vrije Universiteit amsterdam

GAMIFICATION
OF
SECOND SCREEN APPLICATIONS

Developing Ad Spotter Alternatives

AUTHOR: CEREN GAZIOGLU MAJOOR

STUDENT NUMBER: 2000679

EX MACHINA

Supervisor	Prof. Dr. Anton Eliens
Internship Supervisor	Paul Van Beurking
Second Reader	Damien Andrew Tamburri

Department of Computer Science - Multimedia

Amsterdam, The Netherlands

2014

Abstract

Over the past decade, there has a been a decline in the number of minutes traditional television is being watched daily. Television broadcasters also report a decline in ratings during the commercial breaks. While the amount of time general population views television decreases, the daily usage of smartphones and tablets continues to increase. The general population in United States uses their smartphones and tablets while watching television, especially during the commercial breaks.

Ex Machina Games is a company focusing on the integration of TV with games and social media. One of their goals is to increase the ratings during commercial breaks by making use of second screen applications. AdSpotter is one of their Second Screen applications which aims to keep user engaged during the commercial breaks. Although AdSpotter worked perfectly on multi platform mobile devices, it wasn't elaborate enough to create a continuous user engagement.

During my internship at Ex Machina Games I researched Gamification and in this thesis I will be introducing the design and development methodologies for Second Screen applications, as well as the building blocks of gamification. The purpose of this master thesis is to find out how we can apply Gamification to Second Screen applications in order to effectively influence user behaviour, in particular to keep user engagement constant during commercial breaks.

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Preface

Before I start writing my thesis, I would like to warm up with a little quote from my favourite author Terry Pratchett to remind us that we can try to solve every problem and prove everything by science and research, but sometimes the imagination and humour already has a good point: "Light thinks it travels faster than anything but it is wrong. No matter how fast light travels, it finds the darkness has always got there first, and is waiting for it."

Likewise, during my internship I have been trying to find answers to some questions. Although it could be theoretically possible to research the accuracy and effectiveness of these answers by observing a certain group of people, practically it was not feasible. Besides, the subject at hand involves too many abstract parameters (fun, engagement etc.) which could be changing relative to who we are dealing with, on what sort of problem. So the best thing we could do is to evaluate each situation separately and then use this thesis as a rough guide to come up with the best possible solutions.

Chapter 1

Introduction

This thesis is eventually about changing user behaviour. More specifically, it examines the role of Gamification on non-game experiences and breaks it down to functional modules, and investigates how these modules can be applied to Second Screen applications in order to help keep television audience engaged during commercial breaks. As a side benefit, for me, it serves as a master thesis to complement the internship I have done at Ex Machina Games and help me get my master title at Computer Science - Multimedia from the Vrije Universiteit Amsterdam.

1.1. Ex Machina Games

Ex Machina Games is a social media and game company whose primary target of integrating these two tools of interaction is television. They work together with broadcasters and offer them a wide variety of business opportunities to help them increase the Return On Investment[1] of television shows and sell products. [Business models, 2014]

1.2. Context

At the beginning of my internship, Ex Machina Games was trying to increase the television ratings during the commercial breaks through the use of Second Screen applications. Their main goal was to increase audience engagement with the brands whose advertisements take place at a particular commercial break, increasing brand-awareness among users. Ideally, the more users are engaged with the brands, the more those brands will become known, remembered and talked about in social media.

One of the Second Screen projects developed by Ex Machina was a web application called "AdSpotter". AdSpotter added more interaction and challenge to traditional TV watching by asking the users to find the logo of the advertisement they are currently watching from a number of other logos. In the end, a winners-board was presented with the top three scoring players who won tangible products such as a game console, tablet or a smart phone.

The classic version of AdSpotter worked on all mobile devices with a web browser allowing a wide range of users to quickly reach the app when the commercial break starts. However it wasn't fun and engaging enough to continue playing after a number of trials. As a result of this problem, Ex Machina Games was looking for ways and alternatives for AdSpotter that could increase their users' engagement.

While this problem is very specific to AdSpotter application, many other companies have been facing similar sort of problems for ages, trying to increase their customer loyalty or change user behavior in a way they want by re-designing the whole experience. This new way of designing of the user experience by adding game elements has recently got a name. "Gamification" has been a trendy concept during the last decade. It is said to be a business strategy that can help drive user behavior in non-game experiences. This is why learning more about gamification and finding out how it can be applied to Second Screen applications could be helpful in creating more effective alternatives for AdSpotter.

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1 Return on Investment (ROI) is investing on a resource that will yield a benefit to the investor. Increase in ROI means that the investor will gain more capital than he initially spent. [Appendix A. Glossary: ROI]

1.3. Research Questions

From the problem statement in the previous section, the primary research question for this thesis arises:

(How) can we use Gamification in Second Screen applications to influence user behavior?

The answer to this research question can be better supported if the following three sub-questions are investigated:

1. (To what extent) is it possible to influence user behavior by using Gamification?

2. What are the design and development methodologies for Second Screen applications?

3. How to apply Gamification in to AdSpotter Second Screen application to keep user engagement constant? And what other alternatives could we derive for AdSpotter Second Screen application using Gamification?

Exploring the ways to change user behavior, be it for enhancing user engagement during commercial breaks or any other subject, will contribute to professional practices.

1.4. Research Methodologies

My internship as well as the writing of this thesis has been a one big exploratory process with a lot of so-called "design thinking". As it is hard to measure the behavior of people in big scales, it is also hard to guess human emotions using rules. Gamification is not an exact science like mathematics where 1+1=2. We cannot be sure that it will fix every problem of a product, if we follow certain rules. It cannot do more for a product which originally is not useful to anyone. It may only add value if the original product already works, has a user base, and is seen as a successful application. Perhaps then, Gamification can help make it more fun and increase its reach.

Keeping this in mind, I tried to justify my points using logical comparisons, using existing frameworks, custom defined heuristics and getting feedback from a small number of people.

1.4.1. Use Of Gamification Elements

One method I used was to count each addition of certain game elements (mechanics or dynamics) as an improvement compared to the original application. For the gamification elements, see Chapter 7.1.

1.4.2. Comparison According To Existing Frameworks

I used two Gamification frameworks: Octalysis and MDA, for the analysis and comparison of the original application with the new and gamified versions. I compared the original and new application according to MDA framework in Chapter 5.2. while mentioning user interface design process of the new AdSpotter application. And, I compared the original application with the gamified version with respect to the motivators they are targeting, using the Octalysis framework, in Chapter 7.3.

For the range of available technologies, see Chapter 6. in particular Table XX. for a platform comparison.

1.4.3. Custom Heuristics

In the idea generation process for the new AdSpotter application, I enlisted and compared different concepts making my own heuristics/framework. To get a more solid grip on it, I made comperative tables with metrics, partly derived from literature, See in Chapter 5.2.2. the tables and functions over Feasibility and Fun Score metrics.

1.4.4. User Statistics

Besides this idea categorization table, I will be looking into the number of actions the users can engage in, and the number of distractions in the game screen etc.

Other measurables could be the number of times users return to this application, time and frequency of the application being used, number of active users, sales increase etc. However it wasn't practically possible to measure all of these due to the application not being live yet.

1.4.5. Other Impractical Methods

Other than the methods listed above, the only observable measurement of the final project could be the ROI (return of investment) which we couldn't measure within the time of my internship because the product was not live yet. It is even still under development and looking for a client to get real life users. Another measurement could be to test the commercial ratings, but again this is not in my capability as a student.

1.5. Structure Of This Thesis

This thesis will be focusing on Gamification and it's application on Second Screen applications.

In Chapter 1. a brief introduction to the current situation in ExMachina Games is given, together with the problem statement about AdSpotter, and the research questions that will be addressed further in the rest of this thesis.

Chapter 2. includes a background literature study about Gamification. I will be breaking it down to functional modules that can later be addressed individually in the following chapters. I will also introduce two Gamification frameworks which will help us compare the new and gamified versions of AdSpotter application with the old one.

In Chapter 3. I will be introducing the Second Screen applications and explaining the current situation of television advertisements.

In order to find the missing ingredients in AdSpotter and come up with more fun and engaging alternatives it is first important to analyze the situation at hand and evaluate the current AdSpotter application. This is why in the Chapter 4. I will be examining the AdSpotter application in detail, evaluating it according to forementioned frameworks.

In Chapter 5. I will be moving on to the work done on AdSpotter realization and give more information on the AdSpotter alternative application I developed during my internship as a prototype. Besides introducing the product itself I will also take a look at the implementation and design process of this application as well the selection process of this alternative application idea.

In Chapter 6. I will be mentioning available platforms and technologies for Second Screen applications as well as technology restrictions and limitations I have faced during the design and development of this project.

In Chapter 7. I will be presenting the future issues of research and provide a list of Gamification elements and possible use-case scenarios for future implementation.

And finally I will be concluding my thesis in Chapter 8.

All the literature that has been read and cited can be found in References section while a other additional resources such as code fragments, additional diagrams and tables and list of technology resources can be found in the Appendix section.

Gamification Background Study

In the last decade, Gamification has been a buzzword[2], it has been discussed frequently in the social media, and is claimed to be "a proven powerful strategy for engaging, influencing and motivating diverse groups of people" [Gamification 101, 2012]. If it has the potential to be applied to various business contexts as promoted by Bunchball, it will be worthwhile to examine it in more detail. This is why in this chapter, I will discuss the "What", "Who", "Why", "How", "Can" questions concerning Gamification. I will first define Gamification and Game (What) and then investigate the types of players (Who) and what are their core motivators are (Why). It is important to scrutiny what motivates different types of players[3], and elucidate the characteristics of a television audience so that we can choose the suitable game elements for the AdSpotter project. Later, I will define current frameworks in Gamification (How) and enlist its building blocks so that we can point them later on in the next chapters while examining AdSpotter Second Screen application. Finally, I will try to address our first subquestion (Can) stated in the introduction [see Ch.1] by mentioning a few prominent Gamification case studies:

> "1. *(To what extent) is it possible to influence user behavior by using Gamification?"*

2.1. Definitions

2.1.1. Definition Of Gamification

The word *Gamification* is an English noun, "gam(e) + -ification" and it is derived from the verb "to gamify" which means to turn something into a game.

Many of us have probably already experienced the concept of gamification in our lives. Usually parents use some fun tricks to make their children eat healthy food or promise them little awards for finishing their homework. We didn't have the word "Gamification" until recently, but we were already practicing it in different forms all our life. From marketing strategies like "buy 2 get 3rd for free" to collecting stamps, from military simulations [Kapp, 2012] to taking stairs and making music [The Fun Theory, 2009], gamification has been emerging. According to Andrzej Marczewski, the concept of Gamification has been around forever, but the word "Gamification" was only recently coined in early 2000s [Marczewski, 2013].

Although the etymological definition above, Gamification does not mean making a game and it is not restricted to electronic contexts [Maxwell, 2014].

Gamification expert Gabe Zichermann [Zichermann, 2011] defines gamification as:

> *"the use of game-thinking and game mechanics in non-game contexts in order to engage users and solve problems"*.

Kerry Maxwell thinks when the tasks are made more fun and people are enjoying themselves they will feel more motivated and the corollary of this can only be perseverance and working harder and achieving goals [Maxwell, 2014].

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2 A buzzword is a word or phrase used to impress, or one that is fashionable. [Appendix A. Glossary: Buzzword]

3 During this master thesis I will be using the words "television audience", "customer", "user", "player", "client" interchangeably for the people who will be participating in the usage of our final application.

In order to understand Gamification better, we should first look at the elements that make a game. We can then use some of these elements for AdSpotter Second Screen application to suit our needs.

2.1.2. Definition Of Game

Although on Wikipedia, there are more than one definitions of game, the one which mentions the two essential qualities of Gamification is the following by Salen and Zimmerman [2003]:

"A game is system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome."

Karl M. Kapp [2012] modified this generalized definition into:

"A game is a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction."

Even though Kapp added new features to the definition of a game for adapting it to the learning context, he still kept the main components: the challenge (conflict), the rules and the outcome (feedback and result).

By using these basic components that make a game, decoupled from the context, we can gamify any task.

2.2. Players And Motivators

2.2.1. Why People Play Games?

In order to understand why and how gamifying a context could be useful for us, we can first look at the reason why people play games.

A more philosophical and general definition of the word 'game' was mentioned by Suits [1978] and quoted by McGonigal [2011] as:

"Games are unnecessary obstacles we volunteer to tackle."

An example given by McGonigal was golf. Instead of walking as close to a hole as we can and putting a ball in that hole directly by hand, we walk as further from the hole as we can and hit the ball with a stick and call this the game of golf. By choosing a less efficient way of doing things, or applying rules that make certain tasks harder for us, we make sure there is a eustress, a positive and healthy stress, a feeling of fulfillment in the process. After accomplishing the task with enough unnecessary obstacles added, we will have the feeling of accomplishment and have positive feelings. The reason why we game, is because of this feeling of "blissful productivity" according to McGonigal [2011]. She states that:

"With each accomplishment, our brains release a potent cocktail of norepinephrine, epinephrine and dopamine, three neurochemicals when combined make us feel satisfied, proud, and highly aroused."

The same concept is also mentioned by Zichermann [2011] giving the example of making broccoli more attractive for children to eat by making games and at the same time adding melted cheese on top of it as a reward, he states that:

"the interplay among challenge achievement and reward not only allows you to train children to eat their broccoli, but it releases dopamine in the brain, intrinsically reinforcing the action as biologically positive."

Both Zichermann [2011] and McGonigal [2011] are stating that there is a positive feeling after playing a game.

In addition to this main reason of having a "positive feeling" or "blissful productivity", Zichermann [2011] also suggests that besides this positive feeling, there might be other reasons for why people play games and they change from person to person:

> *"The player is at the root of Gamification and player's motivation drives the outcome."*

Zichermann lists a few human motivators as de-stress/fun, power/status, mastery, socialization. These motivators are eventually derived by who the players are and what their personalities look like. This is why in the next section we will identify the possible player types.

2.2.2. Types Of Players

The first player types were identified by Richard Bartle [1996], a British writer, professor and game researcher. He has put together four player types which were mainly deduced by analyzing highly experienced players in MUD[4] games: Achievers, Explorers, Socializers, Killers. Although these player types were completely based on a specific type of game, they are still useful in the context of Gamification and make a good basis for understanding types of users who will be involved in a gamified product.

Another game designer who has probed player types was Amy Jo Kim. According to Kim [2011], different genders tend to have different aims. While males are more competitive, females tend to collaborate more, she states. Kim also mentions one more player type that Bartle hasn't considered: self expressionists.

If we combine these two models we come up with 5 different player types and action words respectively:

Table 1. Types of players and actions

Type Of Players	Action Words
Achievers	gain, win, challenge, fight, brag, pass, show off, taunt, compare
Explorers	explore, view, read, search, collect, curate, complete, find, vote, rate, review
Socializers	join, share, exchange, gift, trade, help, greet, like, comment, give, recommend, connect
Killers	kill, beat, pass, compete, harass, argue, disrupt
Self Expressionists	choose, customize, layout, design, dress up, decorate, make, create, pick, like, purchase

Player types listed above are mutually inclusive, meaning, a player can have all of the above characteristics at the same time.

We can find the player type of a person by taking a Bartle Test [1996], or simply by writing down the verbs or actions that would describe our player as in Table 1. Types of players and actions

2.2.3.Intrinsic Vs. Extrinsic Motivation

Although there are many different types of players, in psychology motivation is divided into two groups: intrinsic motivation and extrinsic motivation. Intrinsic motivation comes from with in, it is the direct willing to take an action by yourself. On the other hand, extrinsic motivation is derived by other factors around us, such as making money.

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4 MUD is the acronym for Multi-User Dungeon and it is an early form online virtual environments with many players. [Appendix A. Glossary: MUD]

One of the criticisms is questioning if elements used as extrinsic motivators increase or decrease users' natural motivation and loyalty.

According to Daniel H. Pink [2011] extrinsic motivators like cash do not work in creative thinking. When the players get used to being payed or awarded by goods, and when there comes a time without the payments, the players totally lose their motivation due to lack of external motivator. According to Zichermann [2011] this could be true but he also claims that other rewards such as 'social status' might be more motivational for players.

Gamification uses extrinsic motivators to engage the players. However, this may result in losing the intrinsic motivation. As an example Zichermann [2011] gives a child playing the piano simply because she enjoys it. And when we introduce her to competitive piano playing with rewards, if she fails to get the reward this may result in her stopping to play. Thus, extrinsic motivation crushes intrinsic motivation.

2.3. Building Blocks Of Gamification

There is no single rule for gamification that can be applied for every situation. Instead, gamification may be achieved by combining many different elements. However there are some characteristics of gamification which are fundamental to every application. Below is a collection of the building blocks of gamification that are very crucial for a successful application.

2.3.1. The Fun Factor

The first building block of gamification is to make it fun. When we like the activity we are doing, we want to do it more often. The aim of Gamification is not to turn an activity into a hobby[5], yet still, we want the users to enjoy their time while using a product or performing a task so that they can turn back and continue performing the same task or continue using the same product.

The key is to take the fun as a base, and add on the serious tasks on top of it for more advanced users. So our product not only serves for experts, masters and visionaries, but also the novice players who just want to try it and have fun.

If we start with the idea of education and put fun at the second place, "learning doesn't seem to work as effectively" says Zichermann [2011]. One of the examples he gives is the game Civilization[6] and how it thought millions of people history lessons and basics of urban planning without forcing it onto them. This is the "positive emotion" mentioned by Kim [2011] and McGonigal [2011] that puts our minds in a state of optimistic engagement, biologically making it possible to think positive thoughts and to make social connections. Like wise, unless we put fun at the first place, it will be harder for the player to perform any other wanted behavior.

2.3.2. The Flow

The flow is a mental state where a person is fully immersed and focused while performing an activity. Neither anxious nor bored, the person in flow is intrinsically motivated and feeling positive emotions. As proposed by Mihaly Csikszentmihalyi [1991], a Hungarian psychology professor:

> *"It is a state in which people are so involved in an activity that nothing else seems to matter."*

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5 Hobby is a regular activity which is done for pleasure. [Appendix A. Glossary: Hobby]

6 Civilization is a turn-based strategy game whose objective is to build an empire. [Appendix A. Glossary: Civilization]

According to his theory people are happiest when they are in the "state of flow". This is a crucial ingredient for a successful Gamification, so the players are concentrated in their activities and motivated to continue the action for longer periods of time. To achieve the flow state, the goals of the activity one is involved must be clear, there has to be clear and immediate feedback about the progress, and the skill level of the person and the challenge level of the task at hand has to be in balance.

Figure 1. Csikszentmihalyi's Flow Model
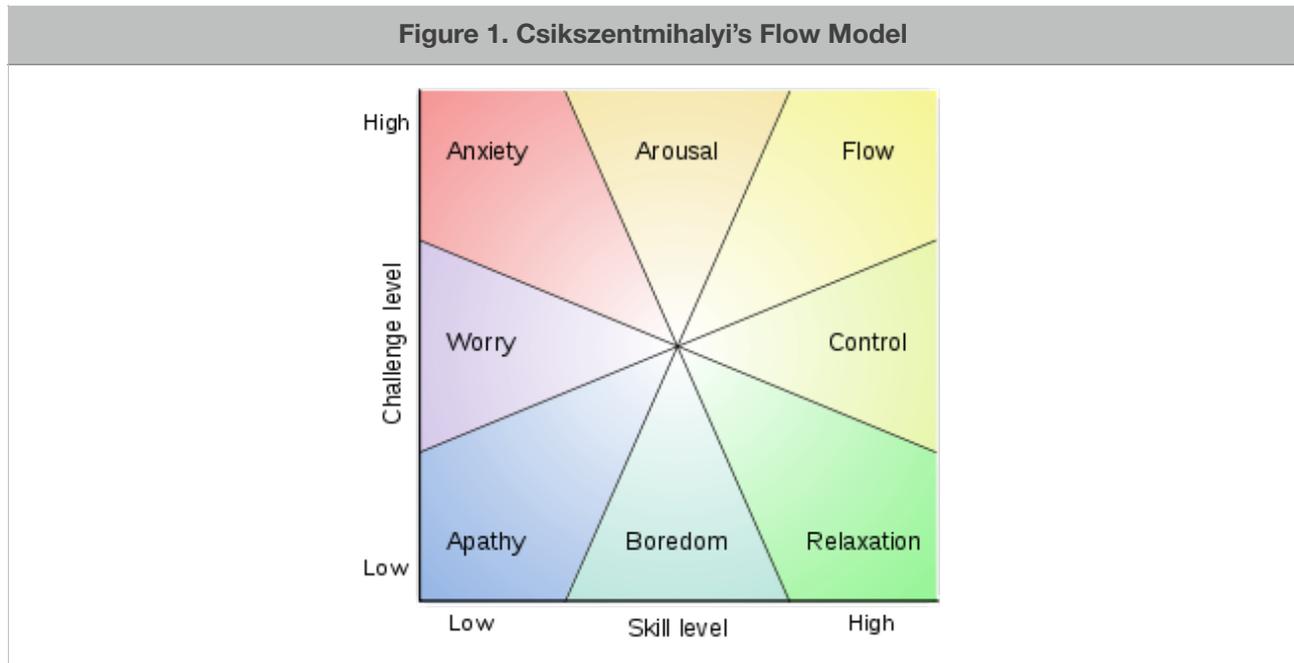
In Figure 1. above the flow model suggested by Csikszentmihalyi can be found. This model suggests that one will be in an intenser state of focus, so he stays in the flow, if the skill level and challenge level are at the highest. If the challenge is low and the skill is also low, then the user loses interest by feeling apathy. On the other hand, if the challenge is low but the users skill level is higher than needed, then the user gets bored. Similarly, if the challenge is too high for the user's skill level to cope with, then the user becomes anxious.

Based on the studies made on annual Game Developers Conference [2006], gamers spend 80 percent of their play time failing. McGonigal reasons this love of failing with when people fail knowing that they had the skill to succeed, they get hopeful, excited and more interested. This is why they stay in the flow and try one more time to succeed.

2.3.3. Challenge

In order place the player in the middle of flow we may need enough challenge. According to Tom Chatfield, to keep different types of players engaged, we need more than one type of challenges. Chatfield [2010] proposes to separate short term challenges from long term challenges so that players don't have to wait too long before they get a feedback once short tasks are complete. He also thinks providing multiple challenges to choose from will keep the players from all levels interested. The users can choose the challenges which fit their skill level, without being frustrated by the heavier challenges nor being bored by the tasks that are not challenging enough for them.

2.3.4. Feedback

Feedback is one of the most necessary building blocks of Gamification, because it helps the player evaluate his position in the flow diagram.

Zichermann [2011] defines feedback as:

"returning information to the player for informing them of where they are in their progress".

In addition to informing the players about their progression, feedback also let's the players know if their skills are enough to perform certain tasks. It helps the players know how good their skills are compared to a certain task's challenge level and how far they have progressed and how close they are to the completion of a task. It is essential for a player to get information on his current situation to stay in the flow.

Feedback could be given in many different ways. It could be an abstract number increasing as the player gets more experienced, or it could be an irritating sound when a wrong answer has been given to a question, or it could be a tool or a useful asset gifted to the user when a task is performed right.

The important thing is to use feedback immediately, almost as a natural reaction to each remarkable action of the player, and be consistent with it during the application.

Chatfield [2010] thinks when consequences are too far away, people tend to forget about them. To prevent this, Chatfield proposes to provide an instant and clear feedback to all challenges and as frequently as possible.

2.3.5. A Reward Mechanism

Games by definition result with an outcome. Rewards are the benefits one gets as a result of an achievement.

Chatfield [2010] suggests that every effort should be rewarded. Even for trying and failing, the user should at least be rewarded with experience. And the user's experience should never go backwards. This way, the user doesn't have a discouraging punishment when he fails to be successful. Experience bars or points which show the constant progress are a good example for such an ongoing reward mechanism.

There can be various reward mechanisms in games: points, badges, gaining experience or status, unlocking levels or more content, winning virtual goods, obtaining useful or collectible items (resource acquisition) or getting means of exchange value such as gems, stars, gold, credits etc. These will be discussed in more detail later in this chapter.

2.3.6. Element Of Uncertainty

Element of uncertainty, in other words, chance or luck, can add unexpectedness to the game play and arouse curiosity, which is one of the components one needs to be in the flow state [Csikszentmihalyi,1991].

Element of uncertainty exists during PvP[7] combat when both of the opponents in a competition are selected randomly when one doesn't know how advanced the opponent will be.

Element of uncertainty can be also applied to a reward mechanism, determining when and how big a given reward will be. Both Chatfield [2010] and Zichermann [2011] agree on providing elements of uncertainty in our gamification experiences to yield a high reinforcement level. This can be achieved by scheduling of rewards in variable ratio (VR) where the reinforcement is provided on average every n^{th} response, but not always on the nth response [Variable Ratio Schedule, 2014].

