophy is that it can help for a wide coverage of many different situations [66]. However, there are disadvantages of using a positive philosophy in a research or major project.

### Disadvantages

One disadvantage of using a positivism philosophy is that it can be inflexible at times. This is due to the philosophy of producing measurements and calculations which may also disregard an unexplained phenomena [66]. This might affect the project because lots of calculations and measurements about how a Twitter game is suitable for users need to be collected within a short period of time. This will lead to the project being too complex.

### Approach

The suitable approach that is needed to be used within the research methodology for designing a game on Twitter using an algorithm is a deductive approach.

A deductive approach involves developing a theory and hypothesis, and designing a research strategy to test that hypothesis. An example of this is trying to build or create a game suitable on Twitter that is more reliable than the current games.

Using the deduction approach will involve the collection of quantitative data. An example of quantitative data for a project about Twitter games is to collect data about how many users on Twitter have played or followed a person who has created a Twitter game. This will then be compared to the large number of Facebook users who have play one of their games. Twitter users could also rate the games designed suitable for them similar to how games are rated by Facebook users.

#### Advantages

A reason why a deductive approach is being used is because it is a highly structured approach. An advantage of using a deductive approach is that it is time saving [67]. Another advantage of using a deductive approach is that it will allow for more time for practice and application [68]. This means that it enables to the ability to focus more on coding or producing a suitable game that can be played on Twitter. Also a deductive approach can be classed as a powerful method. This means that it is a powerful method of analysis for deducing conclusions from certain facts [69]. Using a deductive approach can been the better approach to learn compared to an inductive approach.

#### Disadvantages

However, a disadvantage of using a deductive approach is that it also does not emphasize reasoning and problem solving [70]. This problem can be avoided by the project not using problem solving and by getting feedback or input from Twitter users to explain what game is suitable for them on Twitter.

#### Strategies

The direction of the research process, as well as the process by which the research is conducted, is defined by the projects research strategy. Different research aims require different data collection methods; therefore, require different research strategies [71].

#### Document Review

A document review will be one of main strategy being used which is known as the literature review.

An advantage of writing a literature review is that it can contain spontaneous data [72]. This means that the data, which has been collected or gathered, may surprise a few people; this can be due to how in-depth the research about a specific topic is.

However, a disadvantage of designing and producing a literature review is that it is time consuming. This is because if a suitable literature review needs to be produced there needs to be a lot of research and background of a specific topic done including suitable references [72].

#### Software Development

The other strategy that will be used is software development. An advantage of using software development as a research strategy is that it puts more focus on the users who will be playing the Twitter game. By focusing on the needs of real users, each feature of the Twitter game incrementally delivers value, not just an IT component [73]. This strategy involves developing novel software and testing that it works effectively. An example is that a Twitter game designed using an algorithm will be tested to see if it is suitable for Twitter users and feedback will be given if it is tested on the Twitter website.

#### Experiment

The final strategy that will be used in this project is experiment. This means that Twitter users or follower will be able to experiment with the Twitter game and give any feedback or recommendations to improve it to suit their user requirements. Within the experiment strategy, a questionnaire will be designed to be given to users on Twitter who play the games using #twittergames. The estimated amount of responses that are needed to improve the game is approximately 30. The questionnaire will then lead to the games being publicised on Twitter to enable other users to play it. An advantage of using experiments as a research strategy is that it will lead to clear cut conclusions. This means that, within the project, the success or failure of the effects when analysing data can be cleared examined and understood [74]. However, a disadvantage of using experiments is that it is largely subject to human error. This means that any form of error, whether a systematic (error with the experiment) or random error (uncontrolled or unpredictable), or human errors such as revealing who the control group is, can all completely destroy the validity of the experiment [74].

### Successful project

For the project to be successful, a test server needs to be created to test to see if the game is suitable and works. A test server will enable users to play a “beta” of the game and to give feedback on it. The project will be successful if the feedback of Twitter users is positive and explaining that there are no more improvements to the game that could be made.

### Risks to the Project

There can be many risks to this project. One risk is that the Twitter’s API or server may be shut down for maintenance. This means that if a game which uses #twittergames on the Twitter servers will be affected. This will lead to users being unable to access or play the game. This risk can be avoided by using a separate server to the Twitter server to enable users to play the game. Another risk that can occur in this project is that the game being designed incorporated within the Twitter server may not be suitable of Twitter users. This will then lead to users being tempted towards playing Facebook game because many people enjoy playing those particular games rather than playing a standard chess game on Twitter.

## 5.0 Development Methodology

This section will give a detailed explanation of Feature Driven Development. This will include a definition, an explanation showing how Feature driven development works and the advantages and disadvantages. There is also an explanation of the software and API needed to design a suitable game on Twitter.

### Feature Driven Development

This part of the document gives an explanation of what is Feature Driven Development and the way in which it works. Also there are advantages and disadvantages of using Feature Driven Development in accordance with a major project.

#### What it is?

Feature Driven Development is an agile software development methodology by Jeff De Luca and Peter Code [75].

Feature-Driven Development (FDD) is a client-centric, architecture-centric and pragmatic software process [76].

Feature driven development revolves around quick development cycles and provides businesses with feature-rich systems because they are constantly developing [77].

The Feature Driven Development approach focuses on the software feature of the system. They are the main driver of the entire development process. It differs significantly from the other agile processes because they put a strong emphasis on planning and upfront design [78].

Within Feature Driven Development, designing and construction merge together [79].

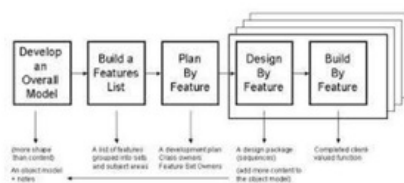
#### What does it do?

There are five processes that are used within the Feature Driven Development methodology. These are:

- Develop an Overall Model-This means to describe key abstractions and their relationships in a system.
- Build a Features List- This process of Feature Driven Development enables people to obtain users' requirements and build suitable lists of features, feature-sets and subject-areas.

- Plan By Feature- This means to obtain an estimate time intensities of feature-sets and features.
- Design By Feature-This process within Feature Driven Development is to enable users to design sequence diagrams and another models and describe interfaces and declarations for classes and methods.
- Build By Feature-The final process within Feature Driven Development will tell the user that they need to implement and integrate new classes, their parts or their modification.

[80]



### Advantages

There are many advantages of using the Feature Driven Development methodology. Some of those advantages are:

- Semi-adaptable planning framework within a major project-This is good for a major project because it is easy to go through, step to step, the five main process of Feature Driven Development.
- Supports iterative development cycles-Within a major project, there will a few iterative development cycles. This is because there will be a user requirement that will needed to be researched, implemented and then tested. For example, a functional user requirements saying that the game must have instructions. This will lead to research into how to display instructions whilst the user is playing the game on Twitter. The coding for displaying instructions will then be implemented and tested leading to feedback from the users.
- Supports code reviews and inspections
- All aspects of a project tracked by a feature
- Offers well defined progress tracking and reporting capabilities

[81],[82]

### Disadvantages

There are many disadvantages of using Feature Driven Development. Some disadvantages are:

- Traditional requirements model-This means that the requirements model that will be designed within the major project using Feature Driven Development would be too simple. However, this can be classed as an advantage for a major project. This is because the requirements need to be simple to understand and implemented to ensure that the game is suitable for users to play on Twitter.
- Few customer interactions and automation-This disadvantage will not be suitable for a major project. This is because customer or user interactions is needed to be able to give constructive feedback on any improvements to the game that is designed for Twitter.

