

UNIVERSITY OF BREMEN

DOCTORAL THESIS

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**Human Computation and Human  
Subject Tasks in Social Network Playful  
Applications**

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*Author:*

Aneta TAKHTAMYSHEVA

*Supervisors:*

Dr. Rainer MALAKA

Dr. Andreas BREITER

*A thesis submitted in fulfilment of the requirements  
for the degree of Doctor of Engineering (Dr.-Ing.)*

*in the*

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# Declaration of Authorship

I, Aneta TAKHTAMYSHEVA, declare that this thesis titled, 'Human Computation and Human Subject Tasks in Social Network Playful Applications' and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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UNIVERSITY OF BREMEN

## *Abstract*

Mathematics and Informatics

Doctor of Engineering (Dr.-Ing.)

### **Human Computation and Human Subject Tasks in Social Network Playful Applications**

by Aneta TAKHTAMYSHEVA

Universal connectivity has made crowdsourcing - an online activity of a crowd toward the completion of a goal requested by someone in an open call - possible. The question rises whether users can be motivated to perform those tasks by intrinsic rather than extrinsic factors (money, valuables). The current work explores the gamification approach in order to appeal to the intrinsic motivation of players. Namely, instead of bringing the serious task into the major focus of the contributors, it proposes to use storytelling and playful metaphors as the elements that can mask the serious tasks and at the same time may attract the attention of potential contributors. Furthermore, it explores the possibilities of constructing such system as social network playful applications and employs Facebook as a distribution platform. The results demonstrate a positive feedback of the players. Identified are also differences in female and male players' attitudes, which gives space for a deeper research of the players' profiling and motivation in the future.

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# Chapter 1

## Introduction

The social network era has undoubtedly changed the way individuals interact today. As content sharing gains momentum and becomes a daily routine for millions of internet users, organizations are yet to learn new ways of integrating themselves into the new communication formula by reshaping communication patterns with its target audience, collect information about it, and as of lately, find ways to harness its enthusiasm and creative powers to mutually benefit from.

When instant access to thousands of users becomes available, finding solutions to the tasks that require the contribution of many becomes possible. Thus emerge *Amazon Turk*, *Groupon*, *Kiva*, *Kickstarter* just to name a few that realize various crowd based projects and activities. Such tedious and expensive tasks as data collection, mining and/or training using the input of numerous online users also became possible. However, in the competitive environment for the input of the users, the major question arises: how to gain and retain a desired user base when the entry and exit costs are small.

This issue becomes particularly important when talking about attracting users to contribute to generally boring tasks like ontology creation [Davidov and Rappoport, 2008], [Girju et al., 2009], or text annotation [Papantoniou et al., 2010], [Zavitsanos et al., 2010] that require a vast amount of data to be used in training of machine algorithms [Kietz, 2003]. Gamification seems to be a right tool to motivate users to do those tasks. However, the experience with it so far has shown that gamification is not a simple tool and requires lots of fine-tuning and adaptation to the specifics of industry, the audience, the execution platform, and the task itself.

On the other hand, the staggering success of social gaming within the last few years presents a potential opportunity to use social gaming energy to tackle human computation or other human based serious tasks through the process of the gamification.

Therefore, the current work focuses on this approach and presents projects that integrate serious tasks into gamified environments that are shaped as social network playful applications.

Chapter 2 presents a detailed overview of the projects that have been associated with the collective intelligence contribution systems. It covers the tasks that have been so far attempted at the crowdsourcing and present various systems that follow different motivational approaches, including the fun factor (intrinsic motivation) and which is the focus of this work.

Chapter 3 focuses on the theory of game creation, good practices and heuristics that when properly followed may ultimately lead to the construction of a well balanced intrinsically motivating system.

In chapter 4 we describe a user study that was run in order to better understand existing social network game players, their expectations, concerns and preferences in games.

Furthermore, chapter 5 explores the social network gaming environment and focuses on the overview of the existing games. It also attempts at distinguishing the features and heuristics that make these applications lucrative for the social network users.