According to the researches done using a Skinner box and rats who are given food after pressing a bar, it is found out that if the rewards (the food) always come in fixed intervals with fixed sizes, the mammals can

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7 PVP is an acronym for Player versus player, is a combat between two real players instead of one being the program itself. [Appendix A. Glossary: Player versus player]

calculate when they will get a reward and how big the reward will be. This fixed ratio in reward systems may not be appealing after a while. In fixed interval reward schedule where the reward is given after a certain time period n, the player (the rat) will only go and press the pedal when he estimates the food will drop. On the other hand, if the reward mechanism is a mix of variable quantities, sizes and intervals; for instance if the player (the rat) continues pressing on the bar there is a chance that he may get a very big reward at some unknown point in time, he tends to continue trying until he gets the reward. Such as the lab rat given varied amounts of food after 2 bar presses, 6 bar presses and 4 bar presses and he cannot keep track of when the food will come but he knows if he presses enough the reward will come, he keeps on pressing until the food comes. In Figure 2. below, is a diagram that shows the behavioral responses in mammals according to different reinforcement schedules.

Figure 2. Reward Schedules and Level of Behavioral Reinforcement
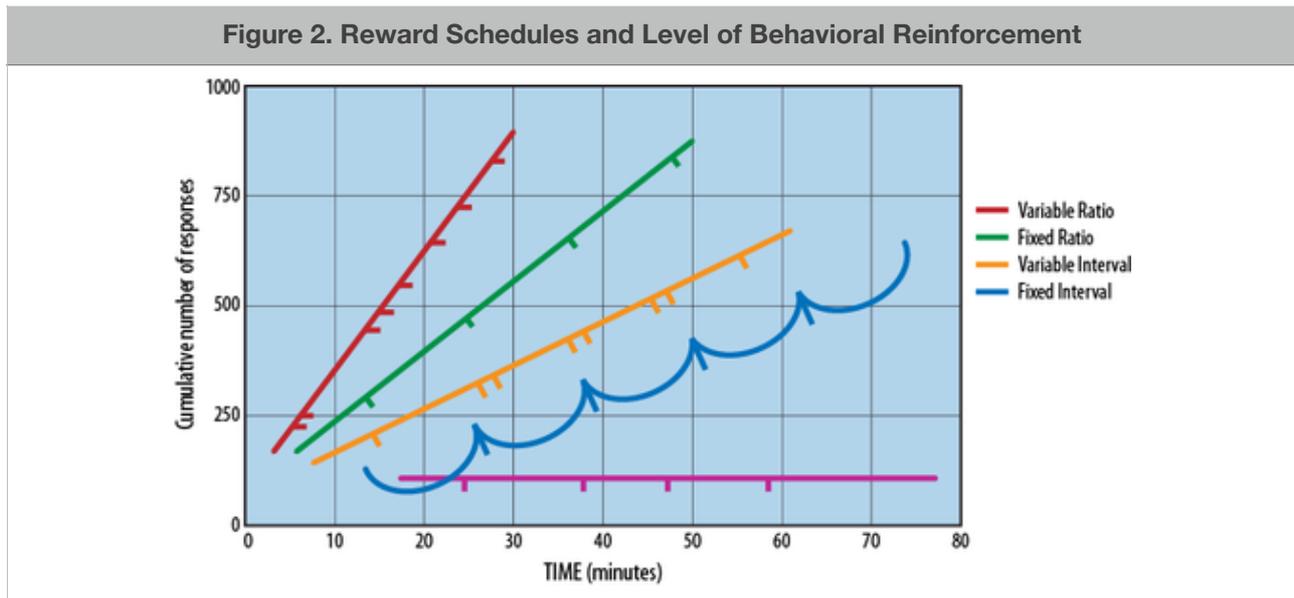
2.3.7. Aesthetics

The look and feel, the art and the beauty of a game is called aesthetics. Aesthetics is not only measured by the appeal of visual elements but also the player experience a game creates.

The visual elements play an important role in player engagement. Good looking visuals can make a game environment more immersive and hence increase the overall game experience of players.

Kapp [Kapp, 2012] supports the use of aesthetic elements in Gamification. According to him:

> "The aesthetics help the players become caught up in the game experience."

Yet, he adds the fact that aesthetics will not make a bad product or experience magically great, it would only turn a good experience into a great experience.

There are no rules defined in aesthetics, for it is dependent on sensors and taste, it may be impossible to capture all aspects of aesthetics, however empirical studies show some common assets such as: simplicity, diversity, colorfulness, craftsmanship, [Moshagen, 2010] comprehensibility, originality, emotiveness, pleasingness, impressiveness [Augustin, 2011], harmony and symmetry which could be used to help us understand what contributes to a visually appealing aesthetic experience.

2.4. Gamification Frameworks

According to Jesse Schell, designing a game is like being a doctor. [Schell, 2008] In order to design a good game or to know where the problem is in a failed game, we need to know what the games are made of, and how the game elements fit together, just as if we would be studying human anatomy to be able to pinpoint a patient's problem and help him quicker.

To make the process of game design easier, game designers have come up with methodologies based on player types, human motivators, psychology and systematical thinking. These methodologies organize the notable issues faced in game design and decision process into related topics which make up the frameworks that will be discussed below.

2.4.1. Mda Framework

One of these frameworks is MDA framework (Mechanics, Dynamics, and Aesthetics) and it is a tool developed by Marc LeBlanc, Robin Hunicke, and Robert Zubek [2001] to analyze and design games in a more systematical way. MDA helps game designers refine the end result by using qualitative and quantitative analysis in an iterative fashion. [Hunicke, 2001]

MDA framework tries to connect the developers', designers' and players' perspectives by mapping all possible parts of the system to each other, from code to content to player experience and back. In Table 2. we can see how MDA framework has mapped distinct components of a game to their design counterparts.

Table 2. MDA Components

Component	Design Counterpart	Detailed Explanation
Rules	Mechanics	Components of a game at the level of data representation and algorithms [Hunicke, 2001]
System	Dynamics	Run-time behavior of the mechanics acting on player inputs and each others' outputs over time [Hunicke, 2001]
Fun	Aesthetics	Desirable emotional responses evoked in the player when she interacts with the game system [Hunicke, 2001]

As each little change in the mechanics can lead to a different game play, each change decision taken in the aesthetics of a game introduces some changes in game mechanics and dynamics. Using feedback loops and going back and forth between mechanics, dynamics and aesthetics, designers can re-think and adjust the game play to enhance the overall player experience. See Figure 3. below.

Figure 3. MDA Framework Perspective
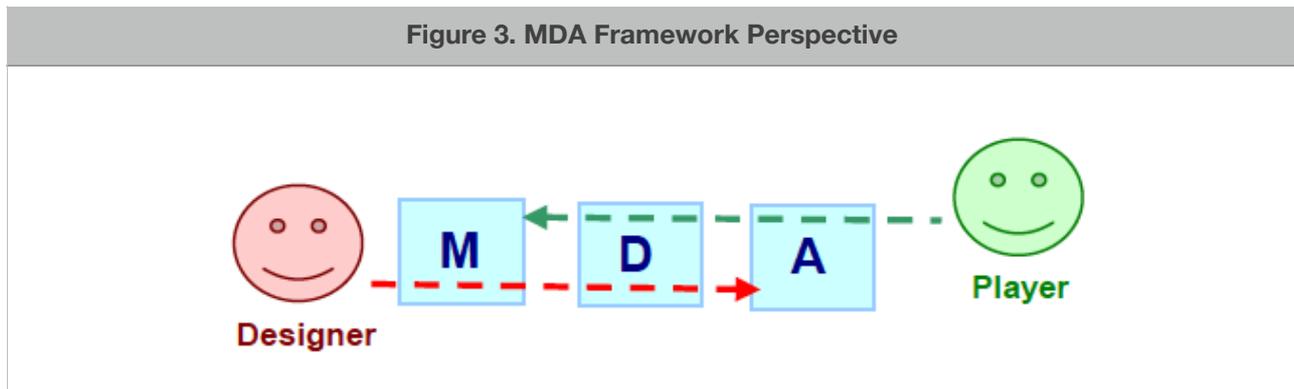
2.4.1.1. Mechanics

According to Wikipedia, game mechanics are the rules intended to produce a gameplay. They include interactions and the actions the players will be taking during a game that have immediate feedback or result.

Various game mechanics can be combined to form a basic gameplay. Some examples are listed below. Each of these mechanics can also be used in different contexts and can be combined with each other to create a more complex game play. While a gameplay is a design concept, game mechanics can be listed as engineering concepts, each mechanic representing a single action which will result in an instant feedback. For example while a gameplay is consisting of fighting, the game mechanics can be broken down to: kick, hit, attack, block, defend, punch, dodge, throw.

Some example game mechanics include: achievements, area, avatars, badges, bonuses, chat, collections, combat, currency, customization, discovery, earn, free lunch, leaderboard, lottery, gifting, levels, points, power-up, pvp, random events, rewards, status, quests, time events, trading system, tutorial, unlock, virtual goods, world.

2.4.1.2. Dynamics

Game dynamics are the players' interactions with game mechanics over time. Even little changes in the game mechanics can lead to different dynamics. Game dynamics can be recognized during a gameplay testing.

2.4.1.3. Aesthetics

Aesthetics is the effect of game dynamics on the player's feelings, such as fun or boredom or frustration. Since "fun" is hard to measure, MDA framework works with a more specific and directed vocabulary to focus more on respective player types to define "fun". LeBlanc has come up with 8 kinds of fun: Sensation, Fantasy, Narrative, Challenge, Fellowship, Discovery, Expression, Submission. [LeBlanc, 2001] These help us realize why a game would be more appealing to certain types of players.

2.4.2. Octalysis Framework

According to Yukai Chou [2012], Gamification is a human-focused design as opposed to function-focused design. He claims that most of the designs are made for getting certain tasks done. But we should also think about the human integration in the process and investigate what human incentives are and what motivates them.

Chou published a Gamification Framework called Octalysis which can be used to analyze certain activities and the human desires they satisfy and as a result to choose the right strategies and game elements to make those certain activities more engaging for humans.

Octalysis consists of 8 "Core Derives" that motivates humans:

- Epic meaning and Calling: The derive felt when the player feels "chosen" to do something great, mostly happens with a "beginners luck", gaining possession of a rare item or a right to do something.

- Development and Accomplishment: The derive felt when the player makes progress, develops a skill, accomplishes a task or overcomes a challenge.

- Empowerment of Creativity and Feedback: The derive felt when the player can continuously be creative and get feedback respectively from what he creates.

- Ownership and Possession: The derive felt when the player feels ownership towards something, he would spend more time collecting resources that can be used for instance in customization of the existing environment.

- Social Influence and Relatedness: The derive felt when player feels socially active with his friends or gets responses from other players for mentorship, as well as competitive reasons.

- Scarcity and Impatience: The derive that is felt when a player wants to do or own something but cannot do or have it yet due to time, financial or privilege constraints.

- Unpredictability and Curiosity: The derive when the player wants to know or explore more.

- Loss and Avoidance: The derive when the player tries to avoid losing a possession or position.

A list of game elements which are relevant with these 8 Core Derives can be seen in Figure 35. in Appendix B.

Each motivator adds to the gamification scoring of a project. The more the Octalysis score of a project, the more gamified that project is. Later in section 4 and 5 I will be analyzing and comparing AdSpotter Classic version and the AdSpotter Alternative version using the Octalysis Tool developed by Yukai Chou.

2.5. Stages Of Gamification

According to Zichermann [2011] a gamification designer should also think about what will bring the player back once he completes a task. See Figure 4. below for a social engagement loop according to Zichermann.

Figure 4. Social Engagement Loop

Figure 4-7. A social engagement loop, designed to maximize player engagement and reengagement using core product design.
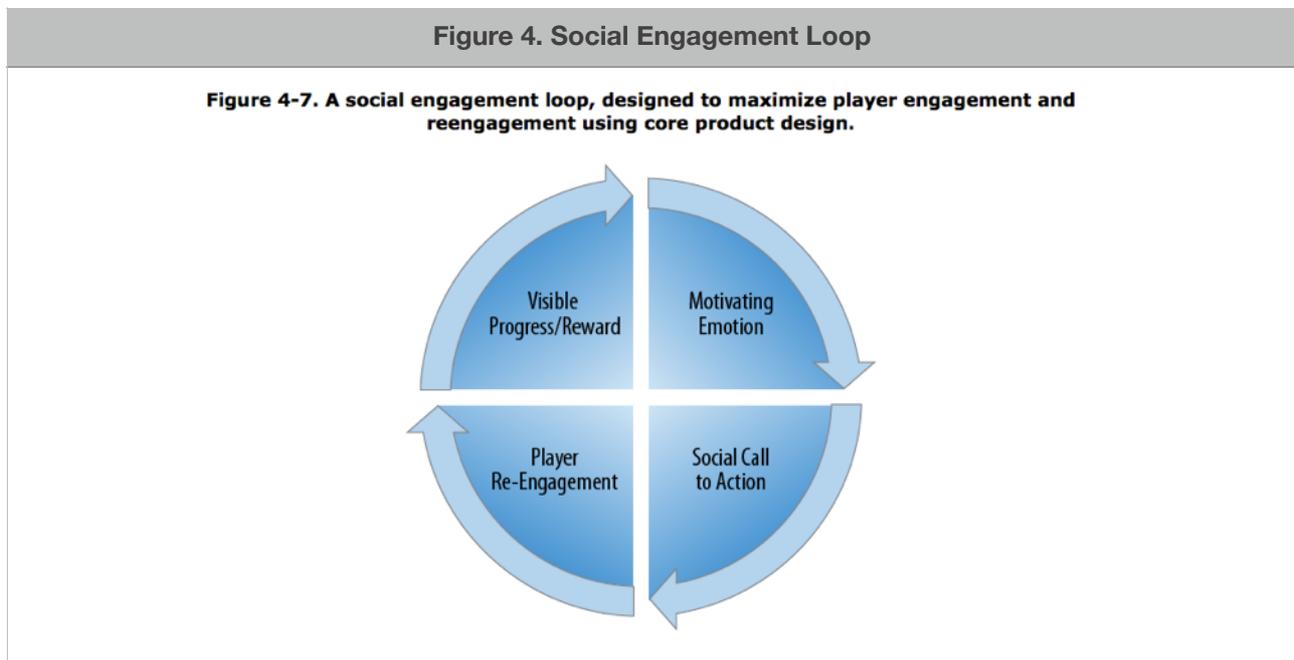
Engagement loops start with a motivating emotion, any time there can be a social call to action where the user can invite other people into the game, continuing with player re-engagement, and always a reward or a visible progress at the end so that the user can continue his engagement with the activity.

We can simplify this to 3 stages: engagement, loyalty and commitment.

Engagement is the how the user starts paying attention to the product. This happens either by their inner motivation or using extrinsic motivation.

Loyalty is the stage where the user has a repeated interest in a certain product or behavior.

Finally, commitment is when the users choose a certain product over other products of the same type. Or in case of behaviors, the user becomes a delegate of the action to be taken. Taking the next step to invite others to also take the same action.

Chapter 3

Second Screen Applications

In this chapter I will be introducing the related concepts with AdSpotter application such as television, broadcasting, second screen and show some supporting data and media impressions. Following this introduction I will explain the current situation of advertisements and the problem at hand.

3.1. First Screen

In order to understand "second" screen applications, we first need to take a look at the "first" screen, Television. Television (TV) [Appendix A. Glossary: Television], is a telecommunication medium that is used to transmit and receive images and sound. It has been almost a century since its first experimental usage. Now, it is commonly found in every household in developed countries and it is being used for entertainment, news and advertisement reasons.

Today, we experience television in our homes as a one-to-many communication medium where the viewers are the end receivers of the information sent from a certain channel. This sort of usage of television is called "*Broadcasting*". Unless a channel is sponsored by a non-profit organization or government funding, it is important to note that commercial broadcasters have two main monetization strategies. One: subscription fees, where a channel is encrypted and cannot be watched by public audience without paying a certain fee, two: advertisements, where the broadcaster sells air time to advertisers to earn revenue.

What makes television so attractive for advertisers is its great reach. Nielsen estimates 116 million households in the United States that own a TV set. [Nielsen, 2014] This is approximately 98 percent of all the households in the United States. See Figure 36. in Appendix B. for the number of TV households in America.

Besides this high percentage of population it can reach, television also has effect on these people's lives. Mike Proulx, a Social Media expert, states that television has always been social and it influences people. [Proulx, 2012] From the important news we are informed all at the same time, to touching stories it carries to our hearts with a soap opera, from humorous jokes we laugh at during a comedy show, to the exciting moments in a live football match, television has an impact on our emotions. And our emotions reflect to our conversations. What we have seen on television today, might effect our discussions with colleagues tomorrow.

3.2. Current Situation Of Television Advertisements

Marketers, who buy air time from broadcasters, can show their own program with their own content during a defined period of time on television. This short film, promoting a product or service is called a co*mmercial advertisement* on television or in short an *ad*.

The average percentage of a given population group watching a TV channel across a set time interval is called *TV rating*. *Commercial rating* is the TV ratings during a commercial advertisement video.

Together with its broad reach and its influence on human emotions, television has proved to be a great choice for marketers. However, Proulx claims that the way we experience television continues to evolve as the new technologies emerge. Corollary, emotional effect television had on people and the potential reach it had a decade ago cannot be expected to be the same today or a decade from now.

Although, ideally the viewers would continue watching television during a commercial break, this is, in reality, the other way around. People tend to avoid advertisements for various reasons. They leave the room they were watching television, or switch to another channel (zap) which doesn't have a commercial at that moment. Or in the newer circumstances: they make use of technological advancements. See Figure 37. in Appendix B. for the increase in devices in TV households.

One of the technological advancements that allows audience avoid advertisements is the Digital Video Recorders (DVR). DVR lets the audience record a television program and later on watch the recorded video. This made it possible for audience to skip or fast forward the television advertisements during a television program. Although this advancement makes it possible to skip advertisements on a recorded television program, it hasn't necessarily proved to decrease the commercial ratings. [Wikipedia, 2014]

Another potential disturbance in commercial viewing is the emergence of mobile devices. As smartphones are becoming more affordable and the 3G and 4G networks advance, mobile device owners have been increasing around the world, reaching 1.75 billion people. See Figure 38. in Appendix B. for smartphone and tablet penetration. Mobile device ownership gives the TV audience a chance to pick up their mobile gadgets when an advertisement appears on television screen.

Figure 5. Tablet or Smartphone Activities While Watching TV
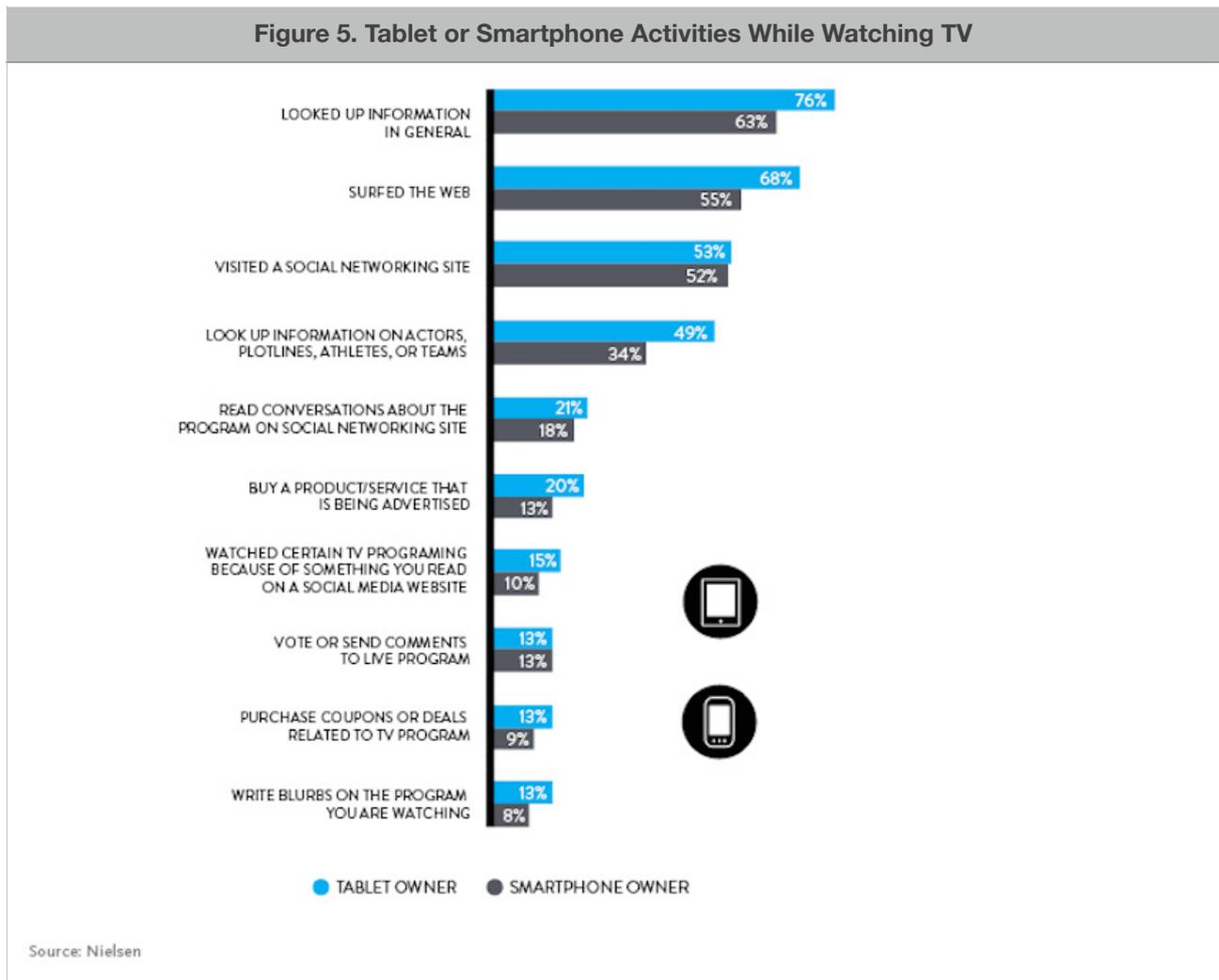
As can be seen in figure 5. Tablet or Smartphone Activities While Watching TV, people are not only spending time on surfing the web, taking social and . [Nielsen, 2014]

3.3. Second Screen

Although aforementioned mobile devices, such as a smartphone or a tablet, might be seen as a competitor to television, as seen on figure 5. above, they are also being used together with television as a second and smaller complementary screen that adds interaction and socialness to traditional tv watching experience.

The concept of using such a mobile device that has internet connection and that acts as a companion to the television screen is called the Second Screen experience.

3.3.1. Second Screen Applications

Applications on these mobile devices that let viewers socially connect in the concept of an ongoing program, enrich and expand television experience beyond the first screen are called Second Screen Applications. According to Morales, the goal of a second screen app is to provide a single place to aggregate all the interactions that a user has with the Web while watching TV, making interaction smoother or even predicting and fostering it. [Morales, 2010]

Despite the fact that the average television viewing is in decline due to the penetration of mobile devices (see figure 39. and 40. in Appendix B. for the comparison of time spent on TV and digital video between 2013 and 2014), the same technology is also being used for searching information about the programs shown on television and for making the traditional isolated and passive television experience richer and more social. Proulx claims that rather than internet and mobile devices take over television's popularity, the web, social media, and mobile are rapidly converging. [Proulx, 2012] This convergence can lead viewers to an increased cross-channel media experience which might increase a brand's impact. So, by making better Second Screen applications, we could use mobile web and social media in favour of broadcasters.

3.3.2. Design And Development Methodologies

There is no specific methodology for for the design and development of Second screen applications. Although from design practice, we know the value of brain storming and idea evaluation. For this, I developed provisional feasibility metric that is then applied to the solution which can be found on Chapter 5.2.

Although there's not one single methodology, the Second Screen applications have been categorized into 3 groups by Morales [2010] according to their interaction types: Human-Human, Machine-Human, Human-Machine. See Table 3. below for the types of interactions proposed by Morales [2010].

Table 3.Types of Interactions in Second Screen Applications

Interaction Type	Explanation
Human-Human	Social actions between humans, sharing content on social profile, commenting on events, chatting with friends, any content generated by the users
Human-Machine	Actions that start with a user request. User searching for behind-the-scenes of a movie, user looking to TV-guide, using the app as a remote controller for TV, badges and rewards that are won by the user.
Machine-Human	Activities that are driven by the application, such as recommendations, audio identification, giving user related content and news, any information that is generated algorithmically by the app.

According to Morales [2010], by integrating these three types of interactions into our Second Screen applications, we could create a holistic experience for the user.

Chapter 4

AdSpotter Analysis

In this chapter I will represent the demand of broadcasters and marketers and introduce the AdSpotter project ExMachina Games is developing in order to answer these demands. Following this introduction, I will investigate the original AdSpotter application and analyze it to elicit the current issues with regard to gamification elements. I will finally depict the player type, AdSpotter is intended to. This will help understand how we can further enhance this application.