### Software

This part of the document will explain the preferred programming that will be used during the project to design suitable games for users on Twitter.

### Programming language

The preferred programming language that is suitable a game on Twitter is C#. This is because it will then connect to a database using ASP.NET and SQL to save the scores of the players or users playing the games on Twitter.

## 6.0 Design and Implementation

### Design

#### Requirements list

Below is a requirements list, including a key, that is needed to complete the project without any problems.

|      |           |             |          |            |
|------|-----------|-------------|----------|------------|
| Key: | Usability | Performance | Features | Processing |
|------|-----------|-------------|----------|------------|

#### Functional Requirements

| MUST                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  The database combined with the game must hold Twitter users scores efficiently and safely |
|  The database must ensure that all data is validated                                       |
|  The system must look for messages on the Twitter feed                                     |
|  The system must receive tweets from Twitter                                               |
|  The system must recognise the player from a tweet                                         |
|  The system must be able to tweet (send messages on Twitter)                               |
|  The system must record the position of each ship on the board                             |
|  The system must extract the position information from a tweet                             |
|  The system must compare the position extracted from the tweet with the board              |
|  The system must check for hit or miss                                                     |
|  The system must set up the ships on the board                                            |
|  The system must record hits on ships                                                    |
|  The system must tweet if ship has sunk                                                  |
|  The system must tweet when the player wins or loses                                     |
|  The system must play battleships                                                        |
|  The database must be secure with the use of a username and password                     |
|  The system must generate a "Battleships" board                                          |
|  The database must be able to hold a high volume of Twitter users' scores                |
|  The game must be able to be played for certain periods of time                          |

Table 2-Functional Must Requirements

| SHOULD                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  The game should run on any windows format but several versions should be consider e.g. XP, Vista, Windows 7 and 8 |
|  The game must include an instruction section for Twitter users                                                    |
|  The user manual for the games must be available for Twitter users                                                 |

Table 3: Functional Should Requirements

| COULD                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  The database could store the highest score from each of the games played on Twitter |

Table 4: Functional Could Requirements

|                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------|
| WON'T                                                                                                                                            |
|  The game will not be personalised to any specific Twitter user |

*Table 5: Functional Won't Requirements*

### Non-Functional Requirements

| MUST                                                                              |                                              |
|-----------------------------------------------------------------------------------|----------------------------------------------|
|  | The game must be easy to understand and play |
|                                                                                   |                                              |

Table 6: Non-Functional Must Requirements

| SHOULD                                                                            |                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|  | The game should take a minimum of 10 seconds to load                      |
|  | The game should have consistent colour or fonts to suit the Twitter users |
|  | The game should have a user friendly interface for Twitter users          |

Table 7: Non-Functional Should Requirements

| COULD                                                                             |                                    |
|-----------------------------------------------------------------------------------|------------------------------------|
|  | The game could be self-explanatory |

Table 8: Non-Functional Could Requirements

## Implementation

Time box 1

Date – 7<sup>th</sup> February 2016

Duration – 4 Days

Completion Date – 11<sup>th</sup> February

## Features

- Create a new Twitter account called Battleships
- Send out a tweet
- Receive a tweet from a Twitter user

## Design and Implementation

Use Case Description

|                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use Case Name: Sending and receiving tweets using #BattleTweet                                                                                                                                                                                       |
| Stakeholders & Interests: Twitter users                                                                                                                                                                                                              |
| Brief description: The Battleship's Twitter account will receive and send tweets via the Twitter feed                                                                                                                                                |
| Trigger: The Battleship account will send a tweet via Twitter                                                                                                                                                                                        |
| Normal flow of events: <ol style="list-style-type: none"><li>1. Setup an Twitter account for Battleship</li><li>2. The account will look for the Twitter feed</li><li>3. The account will then send a twitter so that followers can see it</li></ol> |
| Sub-flows:<br>S-1 <ol style="list-style-type: none"><li>1. The account will need a username and password to access it</li><li>2. The account will need to follow suitable Twitter users</li></ol>                                                    |
| Alternative / Exceptional flow of events:<br>S-1a: <ol style="list-style-type: none"><li>1. The email address, username and password could already be stored on Twitter's database</li></ol>                                                         |

Table 9: Use case description for sending and receiving tweets

### Use case Diagram

Figure 1 below shows how the Battleship systems' Twitter account will send and receive tweets from Twitter users.

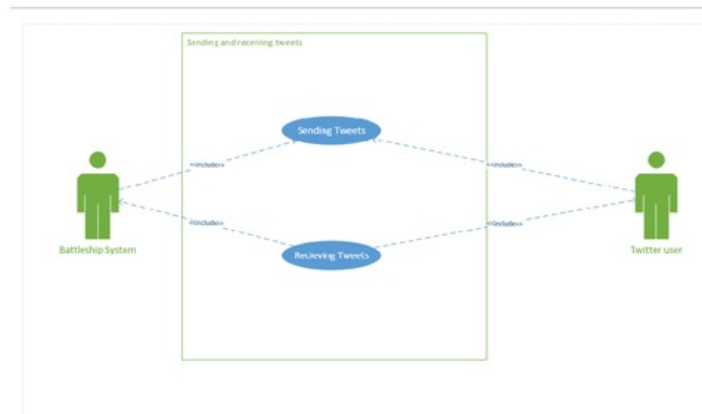


Figure 27: Use case to show sending and receiving tweets

To be able to create a suitable account for the system on Twitter, the username that the system needs to communicate with Twitter should not be the same as a username that is already on Twitter's database. The system will also need to have suitable followers to be able to spread the word of Twitter users wanting to play battleships on Twitter. Figure 2 shows the account details that the Battleship has to be able to access the Twitter feed.

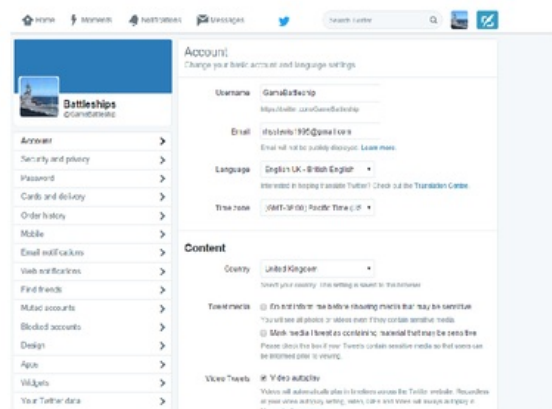


Figure 27: Twitter account details for the Battleships system

Once a Twitter account has been created, the system is able to send out a tweet using the Twitter feed. Figure 3 shows the system sending a specific tweet on the Twitter feed to

encourage Twitter followers to tweet back if they want to play Battleships using the #BattleTweet.