Consequently, in chapter 6 we explore the utilization of the theoretical aspects covered in the previous chapters through construction of a gamified application that tackles the issue of motivating users to fill out questionnaires. We built an application, ran it, collected and analyzed user data, both in the controlled and non controlled environment (Facebook platform), in order to understand the importance of the gamification in motivating users, and the influence of the gamified elements on the user input.

As a next step, in chapter 7 we describe a system developed as a fairly complex social network game with a serious purpose (image tagging). We use the approach explored in chapter 6 in which we try to shift the user's attention further down from the real goal of the game, and break the serious task down into various playful activities united by a story telling mechanism. We analyze the user participation patterns across various demographic parameters and evaluate the quality of the user input.

Finally, in chapter 8 we review the results of the conducted studies, draw conclusions and shape further guidelines in the direction of gamification of human based tasks.

## Chapter 2

# Collective Intelligence Contribution Systems

### 2.1 Research Question

Serious games are also gamified systems that are used in education, health care, advertising, decision-making and data collection in order to motivate behavioral change or render a certain outcome. They appeal to people's natural desires to learn, compete, achieve, and express themselves in order to accomplish goals that are not related to games.

However, the impact of the gameful elements on the user behavior is not yet entirely explored. This impact is particularly important for the data collection systems as the nature and quality of the users input is influenced by the playful elements, their mechanics, and presentation.

Being interested in the potential that the social network games have to offer in terms of attracting players, in this work **we attempt to explore how a serious task may fit into a game with a typical social network game setup; whether such game can have a positive response from social network game players who are otherwise not interested in human computation games; and whether the gamified side of the human data collection applications constructed as a social network playful applications negatively influences the quality of the user's input.**

Namely, we attempt to build highly gamified systems that use distinct storytelling and rich aesthetics in order to explore the impact of masking a serious task hidden behind playful elements on the quality of users' input, users' perception of the system, and the sustainability of their interest to such systems.

This will help to draw conclusions regarding the usefulness and viability of this approach to the human subject data collection methods (surveys) and data contribution systems (knowledge collection).

Further, in this chapter we are reviewing existing approaches to the human data collection methods, their limitations and benefits in order to help identify useful elements that must be carried into the gamified applications that we intend to present as a result of this thesis work.

## 2.2 Taxonomy of Collective Intelligence

On a daily basis, users are contributing to the on-line content with millions of comments, tags, ratings, searches and other types of input.

Cook [2008] built a taxonomy of user contributions in which he distinguished between *passive contributions* (people provide their input *unintentionally*, i.e. by running queries to improve a Google searching algorithm or purchasing items, which determines the popularity of the products) and *active contribution* in which users intentionally share content with a purpose of bringing value to others.

### 2.2.1 Human Computation Tasks Types

Yuen et al. [2011] propose the following categorization of tasks that can be fulfilled through collective intelligence contribution systems:

- **Geometric reasoning:** humans are better than current artificial intelligence at dealing with the contextual object interpretation and, in some cases, object position optimization [Jagadeesan et al., 2009]. These skills have been put to use in projects like object discrimination in *Peekaboom game* [Von Ahn et al., 2006b], sketch interpretation [Engel et al., 2012], combinatorial problem solving [Corney et al., 2010].
- **Entity annotation:** annotation of images ([Sorokin and Forsyth, 2008], [Law and Von Ahn, 2009]), music and sounds [Law et al., 2007], [Mandel and Ellis, 2008], [Turnbull et al., 2007]), difficult cases of speech transcription [Williams et al., 2011], and video [Siorpaes and Simperl, 2011] etc.;
- **Opinions:** human subject information collection through an open call [Kriplean et al., 2012], [Krause et al., 2012];