4.1. Adspotter Project

ExMachina Games is trying to produce a desirable product to be offered to broadcasters that proves to be a good companion for TV advertisements, increasing the view rates during commercial breaks. To solve the problem of dropping ratings during commercial breaks, ExMachina Games have come up with the idea of a second screen application called AdSpotter that aims to increase the interaction of viewers with television during the commercial breaks and hence, keep the viewers engaged with television, eventually increasing commercial ratings.

4.2. Classic Adspotter Application

The original AdSpotter is a web-based application that let's users play a little guessing game during the advertisement break. The television viewers can use AdSpotter web application when an advertisement break starts on television. To do this, they first have to type AdSpotter application's URL in their web browsers.

4.2.1. Initial Screen

See Figure 6. below, the initial screen of the client application.

Figure 6. Original AdSpotter - Initial Screen
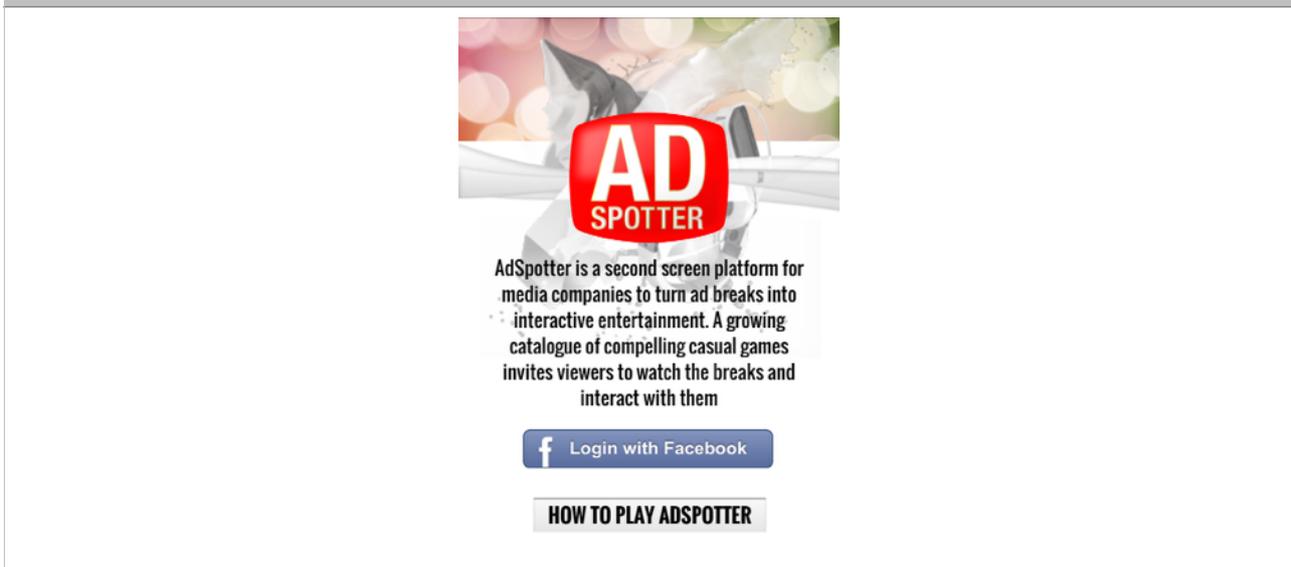
The initial screen welcomes everyone with a short explanation of the game regardless of there's an advertisement break currently being shown on television screen or not. Users are prompted to login with their Facebook accounts to see the current game sessions available. There is also a button at the bottom of the page to direct users to the "How To" page.

4.2.2. Instructions

See Figure 7. for the instructions screen.

Figure 7. Original AdSpotter - Instructions Screen
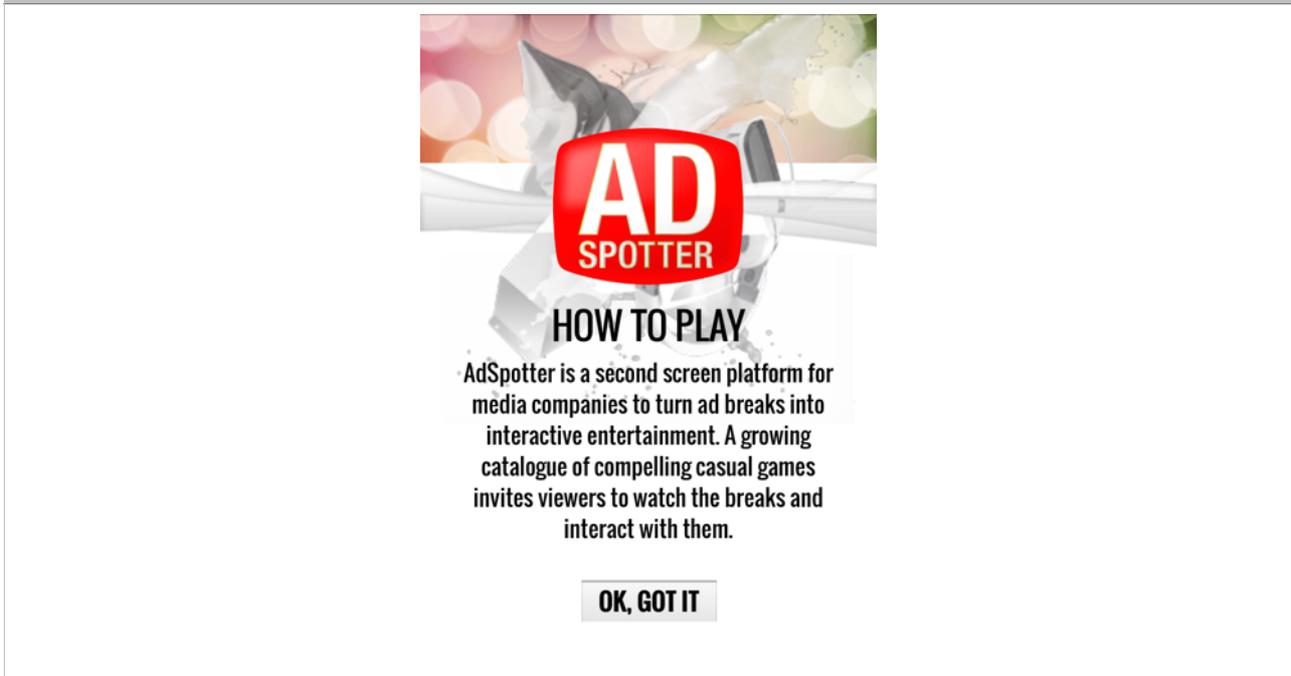
On this instructions screen, the users are supposed to get more information about how to play the game. However currently this page is not filled with the necessary "how to play" information, but rather filled with some dummy visuals to be changed later.

4.2.3. Channel Selection

See Figure 8. below for channel selection screen.

Figure 8. Original AdSpotter - Channel Selection Screen
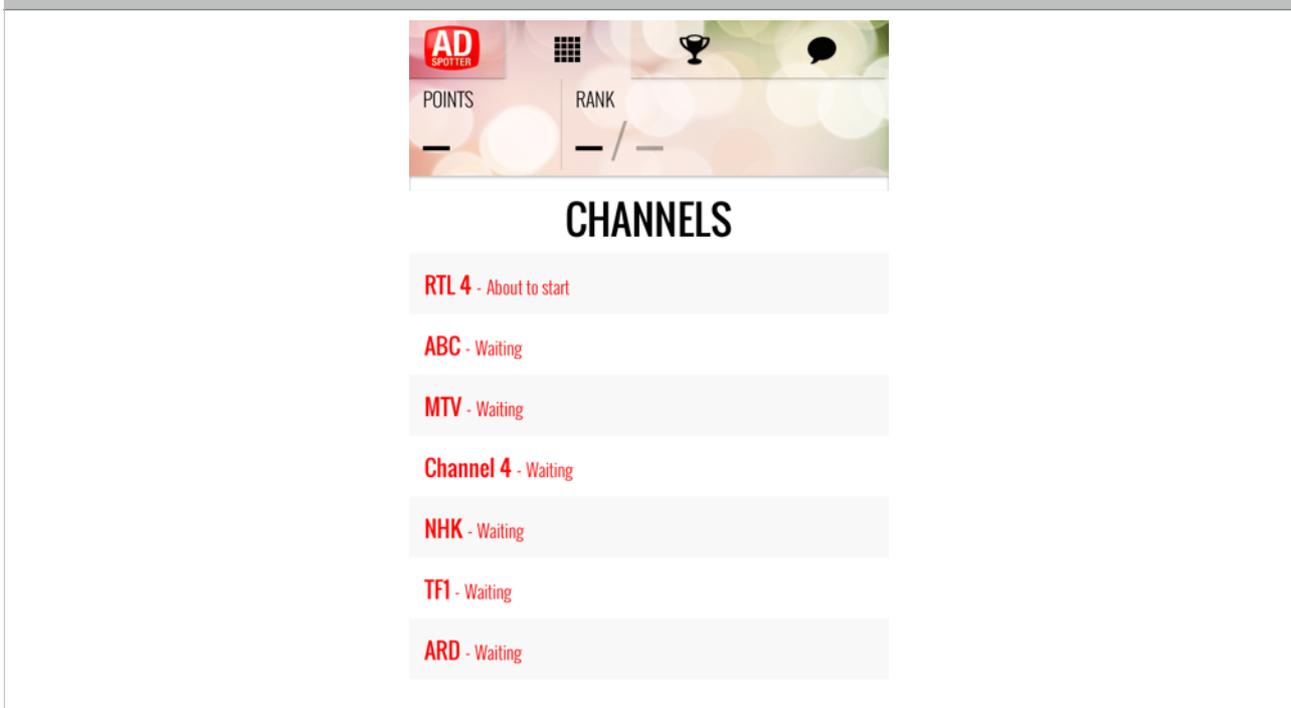
Once a new game session is created by the administrator through AdSpotter's web-based content management system (CMS), the users can then see the channels that are available to play a game. Before the game starts, the players have to choose the channel they are currently watching so that the application is in sync with the advertisement films they are viewing on the first screen. The game that has been created by the administrator on the channel that is expecting advertisement at that moment can be seen with a tip next to the channel name as: "About to start", where as all the other channels are still saying: "Waiting".

4.2.4. Joining The Game Session

See Figure 9. for joining the game session.

Figure 9. Original AdSpotter - Joining Game Session SCreen
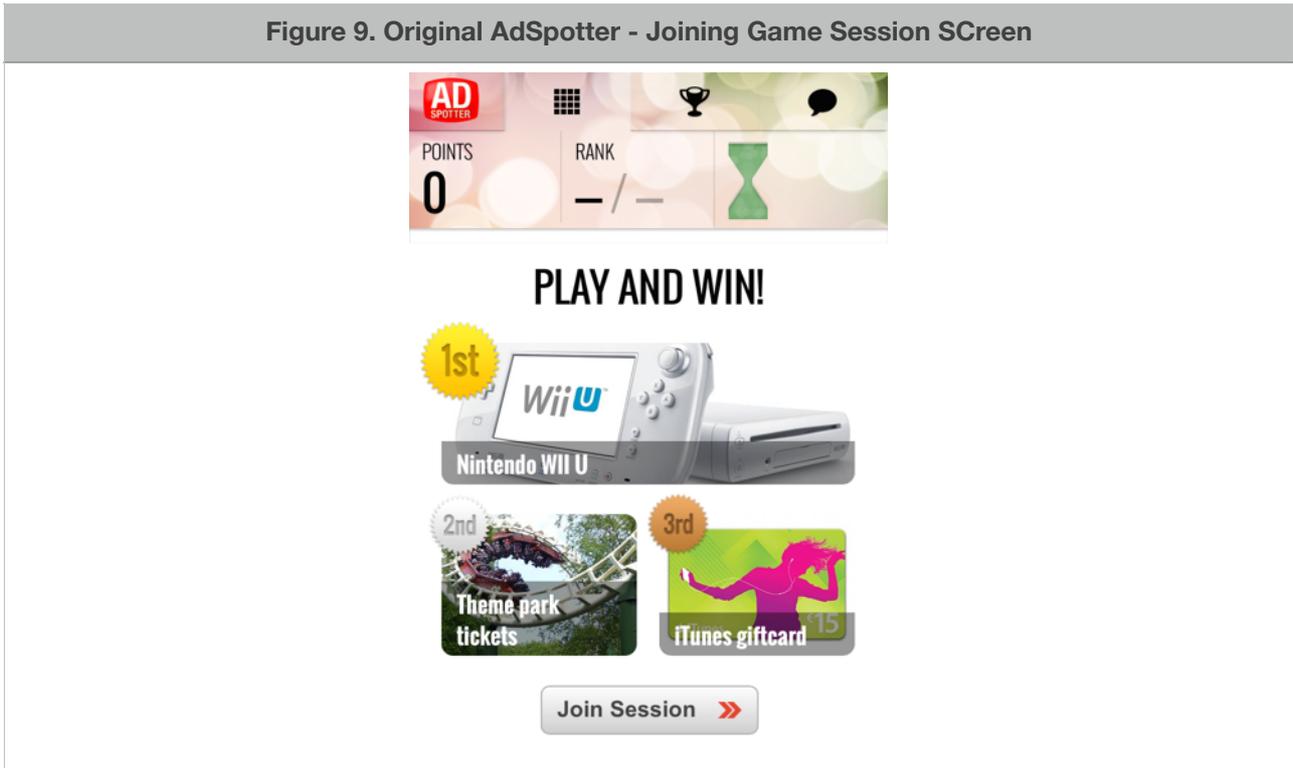
In the Joining The Game Session Screen, users can see the real life gifts they can win before they join the game session.

4.2.5. Wait Information

See Figure 10. below for the Wait Information Screen that tells a player to wait.

Figure 10. Wait Information Screen

In this AdSpotter demo, the game starts at the same time for everybody as soon as the admin starts the selected channel's advertisement films. The users who are already joined the game session, have to wait until the demo video is started. In real life conditions, this would be when the ad break starts and the users start seeing the first advertisement video on television.

4.2.6. Game Play

See Figure 11. for the Initial Game Screen.

Figure 11. Initial Game Screen
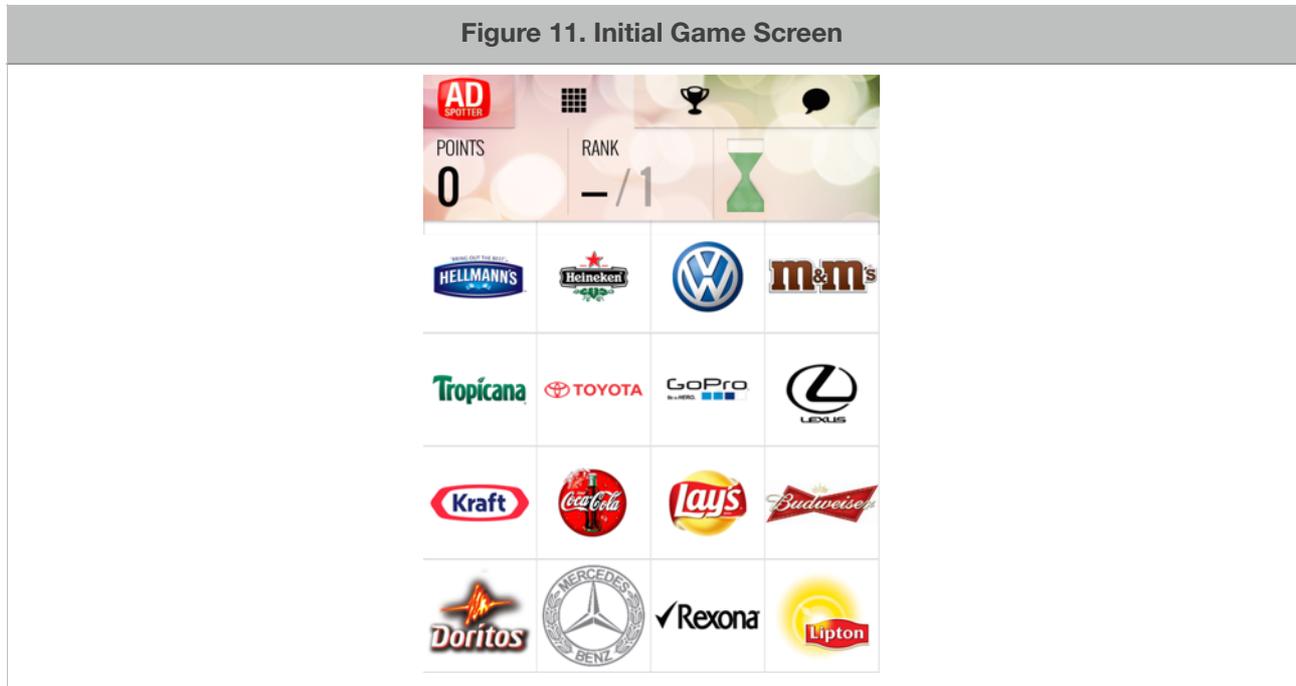
When the player sees the first advertisement video on television screen, a random board of logos is generated on her second screen. This board includes the brands that will be shown on the current ad break plus some other logos. The player can now guess the current brand and touch the logo that belongs to the brand that is currently on screen.
See Figure 12. for an Ongoing Game Screenshot.

Figure 12. Ongoing Game Screenshot
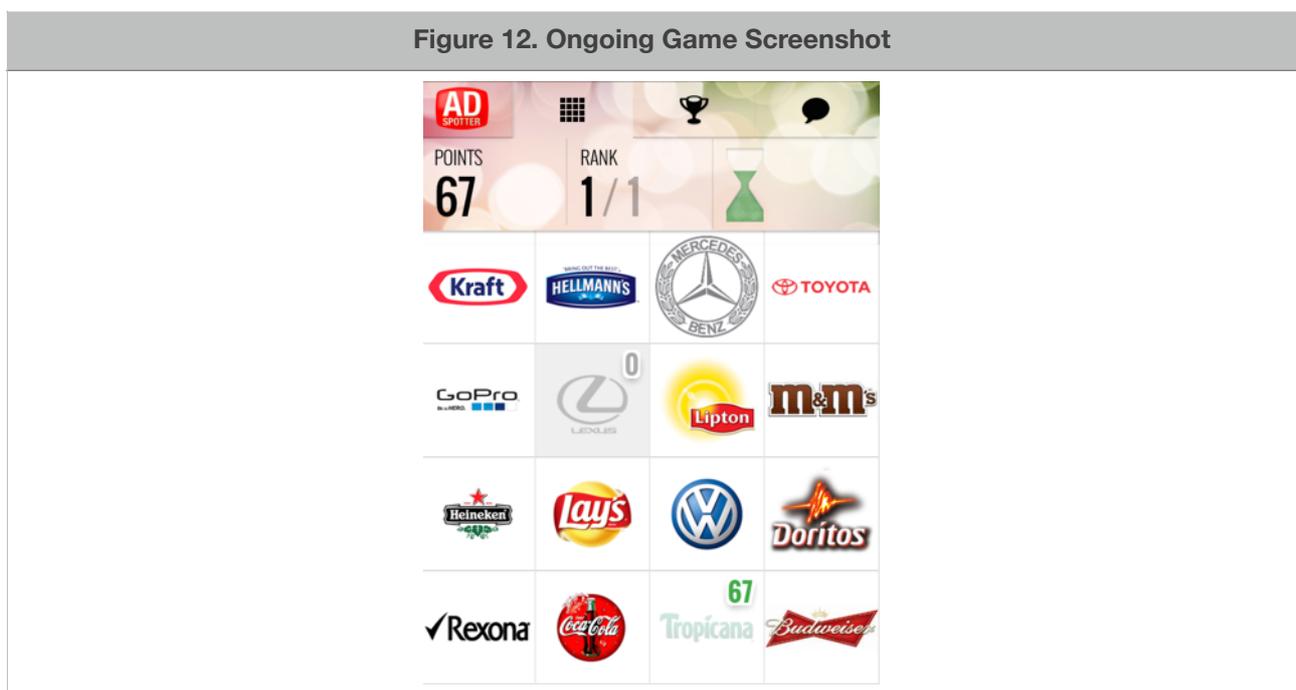
As the user gives a right and wrong answer she gets points depending on how fast the answer has been given and her rank changes as the other players are also advancing in the game.

After each advertisement finishes, the logo board is updated with scores taken from each logo, and the logos that have already been shown are filtered to keep focus on the rest of the logos that might be the answer to the following advertisement's name.

Finally, when the ad break ends the score is calculated and shown to the players, and the user can see how good she has done is in the leaderboard. The top winners are given a prize to celebrate their success.

4.3. Adspotter Evaluation

The original AdSpotter application is still a proof-of-concept and is not perfectly optimized yet for the best results. In order to determine the missing points I have studied AdSpotter according to the previously mentioned gamification frameworks.

4.3.1. Adspotter Classic - Octalysis Framework Analysis

See in Table 4. below the evaluation of AdSpotter Classic (original version) according to Octalysis Framework Tool. The original output from Octalysis Tool can be seen in Figure 41. in Appendix B.

Table 4. Adspotter Classic - Octalysis Framework Evaluation

Motivator (Motivation Factor)		1	2	3
Meaning (1)	Showing knowledge of logos			
Accomplishment (3)	Points		Leaderboard	Win a prize
Ownership(1)	User avatar			
Scarcity (1)	Time-based challenge			
Avoidance (0)	-			
Curiosity (1)	New logos			
Social Influence (3)	Facebook connection		Brag	Friends watching you
Empowerment (1)	Feedback			

The Octalysis Score for AdSpotter is 23. This number is calculated by giving weights to each motivator item and according to how many items the application has to offer intended for each human motivator.

The calculation for Table 4. is then:

(1*1) + (3*3) + (1*1) + (1*1) + (0 * 0) + (1*1) + (3*3) + (1*1) = 23

As can be seen from the Table 4. above, the AdSpotter Classic hasn't made much of an effort to attract user's attention in any of the motivators except for the "Accomplishment" and "Social Influence". Below is a detailed explanation of each motivator in AdSpotter classic.

Meaning: The epic meaning in AdSpotter is to have the knowledge of all the logos and brands that exist.

Accomplishment: AdSpotter Classic offers points and leaderboard to check player's global position as well as the chance to win real life prizes for players as an accomplishment motivator.

Ownership: There is not enough customization options. The only ownership indicator is the avatar of the player fetched from Facebook user account.

Scarcity: The only scarcity in AdSpotter Classic is time. A logo must be guessed before the next advertisement film starts.

Avoidance: There is no avoidance in AdSpotter Classic. If the user was given some dynamic badges which are given after some calculations and refreshed every week, for instance "100 ads/week" badge to show that user makes 100 ad guesses per week, this could be serving as a motivator to avoid losing this succesful title. So the user will have to work everyday to guess at least 15 ads to continue keeping the badge of making average 100 ads per week.

Curiosity: The users might be wondering which new brands will show next.

Social Influence: Facebook connection let's users learn from each other what they are watching and playing, as well as brag about how well they have done at guessing logos. This makes other facebook users envy our player and also join using the application.

Empowerment of creativity and feedback: The feedback given when a logo is guessed is not actually instant in AdSpotter classic due to technical reasons such as the lack of audio sync and recognition of the advertisement before a certain amount of time. However the feedback is still right after the advertisement finishes and at the same time with all other players.

4.3.2. AdSpotter Classic - MDA Framework Analysis

If we also take a look at the MDA framework, the situation is not too different than the Octalysis framework.

Mechanics: AdSpotter classic has only one main game mechanic, that is to tap (guess) the logo name. So there is not much a user can do within a game. For example, to make it more challenging, when a board is created with all logos plus some random logos in it, we could show all the logos to the player and then turn their back. In order to win the game now, the user both has to know the logo and remember where it was on the board. This would add more mechanics to the game play such as remember and find, making it more complicated and diverse, hence adding to the fun factor.

Dynamics: The dynamics of AdSpotter classic might be a player seeking an answer to a question in his social network: "Which logo belongs to the advertisement that is on air at the moment?" However to do this the user has to close the app and go to another app because there's no in-app chat.

Aesthetics: The game aesthetics of AdSpotter Classic are simple but not strong enough.

The logos for each brand keeps most of the space, which is logical, because the game play is bound to these images. However the the feedbacks are visually too silent, points earned are shown in small fonts just on the corner of each logo, which is hard to see and recognize. The moment a right or wrong answer is determined a bigger and more noticeable visual feedback backed up with a distinguishable sound would suit better for keeping the game exciting thus, keeping the player in the Flow. It would be more fun, for instance, if we saw a big celebration message together with clapping sounds, in case of a right answer and a thumb down image together with a buzzer sound if the player fails to guess the logo.

The application doesn't make use of device capabilities such as accelerometer or gestures with more finger touches or animation libraries.

The navigation is only using images and no text, there are no clues on what each navigation item does.

Also the navigation could be hidden on a side sliding menu to give the ongoing game the most space available. This would increase the immersiveness of the game play. And the screens which are in no interest of the user at that moment can be kept away from the visual sight until they become necessary again.

There is no walkthrough explanation step by step in an easy to understand way. The instructions and initial screen is showing the same message.

There is no tutorial level. It would be nice if the user could experience the game play without the possibility to fail for the first time.