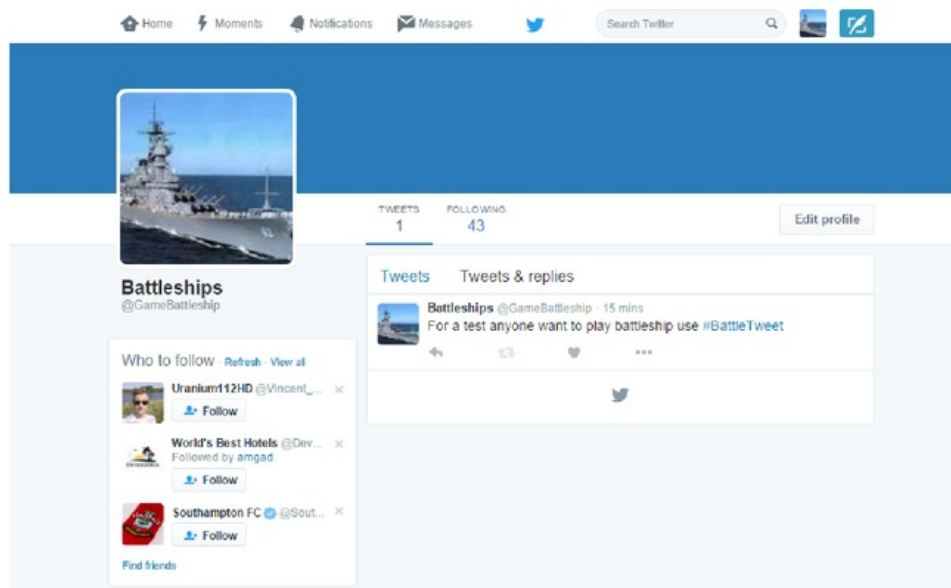


Figure 28: The Battleship system sending a tweet on Twitter

### Testing

| Task ID | Task Name                                                                | Days expected | Actual Days | Planned Results                                                                                                                          | Actual Results                                                                                                                          | Problems                                                                                                                                                                               | Comments |
|---------|--------------------------------------------------------------------------|---------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1       | Battleship Twitter account sending a tweet on Twitter                    | 1 day         | 1 day       | The Battleship Twitter account should be able to send a tweet on Twitter for users to tweet if they want a game of battleships           | The Battleship Twitter account is able to send a tweet on Twitter                                                                       | N/A                                                                                                                                                                                    | N/A      |
| 2       | Battleship Twitter account looking on the Twitter feed with #BattleTweet | 1 day         | 1 day       | The Battleship Twitter account will look for the #BattleTweet                                                                            | The Battleship Twitter account does look specifically for #BattleTweet                                                                  | N/A                                                                                                                                                                                    | N/A      |
| 3       | Battleship Twitter account receiving tweets on Twitter                   | 1 day         | 2-3 days    | The Battleship Twitter account will have a mention in a tweet from a Twitter follower with #BattleTweet wanting them to play Battleships | The Battleship Twitter account does get mentioned in a tweet from a Twitter follower with #BattleTweet wanting them to play Battleships | The Twitter followers or user are unable to see the tweet because the Twitter feed may go too fast for some user so they be unable to retweet or reply to the tweet sent by the system | N/A      |

#### *Evaluation*

All tasks were completed within the given period of time. However, there was one task that took longer than the others. This is the first time box of the project which means that there is expected to be some margin for error within the time box. This will lead to the completion time for one task extended and make sure it does not affected any other forthcoming task during the next time box.

During the process of creating a suitable Twitter account for the Battleship system, the step through to make a Twitter account is simple and easy to do. The complication is when the username that could be used for the Battleship system is the same as one on the Twitter database already then it cannot be used so the username will be to be changed.

During the process of the Battleship system receiving and sending tweets, sending tweets to be posted on the Twitter feed to simple. However, the complication is when the Battleship is trying to receive and look for tweets with the #BattleTweet. The Twitter users, who are able to follow the Battleship Twitter account, will find it difficult to easily find the tweet that has posted by the Battleship systems' Twitter account and reply using #BattleTweet to test if the user wanted to play Battleships.

#### *Requirements Completed*

- The system must be able to tweet (send messages on Twitter)
- The system must receive tweets from Twitter
- The system must look for messages on the Twitter feed

## Time box 2

Date – 15<sup>th</sup> February 2016

Duration – 34 Days

Completion Date – 20<sup>th</sup> March

### Features

- Build the service host for the Battleship Game
- Receive a tweet from a Twitter user
- The service host looks for #BattleTweet

### Design and Implementation

#### Use Case Description

|                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use Case Name: Building a service host for the Battleship Game                                                                                                                                                                                                                                                                                                                                                      |
| Stakeholders & Interests: Twitter users                                                                                                                                                                                                                                                                                                                                                                             |
| Brief description: The service host will communicate with the Twitter feed to check for #BattleTweet                                                                                                                                                                                                                                                                                                                |
| Trigger: When a Twitter user tweets using #BattleTweet                                                                                                                                                                                                                                                                                                                                                              |
| Normal flow of events: <ol style="list-style-type: none"><li>4. Design or setup an appropriate service host to contain the Battleship Game</li><li>5. The service host will look for the Twitter feed</li><li>6. A user will tweet out that they want to play using #Battleship</li><li>7. The Battleships Twitter will send a tweet saying the game is loading</li><li>8. The Battleship game will start</li></ol> |
| Sub-flows:<br>S-1 <ol style="list-style-type: none"><li>3. The service will need to be secure to only allow users on Twitter who tweet with #BattleTweet</li></ol>                                                                                                                                                                                                                                                  |
| Alternative / Exceptional flow of events:<br>S-1a: <ol style="list-style-type: none"><li>2. The user can only play the battleship game once. This will means the service host needs to check the username of the Twitter user so that they can only play the game once.</li></ol>                                                                                                                                   |

Table 10: Use case description for the system

### Use case Diagram

Figure 1 below shows how the service host will be able to communicate via the Battleships Twitter account to the Twitter user. The diagram also explains what happens when the user sends out a tweet saying they want to play Battleships.