- **Common sense extraction:** [Stork et al., 2000, Von Ahn et al., 2006a] and relevance evaluation [Alonso et al., 2008];
- **Natural language annotation:** sentiment analysis [Rafelsberger and Scharl, 2009], word sense disambiguation [Akkaya et al., 2010], Biemann and Nygaard [2010], [Chamberlain et al., 2008, Finin et al., Lawson and Eustice, 2010]);
- **Character recognition:** [Von Ahn et al., 2008] (Recaptcha);
- **Open collective information sharing:** *Wikipedia*<sup>1</sup>, *del.icio.us*<sup>2</sup>, *Yahoo Answers*<sup>3</sup>, *Pinterest*<sup>4</sup>, *Mendeley*<sup>5</sup>, *DBPedia*<sup>6</sup> and crowd assisted translation (*DuoLingo*<sup>7</sup> *Google Translator*<sup>8</sup>)

### 2.2.2 Forms of Motivation

If passive human computation contributions consist of browsing and activities' log data collected automatically [Cook, 2008], active contribution requires *open call format*. Open call contributions will actually take place if users are sufficiently motivated to participate. Current collective intelligence contribution systems utilize various motivational mechanisms ranging from *intrinsic* to *extrinsic* in order to induce user participation.

Deci and Ryan [1985] define extrinsic and intrinsic motivation as thee following: ”*Intrinsic motivation* refers to doing something because it is inherently interesting or enjoyable, and *extrinsic motivation* refers to doing something because it leads to a separable outcome.”

There are, however, collective contributions which motivate users both intrinsically and extrinsically. In fact, Deci and Ryan [2000] suggest that there is a gradual shift from extrinsic motivators to intrinsic through the degree of *internal involvement* as depicted in figure 2.1 As the figure suggests, the line between the intrinsic and extrinsic motivations may at some point become unclear.

Quinn and Bederson [2011] define the position of known collective intelligence systems in terms of their appeal to extrinsic, personal and intrinsic motivators based on definitions found in literature (figure 2.2).

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<sup>1</sup><http://wikipedia.com>

<sup>2</sup><http://del.icio.us>

<sup>3</sup><http://answers.yahoo.com/>

<sup>4</sup><http://pinterest.com>

<sup>5</sup><http://mendeley.com>

<sup>6</sup><http://dbpedia.com>

<sup>7</sup><http://duolingo.com>

<sup>8</sup><http://googletranslate.com>

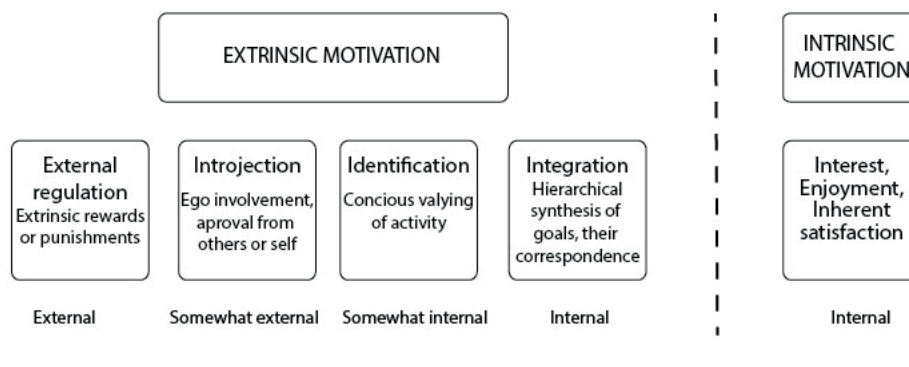


FIGURE 2.1: Extrinsic and intrinsic motivations by Deci and Ryan [2000].

*Human Computation* is defined as “a paradigm for utilizing human processing power to solve problems that computers cannot yet solve” [Von Ahn, 2005b]. *Crowdsourcing work* is referred to as “an act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call” [Howe, 2008]. *Social computing or content-sharing* refers to blogs, wikis and on-line communities, and was defined by Parameswaran and Whinston [2007] as “applications and services that facilitate collective action and social interaction online with rich exchange of multimedia information and evolution of aggregate knowledge.”

Furthermore, Quinn and Bederson [2011] suggest that while the *human factor* is a common denominator in the scheme, there are plenty of other elements, such as *motivation, quality control, aggregation, required skills, process order, and task-request cardinality*, which shape the variety of the approaches.

Considering this variety, the following sections will focus on the collective intelligence contribution platforms mentioned above.