There is no guest login possibility to allow players to try the game play first and get a taste of the application.

4.3.3. Further Analysis

All in all, AdSpotter Classic has enough space to improve both according to the Octalysis framework and MDA framework. Although, these frameworks make a good basis for understanding the current application, they are not custom-tailored for the best understanding of AdSpotter Second Screen application. In Chapter 5. I will elaborate more on the missing features in AdSpotter application and compare it with the new design.

4.4. Adspotter Player Analysis

It is important to know who the user of our application will be, so we can make better improvements especially designed to attract them. Second screen application users are first of all TV viewers. Here we could examine TV viewers using the player types we have mentioned earlier in Section 2. Because player types can also be applied to media other than just games.

See in Figure 13. below the concepts TV viewers talk about.

Figure 13. What Do Viewers Talk About?

Winning	14%
Entertaining	11%
Funny	10%
Physical Attractiveness	9%
Fans	9%
Romance	8%
Voting	6%
Writers/Creators	6%
Judging	6%
Drama	6%

Source: NM Incite - Volume is represented as a percentage of 2,058,828 messages about the top 10 television series, posted on boards, blogs, and groups from July 1, 2009 to February 28, 2011.
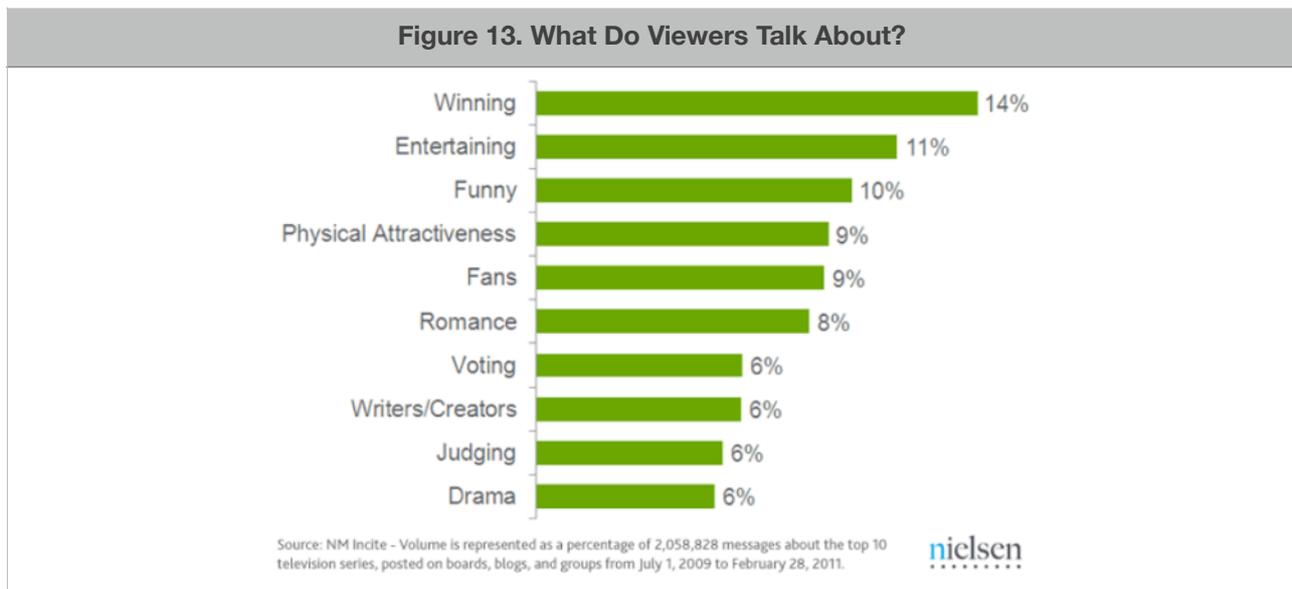
nielsen

If we look at the keywords found in a research conducted by Nielsen [Social Media and TV, 2011], on people who are using a smart phone or tablet while watching TV, we can deduct the player type of TV audience in this research as: socializers, achievers, and explorers.

I will be taking this player analysis further in Chapter 7. and compare how AdSpotter Classic and the Gamified AdSpotter application satisfies the anticipated player motivators.

Chapter 5

AdSpotter Realization

In this chapter, I will demonstrate the actual work I did in ExMachina games. I will first introduce the new prototype of AdSpotter application I have developed with the help of some mock-up screenshots accompanied with detailed explanation. Later on, I will describe the process of realization and implementation of the working prototype. I will also add information on the idea generation process and compare AdSpotter Original web application with the New AdSpotter mobile application in different aspects related to Gamification. I will finalize this section with how this new application fits within the company's requirements.

5.1. Product

ExMachina Games describe AdSpotter as a Second Screen platform for media companies to turn ad breaks into interactive entertainment. They envision AdSpotter as a growing catalogue of casual games.

The New AdSpotter Application

At the beginning of my internship I was approached for the design and realization of AdSpotter platform. Naturally they wanted to create a full product with a portfolio of games in it. However this was a big project to finish during an internship period. We down-scaled the project to fit in an internship period. I worked on the design and development of a working prototype with one alternative game in it to help us case study for the gamification process.

Mobile application for IPhone

The product I developed is a mobile application that works on IPhone rather than a web application that works on all devices with an internet browser. I will discuss the technical issues involved in the design and development process together with why I used this platform in Chapter 6.

"Type The Ad" Case Study Game

The demo game I developed for this application is called "Type The Ad". In this game players are prompted to actively type the name of the brand name they see on television advertisement on their second screen as soon as possible. This brings the logo images that belong to the brand. Once they agree and submit their answer to the question "which logo belongs to this advertisement?" they wait until the advertisement is over. Finally they get scored according to a ranking algorithm and can see their score and rank with an immediate feedback.

I will add a general view of screen flow and user navigation while I am explaining the Architectural Design Process in Chapter 5.2. Below is a detailed look at the application and each screen specifically.

5.1.1. Initial Screen

The application starts with a Splash Screen. On this screen a small animation of AdSpotter logo shows up and disappears within a determined amount of time (3 seconds). While the application is being loaded, the user can see the application logo bigger. The smaller version of this logo is used within the application later on.

After the short animation on Splash Screen, the user is taken automatically to the Initial Screen where she can be welcomed with a short introduction of the whole application. She can then login to start using the application further. See Figure 14. for the Initial Screen.

Figure 14. AdSpotter New Version - Initial Screen
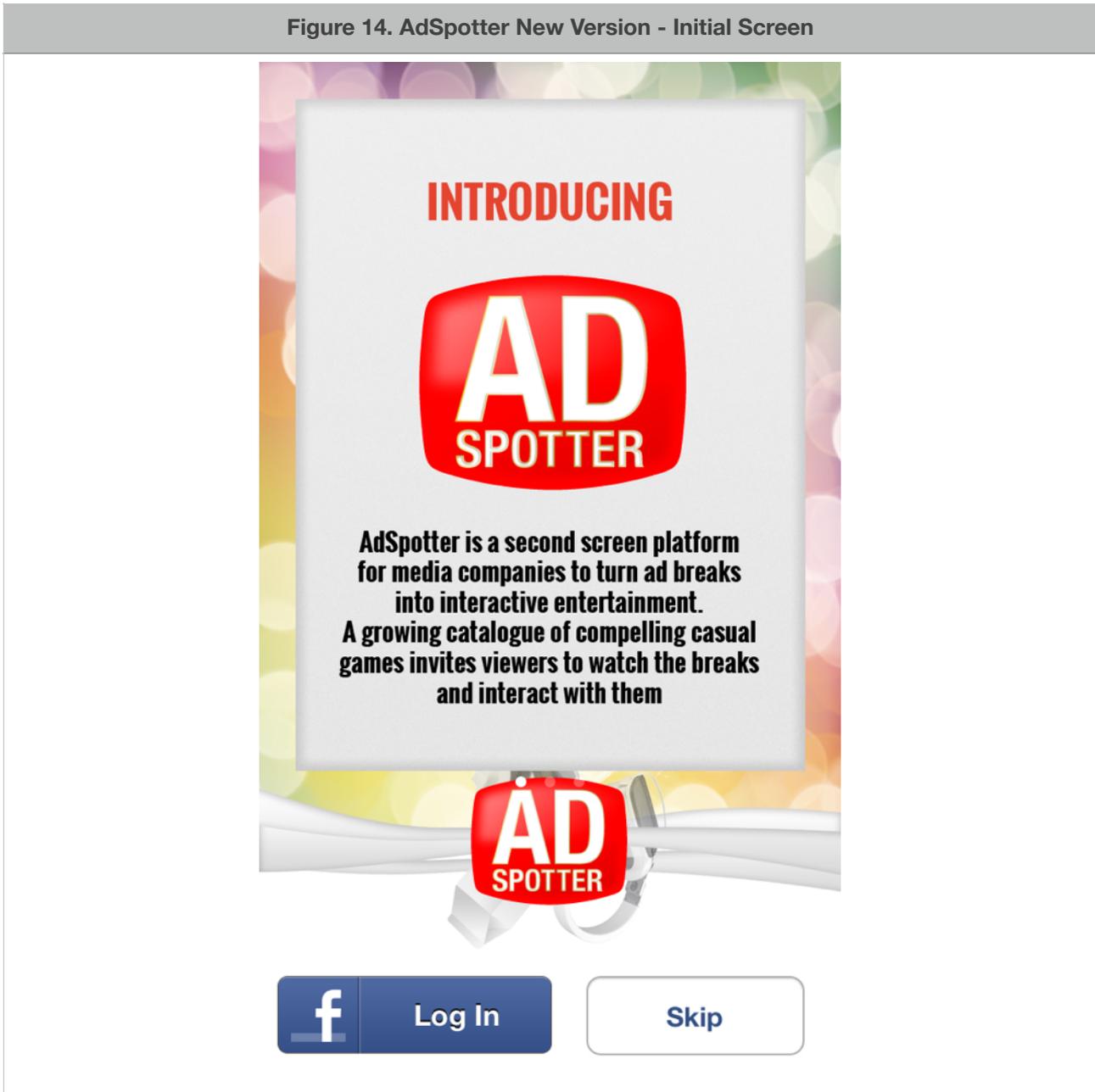
The Initial Screen consists of 2 screen sections:

1) Introductory / tutorial section

2) Login section

In this screen there's nothing else the user can do, so the possibility of user ending up in an unnecessary or forbidden screen is nonexistent.

5.1.1.1. Introductory Section

Tutorial is a commonly used design pattern for IPhone applications to transfer knowledge about how the things work within the app.

Currently, I use this section to give more general information about the application rather than taking the user step by step through a tutorial.

See Figure 15. and 16. for some introductory pages I have used in this application.

Figure 15. AdSpotter New Version - Walkthrough Page 1	Figure 16. AdSpotter New Version - Walkthrough Page 2
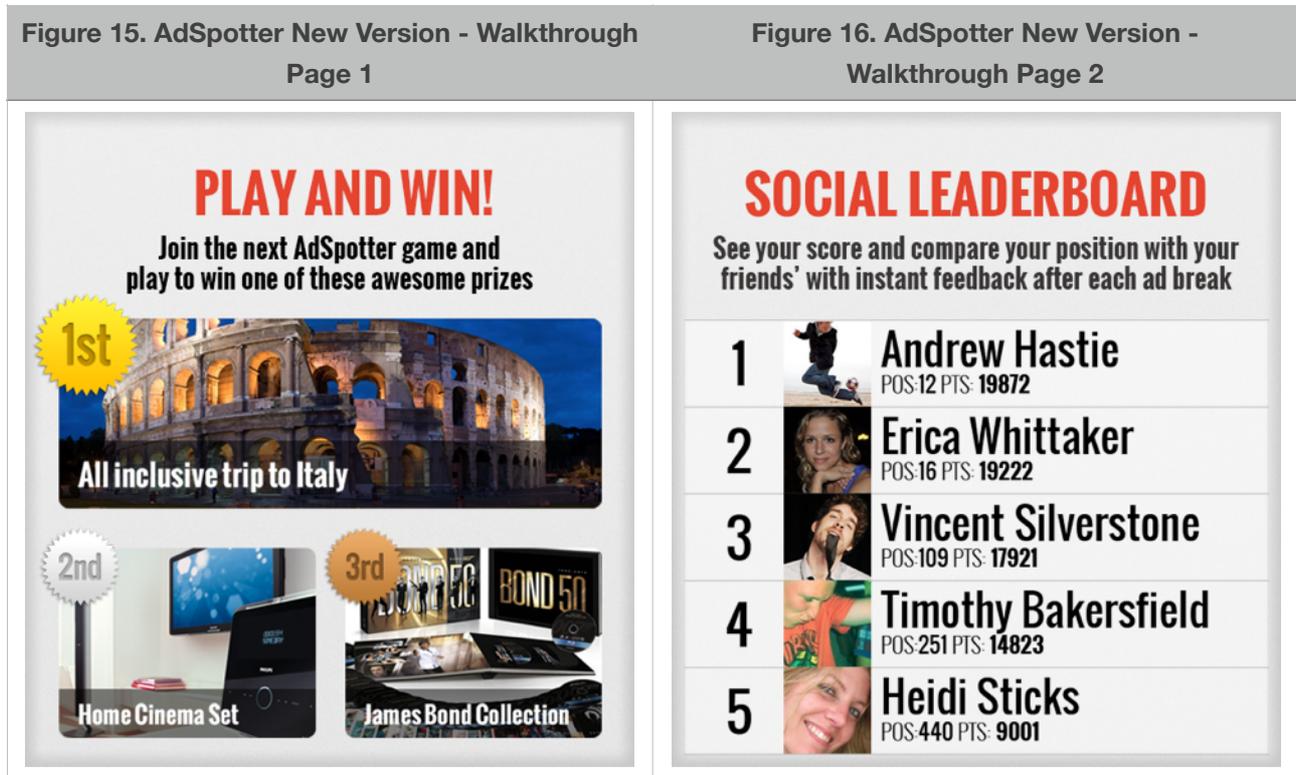
Since this section is designed as a *Scroll View,* it can be easily extended with more images later on if necessary.

The user can read more about the application by scrolling through the walkthrough tutorial with a "swipe left" hand gesture.

5.1.1.2. Login Section

Here the user can use the Facebook Login button to login with her Facebook account or use the Guest Login button if she would like to skip logging in and try the application without connecting with her friends on Facebook. In both cases the user is directed to the application's Main Screen.

5.1.2. Main Screen

The main screen consists of 2 sections:

1) Side-bar navigation button (Rear view)

2) Current view (Front view)

At the top of this screen there is a navigation bar with a small version of AdSpotter logo in the middle. This is currently just an image, but it could be serving as a button which takes users to ExMachina's AdSpotter website or it could take us to a credits/about page. Thanks to the power IOS and the ease of code management in XCode, this sort of tasks are very easy to accomplish. I will mention some related code in Chapter 6, together with the libraries and frameworks used in the implementation of this intuitional navigation design.

5.1.2.1. Side-Bar Navigation Button (Rear View)

Other than the little AdSpotter logo, the navigation bar also has a side-bar button at the left, which gives the user a clue that there is more behind this screen. Once this button is touched, a rear view slides in from left to the right of the screen, revealing a menu with other possible views the user can navigate to. See Figure 17. for when this rear view comes forward.

Figure 17. AdSpotter New Version - Rear View
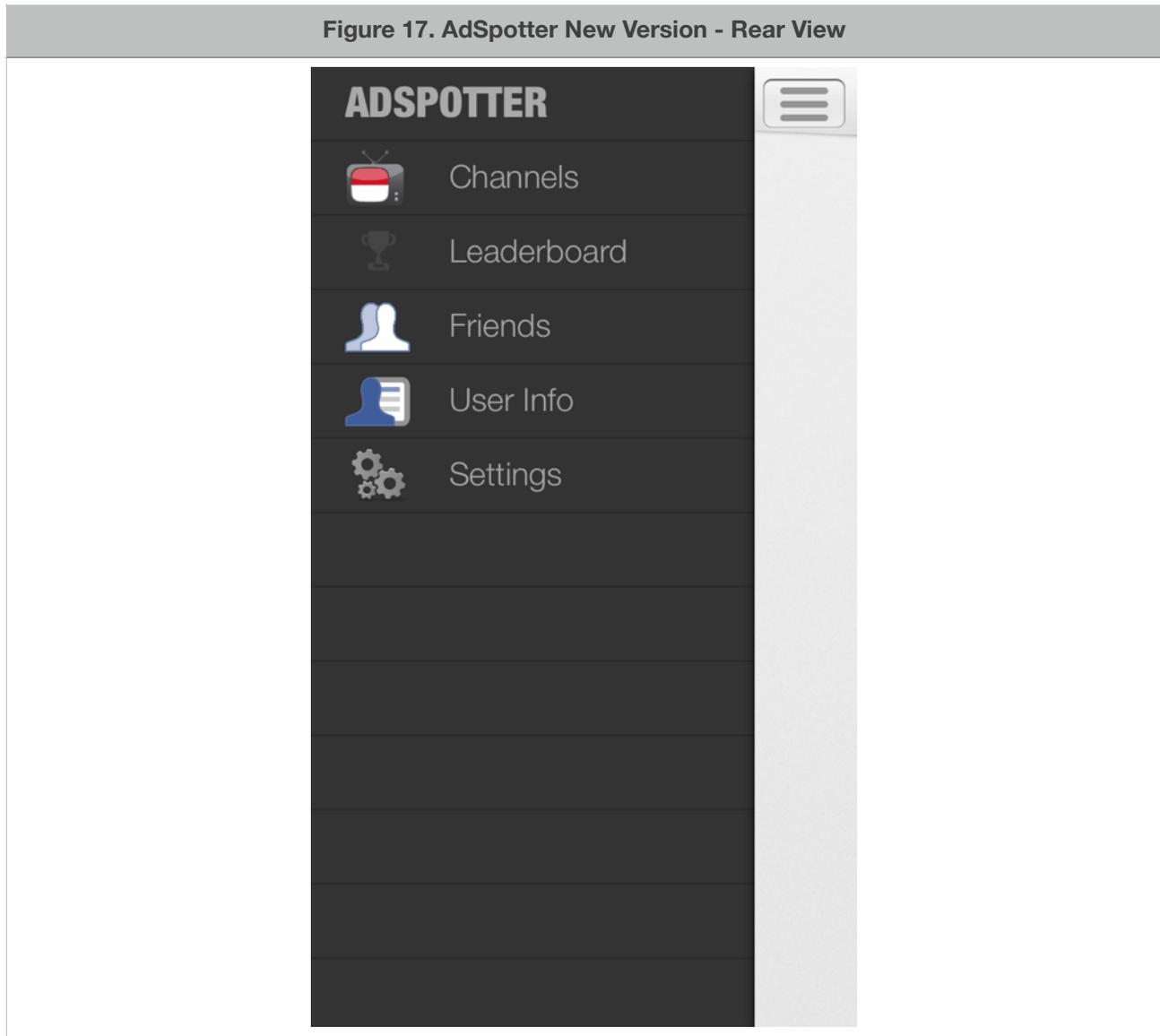
This menu has currently 5 items in it: Channels, Leaderboard, Friends, User Info, Settings.

Once the user touches one of these items in the menu, the menu slides back to right side and the user is directed to the Front View which starts showing the view that belongs to the selected menu item.

As I indicated earlier, adding more menu items is also straightforward. And adding a new menu item does not affect or get affected by the existence of other menu items. Although it would be a good practice to keep the menu list short so the user does not get confused by too many choices.

Currently, we only make use of the Channels, Leaderboard, User Info and Settings menu items. The Friends Screen is not really being used in the AdSpotter New Version yet. However I added this for the complete look and feel of the application.

5.1.2.2. Current View (Front View)

Current View occupies the biggest part of the Main Screen. When the user chooses to login or skip login in the Initial Screen, she is presented with the Main Screen with Channels View loaded in its Front View. (See Figure 18.)

Figure 18. AdSpotter New Version - Front View
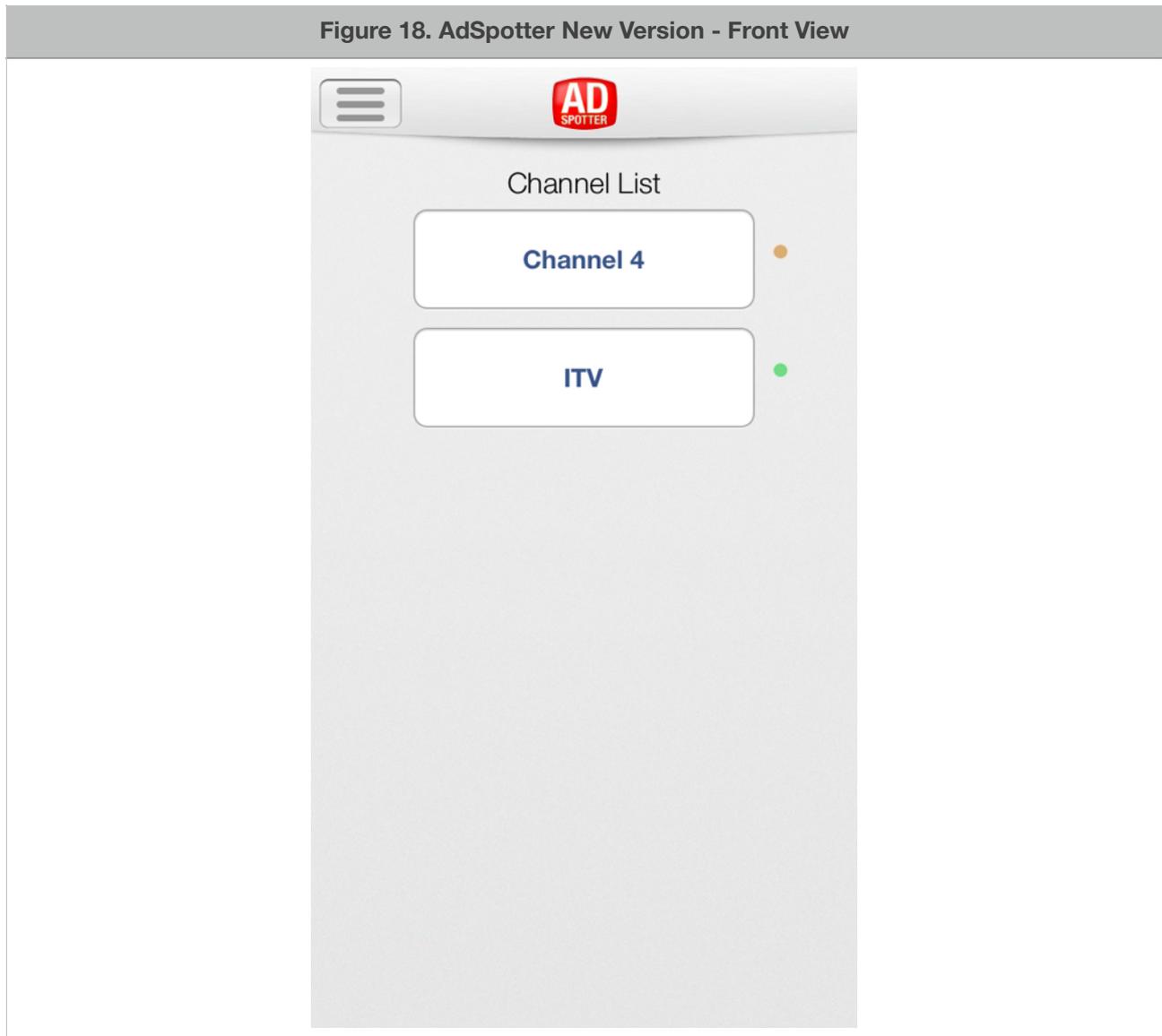
In this view, the user is first presented with a list of available Channels because the first thing we need to know before we start a game is which television channel the user is watching right now. Although we could identify the television channel which is currently being watched automatically, there are technological limitations to this which I will mention in Chapter 6.

The Channels List is a dynamic view which shows the channels as they are made available through the AdSpotter CMS. The availability of a channel can be seen through the color of the little dot that is next to each channel name. The user can join a game session if the dot is orange or green, meaning the advertisement break is about to start or has started.

Once a channel is selected, the user is directed to the "Type The Ad" game, because this is the only game the user can play right now. Once more mini games are created, a Game Selection Screen could be added.

5.1.3. "Type The Ad" Game

Following the channel selection, the user can start playing the first game which is rather a simple but more active input version of AdSpotter original.

5.1.3.1. Goal Of The Game

The users need to type the brand name of the advertisement on the television channel they are currently watching and submit the logo image as soon as possible to score points.

The game is also shown within the Front View of the Main Screen.

5.1.3.2. Suggestion List

The user is initially presented with some privileged logos together with a text input field under it. See Figure 19. for the Type The Ad Game's Start Screen.