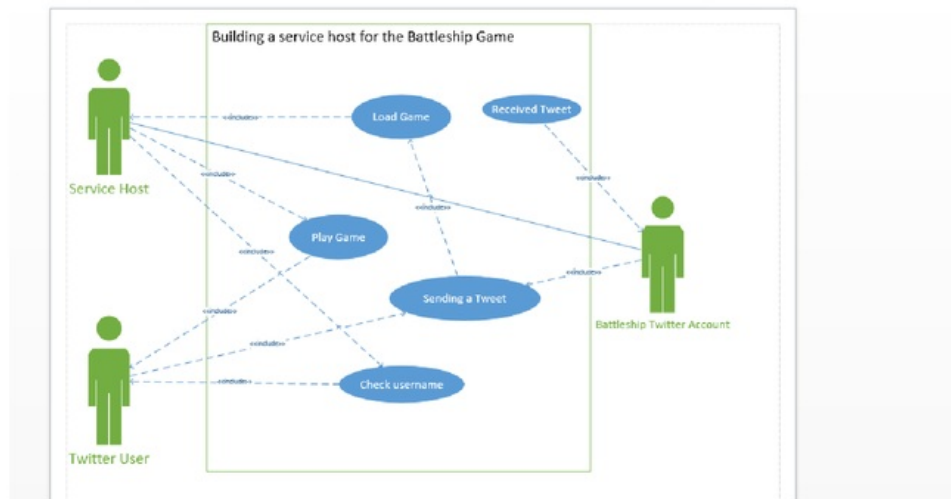
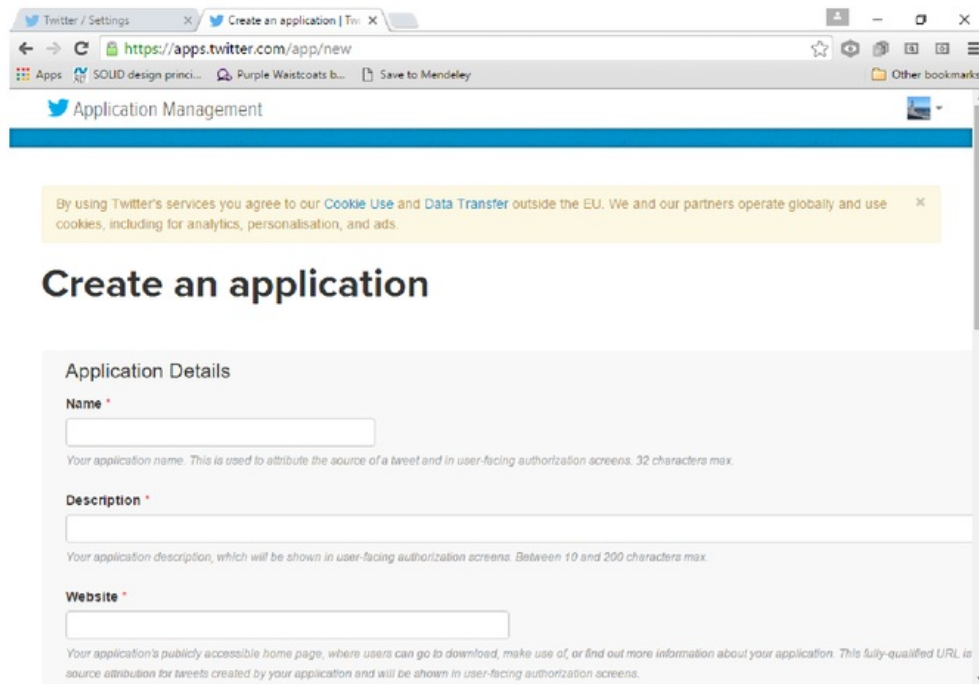


Figure 29: Use case Diagram for the service host

To design and setup a suitable service host for the Battleship Game, the use of a specific programming language will be needed. The programming language that is being used is C# including ASP.NET using the software WAMP. The way in which the web service host is designed will get complex when it then has to communicate with the Twitter feed and check for #BattleTweet. However, to enable the system to communicate with the Twitter feed, an application needs to be created within Twitter's API. This will be useful because the ability to connect with Twitter is difficult so a set of keys and token need to be initialised or created such that the code with a C# application can communicate with Twitter feed. Figure 30 shows a template of how to create an application within the Twitter API. Figure 31 shows the template being filled suitable for a BattleshipTweet application. Figure 32 shows that the application has been created and it can use or access some Twitter APIs.



Twitter / Settings X Create an application | Twitter X

https://apps.twitter.com/app/new

Apps SQUID design princi... Purple Waistcoats b... Save to Mendeley Other bookmarks

Application Management

By using Twitter's services you agree to our [Cookie Use](#) and [Data Transfer](#) outside the EU. We and our partners operate globally and use cookies, including for analytics, personalisation, and ads.

## Create an application

### Application Details

**Name \***

Your application name. This is used to attribute the source of a tweet and in user-facing authorization screens. 32 characters max.

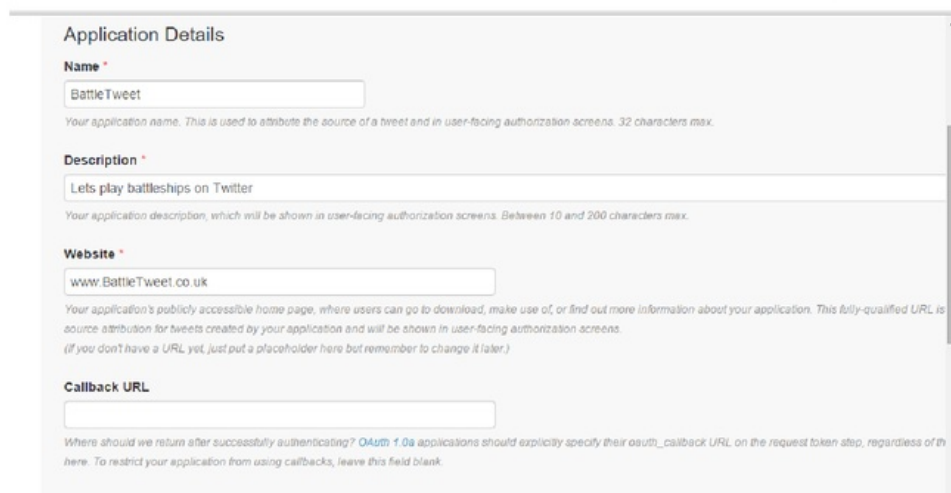
**Description \***

Your application description, which will be shown in user-facing authorization screens. Between 10 and 200 characters max.

**Website \***

Your application's publicly accessible home page, where users can go to download, make use of, or find out more information about your application. This fully-qualified URL is source attribution for tweets created by your application and will be shown in user-facing authorization screens.

Figure 30: Template of Twitter API creation of an application



### Application Details

**Name \***

Your application name. This is used to attribute the source of a tweet and in user-facing authorization screens. 32 characters max.

**Description \***

Your application description, which will be shown in user-facing authorization screens. Between 10 and 200 characters max.

**Website \***

Your application's publicly accessible home page, where users can go to download, make use of, or find out more information about your application. This fully-qualified URL is source attribution for tweets created by your application and will be shown in user-facing authorization screens. (If you don't have a URL yet, just put a placeholder here but remember to change it later.)

**Callback URL**

Where should we return after successfully authenticating? OAuth 1.0a applications should explicitly specify their oauth\_callback URL on the request token step, regardless of the here. To restrict your application from using callbacks, leave this field blank.