## 2.3 Crowdsourcing from the Perspective of Human Computation Tasks

Referring to figure 2.2, one of the most well known extrinsically motivating crowdsourcing platforms is *Amazon Mechanical Turk (AMT)*<sup>1</sup>. The tasks that are normally posted as jobs (HITS) require certain English proficiency and computer skills and can include such tasks as annotation, word sense disambiguation, information search, and affective text analysis (see section 2.2.1).

<sup>1</sup><https://www.mturk.com>

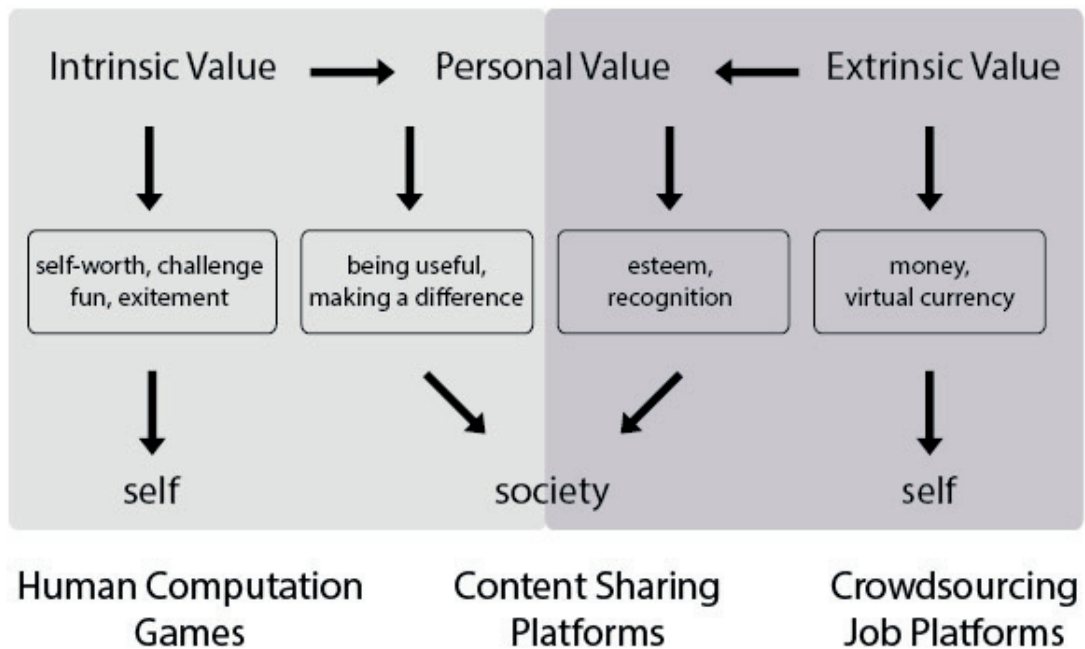


FIGURE 2.2: Collective intelligence contribution systems from a motivational perspective by Quinn and Bederson [2011].

There are similar platforms like *Crowdflower*<sup>2</sup> and *StandardMinds*<sup>3</sup> that are, in fact, backed by the AMT platform but are either focused on a specific task type or conversely provide extended capabilities. Namely, *Crowdflower* allows filtering of workers by country, and extending employer base to the rest of the world (AMT is open directly only to US employers) and offers more sophisticated quality control services. The *StandardMinds* offers advanced proofreading services with thorough content editing services.

Snow et al. [2008], Feng et al. [2009] show that the quality of returned jobs on *Amazon Mechanical Turk* is acceptably high. Experiments of Paolacci et al. [2010] showed that non-expert Mechanical Turk workers provided data quality equal to one expert worker and higher than results collected from users on Internet discussion boards.

At the same time, Horton and Chilton [2010] estimated that the smallest median wage that an Amazon Mechanical Turk worker is willing to accept for a task is as low as 1.38 dollars per hour, and Paolacci et al. [2010] observes that 90 percent of tasks cost on average 10 cents. Interestingly, Mason and Watts [2009] have proven through experiments that higher pay does not motivate workers to work harder because they assumed that the task complexity is worth the value. Higher pay, however, increased the quantity of the accomplished tasks.