Figure 19. Type The Ad Game - Start Screen
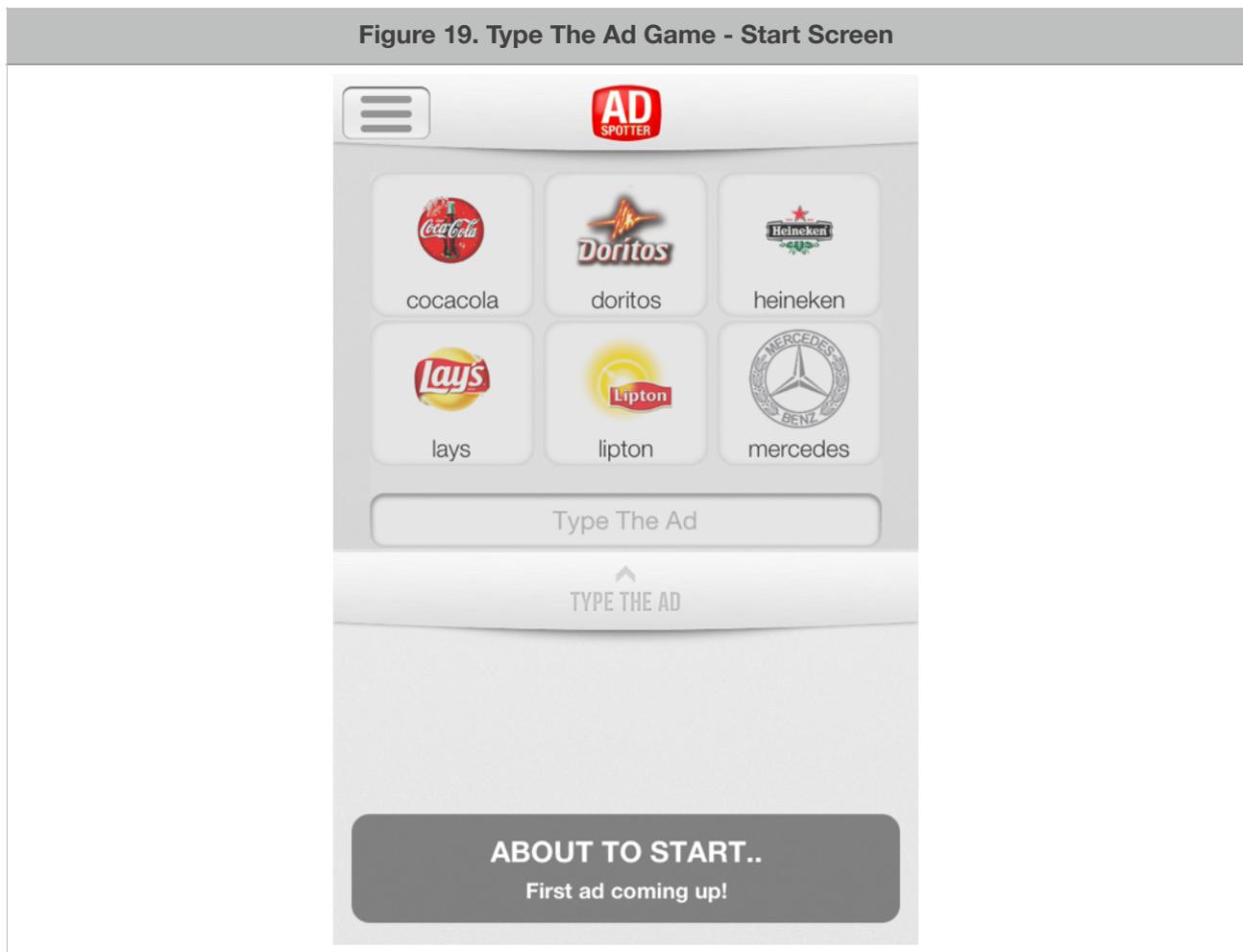
The game starts by showing a suggestion list full of logos. These logos could be initially selected randomly or by giving previlige to the brands that has supported the application. The Suggestion List could also be filled with an algorithm for creating a more compelling experience for the user. For example, learning from the social profile of the user and showing the brands user might be interested in. Of course, this is more of a business choice that ExMachina should decide at another stage.

Currently the Suggestion List starts with a pre-defined list of logos to make the prototyping easy. The user can either touch a logo from this list or type the advertisement name in the text input field below this list to search the logo she wants.

5.1.3.3. Interaction

As seen in Figure 19. in the previous page, there is a visually clear separation between the Interactive Section and the Notification Section at the beginning. The separation point is also determined due to the appearance point of the keyboard once the user starts typing in the text input field. See Figure 20. for how the game looks when the user starts typing a logo name in the input field.

Figure 20. Type The Ad Game - Text Input
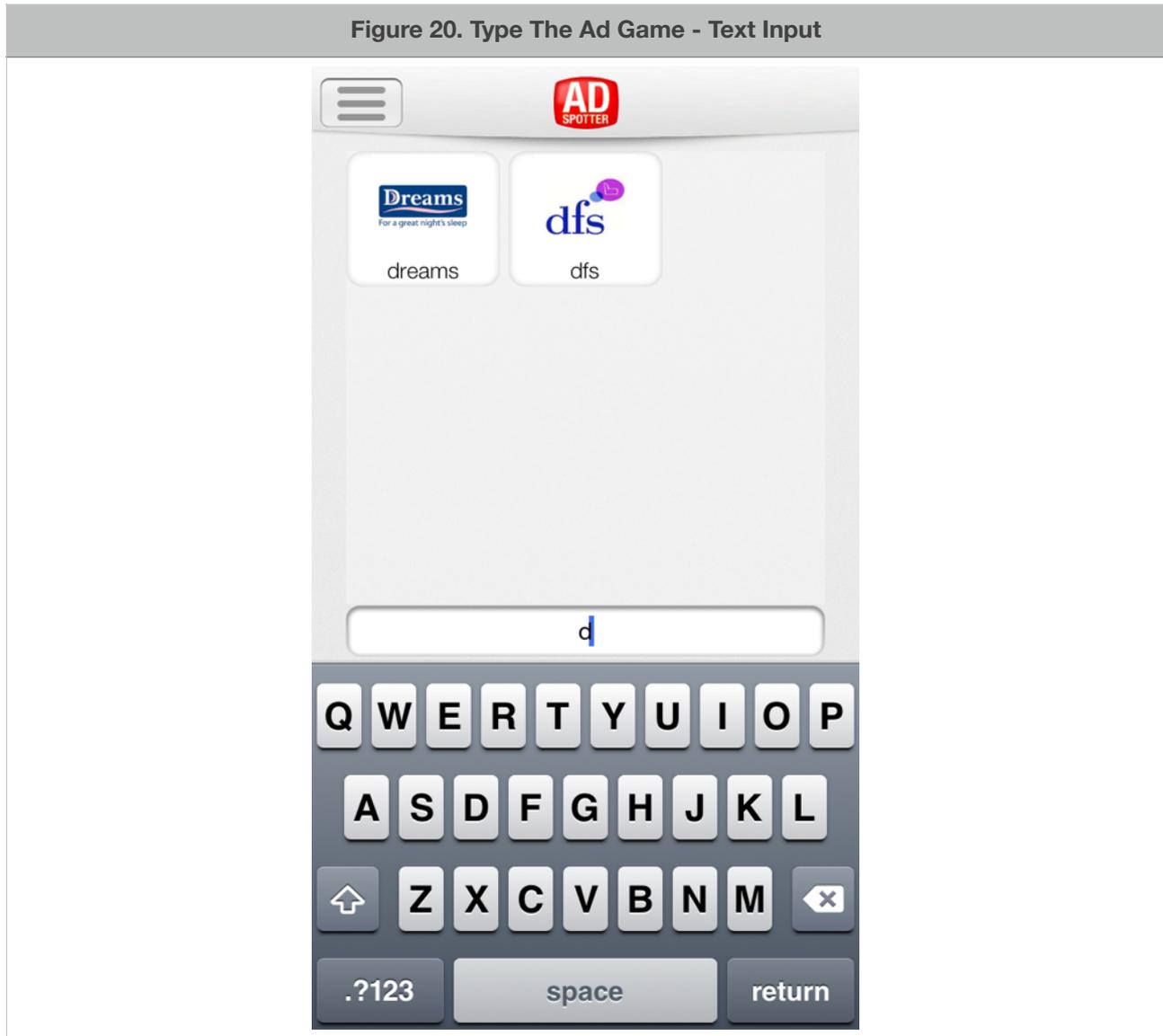
Once the user touches the input field, the keyboard shows on top of the notification section. As the user types the letter "d" in this keyboard, the Suggestion List is updated with all the logos that start with a letter "d". At this point, all the other logos are cleared, to make it faster for our user to recognize the logo of her interest.

If there were too many logos starting with a letter single, the Suggestion List would dynamically include all of them in a scrollable view. The user could either choose to scroll down to see the logo she wants to pick or type in more letters that belong to the brand to refine her search.

Once the user picks a logo from the list, it is submitted to the server.

5.1.3.4. Notifications

Through out the game play the user is constantly notified about the ongoing events. Some notifications are shown briefly and then disappear while the others block user input until the game state changes.

See Figure 21. for a notification of submission.

Figure 21. Type The Ad Game - Submission Notification
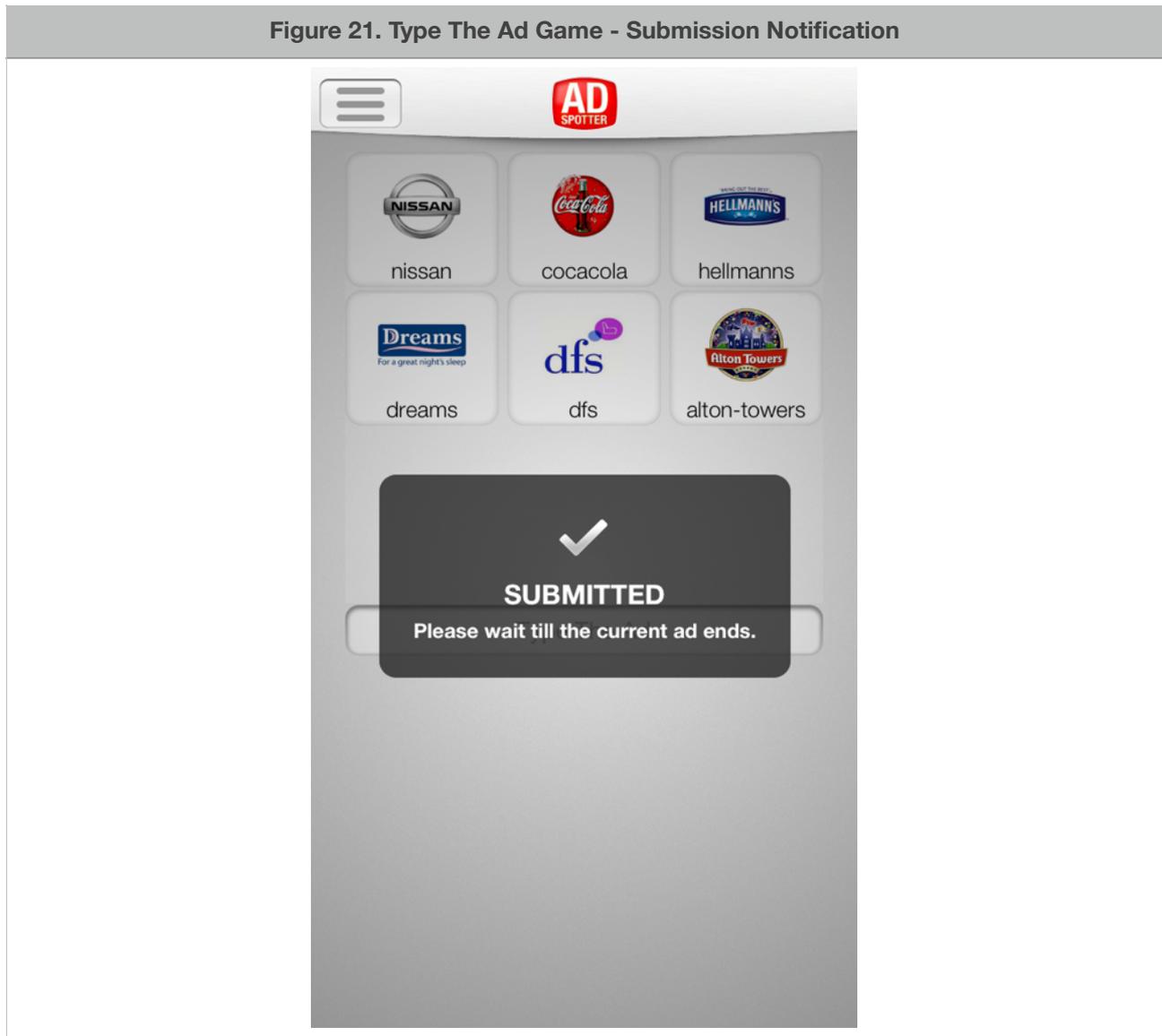
At this stage, once a logo is submitted, the screen is dimmed, the user input is blocked and everything on this view is disabled. This prevents the user from entering an answer twice or taking other unwanted actions. The user has to wait for the current advertisement to finish and the new advertisement to start, to be able to submit another logo.

After each advertisement, a big and cheerful message bubble is shown to notify the user about her current score and ranking. This is done after each answer is successfully submitted and before the next advertisement starts. The score is calculated on the server side and sent to the client after calculation.

See Figure 22. for the Score Feedback and a Waiting Notification.

Figure 22. Type The Ad Game - Score Feedback
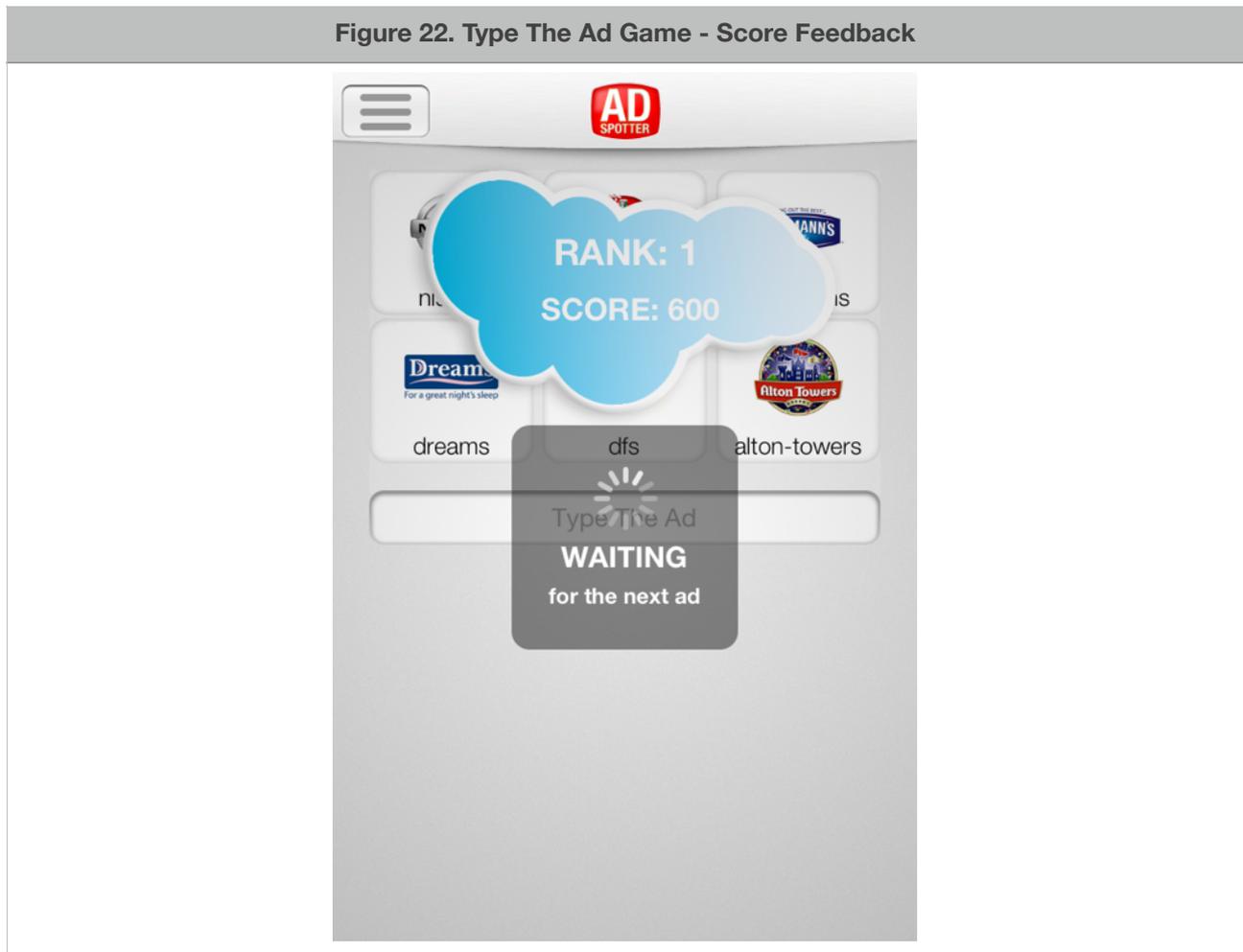
This feedback is bigger, thus better visible and more fun compared to showing little score numbers at the corner of AdSpotter Original application. The immediate feedback about score and ranking is for creating a eu-stress in users.

Lastly, when the last advertisement is over, the game finishes and the Leaderboard is fetched from the server. The user is first notified about these events (see Figure 23.) and later on directly taken to the Leaderboard View.

Figure 23. Type The Ad Game - Game Ended Notification
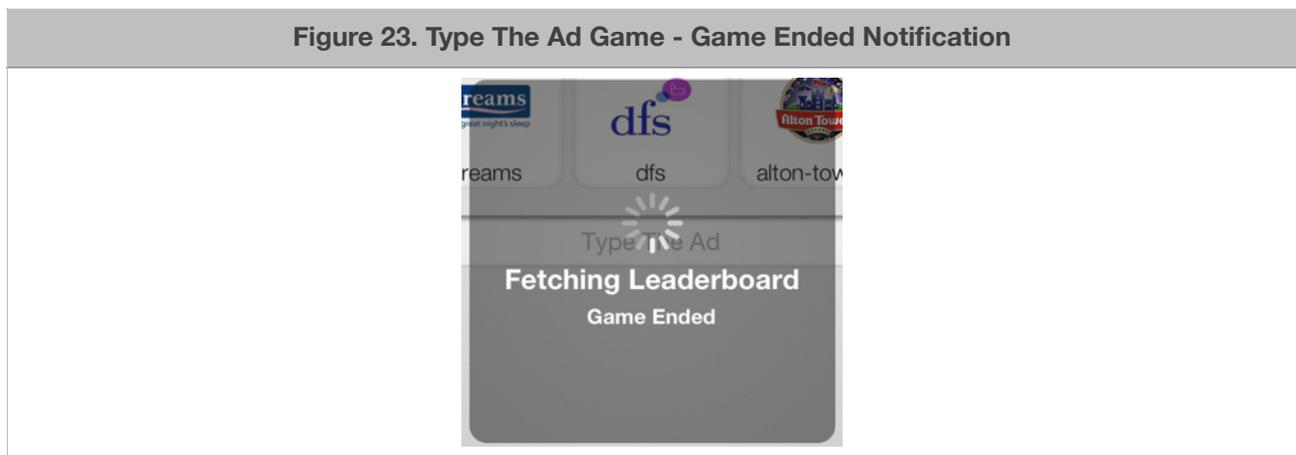
5.1.3.5. Leaderboard

Once the game is finished and the Leaderboard is updated the user can see all the players of this game together with their scores and ranking on each side. See Figure 24. for Leaderboard.

Figure 24. Type The Ad Game - Leaderboard
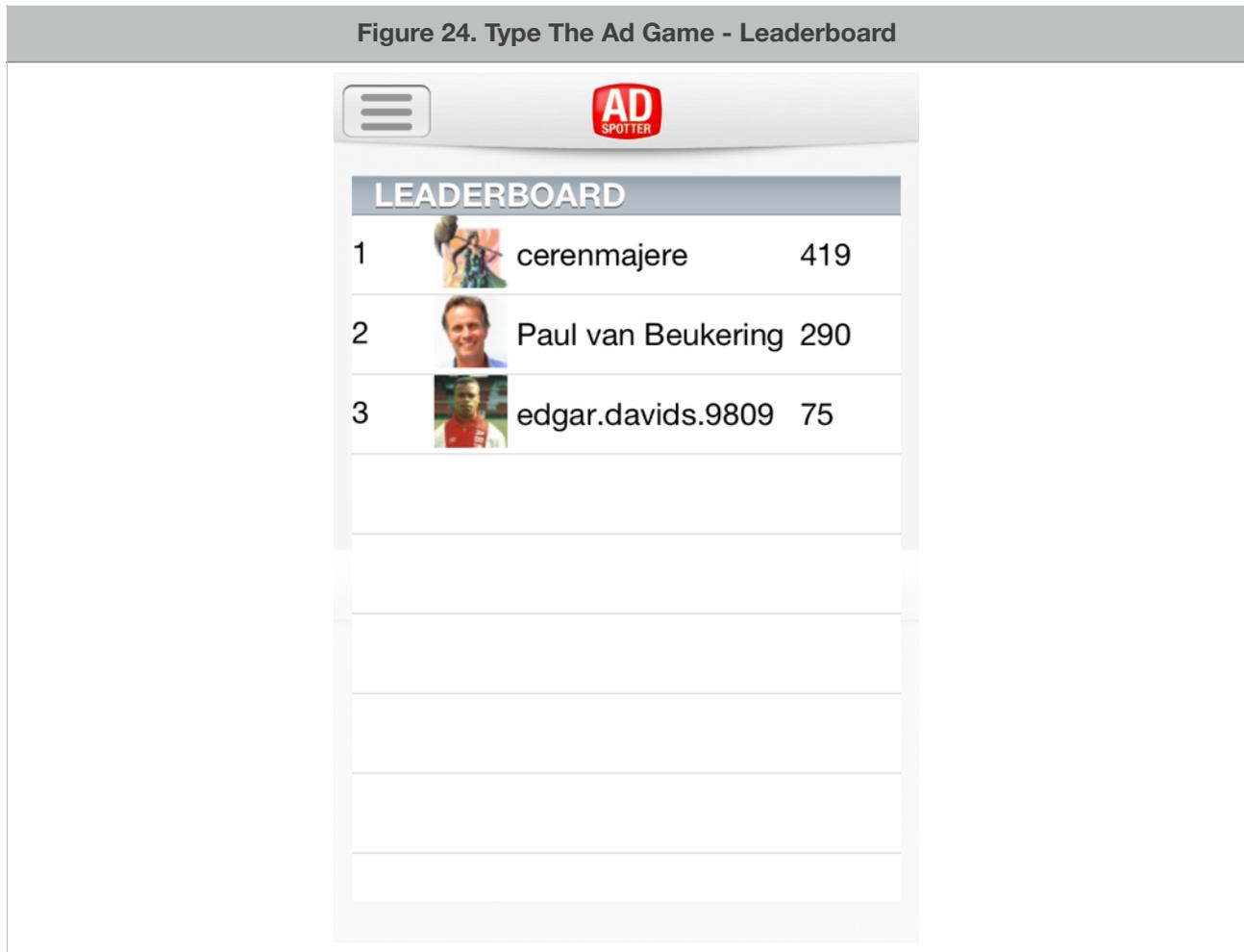
This is where the user can be notified about the prizes she has won or if she hasn't she can be encouraged to make a better score in the next game session.

5.2. Process

The process of creating the new AdSpotter application includes the analysis of the current situation, requirements gathering, creative thinking, the idea generation, technological research and finally design and implementation of the prototype application. All this, excluding the initial background research study on Gamification, took six months of part-time work at my ExMachina internship. I have already made the analyzation of the situation in Chapter 4. In this section, I will first report the implementation of the AdSpotter New Version and later on I will dive into the creative process where the alternative ideas are generated and selected. Finally, I will compare the new AdSpotter application with the AdSpotter Classic version.

5.2.1. Implementation

The implementation process went through several stages before starting to actually code the prototype: setting up the necessary development environment, creating the architectural design, storyboarding the general screen flow of the application, laying out the user interface elements, determining the behavior of components. After this step comes the actual programming, testing and bug fixing.

5.2.1.1. Requirements

In order to develop IPhone applications a developer needs to work on an Intel based Mac running Mac OS X Snow Leopard or later.

In order to test an application on your own IPhone or publish your application to Apple's online application store for the whole world to be able to download/purchase, you need to enroll to Apple IOS Developer Program (costs 99$).

5.2.1.2. Development Environment and Language

The development of the New AdSpotter application is made in XCode using Objective-C programming language.

XCode is the Integrated Development Environment for developing IPhone applications which provides code editing, organizing, compiling and debugging possibilities as well as a graphical tool which let's coders create the user interface elements and the IOS simulator which let's coders test their applications. [XCode, 2014]

Objective-C is an object oriented programming language used for IPhone development which is an elegant superset of C programming language. At the time of my internship I made use of IOS 6 SDK on XCode 5. however development kits and libraries provided for developers are changing very rapidly in mobile development and at the time of finishing this thesis Apple has already released IOS 8 together with XCode 6.