Figure 31: Template filled with BattleshipTweet details

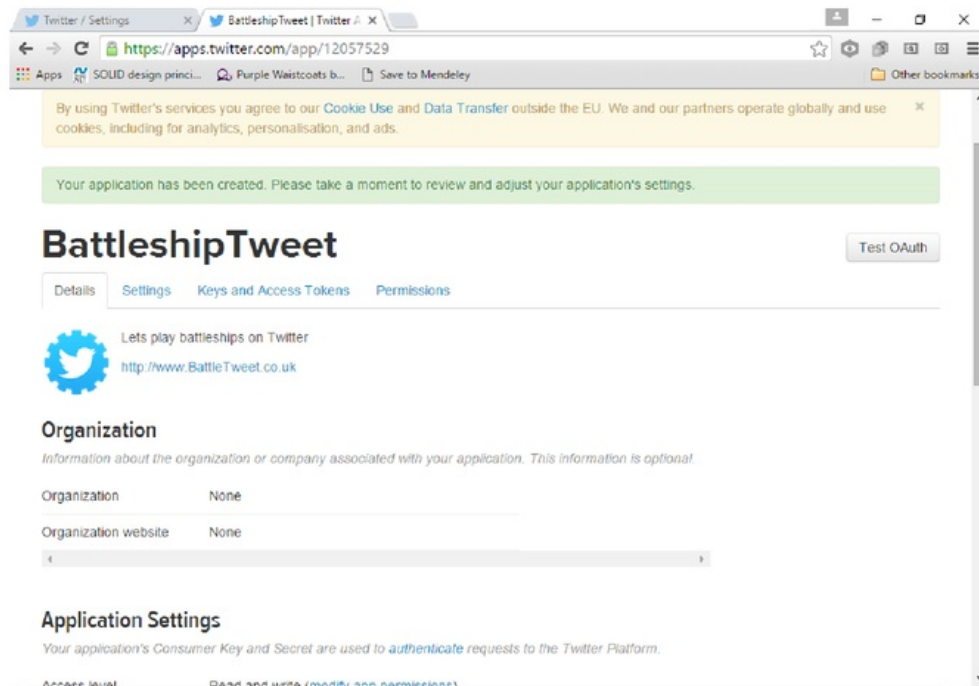


Figure 32: Application for BattleshipTweet has been created

When the application has been created to enable it to communicate with Twitter, a consumer key and its secret key needs to be assigned to the application. Figure 33 shows the consumer key and its secret key belonging to the owner which is the application itself and its ID.

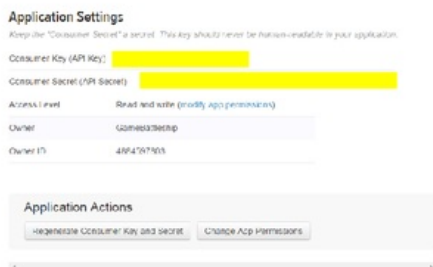


Figure 33: Consumer key and secret key

Along with the consumer key and its secret, an access token key and its secret key need to be create and then assigned to the application. Figure 34 shows the layout within the application of the access token and its secret token.



The next step is to code the system using the consumer key and access token alongside its secret keys or tokens. The first class that has been designed is a Tweet class within Microsoft Visual Studio using the programming language C#. Attributes needed to be created first which will enable other classes to use them via the Model namespace used to access the methods or attributes needed. Figure 35 shows the Tweet class which contains all the attributes and methods necessary.



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TwitterComparer class which has been designed in C#. Figure 36 also shows the TwitterComparer class implementing the interface called IComparer.

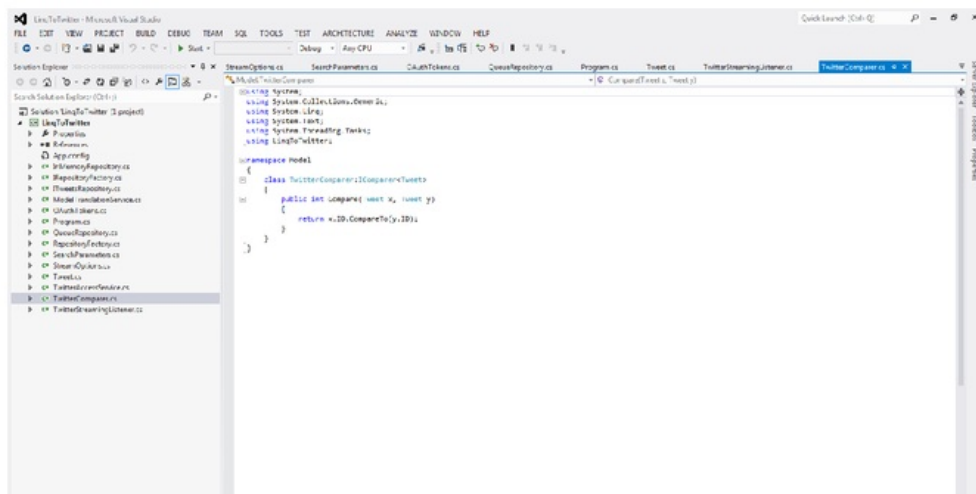


Figure 36: The TwitterComparer class in C#

A repository can also be created using C# which can contain other classes using the Repository namespace. The Repository namespace will contain some interfaces, one of those interfaces is called ITweetsRepository. This particular interface has the ability to add a new tweet with the attribute of status, delete a tweet using the ID from the Tweet class and clearing the tweet using the method of Clear(). The interface also will contain a range of Tweets using a List which will include the attribute of count classed as an integer and the Tweet ID classed as a decimal. Figure 37 shows the ITweetsRepository code which all the relevant methods in C#.

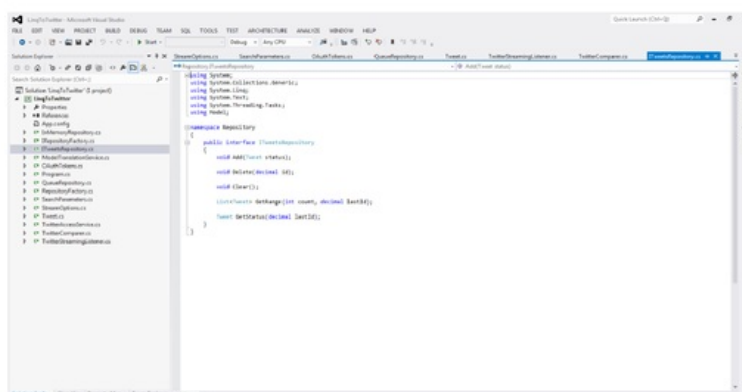


Figure 37: ITweetsRepository interface in C#

### Testing

| Task ID | Task Name                                                   | Days expected | Actual Days | Planned Results                                                                        | Actual Results                                                                                           | Problems                                                                                                                                                     | Comments |
|---------|-------------------------------------------------------------|---------------|-------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1       | Building the service host to play Battleships               | 14 days       | 20 days     | A service host will be functional and it will be able to play Battleships              | A service host is not functional meaning that it is unable to play Battleships for Twitter users to play | The code to build the service host or application is very difficult and it will take longer to learn how the code works and how it communicates with Twitter | N/A      |
| 2       | Service host will recognise the Twitter user from the tweet | 5 days        | 9 days      | The service host should recognise the Twitter user's username or identity from a tweet | The service is unable yet to recognise the Twitter user from a tweet                                     | The service cannot recognise the Twitter user because the code is incomplete                                                                                 | N/A      |
| 3       | Service host looks out for #BattleTweet                     | 2 days        | 5 days      | The service host or system would look out for #BattleTweet                             | The system is not ready to look out for #BattleTweet                                                     | The problem is that the system is incomplete meaning that it does not have the ability to look out for a specific hashtag                                    | N/A      |

### Discussion

There were many avenues to try and fix the problem of building the code to communicate with Twitter. First option has to check GitHub to find a programmer who has built LinqToTwitter using Microsoft Visual Studio C#. There were two separate programmer who have built LinqToTwitter, they are Joe Mayo (<https://github.com/JoeMayo/LinqToTwitter>) and Mirco Bauer (<https://github.com/meebey> and <https://github.com/Twitterizer/Twitterizer>). Using code from both of this programmers helped, however none of the code worked when implementing it in visual studio. On the next page is the battleship game working in a console application in C#.