<sup>2</sup><http://crowdflower.com>

<sup>3</sup><http://standardminds.com>

In terms of demographics, studies by Paolacci et al. [2010] revealed that Mechanical Turk has two major worker segments: well educated Americans (with 65 percent females, 35 percent males, with an average age of 36). Thirteen percent of survey participants reported that the work on AMT is a primary income resource, with the rest participating because they find it a fruitful way of spending free time, earning on average less than 20 dollars per week. Similar tendencies are established among Indian workers, who represent, in fact, the second largest segment of Amazon Mechanical Turk workers. However, they demonstrate slight demographic differences: the average age is slightly lower, the number of male workers is larger and 26 percent of them rely on Mechanical Turk as a major income resource [Wang et al., 2011]. In general, there is a trend indicating that the segment of Indian workers is growing.

Indeed, the low wages seem to be most fit for crowdworkers from financially disadvantaged countries where the cost of life is significantly lower than in most developed countries. Such crowdsourcing projects as *Samasource*<sup>1</sup>, *txtEagle* Eagle [2009], and *MobileWorks*<sup>2</sup> are targeting worker pools in developing countries living on less than two dollars per day, and therefore, benefiting most noticeably from the earnings that Amazon Mechanical Turk can offer. However, lower qualifications often results in what Vuurens [2009] labels as *sloppy work*. Moreover, an honest worker may perform poorly due to misunderstandings and even lack of qualification. The unintentionally poor quality coupled with the even bigger issue of massive spamming create a need for a solid quality control, which so far is represented by a *majority voting* approach [Raykar et al., 2010], as well as other spam filtering algorithms of Callison-Burch [2009], Ipeirotis et al. [2010], Vuurens [2009].

More versatile and comprehensive tools like *TurKit* [Little et al., 2010], or *Turkalitycs* [Heymann and Garcia-Molina, 2011] allow to process, report, and visualize in real-time logging events (workers' searching behavior, locations, browser environments, activity information) and as a result, help to make conclusions regarding task attractiveness and execution time. Consequently, they are useful in setting better pricing, and tracking the quality and reputation of specific worker IPs.

The *Turkalitycs* tool partially addresses the issue of limited access to the employees' demographic data (concealed due to privacy concerns). It allows pre-screening, and recontacting specific Worker IDs or coding that exempts specific groups of workers from viewing the task.

Another concern of monetized crowdsourcing platforms is related to the protection of employees who lack immediate performance feedback and often feel "cheated" without

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<sup>1</sup><http://samasource.com>

<sup>2</sup><http://mobileworks.com>

the ability to prove it due to the fact that feedback is given only after the work is submitted. Dow and Klemmer [2011] posit that immediate feedback has an impact on future task performance and propose to develop synchronous feedback systems that, unlike of current asynchronous system (including AMT), can provide a parallel peer review. The authors further present a system called *Shepherd*, which manages the parallel feedback of the crowd. *Soylent* [Bernstein et al., 2010], another project that manages a real-life word processing system that focuses on text editing tasks, such as shortening or proofreading, also provides nearly real-life synchronous feedback. A synchronous crowdsourcing application *VizWiz* [Bigham et al., 2010] intends to help blind people to be aware of objects that surround them using crowdworkers or their social network friends.

Kaufmann and Schulze [2011] indicate that while the extrinsic motivation category is important for Amazon Turk contributors (i.e. immediate payoffs) intrinsic motivation aspects also present significant equal importance (task autonomy and variety). At the same time, while Joyce [2007] finds that under certain conditions users are capable of providing creative and versatile ideas, Dontcheva et al. [2011] indicate that crowdsourcing platforms with strong intrinsic task quantity-money correlation do not motivate creativity. In their study, participants spent on average 6 minutes on each task, while creative solutions normally require more time. In general, most crowdsourcing platforms contend with standard performance and have no means, tools or mechanics to encourage singular performance.