5.2.1.3. Architectural Design

In order to see the big picture, and not get lost in a detail-first thinking, let's first take a look at the technical architecture of the new AdSpotter application. See Figure 25.

Figure 25. AdSpotter New Version - Technical Architecture
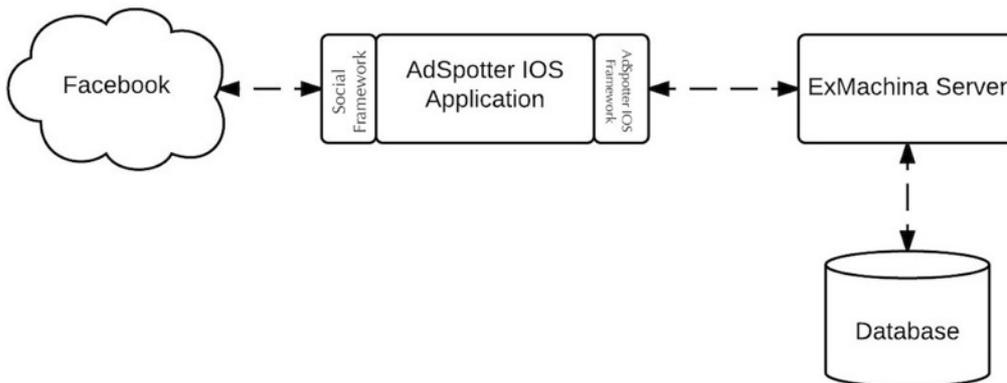
My work done during the internship includes the implementation of AdSpotter IOS client application. For handling social connection and data retrieval I made use of the integrated Social Framework in IOS SDK. Also for retrieving ExMachina data from servers I used the AdSpotter IOS Framework developed within the company. Important database actions such as creating a new ExMachina user, retrieving game session, and calculations such as game scoring and ranking were already done on the server side.

Before the implementation of AdSpotter IOS client application, I made a list of essential use-case scenarios and put them in a diagram as in Figure 26. below.

Figure 26. AdSpotter New Version - Use Case Diagram
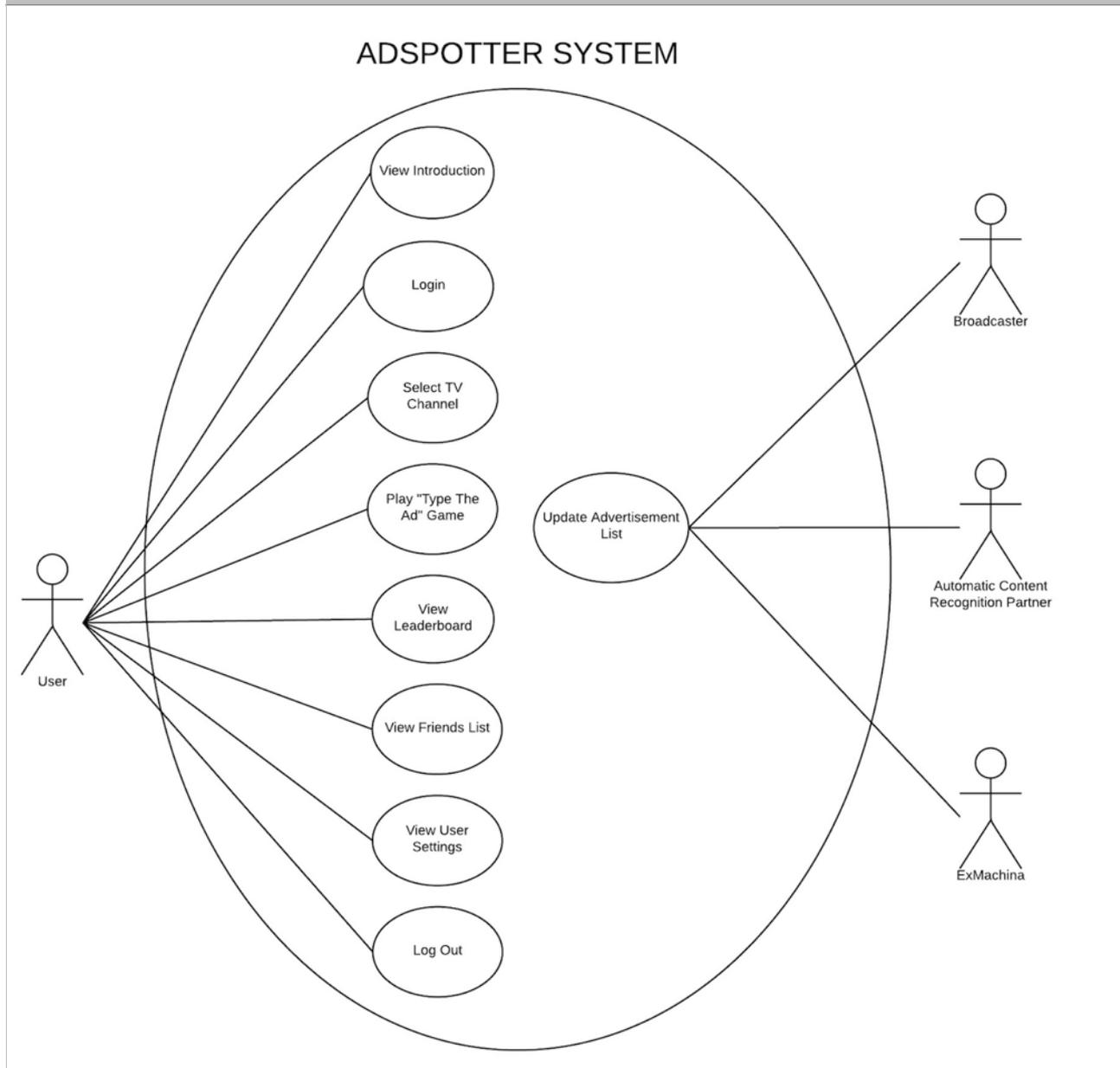
This diagram shows who the actors of AdSpotter system are and how each actor reacts with the new AdSpotter system.

Obviously, the user is the person who will be playing the mini games in AdSpotter Second Screen application, while the other actors such as the Broadcaster or Automatic Content Recognition Partner or ExMachina are the companies that work together to provide the current or next advertisement list to the server side of the application so the game can work and the user's answers can be checked.

The number of use-cases in this list is currently little, however we could add more Gamification elements and new mini games to make it a more complex system. I will enlist some additional use cases and gamification elements for future use in Chapter 7.

To make it more clear how the screen flow and user navigation works within the application, I made an activity diagram as can be seen in Figure 27. below.

Figure 27. AdSpotter New Version - Activity Diagram
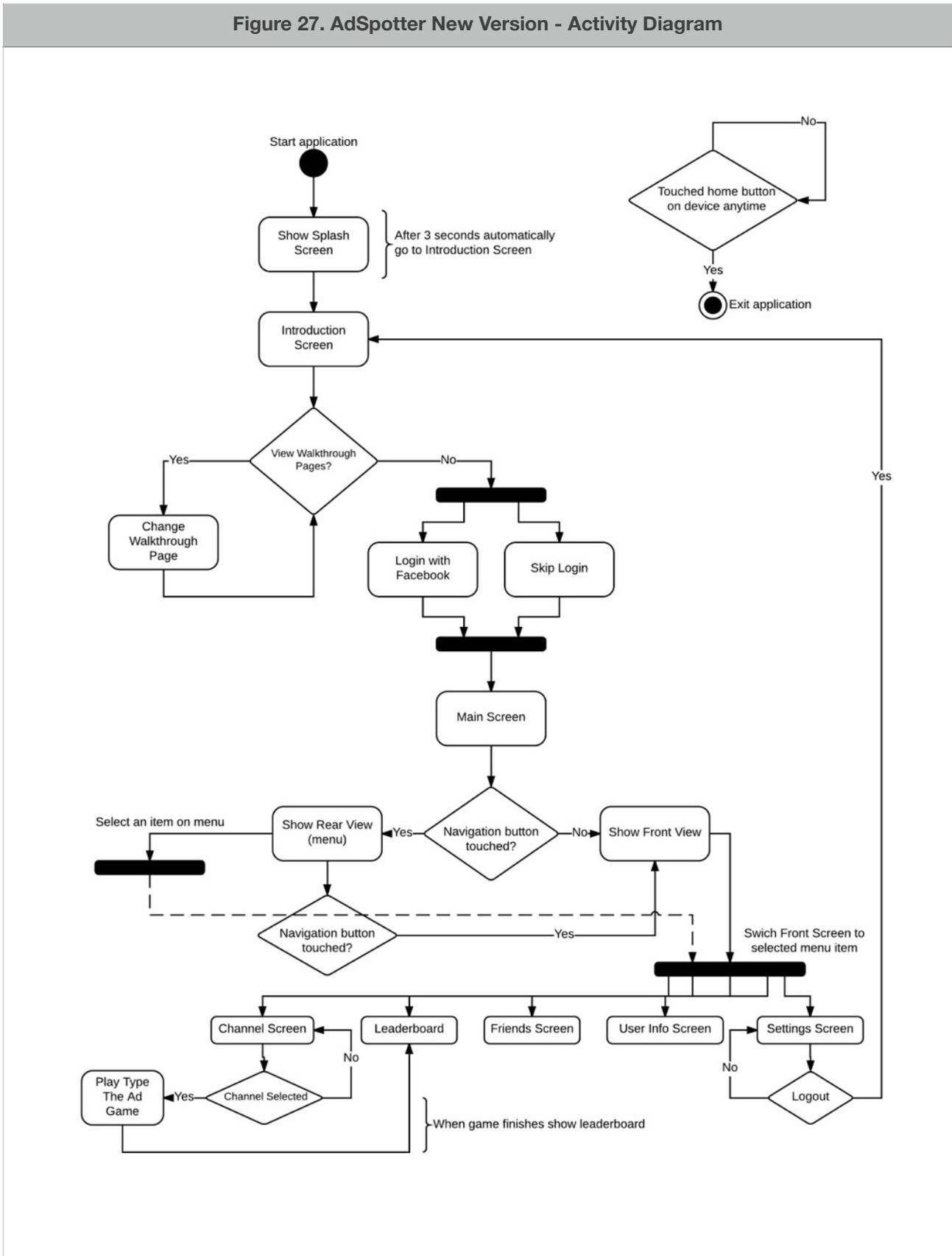
I have already explained this screen flow while I was showing the screenshots from the application in Chapter 5.1. however this diagram brings all possible actions of the user together in one page.

After this stage, I used XCode's Storyboards to turn this into a real user interface as I displayed in Chapter 5.1.

5.2.1.3. User Interface (UI) Design

Both while introducing the building blocks of Gamification and discussing the MDA framework, I have mentioned the importance of aesthetics. Working on a new version of the AdSpotter application gave us the chance to consider some design issues considering the user interface and experience, as they are a part of the aesthetics of the application.

Sliding Menu

One of the important decisions was to make the menu hidden, to give the screen that is currently in use some space of its own. See Figure 28. and Figure 29. for a comparison of the old AdSpotter with the new AdSpotter. The users don't have to deal with too many distractions while viewing a page. They know that they can reach the menu through a single button touch anytime when they want to navigate somewhere else. Keeping each menu item in a slide menu makes the navigation more organized.

Figure 28. AdSpotter Original Menu | Figure 29. AdSpotter New Version Menu
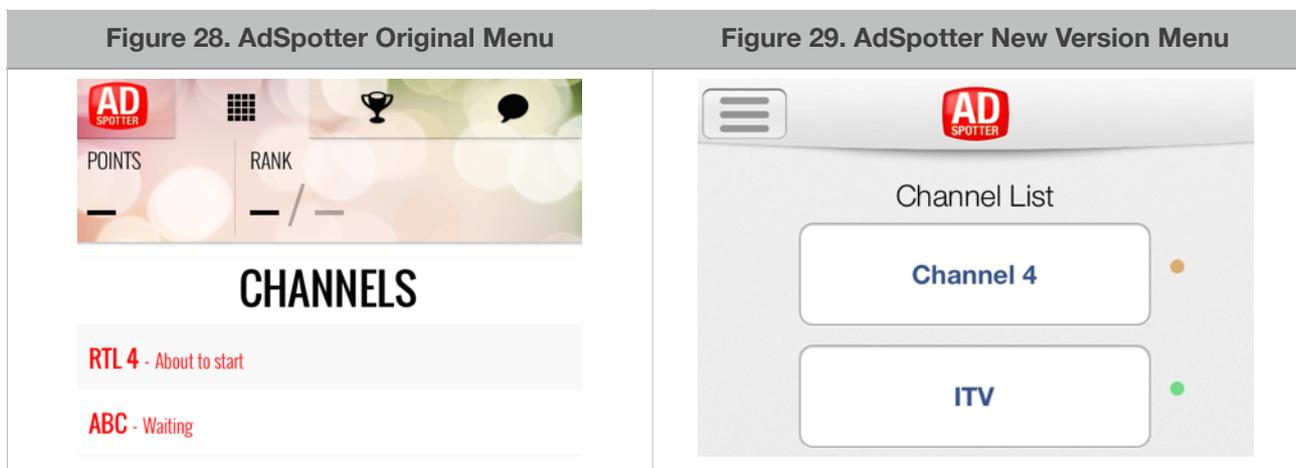
Recognizable Feedbacks

Making the feedbacks and notifications bigger and easier to read was another good decision. For example, see Figure 30. for an older version of user score feedback vs. Figure 31. the new version of score feedback.

Figure 30. Score Feedback in AdSpotter Classic | Figure 31. Score Feedback in AdSpotter New
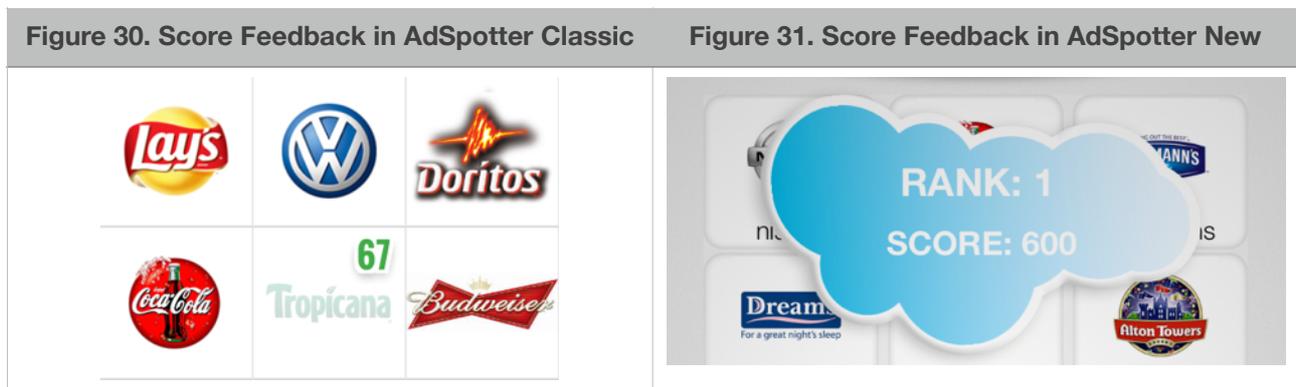
Making the change from showing the score in a small font in the corner of a logo card to showing the score in a giant and colorful bubble in front of the game screen made the user recognize her score and ranking immediately.

Color Coding

Another decision was to make the channel selection more intuitive. For this, I used color coding. It makes distinguishing channel states easier compared to reading a long text which says "About to start" or "Waiting". See Figure 28. and 29. for a comparison of old AdSpotter with the new AdSpotter. Just as in traffic lights green means ready or available, orange is almost ready, red is not ready.

Native UI

Finally, the use of native IOS user interface elements makes the application more intuitive for the users. The elements such as table views, scroll views, pagination, collection views, buttons are all popular UI elements the user is familiar from other popular applications.

5.2.1.4. Application Behavior

As shown in Figure 25. technical architectural diagram, the client and server connect through AdSpotter Framework provided by ExMachina. To make the application development process and the maintenance easier, I created the following class diagram in Figure 32.

Figure 32. AdSpotter New Version - Class Diagram
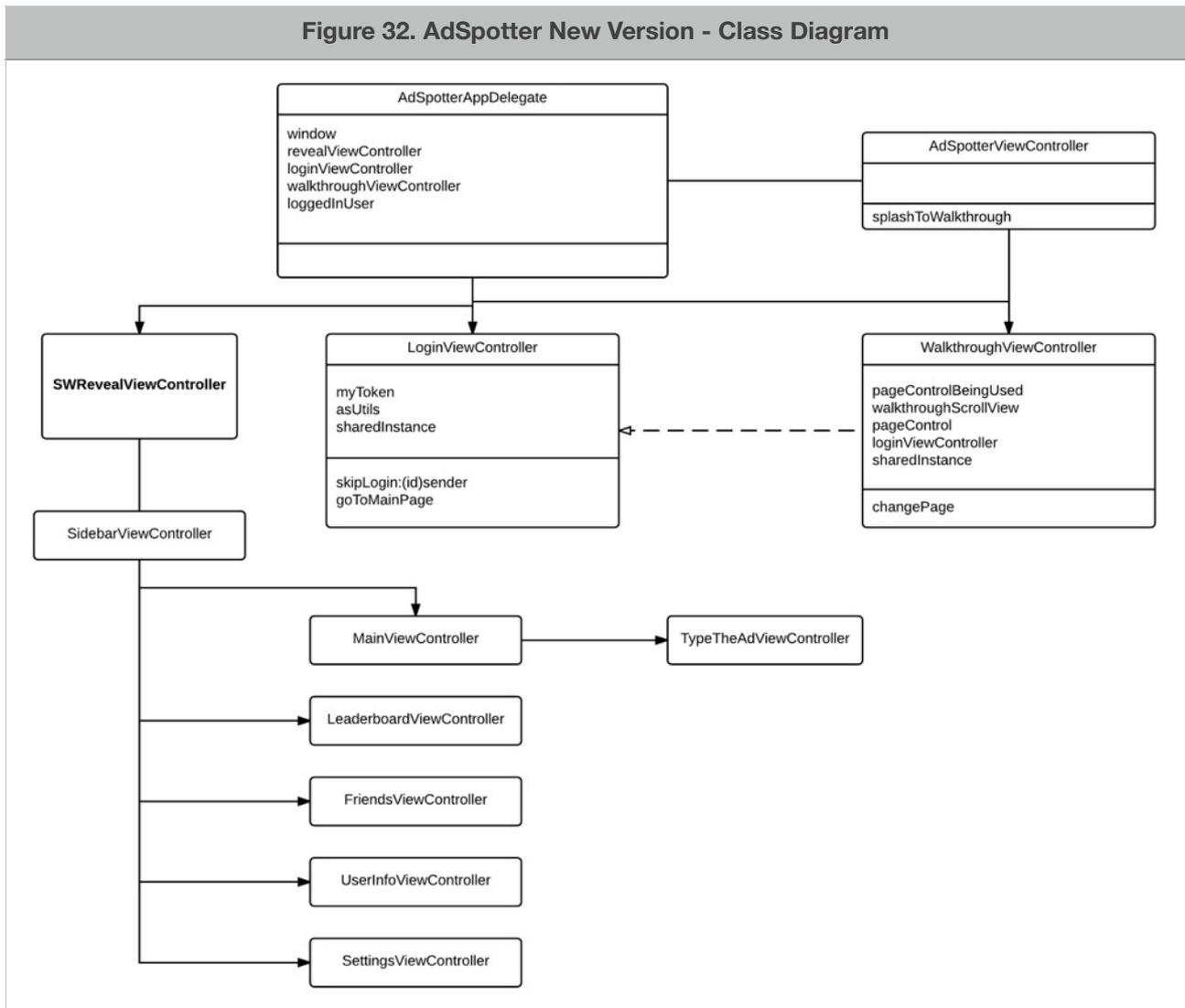
This diagram shows the objects and interactions of the AdSpotter client application.

The application starts with the app delegate, when launching finishes, the application checks for the device and selects the right storyboard to instantiate. Using the Model View Controller (MVC) design pattern, the application starts the right screen with the respective controller, namely: `AdSpotterViewController`.

From here on, with the help of segues defined in the storyboard and the communication of views with controllers, the application continues to execute the WalkthroughViewController where the user can then login and go to the MainViewController (the screen which shows available Channels). The view includes a side bar where the user can navigate to other screen by using the side menu options, as well as the TypeTheAd-ViewController which controls our first alternative game play.

In addition to this, see in Figure 33. below, the class diagram made for the objects and their interactions within the AdSpotter IOS Framework.

Figure 33. AdSpotter IOS Framework - Class Diagram
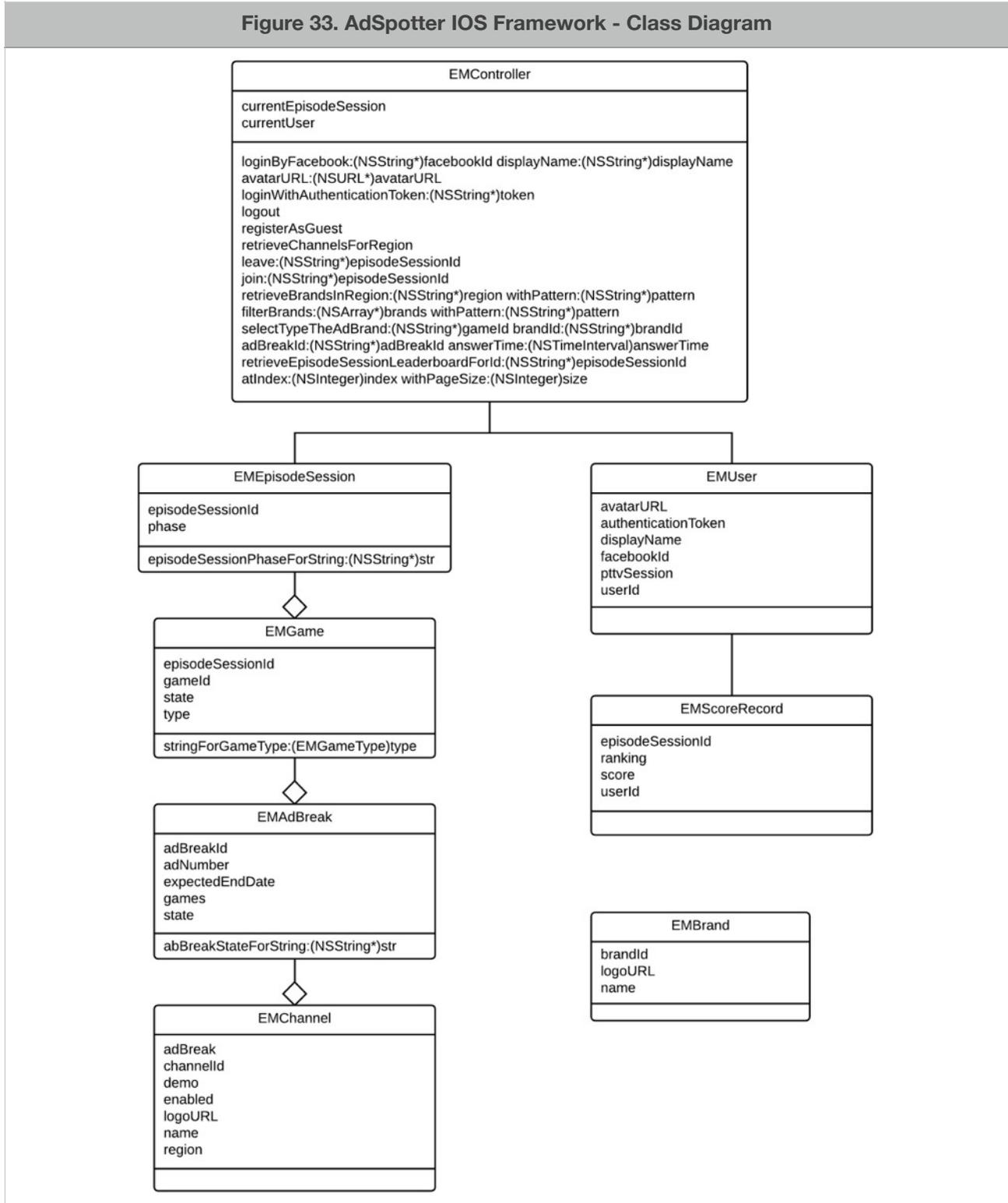
Firstly, there is an EMController which acts as the starting point for the framework. Through the creation of a new EMController object in a shared instance in the client, we are able to use possible methods that help the client reach certain information on the server (such as the channels on a specific region, brand names, leaderboard, etc.), execute necessary commands (such as join an episode session, or register user as a guest, etc.) and retrieve notifications when certain events occur (such as advertisement ended, rankings updated, etc.) Each controller keeps a current user and a current episode session information.

Secondly, there must be a user to play the game, so we have an EMUser class. Each user has a user id, avatar URL, and an authentication token to identify if the user has logged in before.

Thirdly, there's a channel class, which corresponds to the channels on television such as ITV, Channel 4, etc. Each channel has an advertisement break and naturally a game associated with it.