#### *Evaluation*

Most, if not all, of the tasks within this time box had to be extended for a considerable period of time. This can become a major problem because this is a portion of the project that is the most important. The system, at the moment, is unable to communicate completely with Twitters' API. This is due the large amount of code that is required to enable this specific system to communicate with the Twitter API. The coding will need to include the details of a tweet or Twitter user information, the specific access and consumer tokens or keys needed to access the Twitter API via an application created within Twitter. The code necessary for a good system to communicate with Twitter is massive due the amount of classes and/or interfaces that need to access each other's methods or attributes using different namespaces. Also after completion of those classes and interfaces, they all then need to be combined together into the main program to ensure that it can be executed at runtime.

The tasks of the service host or system being able to communicate with Twitter whilst look for a specific hashtag cannot be started or undertaken. This is due to the fact that the code needs to be completed and the code will then be debugged correctly without any errors.

#### *Requirements On-going*

- The system must recognise the player from a tweet
- The system must play battleships

## 7.0 Evaluation

This evaluation section will entitle any conclusions that have drawn up during the project, if the data collected backs up the research done and if the aims and objectives have been meet.

The conclusion that have been drawn up is that it is difficult to design and successful build a text-based game using Microsoft C# within Twitter's API. The code to create the Battleship game is simple to understand however, the code to communicate successful to both the Twitter's API and the Twitter account for Battleships is complicated to build and understand.

The data that has been collected has backed up the research in the literature review because it shows that it is difficult to create a suitable game for Twitter users to play on Twitter compared to Facebook.

The one of the three objectives of the project has been met. This objective is investigate the background of gaming on Twitter. This objective has been met because large amount of research to find any background information showing if there are any games on Twitter and if they are good or not. The other two objectives have not been meet which are to create and test a game on Twitter and to receive constructive feedback from users to improve the game.

The main aim of the project has not been met. This is because not all of the objectives connecting to the main aim have not been met either.

The answers that have been collected were what was expected from the questions or aims at the start of the project. The main question that has been answered is "Is it suitable to build a text-based game on Twitter". The answer was that it is not straight forward to design a suitable text-based game for all Twitter users using #BattleTweet. From the literature review, it says that Twitter games need to use Twitter as a platform to distribute a particular person's game so that their Twitter followers can play it [54]. Another question that needed answering is can the game be advertising on Twitter because, according to the literature review, Twitter enables companies from all sections of the selling and purchasing environment the ability to advertise their products or company within 140 characters on

their Twitter account [19]. The answer is that the game has not currently being advertised for all Twitter users to play the game.

If the project was done again, the differences would be to try and simplify the layout of the coding and ensure that it does not become too complicated. This will then lead time running out without completing the code fully.

## 8.0 Conclusion and Recommendations

This conclusion will include a summary of everything that has been done and suggestions to any further avenues for research.

The literature review covered the history and background of Twitter which include how it works and the different uses of Twitter. The literature review also covered the types of online and non-online gaming and also ways that make a game good.

Research methodology explained the philosophy, including advantages and disadvantages, the suitable approach for the project which also includes advantages and disadvantages. The final thing that the research methodology section explained was the risks of the project and what the project a success.

Development methodology section explained the development methodology which has been used throughout the project which is Feature Driven Development. Within this section, there was an in-depth analysis of what is Feature Driven Development, how it works and the advantages and disadvantages of the development methodology.

The design and implementation section of this report has detailed the designs that have been followed during the project i.e. requirements lists and a suitable Gantt chart to show progress through the project. The implementation part shows the time boxes that are completed or on-going in the project using the Feature Driven Development methodology.

The avenue for further research that has been suggested for this project to progress is to research a suitable user documentation that can help to improve how the system can link more effectively with Twitter's API. Another avenue that can be undertaken is to try and figure out how to in cooperate leaderboards into the battleships game so that Twitter users can tweet out to their followers that they have beaten the computer at battleships. This would make the battleships game gain more publicity.

## 9.0 Reflection

This reflection section of the report will explain what has been learnt during the project. There have been many questions or knowledge that have been learnt during the duration of the project. The large quantity of online and non-computer games that are being produced which is making people loads of money and encouraging more people to develop suitable games for all age ranges. Learning about the history of Twitter was interesting because it showed how it started off as something so small between office employees to a global social media site. The coding aspect of this project has gained lessons and knowledge from because it shows that it is very difficult or complicated to link a suitable text-based using the programming language C# with the Twitter's API to enable users to play it and share the game with their followers. One lesson that has been learnt during this project is to make sure that if the coding is difficult to understand and implement then try not to leave it to the last minute.

The change that has happened during this project is that time management is essential to make sure tasks are completed before a certain milestone.

## 10.0 References

- [1] C. Profile, "Twitter, Inc.," pp. 1–8, 2015.
- [2] C. Honey and S. Herring, "Beyond microblogging: Conversation and collaboration via Twitter," *System Sciences, 2009. HICSS'09. 42nd*, 2009.
- [3] H. Kwak, C. Lee, H. Park, and S. Moon, "What is Twitter, a social network or a news media?," *Journal of the 19th international conference on Twitter*, 2010.
- [4] "How did Twitter start? What is the history behind Twitter?" [Online]. Available: [http://profilerehab.com/twitter-help/history\\_of\\_twitter](http://profilerehab.com/twitter-help/history_of_twitter). [Accessed: 03-Nov-2015].
- [5] "Life Before Twitter." [Online]. Available: <http://lifebeforetwitter.com/>. [Accessed: 02-Nov-2015].
- [6] "Jack Dorsey - Inventor, Computer Programmer - Biography.com." [Online]. Available: <http://www.biography.com/people/jack-dorsey-578280#creation-of-twitter>. [Accessed: 02-Nov-2015].
- [7] "Marketline |." [Online]. Available: [www.marketline.com](http://www.marketline.com). [Accessed: 02-Nov-2015].
- [8] "Where is the Twitter Competition? | Social Media Today." [Online]. Available: <http://www.socialmediatoday.com/content/where-twitter-competition>. [Accessed: 24-Oct-2015].
- [9] "WordPress.com: Create a free website or blog." [Online]. Available: <https://wordpress.com/>. [Accessed: 02-Nov-2015].
- [10] "The 10 Best Free Blog Sites | StyleCaster." [Online]. Available: <http://stylecaster.com/best-free-blog-sites/>. [Accessed: 02-Nov-2015].
- [11] "Top 10 Social Networking Sites by Market Share of Visits [August 2015] | DreamGrow Content Marketing & Social Media." [Online]. Available: <http://www.dreamgrow.com/top-10-social-networking-sites-by-market-share-of-visits-august-2015/>. [Accessed: 17-Oct-2015].
- [12] J. Golbeck, J. Grimes, and A. Rogers, "Twitter use by the US Congress," *Journal of the American*, 2010.
- [13] Z. Ma, A. Sun, and G. Cong, "Will this# hashtag be popular tomorrow?," *Proceedings of the 35th international ACM SIGIR*, 2012.
- [14] D. Romero, B. Meeder, and J. Kleinberg, "Differences in the mechanics of information diffusion across topics: idioms, political hashtags, and complex contagion on twitter,"

*Proceedings of the 20<sup>th</sup>*, 2011.