The class for advertisement breaks has a notification method which helps the client learn about the current state of the advertisement break, for example it can tell the client if the advertisement is running or if the advertisement break has ended.

The class for games keeps game state, game type and the episode session id it is currently associated with.

Finally, we have a simple class for brands which keeps a brand's logo information and name when we want to search or show it in an image, and we have a class for keeping user's score and ranking.

All the classes in AdSpotter IOS Framework starts with an "EM" word that stands for "ExMachina", for naming convention reasons.

The client application in Figure 32. connects to this AdSpotter IOS Framework through the use of a shared instance singleton object in MainViewController, WalkthroughViewController etc. This shared instance assigns itself as an EMController delegate and implements the protocol functions to be able to make use of the framework. Some related pseudocode can be found in Appendix D. Code Fragments section.

During the development of this IOS application I have made use of certain design patterns such as MVC, Delegation, Singleton, Observer, Target-Action. For an extended information on these design patterns and more, see Appendix E. Technology Resources section.

5.2.2. Idea Generation And Prototype Selection

As previously explained, the New AdSpotter application included just one game and not all the Gamification elements for the sake of being a prototype. Since there was a time constraint that made it possible to develop a one-game-only application, I had to make a list of possible ideas and select the most cost-effective, yet a fun one.

To do this, I first gathered all ExMachina employees and gave a small Gamification presentation including game mechanics and dynamics and how we can apply game elements to AdSpotter project and asked them to brainstorm for new ideas that would motivate them. Later on, I put these ideas in a table crossing them with some of the metrics I found could be measurable.

Scoring Game Ideas

Since during my internship AdSpotter project was not live, it was not possible to measure everything on this list. However we formed a group of people who would grade each item, and took the average of our grades for the final scoring of each item. Each column in this table represents an important metric in our decision making process.

There are two types of equalization algorithms used to make each number meaningful. I call these micro and macro equalizations.

In micro equalization, I took a metric (a column name) and made a list of possible values for it and numbered them according to their importance within that metric.

In macro equalization, I first came up with two different aspects of a an application which will eventually play the final role in our selection, namely: the feasibility score and the fun score. Afterwards I selected the relevant metrics with each score, and created a function by giving weight to each metric according to their importance. And then I added these to come up with the final score.

Fun Score

See below in Table 5. explanation of each metric for calculating the Fun Score and their possible values:

Table 5. Metrics Used In Fun Score

Metric Name	Explanation	Possible Values
Fun	How Much Fun The Game Play Is.	[1-10]
Reward Factor	How Good The Reward Mechanism Is.	[1-10]
Uncertainty Factor	How Much Uncertainty/Surprise Factor There Is.	[1-10]
The Flow	How Well The Game Is Keeping The User In The Flow. Too Boring Or Too Difficult?	[1-10]
User Quantity	Let's Say There Are 10 People In Total, In 5 Age Groups And 2 Genders. How Many People Could Play It?	[1-10]

The Fun Score calculation is straight forward. I add all the fun values and multiply the result with the amount of people which could experience this fun in the game. Thus the Fun Score function is as below:

Fun Score = ((Fun value) + (Reward Factor value) + (Uncertainty Factor value) + (The Flow value)) * (User Quantity Value)

Just a remark for interpretation: The more the Fun Score, the more users might enjoy a game.

Feasibility Score

Feasibility score is calculated by multiplying each of the above metric's value with its weight and adding them up, thus with the following formula:

Feasibility Score = ((Data Transfer Value) * 1) + ((Time Constraint Value) * 2) + ((Front-end Complexity Value) * 4) + ((Prior Knowledge Level Value) * 8) + ((Back-end Complexity Value) * 16) + ((Image Processing Value) * 32) + ((Back Ofice Work Value) * 64)

See below in Table 6. explanation of each metric for calculating the Feasibility score.

Table 6. Metrics Used In Feasibility Score

Metric Name	Explanation	Possible Values	Weight
Back Office Work	Work That Needs To Be Done On Data, Graphics, Sorting, Managing Etc.	[1-10]	64
Image Processing	How Much Image Processing Or Recognition Algorithms We Need To Use.	[0-10]	32
Back-End Complexity	How Complex Would The Back End Need To Be. Semantic Data Has To Be Pulled And Interpreted? Algorithms For The Game?	[1-10]	16
Prior Knowledge Level	How Much We Need To Know About The Advertisement	1- We Don't Need To Know Anything 4- Only Recognize The Running Ad 6- The Company Name, Brand, Category And Related Data With The Ad 8- Derived Data Such As The Slogan Of The Company 10-Trivial Information About The Advertisement's Scenes Such As Which Objects Were In The Advertisement? How Many Cats Were There? Etc.	8
Front-End Complexity	How Difficult It Is To Implement The Front End User Interface. The Number Of Different Functionalities And Features, Etc.	[1-10]	4
Time Constraint	The Urgency Of Time The Application Has To Recognize The Advertisement.	1- No Time Constraint. We Don't Need Real Time Data. 4- Little Time Constraint. Application Has To Know Which Ad The User Has Just Watched. Recognition After The Advertisement Has Finished Is Good Enough. 6- Some Time Constraint. Recognize The Ad After A Little Delay (5-10 Seconds) But Before It Finishes. 8- High Time Constraint. Recognize The Ad Right Away When It Starts. 1000- Extreme Time Constraint. Application Has To Recognize The Advertisements That Is Going To Run From Before The Advertisement Starts.	2
Data Transfer	How Much Database Transfer Is Needed.	1- No Data Transfer Needed. 5- We Have To Connect To Database And Fetch Data. 10- We Have To Connect To Database Fetch Data And Upload Big Data.	1

Another remark about interpretation here: the Feasibility Score actually shows how hard it is to implement a game. Thus, the less the feasibility score, the more feasible it is.

Alternative Games

Now that the calculation of the Feasibility Score and the Fun Score is explained let's take a look at the game ideas and how they scored below in Table 7. AdSpotter Alternative Games List.

Table 7. Adspotter Alternative Games List

Game Name	Explanation	Feasilibilty Score	Fun Score
Type The Ad	While watching the ad, guess it and type it, autocomplete will help you. But no visual clue.	213	250
Logo Memory Cards	After the commercial is watched show cards to user with logos on it. And then turn the cards. User has to remember the order of advertisements and where the matching logos were.	281	160
Reverse Adspotter	Guess which ads will be there in the next commercial break. When the time comes, you will know if you won or not.	294	190
Logo Memory Pacman	After the commercial is watched, create a pacman-like game where the user has to catch logos in the right order.	329	200
Balloon Shoot Up	Balloon is going up to pigeon holes. You should direct it to the right hole until the ad finishes.	421	170
Logo Bingo	Get a random card. Or buy more cards. Watch the commercial break to see if your card has all the ads that run. Make sure to touch BINGO button if you have them all!.	433	350
Choose Your Mission	You can choose different missions (find 3 KLM ads today, collect all different Audi Auto ads etc) and work towards completing your mission.	457	310
Trivial Questions	Answer the trivial questions about the company, brand, logo, themesong, compete the slogan	677	240
Design Your World	Create and decorate your own room with virtual goods and items you collect based on the ads you have watched.	717	232
Trading Card Collector	Actively tuning into ad breaks to find a missing card. Create series, streaks, collections. Exchange, swap cards with friends.	798	264
Easter Egg Hunt / Find Objects	Spot a certain item or object which appear in the current ad you are watching. Do it fast.	1085	270
Real Life Capture	Make a photo of a print/ campaign. Get multiplier points from ads you watch which are related to that campaign.	1156	120

In the detailed version of this table which can be found in Appendix B. Additional Figures: Figure 42. I added a custom highlighting option which let's us easily spot the easiest game (marked with light green background color) that can be implemented with the most fun score (marked with orange background color): Type The Ad Game.

5.4. Prototype Conclusion

Given the mock up screenshots and explanations about the product, the prototype I created for AdSpotter can be seen as a very lightweight mobile application with minimum amount of details, but it gives a well structured example of how the final application might look and feel, with enough room to add additional features.

ExMachina Games was quite positive about the application I have developed. They have been showing this application in media events to get a funding for further development and to sell the envisioned AdSpotter product to the broadcasters.

I will discuss in the next section, the process of creating this application and mention more about the idea generation process. I will also discuss the possible ideas for future implementation on AdSpotter in Chapter 7.

Chapter 6

Platforms and Operational Issues

In this chapter, I will be first exploring possible technologies for the implementation of a second screen application, later on I will make a comparison of certain tools. Finally, I will mention the additional technologies which could be used to help the improvement of the application.

6.1. Available Platforms And Tools

There are various mobile application development platforms and tools for second screen applications. Before selecting a development platform, I first decided to take a look at the operating systems on mobile devices because if I will spend time to gain more experience in mobile development, I would like to gain experience in the one which is most promising in the market. Some of the mobile operating systems include Android, Apple IOS, Windows Phone, Blackberry. See below, in Figure 34. the market share of smartphone operating systems.

Figure 34. Smartphone Operating Systems by Market share

Q2, 2014

1.7% 0.9%
2.7%
42.7%   52%

● ANDROID OS   ● APPLE iOS   ● WINDOWS PHONE
● BLACKBERRY   ● OTHERS

During Q2, 2014, 52% of U.S. smartphone owners used a handset that runs on the Android operating system.

Source: Nielsen
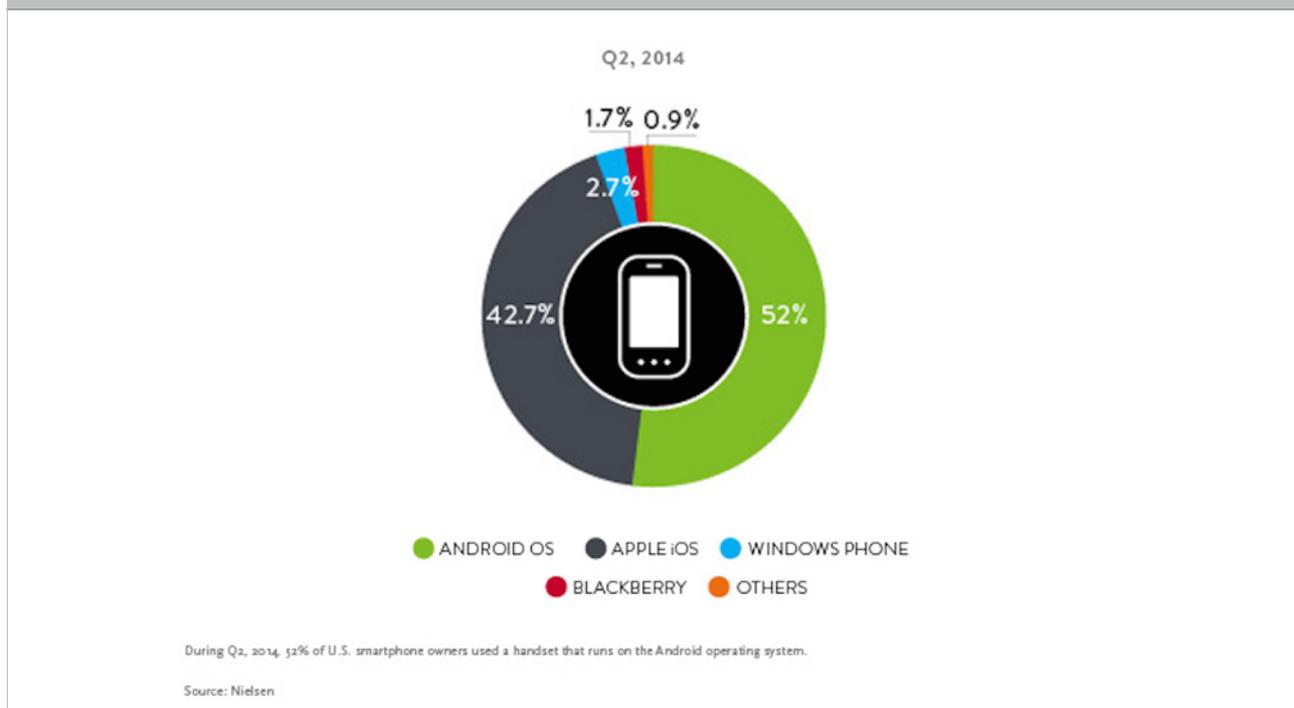
As it is easy to see from this figure, the market is mainly divided into two main operating systems, namely Android OS and Apple IOS. Android is an open platform which offers developers more possibilities, however Apple is more elegant and reliable.

Although the final AdSpotter product is eventually going to be a cross-platform application, and Android has the biggest market share according to the above figure, as a developer, I chose to develop for Apple IOS. While making this decision, there were both personal factors, such as my experience level in Objective-C programming language and the availability of development and testing tools etc.

See the next page in Table 8. for a list of available platforms and their pros and cons.

Table 8. Available Development Platforms

Platforms And Tools	Explanation	Pros	Cons	Language
Android	Native Development Environment For Android Devices.	-High Customization -Open Platform -Quick Release (No App Store Acceptance Waiting Time)	-Too Many Devices To Support -Too Many Applications In The Store -No Quality Assurance Provided -Emulator And Devices Less Quality Than Ios	Java
Apple IOS and XCode	Native Development Environment For Apple Mobile Devices.	-Best User Experience -Powerful Use Of Device Hardware And Graphics -High Quality Devices -Powerful Frameworks And Libraries -Easy To Layout User Interface -Easy To Test -Easy To Market And Deliver Final Product To Customers (App Store) -Big Market Size -Lucrative Users Who Are Willing To Pay -Big Developer Community And Constantly Updated Resources	-Platform Specific (Only Runs On Apple Devices) -Yearly Developer Fee -Application Approval Time	Objective-C
HTML 5	Web Application Development	-Free -Ease Of Development -Constanly Updated Content -Can Be Cached Offline -Good For Web Developers -Cross-Platform And Device	-Slow Compared To Native Applications -Cannot Use Native Functions For Device Capabilities Such As Camera, Gps -Has To Run In A Browser -Less Graphical Capabilities Compared To Native Applications -Less Compelling User Interfaces	Html
Phone Gap	Cross Platform Tool For Mobile Application Development That Takes Web Code And Wraps It Together With Necessary Libraries Into A Native Application.	-Open Source -Free -Good For Web Developers	-Neither Native Nor Pure Web-Based -Slower Than Native -Hard To Maintain -Cannot Make Use Of Native Ui Widgets, Transitions, Standard Controls Etc.	Html, Javascript, Css
Adobe Flex And Flash Builder	Development Tool For Creating Rich Applications Across Multiple Platforms.	-Application Runs On Multiple Platforms	-Performance Issues -Does Not Run On Apple Devices	Actionscript, Mxml
Unity	2D And 3D Game Engine With Cross Platform Support.	-Assets And Plugins Store -Visual Editing Tools -Supports Deployment To Multiple Platforms	-Low Performance -Payed -Engine Is Not Open Source	C#, Unityscript

While choosing for a development environment, if I have taken the availability across multiple platforms as a key factor, I would end up limiting the applications capabilities, performance and native UI look and feel and

powerful graphics for achieving the best aesthetics. Since the design and user experience was more important for this application, I selected the Apple platform for development.

6.2. Additional Technologies

6.2.1. Audio Fingerprinting

An acoustic or audio fingerprint is a condensed digital summary deterministically generated from an audio signal, that can be used to identify an audio sample or quickly locate similar items in an audio database. [Appendix A.Glossary: Acoustic Fingerprinting]

Audio Fingerprinting could come in handy in games where the application needs to know the current advertisement before the user does in order to create the game scenario. Also automatic content recognition might decrease the problems that might occur due to users entering the channel name manually. Automatic recognition of the channel would also decrease the steps a user needs to take before reaching a game. This would be very helpful in reaching a more fluent user experience.

6.2.3. Audio Watermarking

Audio watermarking is explained in Music Trace website as:

"Audio watermarking techniques slightly modify the usable signal to embed additional information into the original signal. This modification is so slight, that human hearing cannot perceive any difference between the watermarked audio signal and the original signal. A computer can, however, distinguish between copies of the same title on the basis of this information."

This technology could be used in cooperation with broadcasters and could have adventges such as embedding the whole advertisement break information together with the list of all advertisements into the first advertisement. Or the broadcasters could embed other trivial information necessary (such as the name of the artists or objects that are seen in an advertisement) to implement some alternative applications such as Egg Hunt or Find the Object.

6.2.3. Speech Recognition

Speech recognition is the translation of spoken words into text. [Appendix A.Glossary: Speech recognition]

Another nice to have technology would be Speech Recognition. This could make the application more fun and perhaps more immersive. For instance, instead of the "Type The Ad" game, we could make "Shout The Ad" game where users will try the shout the ad name when they recognize it.

6.2.4. Semantic Web

My final suggestion for additional technologies is the addition of semantics into the Second Screen application. According to W3C, Semantic web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. [W3C, 2014]

Semantic web integration into a Second Screen application could improve the recommendation system, make the application more personalized and easy to use.

6.3. Limitations

Developing Second Screen applications has its own challenges compared to developing online casual games or stand alone applications.

General Mobile Application Limitations

Certain limitations exist due to developing for mobile devices such as screen size limitations, resolution limitations, slow processing power, less hardware capabilities, different user interaction than computers (no hover over, no right click) etc.

Second Screen Specific Limitations

Other important limitations come from the definition of being a "Second Screen" application. This brings the necessity of being in synch with the current Television program. In our case, the recognition of the advertisement content the user is watching.

Although these limitations might exist for the final product, the prototype application development was not effected because we have been working on a development environment which connected to a demo channel with a predetermined set of advertisement sequence while testing the application.

Chapter 7

Future Issues of Research

In this Chapter, I will first make use of some game mechanics and dynamics from the MDA framework mentioned in Chapter 2. to generate possible uses for the gamification of AdSpotter. I will make a list of these ideas focusing on the player type these gamification ideas are meant for. Secondly, I will make another list of specific use-cases for AdSpotter application that can be implemented in the future. Finally, I will compare the classic AdSpotter application with the possible gamified version according to Octalysis Framework mentioned in Chapter 2.

7.1. Gamification Design

In Chapter 2. I have mentioned key elements of Gamification as well as two frameworks we can use in the gamification process of AdSpotter. In Chapter 4.4. I have analyzed the AdSpotter Player Type and came up with a character combination of socializer, achiever and explorer. Taking this finding as a center point, I tried to fit some of the possible Gamification elements into AdSpotter Second Screen application concept.

See below in Table 9. a list of some Gamification elements and the user types they could attract.

Table 9. Gamification Elements For Adspotter

Gamification Element	Explanation	Example Use	User Type
Point Reward System	Get points for each task accomplished	-Connect your account with Facebook, get extra points. -Invite your friends, earn bonus points -Post your achievements on your social network, get extra points. -Get extra points when you "like" the "Philips Wake Up Light" on your Facebook account and gave the right answer and found its logo on AdSpotter. -Challenge a friend or accept a challenge on AdSpotter. Both the challenger and the challengee gets bonus points.	achiever, socializer
Regional Leaderboard Or Friends Leaderboard	Keep a regional leaderboard or a friends leaderboard besides the global leaderboard that has a smaller scope, so the user will rank higher or will even see and compare himself with his friends	-User can see his friends on a friends leaderboard and brag about his position or try to achieve a higher rank -User ranks Globally:17044 vs. Regionally: 534	achiever, socializer

Gamification Element	Explanation	Example Use	User Type
Local Badges	Make use of local badges to turn into real life rewards	-If user becomes a major of Amsterdam, he gets 10% discount on a television he buys from media shops in Amsterdam.	achiever, explorer
Real-Time Information And Feedback	Show real-time information to users about their friends or about the show.	-Show user which friends are watching which channel. -Once user finishes his game play, show his friends avatars on the logos they guessed as an overlay. - Show on each logo the distribution of friends (40% of friends voted for NESCAFE while 60% voted for LIPTON etc.)	socializer, explorer

Naturally the table above (Table 9.) is not a full list of Gamification elements that are possible for AdSpotter, but it gives a good idea of how we can apply any Gamification element to our situation. See Table 12. in Appendix C. Additional Tables, for a full list of possible gamification elements I gathered for AdSpotter.

Fast Onboarding

One of the things missing on AdSpotter is the importance of onboarding, bringing new and novice users into the system. In order not to trouble the new users, it could be more interesting to totally skip the login screen and land on right away in a game, the user can experience and get a fast taste of what is awaiting him. In case we need his identity information later on, we can always ask the user, after his first experience, if he wants to login or not and why it would be more benefitial for him to login.

Multifaceted Scores

Scoring of the AdSpotter application done on the server-side seems pretty straightforward. It mainly takes into account the time of the answer (how fast the user has submitted an answer) and the correctness of the answer. Changing the scoring algorithm might have a big impact on the user experience. If there are more variables while calculating a user's score, such as multiplier factors, conditional bonuses etc. it will be harder to achieve the "perfect score" while we will be having a wider range of possible scores. [Fields, 2011]

Local/Filtered Leaderboard

Being a number in a giant list of players does not mean much to the user, while being number 1 within a group of friends might mean a lot. So keeping a Local Leaderboard or Friends' Leaderboard might add more meaning to the game.

7.2. Use-Cases For Future Implementation

Below in Table 10. see a brief list of use-cases and functionalities that could be implemented in the future to improve AdSpotter application, to make it more readable I put it in a list instead of the use-case diagram.

Table 10. Use-Cases For Future Implementation

Use-Case	Explanation	Actor
Watch Tutorial Video	The User Could Watch A Tutorial Video Before A Game Starts.	User
Play Another Game	The User Can Select To Play One Of The Alternative Games During A Commercial Break Such As "Reverse Adspotter" Or "Logo Bingo" Etc. Depending On His Experience Level.	User
View Friends List	The User Can View Her Friends List And See Who Is On Which Channel, Paying Which Game, And Get More Information About Their Profile.	User
Add/Remove Friend	The User Can Add And Remove Friends To Their Friends List.	User
Challenge Friend	The User Can "Challenge" A Friend, Where Their Scores Will Be Compared After A Game, However They Will Both Get Extra Points For Each Right Answer They Give, Thanks To The Benefits Of Challenging A Friend Actively.	User
View User Settings	The User Can View Her Account Settings, Such As Facebook Account Connected, Password Etc.	User
Create A Custom Avatar	The User Can Create Her Own Custom Avatar.	User
Retrieve Usage Data	Every Single Statistic Is Important For Broadcasters And Exmachina. This Is Why They Can Retrieve Usage Data Such As Most/Least Memorized Ad Or Number Of People Playing In A Channel How Much Chat Data Going On Around A Certain Subject Etc.	Broadcaster, Exmachina
Add Commercial Action	Companies Might Want To Create Commercial Actions, They Can Be Given An Interface To Do This. For Example, Nike Can Create A Commercial Action With Rules That Will Effect A Game Play Or That Will Effect The Prizes User Will Get At The End Such As: "Find And Guess Right All 3 Different Nike Advertisements, Get A 10% Discount On Your Next Nike Shoe."	Advertising Companies

This list shows some use-cases that might be necessary for keeping users and broadcasters content. It also adds a new actor: advertising companies, who are the owner of brands in the advertisements. They might also get involved in the application directly, to add content via a separate interface provided for management of the commercial actions.

7.3. Adspotter Classic Vs. Gamified Version Comparison

In Chapter 4.3.1. I have analyzed AdSpotter Classic according to Octalysis Framework and MDA framework and I have briefly laid out some missing points in the AdSpotter Classic version.

Since the prototype I have developed during my internship is not the final version of Adspotter product, and certainly not a fully gamified version with a portfolio of games, I think it will be better if we compare the AdSpotter Classic with the AdSpotter Gamified application concept.

See in the next page, in Table 11. the analysis of AdSpotter Gamified version according to Octalysis tool.

Table 11. Adspotter Gamified Version - Octalysis Framework Evaluation

Motivator (Motivation Factor)	1	2	3	4	5	6
Meaning (2)	Show Logo Knowledge	Help Broadcasters Track And Understand Tv Audience				
Accomplishment (6)	Points	Leaderboard	Win Prize	Play Different Type Of Games	Badges	Quests
Ownership (4)	Customizable User Avatar	Collecting Virtual Items	Tradeable Items	Purchase Virtual Cash Or Items Of Value		
Scarcity (4)	Time-Based Challenge	Rare Items	Level Constraints	Unlockable Items Or Functionality		
Avoidance (1)	Punishment By Losing Items To Competitors In A Challenge					
Curiosity (4)	New Logos	New Games	New Collectable Items	Luck Based Outcome In Games (Bingo)		
Social Influence (6)	Facebook Connection	Brag	Friends Watching You	Envy Others World And Avatar	Mentorship	Gift Virtual Items
Empowerment (2)	Instant Feedback	Endless Design Possibility				

As it is easy to see, Table 11. AdSpotter Gamified Version Octalysis Framework Evaluation has more items than Table 4. AdSpotter Classic Version Octalysis Framework Evaluation. The addition of a few Gamification elements suddenly increased AdSpotter's Octalysis Score from 23 to 129. The actual Octalysis Tool output can be seen in Figure 43. in Appendix B. Additional Figures section.

Conclusion

This master thesis serves as a documentation of my exploratory research on Gamification of Second Screen applications, during my internship at ExMachina.

To summarize, the answer to the research question of "Can we use Gamification in Second Screen applications to influence user behavior?" is: yes, we can influence user behavior as long as the application already has users. And the answer to "how?" is: by knowing the players, and determining their personalities, and their motivators, and by selecting the right game elements and turning these into actions users can take.

I came to this conclusion by first understanding the concepts related with game elements, and enlisted the building blocks of Gamification. Later on, I explained the necessary Gamification frameworks that can be useful in analysis of any product to be gamified. I then analyzed AdSpotter application according to these frameworks. Later on during the design of the new AdSpotter application, I suggested a way of selecting the best ideas for implementation, using essential metrics for finding out feasibility score and fun score of a project. I then went on to implement a prototype with the selected game idea. I shared some basic technical information on the project. I compared available technical platforms and introduces additional technologies that can be useful in the generation of Second Screen applications. And finally, I made a list of future issues of research.

To conclude, AdSpotter Second Screen application was an interestting project to work on. I have got nice results with respect to the research issue: Gamification of Second Screen applications. My contribution to the project was found sufficient, primarily as an application developer with a strong interest in Gamification. I could deliver a working demonstrable prototype which is easy to extend into a full-featured application with a noteworthy list of suitable Gamification elements for AdSpotter Second Screen application and possible use-cases for future implementation.

After Words

This master thesis has been written by an IPhone application developer, but more importantly a mother. Also being a Generation Y member born in 1982, I am very tech savvy, a gamer and a so called Otaku (J-drama and anime addict, influenced by Japanese kawaii culture), I am equipped with all sorts of gadgets such as iPhone, iPad and other devices which connect me to the rest of the world and the world of information any time I want. All these combined, you can imagine, I, myself don't even watch Television anymore, or let my child watch it, let alone using a second screen to accompany our watching time, if and whenever I do watch. So, with all respect to ExMachina Games, and the internship opportunity they have offered me, I personally don't like watching television or advertisements (unless on demand!), and would still not watch it even if there was a game accompanying it, and if there was a prize at the end of that game. Reasons? I don't like being manipulated by media and private organizations. I like finding the pure, natural and ecological products for my survival and optimum life style myself. I like finding and watching my genre of programs online. And I don't like being stuck to a specific time frame to watch something. And I don't like being disturbed by unrelated visuals (commercial break) at the peak of a beautiful movie. But I do believe in Gamification. It is even becoming a norm now in my opinion. Many companies are doing it. So it was nice to work on this project and research Gamification.

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Appendix A. Glossary

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Speech recognition. http://en.wikipedia.org/wiki/Speech_recognition

Television. http://en.wikipedia.org/wiki/Television

Appendix B. Additional Figures

Figure 35. Eight Core Derives And Relevant Game Elements [Chou, 2012]

Figure 35. Eight Core Derives And Relevant Game Elements [Chou, 2012]
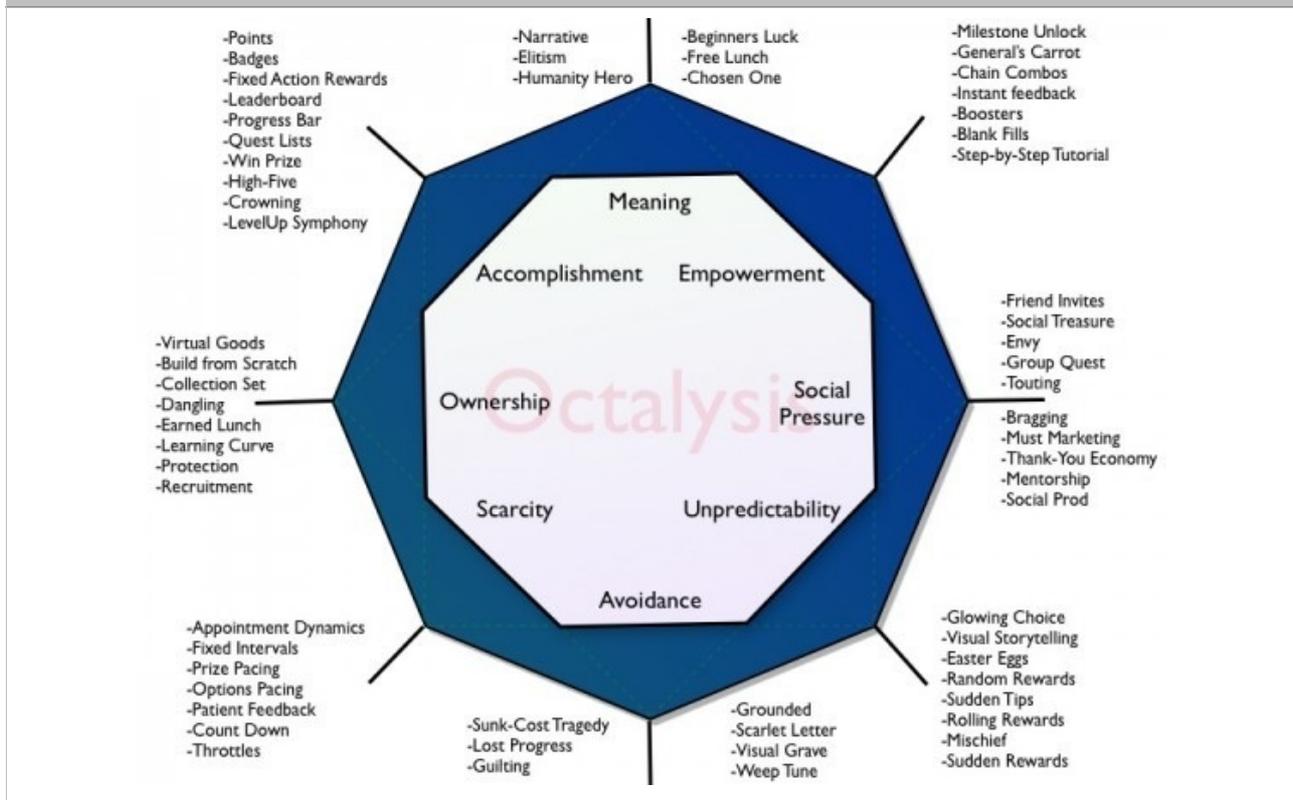
Figure 36. Number Of TV Households In America

Year	Number of TV Households	% of American Homes with TV	Year	Number of TV Households	% of American Homes with TV
			1964	51,600,000	92.3
1950	3,880,000	9.0	1965	52,700,000	92.6
1951	10,320,000	23.5	1966	53,850,000	93.0
1952	15,300,000	34.2	1967	55,130,000	93.6
1953	20,400,000	44.7	1968	56,670,000	94.6
1954	26,000,000	55.7	1969	58,250,000	95.0
1955	30,700,000	64.5	1970	59,550,000	95.2
1956	34,900,000	71.8	1971	60,900,000	95.5
1957	38,900,000	78.6	1972	62,350,000	95.8
1958	41,920,000	83.2	1973	65,600,000	96.0
1959	43,950,000	85.9	1974	66,800,000	97.0
1960	45,750,000	87.1	1975	68,500,000	97.0
1961	47,200,000	88.8	1976	69,600,000	97.0
1962	48,855,000	90.0	1977	71,200,000	97.0
1963	50,300,000	91.3	1978	72,900,000	98.0

Figure 37. Devices In TV Households

NUMBER OF HOUSEHOLDS (IN 000'S)

	COMPOSITE		BLACK		HISPANIC		ASIAN	
	Q2 2014	Q2 2013	Q2 2014	Q2 2013	Q2 2014	Q2 2013	Q2 2014	Q2 2013
DVD/Blu-Ray Player	93,707	94,587	11,381	11,460	12,064	12,110	3,074	3,237
DVR	55,713	52,977	5,884	5,567	5,968	5,574	1,786	1,881
High Definition TV	100,684	93,514	12,156	11,076	13,694	12,703	3,998	3,872
Video Game Console	51,470	50,250	6,476	6,123	8,044	7,936	2,242	2,229
Tablet	42,064	27,049	4,213	2,559	5,224	2,907	2,191	1,729
Enabled Smart TV	11,688	6,193	1,057	530	1,728	769	914	485

Figure 38. Global Device Penetration Per Capita
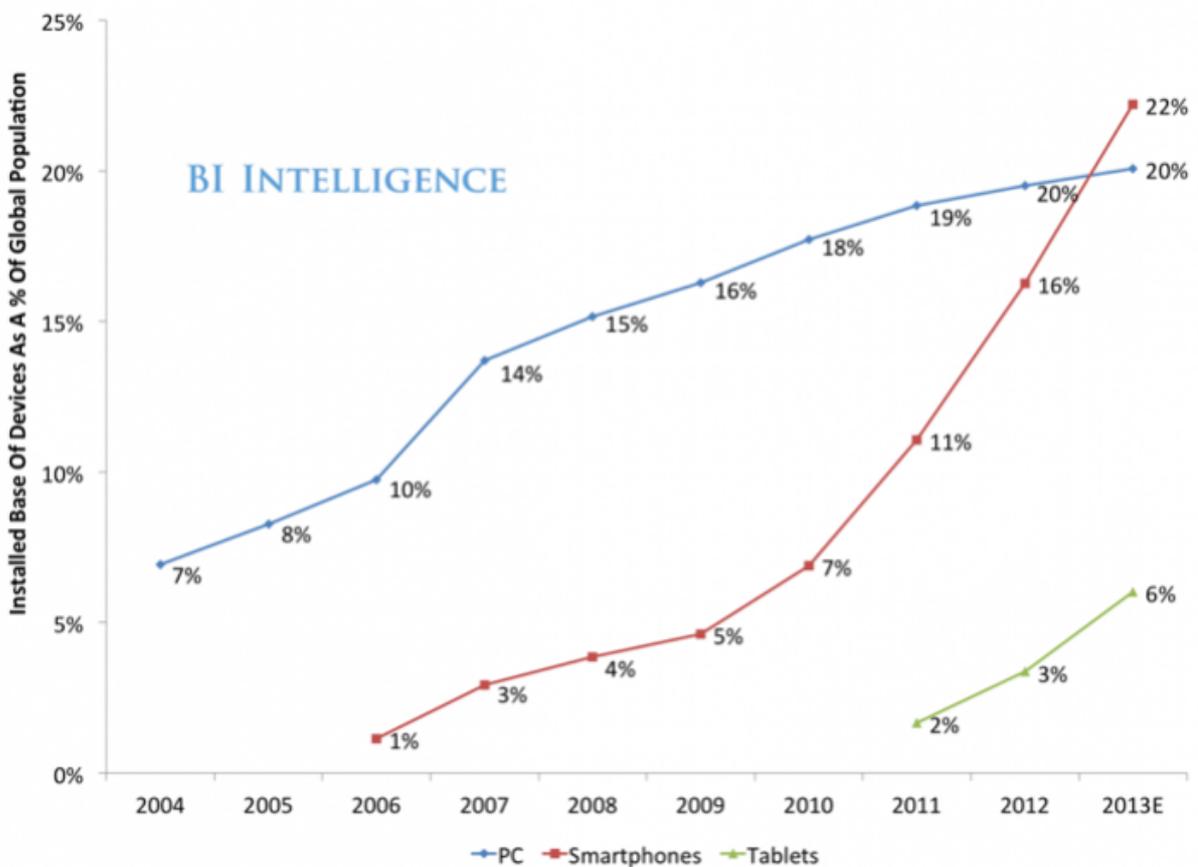
Source: BII estimates, Gartner, IDC, Strategy Analytics, company filings, World Bank 2013

Figure 39. Media Time Is Increasing Fueld By Digital Growth

HOURS PER DAY

8
6
4
2

+53%
-2%
+80%
-1%
+60%
-2%

18-34   35-49   50-64

DIGITAL VIDEO
● Q2 2013   ● Q2 2014

TV SCREEN
● Q2 2013   ● Q2 2014
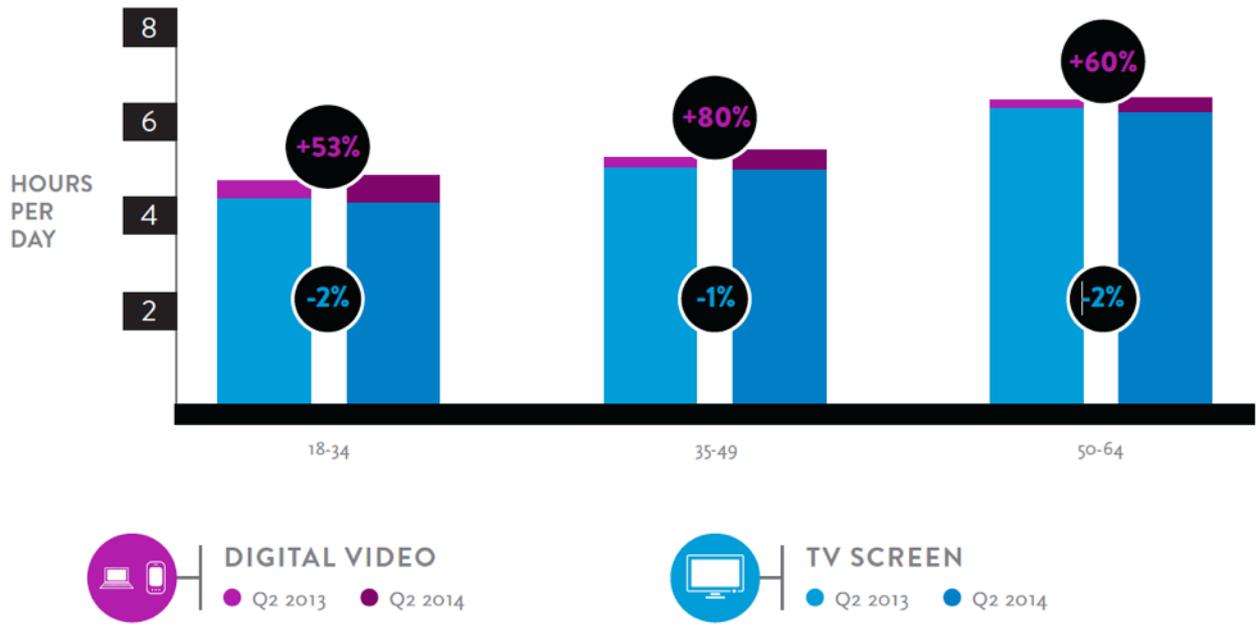
Figure 40. Daily Time Spent TV Vs. Digital Video

TOTAL U.S.

DIGITAL VIDEO
35 MINUTES
23 MINUTES
19 MINUTES

18-34

TV SCREEN
4 HRS 17 MINUTES
4 HRS 22 MINUTES
4 HRS 27 MINUTES

● Q2 2014
● Q2 2013
● Q2 2012

DIGITAL VIDEO
26 MINUTES
14 MINUTES
13 MINUTES

35-49

TV SCREEN
4 HRS 57 MINUTES
5 HRS 01 MINUTE
5 HRS 05 MINUTES

● Q2 2014
● Q2 2013
● Q2 2012

DIGITAL VIDEO
19 MINUTES
11 MINUTES
09 MINUTES

50-64

TV SCREEN
6 HRS 12 MINUTES
6 HRS 18 MINUTES
6 HRS 07 MINUTES

Figure 41. AdSpotter Classic Analysis According To Octalysis Framework

Meaning
Show knowledge of logos

Accomplishment
Points
Leaderboard
Win Prize

Empowerment
Feedback

Ownership
User avatar

Social Influence
Facebook connection
Brag
Friends watching you

Octalysis Score: 23

Scarcity
Time-based challenge

Avoidance
Click to add text

Curiosity
New logos

Figure 42. AdSpotter Alternative Games List - Detailed Scoring

Name	Explanation	Prior Knowledge Level	Time Constraint	Back End Complexity	Image Processing	Back Office Work	Data Transfer	Front End Complexity	Fun Factor	User Quantity	Uncertainty Factor	The Flow	Reward Factor	Feasibility Score	Fun Score
Real Life Capture	Make a photo of a print/ campaign. Get multiplier points from ads you watch which are related to that campaign.	4	1	9	10	10	10	2	3	6	5	4	8	1756	120
Logo Memory Cards After The Ad Break	After the commercial is watched show cards to user with logos on it. And then turn the cards. User has to remember the order of advertisements and where the matching logos were.	4	4	2	0	3	1	4	5	10	2	4	5	281	160
Logo Memory Pacman After The Ad Break	After the commercial is watched, create a pacman-like game where the user has to catch logos in the right order.	4	4	4	0	3	1	8	7	8	6	7	5	329	200
Constant Repetition of Ad Order	The user has to reproduce and constantly repeat the order of ads, gets harder after every ad.	4	8	2	0	2	1	6	8	8	4	4	5	233	168
Async Photo Match	Async version you can play during the day and challenge your friends	1	4	2	0	10	5	6	5	6	4	4	4	717	102
Design Your World	Create your room with virtual goods and items you collect based on the ads you have watched.	1	4	6	0	9	1	7	5	8	9	8	7	717	232
Reverse AdSpotter	Guess which ads will be there in the next commercial break. When the time comes, you will know if you won or not.	4	4	2	0	3	10	5	4	10	4	6	5	294	190
Ad Letters	Get a letter for every correct answer. Make a new word or brand with those letters.	4	6	4	0	1	1	5	6	8	7	6	7	193	208
Guess Fast and Right	AdSpotter Classic but with less options. The user has to guess fast and right. Otherwise gets out.	4	1000	3	0	3	1	3	5	10	4	3	4	2285	160
I have it!	Take a photo of the item you have and upload. Get multiplier points when you watch the ad.	4	6	8	10	10	10	2	3	6	7	5	8	1150	138
AdSpotter Classic	Touch the logo that belongs to the advertisement you are watching.	4	1000	2	0	3	1	4	5	10	2	4	5	2273	160
Balloon Shoot Up	Balloon is going up to pigeon holes. You should direct it to the right hole until the ad finishes.	4	8	2	0	5	1	5	6	10	2	4	5	421	170
Choose Your Mission	You can choose different missions (find 3 KLM ads today, collect all different Audi Auto ads etc) and work towards completing your mission.	6	6	7	0	4	5	6	6	10	8	9	8	457	310
Logo Bingo	Get a random card. Or buy more cards. Watch the commercial break to see if your card has all the ads that run. Make sure to touch BINGO button if you have them all.	4	6	3	0	5	1	5	9	10	9	9	8	433	350
Type the Ad	While watching the ad, guess it and type it, autocomplete will help you. But no visual clue.	4	6	2	0	2	1	2	7	10	4	8	6	213	250
Trading Card Collector	Actively tuning into ad breaks to find a missing card. Create series, streaks, collections. Exchange, swap cards with friends.	4	6	8	0	9	10	10	8	8	9	8	8	798	264
Trivial Questions	Answer the trivial questions about the company, brand, logo, themesong, compete the slogan	8	8	8	0	7	1	5	8	8	7	8	7	677	240
Easter Egg Hunt / Find Objects	Spot a certain item or object which appear in the current ad you are watching. Do it fast.	10	8	8	10	8	5	6	8	10	6	7	6	1085	270
Logo Memory Cards Before the Ad is Watched	Before the commercial break, we see the logos, and then the cards are turned back. We should find the logo of the ad we are watching, and have to remember where it was.	4	1000	4	0	0	1	4	8	10	5	7	5	2113	250
Logo Memory Pacman Before The Ad Break	While watching the ad, try to catch the logo, while being chased by other creatures.	4	8	4	0	3	1	8	7	8	6	7	5	337	200

Meaning
Show your knowledge of logos
Help broadcasters track and understand TV audience

Accomplishment
Points
Leaderboard
Win Prize
Having different type of games mean more challenges
Badges
Quest / mission

Empowerment
Instant feedback
Design your own world gives endless possibilities to create a world with virtual items

Ownership
User avatar
Collect virtual trading cards
Collect virtual items and design your own world
Buy more bingo cards

Social Influence
Facebook connection

Brag
People watching you
Envy others with a better world
Mentorship
Trading virtual cards

Octalysis Score: 129

Scarcity
Time based challenge
Rare trading cards
Level contraints
Unlockable items

Avoidance
Punishment by losing items to competitors

Curiosity
New logos
New games
New trading cards
Bingo

Appendix C. Additional Tables

Table 12. Extended Gamification Elements List For Adspotter

Gamification Element	Explanation	User Type
Chat System	Let players communicate through a chat room.	socializer
Customization	Let users customize their profile by giving them a virtual avatar or an environment of their own	socializer, self expressionist
Local Badges	Make use of local badges to turn into real life rewards	achiever, explorer
Party/Team	Playing certain games is only possible in a team. Each team member votes for an answer and the final answer submitted will be the highest voted one.	socializer, achiever
Point Reward System	Player gets points for each task accomplished	achiever
Quests	Little tasks when completed increase player's ranking or experience level	achiever
Random Rewards	Players get rewards with a virtual value in random times and in random sizes	all user types
Real-Time Information And Feedback	Show real-time information to users about their friends or about the show.	socializer, explorer
Regional Leaderboard	Keep a regional leaderboard or a friends leaderboard besides the global leaderboard that has a smaller scope, so the user will rank higher or will even see and compare himself with his friends	achiever, socializer
Trading System	Provide a market place or environment where users can trade virtual goods or create and sell items with an in-game value	socializer, self expressionist
Tutorial Level	Provide a tutorial level for games with easy to accomplish starter tasks with solutions	all user types
Unlock Content	Certain games cannot be played until the player achieves a certain level.	explorer, achiever
Vanity Items	Rare items that represent status and level of users which can only be ownedor used by advanced users	self expressionist, achiever, explorer
Virtual Goods	Virtual items that can be bought within the game	self expressionist, explorer, achiever

Appendix D. Code Fragments

Selecting Storyboard

```
1    bool applicationDidFinishLaunchingWithOptions

2        setup navigation bar

3        if currentDevice is a phone

4            if deviceScreenSize is 480

5                instantiate iphone35Storyboard

6            if deviceScreenSize is 568

7                instantiate iphone4Storyboard

8        if currentDevice is a pad

9            instantiate ipadStoryboard
```

Shared Adspotter Controller

```
1    init

2        if sharedInstance is nil create new sharedInstance

3            create facebookLoginView

4            create emController

5            assign emController's delegate to self

6        return self
```

Login Delegation In Walkthrough

```
1    setup

2        create new loginViewController

3        assign LoginViewController delegate to self

4        add LoginViewController's view as subview to self

5        if loginViewFetchedUserInfo

6            sharedInstance.EMController loginByFacebookDisplayName

7            save authenticationToken

8        implement protocol method goToMainPage
```

Skip Login

```
1    skipLogin

2        retrieveAuthenticationToken
```

```
3          if retrieveAuthenticationToken is empty string or nil

4                 create a new guest user

5                 save authentication token

6                 go to main page

7          else

8                 recover guest user from existing authentication token
```

Create Channel List For Region

```
1     if retrieveChannelsForRegion returns channelsArray

2          sharedInstance.channels = channelsArray

3          for all channels in sharedInstance.channels

4                 check if the channel is available

5                 assign colors next to each channel according to availability

6     else give error

7     check for channel updates after a scheduled time
```

Type The Ad Game

```
1     get notifications about episode session and advertisement

2     get sharedInstance

3     assign adBeginTime

4     initially show priviledged brands logos

5     if textField is edited

6          update suggestionTable

7          reload suggestionsCollectionView data with EMBrand logoURL

8     if sendSelectedLogoButtonPressed

9          now = current time

10         interval = now - adBeginTime

11         assign brandId

12         assign gameId

13         assign adBreakId

14         tell shared emController to send the current answer's data to server
```

Appendix E. Technology Resources

ARC (Automatic reference counting). http://www.raywenderlich.com/5677/beginning-arc-in-ios-5-part-1

Blocks. http://mobile.tutsplus.com/tutorials/iphone/understanding-objective-c-blocks/

Design patterns. http://en.wikipedia.org/wiki/Design_Patterns

Gamification. https://www.coursera.org/course/gamification

HTML 5. http://www.w3schools.com/html/html5_intro.asp

HTML 5. http://www.w3.org/TR/html5/

IOS developer library. https://developer.apple.com/library/ios/navigation/

IOS human interface guidelines. https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/

Mobile apps. http://www.lynda.com/Mobile-Apps-training-tutorials/55-0.html

MVC (Model-view-controller). https://developer.apple.com/library/ios/documentation/General/Conceptual/DevPedia-CocoaCore/MVC.html

Phone gap. http://phonegap.com/

Sidebar menu. http://www.appcoda.com/ios-programming-sidebar-navigation-menu/

SWRevealViewController. https://github.com/John-Lluch/SWRevealViewController

Udemy. https://www.udemy.com/

Universal applications. http://developer.apple.com/library/ios/#documentation/iphone/conceptual/iphoneosprogrammingguide/AdvancedAppTricks/AdvancedAppTricks.html

XCode. https://developer.apple.com/xcode/