- [15] "Is Twitter server down, problems shared? | Down Today." [Online]. Available: <https://downtoday.co.uk/twitter/>. [Accessed: 03-Nov-2015].
- [16] "Twitter API | ProgrammableWeb." [Online]. Available: <http://www.programmableweb.com/api/twitter>. [Accessed: 03-Nov-2015].
- [17] J. Dunlap and P. Lowenthal, "Instructional uses of Twitter," *The CU online handbook*, 2009.
- [18] "Communication - Definition and Examples." [Online]. Available: <http://grammar.about.com/od/c/g/communicaterm.htm>. [Accessed: 17-Oct-2015].
- [19] P. Danaher and G. Mullarkey, "Factors affecting online advertising recall: A study of students," *Journal of Advertising*, 2003.
- [20] "Twitter tips: how I used social media to find jobs | Guardian Careers | The Guardian." [Online]. Available: <http://www.theguardian.com/careers/careers-blog/job-seeking-twitter-tips>. [Accessed: 18-Oct-2015].
- [21] M. Ebner, A. Holzinger, and H. Maurer, "Web 2.0 technology: future interfaces for technology enhanced learning?," *Universal Access Human-Computer*, 2007.
- [22] T. O'reilly, "What is Web 2.0: Design patterns and business models for the next generation of software," *Communications & Strategies*, 2007.
- [23] N. Shadbolt, W. Hall, and T. Berners-Lee, "The semantic web revisited," *Intell. Syst. IEEE*, 2006.
- [24] S. Vieweg, A. Hughes, K. Starbird, and L. Palen, "Microblogging during two natural hazards events: what twitter may contribute to situational awareness," *Proceedings of the SIGCHI*, 2010.
- [25] "BBC - Home." [Online]. Available: <http://www.bbc.co.uk/>. [Accessed: 02-Nov-2015].
- [26] A. Voiskounsky, O. Mitina, and A. Avetisova, "Playing Online Games: Flow Experience.," *Psychology Journal*, 2004.
- [27] Play Wales, "What is play and why is it important ?", November 2014.
- [28] E. Bodrova and D. Leong, "The Importance of Play: Why Children Need to Play.," *Early Childhood Today*, 2005.
- [29] Ncca, "Learning and developing through play," *Aistear: the Early Childhood Curriculum*

Framework pp. 52–70, 2009.

- [30] S. Lester and W. Russell, *Children's Right to Play: An Examination of the Importance of Play in the Lives of Children Worldwide. Working Papers in Early Childhood Development, No. 2010.*
- [31] W. H. Organization, *The world health report 2002: reducing risks, promoting healthy life.* 2002.
- [32] "The Benefits of Play for Adults: How Play Can Improve Your Health, Work, and Family Relationships." [Online]. Available: <http://www.helpguide.org/articles/emotional-health/benefits-of-play-for-adults.htm>. [Accessed: 16-Nov-2015].
- [33] B. Hughes, "Play Types," no. around 16, pp. 8–9, 2002.
- [34] J. Jansz and M. Tanis, "Appeal of playing online first person shooter games," *CyberPsychology & Behaviour*, 2007.
- [35] C. Anderson, "An update on the effects of playing violent video games," *Journal of adolescence*, 2004.
- [36] N. Yee, "Motivations for play in online games," *CyberPsychology & Behaviour*, 2006.
- [37] K. Chen, P. Huang, C. Huang, and C. Lei, "Game traffic analysis: An MMORPG perspective," *Proc. Int. ...*, 2005.
- [38] S. Suh, S. Kim, and N. Kim, "Effectiveness of MMORPG-based instruction in elementary English education in Korea," *Computer Assistant Journal*, 2010.
- [39] N. Ducheneaut, N. Yee, E. Nickell, and R. Moore, "Building an MMO with mass appeal a look at gameplay in world of warcraft," *Games and Culture*, 2006.
- [40] "Game Preview - Google Play." [Online]. Available: <https://play.google.com/books/reader?id=J1aAAwAAQBAJ&printsec=frontcover&output=reader&hl=en&pg=GBS.PT1.w.3.0.4>. [Accessed: 04-Nov-2015].
- [41] "Benefits of Board Games." [Online]. Available: <http://www.sightwordsgame.com/sightwordgames/benefits-board-games/>. [Accessed: 08-Nov-2015].
- [42] M. Berland and V. Lee, "Collaborative strategic board games as a site for distributed computational thinking," *Developments in Current Game-Based*, 2012.
- [43] "10 best board games | Outdoor & Activity | Extras | The Independent." [Online]. Available: <http://www.independent.co.uk/extras/indybest/outdoor-activity/10-best-board-games->

9942938.html. [Accessed: 16-Nov-2015].

- [44] C. Hernandez, "1-2-3 card game," *US Pat. 5,944,316*, 1999.
- [45] J. Pape and T. Graham, "Coordination policies for tabletop gaming," *Graphical Interface*, 2010.
- [46] "Do You Worship Cthulhu? Card Game - ozgameshop.com." [Online]. Available: <http://www.ozgameshop.com/rpg-and-fantasy-card-games/do-you-worship-cthulhu-card-game>. [Accessed: 08-Nov-2015].
- [47] "Zombie Dice Game Review - Father Geek." [Online]. Available: <http://fathergeek.com/zombie-dice/>. [Accessed: 24-Nov-2015].
- [48] "Kickstarter >> Pirate Dice: Voyage on the Rolling Seas by Gryphon and Eagle Games." [Online]. Available: <https://www.kickstarter.com/projects/167427101/pirate-dice-voyage-on-the-rolling-seas>. [Accessed: 24-Nov-2015].
- [49] "Educational games - EduProfix - The best educational kids games&software. Memory game. Learning&Test program." [Online]. Available: <http://www.eduprofix.com/>. [Accessed: 24-Nov-2015].
- [50] "Download Logical Journey of the Zoombinis (Windows) - My Abandonware." [Online]. Available: <http://www.myabandonware.com/game/logical-journey-of-the-zoombinis-3ei>. [Accessed: 24-Nov-2015].
- [51] "Rules of Card Games: Pelmanism." [Online]. Available: <http://www.pagat.com/misc/pelmanism.html>. [Accessed: 24-Nov-2015].
- [52] "King.com - Play the Most Popular & Fun Games Online!" [Online]. Available: <https://king.com/>. [Accessed: 17-Oct-2015].
- [53] "Pyramid Solitaire Saga Walkthrough - Gamezebo." [Online]. Available: <http://www.gamezebo.com/2012/05/25/pyramid-solitaire-saga-walkthrough-cheats-strategy-guide/>. [Accessed: 17-Oct-2015].
- [54] "10 Real Time Twitter Games You Can Enjoy With Just A Tweet." [Online]. Available: <http://www.makeuseof.com/tag/10-real-time-twitter-games-enjoy-tweet/>. [Accessed: 24-Nov-2015].
- [55] "Starweb." [Online]. Available: <http://www.flyingbuffalo.com/starweb.htm>. [Accessed: 16-Oct-2015].

- [56] "Illuminati." [Online]. Available: <http://www.flyingbuffalo.com/illumin.htm>. [Accessed: 16-Oct-2015].
- [57] "Heroic Fantasy." [Online]. Available: <http://www.flyingbuffalo.com/heroic.htm>. [Accessed: 16-Oct-2015].
- [58] "Heroic Fantasy Review (Play by Mail RPG) - YouTube." [Online]. Available: <https://www.youtube.com/watch?v=V0QNDuw9Qsc>. [Accessed: 24-Oct-2015].
- [59] "Feudal Lords." [Online]. Available: <http://www.flyingbuffalo.com/feudal.htm>. [Accessed: 17-Oct-2015].
- [60] M. Bond and R. Beale, "What makes a good game?: using reviews to inform design," *Proceedings of the 23rd British HCI Group Annual*, 2009.
- [61] B. Ng and P. Wiemer-Hastings, "Addiction to the internet and online gaming," *CyberPsychology & Behaviour*, 2005.
- [62] "PC Turn-Based Games by user score - Metacritic." [Online]. Available: <http://www.metacritic.com/browse/games/genre/userscore/turn-based/pc?view=condensed>. [Accessed: 25-Oct-2015].
- [63] "Sid Meier's Alpha Centauri for PC Reviews - Metacritic." [Online]. Available: <http://www.metacritic.com/game/pc/sid-meiers-alpha-centauri>. [Accessed: 25-Oct-2015].
- [64] "Warhammer Quest for PC Reviews - Metacritic." [Online]. Available: <http://www.metacritic.com/game/pc/warhammer-quest>. [Accessed: 25-Oct-2015].
- [65] "Positivism - Research Methodology." [Online]. Available: <http://research-methodology.net/research-philosophy/positivism/>. [Accessed: 29-Dec-2015].
- [66] "Phenomenology - Research Methodology." [Online]. Available: <http://research-methodology.net/research-philosophy/phenomenology/>. [Accessed: 13-Dec-2015].
- [67] H. Gallaire, J. Minker, and J. Nicolas, "Logic and databases: A deductive approach," *ACM Computing Surveys (CSUR)*, 1984.
- [68] "ADVANTAGES AND DISADVANTAGES OF DEDUCTIVE AND INDUCTIVE APPROACHES | Amirah Alias - Academia.edu." [Online]. Available: [http://www.academia.edu/4110445/ADVANTAGES\\_AND\\_DISADVANTAGES\\_OF\\_DEDUCTIVE\\_AND\\_INDUCTIVE\\_APPROACHES](http://www.academia.edu/4110445/ADVANTAGES_AND_DISADVANTAGES_OF_DEDUCTIVE_AND_INDUCTIVE_APPROACHES). [Accessed: 13-Dec-2015].
- [69] "Deductive and Inductive Methods of Economics (Merits and Demerits)." [Online]. Available:

<http://www.yourarticlelibrary.com/economics/deductive-and-inductive-methods-of-economics-merits-and-demerits/10506/>. [Accessed: 13-Dec-2015].

- [70] S. Hölldobler and J. Schneeberger, "A new deductive approach to planning," *New Gener. Comput.*, 1990.
- [71] M. Saunders and P. Tosey, "The Layers of Research Design," pp. 58–59, 2012.
- [72] "Advantages & Disadvantages of Analysing Written Documents for the Purposes of Research." [Online]. Available: [http://compass.port.ac.uk/UoP/file/ef9dd79a-2a94-4795-be23-f75eb40c8a11/1/Documentary and Content Analysis\\_IMSLRN.zip/page\\_04.htm](http://compass.port.ac.uk/UoP/file/ef9dd79a-2a94-4795-be23-f75eb40c8a11/1/Documentary and Content Analysis_IMSLRN.zip/page_04.htm). [Accessed: 14-Dec-2015].
- [73] "8 Benefits of Agile Software Development | Segue Technologies - Custom Software Development, Professional Website Design, Information Technology." [Online]. Available: <http://www.seguetech.com/blog/2013/04/12/8-benefits-of-agile-software-development>. [Accessed: 14-Dec-2015].
- [74] "7 Advantages and Disadvantages of Experimental Research | Flow Psychology." [Online]. Available: <http://flowpsychology.com/7-advantages-and-disadvantages-of-experimental-research/>. [Accessed: 14-Dec-2015].
- [75] S. Khramtchenko, "Comparing eXtreme Programming and Feature Driven Development in academic and regulated environments," *Featur. Driven Dev.*, 2004.
- [76] "Agile Modeling and Feature-Driven Development | Dr Dobb's." [Online]. Available: <http://www.drdoobs.com/agile-modeling-and-feature-driven-develo/184415799>. [Accessed: 29-Dec-2015].
- [77] "Feature Driven Development: A Guide | Arrk Group." [Online]. Available: <http://www.arrkgroup.com/thought-leadership/feature-driven-development-a-guide/>. [Accessed: 29-Dec-2015].
- [78] M. Wadhwa and N. Sharma, "Review of agile software development methodologies," 2013.
- [79] K. Beck, M. Beedle, and A. Van Bennekum, "Manifesto for agile software development," 2001.
- [80] M. Rychlý and P. Tichá, "A Tool for Supporting Feature-Driven Development.," *CEE-SET*, 2007.
- [81] D. F. Rico, H. H. Sayani, and S. Sone, *The Business Value of Agile Software Methods: Maximizing ROI with Just-in-time Processes and Documentation*. J. Ross Publishing, 2009.

[82] "Feature driven development." [Online]. Available:  
<http://www.slideshare.net/RuhaimIzmeth/feature-driven-development-38369182>.  
 [Accessed: 29-Dec-2015].

[83] Twitter, "Welcome Page: Twitter Inc," 2015. [Online]. Available: <https://twitter.com/>. [Accessed 10 October 2015].

[84] Facebook, "Homepage: Facebook," 2015. [Online]. Available: <https://www.facebook.com/>.  
 [Accessed 10 October 2015].

## 11.0 Appendix 1

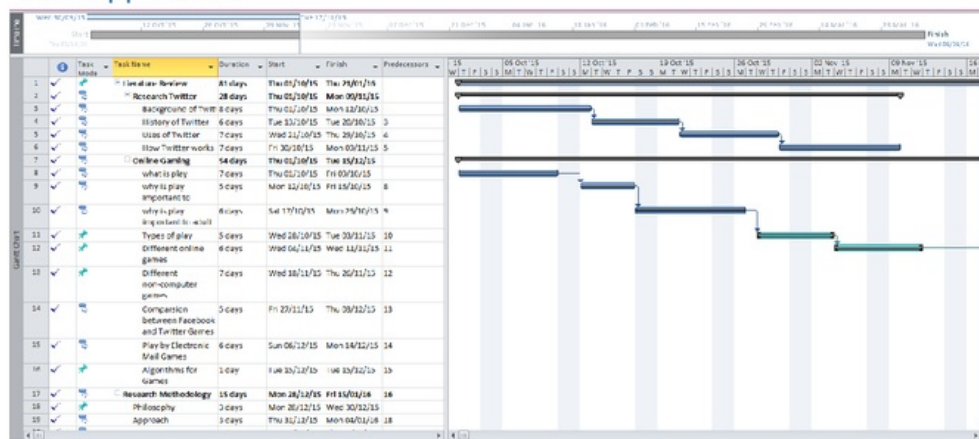


Figure 38: Gantt Chart