Conversely, recently emerged platforms like *Brainrack*<sup>1</sup>, *Jovoto*<sup>2</sup>, *Innocentive*<sup>3</sup>, *Innovent*<sup>4</sup> and many more let employers make open calls, collect and reward best ideas using a competitive reward system [Archak and Sundararajan, 2009]. However, referencing them as crowdsourcing platforms is dubious since there is little or no peer collaboration or interdependency involved [Howe, 2008] and the efforts of non-winners are wasted as in any traditional competitions.

The future of monetary based crowdsourcing systems lies in improving the ability to coordinate more complex human computation tasks, decomposing larger, more complex tasks into smaller subtasks [Zhang et al., 2011]; involving third party coordination; and using more sophisticated algorithms of crowdsourced data validation.

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<sup>1</sup><http://Brainrack.com>

<sup>2</sup><http://Jovoto.com>

<sup>3</sup><http://Innocentive.com>

<sup>4</sup><http://Innovent.com>

## 2.4 Human Computation Tasks on Content Sharing Platforms

The next category of human computation contribution platforms is represented by content sharing platforms. Typically, they involve no financial remuneration or direct personal interest (personal use or career advantages are found to be important for open software developers [Ghosh, 2005]), but provide self-esteem, expert status and recognition, as well as a feeling of usefulness and importance of the contribution as indicated in figure 2.1. Indeed, an experiment conducted on a video sharing platform by Huberman et al. [2008] demonstrated that lack of attention and acknowledgment from the public leads to a decrease in the number of uploaded videos and in some cases to no uploads at all.

Classical examples of the largest content sharing systems are *Wikipedia* and *Yahoo Answers* (content creation), *Reddit*<sup>1</sup> (content submission and ranking), *Imgur*<sup>2</sup> (image sharing), *YouTube* and *Facebook* [Smith, 2008] to name a few.

## 2.5 Playful Human Computation Applications

In order to entice participants, content sharing platforms often utilize playful elements (including metaphoric processes, funny avatars), and make use of rich graphics to facilitate the process of collaboration, appeal to users, or inspire an exploratory mood. Rao [2008] argues that *playfulness* (unlike *play*, which is the opposite of *serious* process) can easily be integrated in serious settings.

Caillois [2001a] described all forms of play as being positioned on an axis between *Paidia* and *Ludus*, where *Paidia* stands for improvisation and joy compared to its opposite, *Ludus*, which is defined by strict rules. Bateman and Boon [2005] point out that the first experience of playing a new game involves playfulness, until the user learns the *Ludus* part (rules) and starts following the structured patterns of play. Thus, playfulness is linked to exploration. Indeed, Ghani and Deshpande [1994] note that the state of flow, characterized by intense concentration and enjoyment, is significantly linked with exploratory behavior. Woszczyński et al. [2002] discuss the difference between the flow state and playfulness, stating that they are to be measured differently, since state of flow is an internal psychological state, and playful behavior is something to be externally observed.

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<sup>1</sup><http://reddit.com>

<sup>2</sup> <http://imgur.com>

Lucero [2010] defined 22 categories of playful experiences, among which are *Friendship*, *Self-Expression*, *Sympathy*, *Simulation*, *Humor*, *Fun*, *Relaxation*, *Nurturing*, *Curiosity*, *Exploration*, that enhance interactive experience. Barnett [1991] defines playfulness as a mixture of "cognitive, social, and physical spontaneity, and manifestation of joy and humor".

To take up this notion of playfulness through analogy, Yahoo and other social platforms use a "Thumb-Up/Thumb-down" button to measure the popularity of the posted content or comments [Ghosh and Hummel, 2011].

Playful image tagging application *Links*<sup>1</sup> is designed to allow uploading image albums and suggests tags that are relevant to that description. It also allows to rate albums and post updates on Facebook. Applications like *SlaveryFootPrint*<sup>2</sup>, *Wahl-O-Mat*<sup>3</sup>, *ConsiderIt* [Kriplean et al., 2012], *Bake your Personality!* and *Who's got it?* [Krause et al., 2012], and a variety of Facebook applications (including in-built quizz making plug-ins) use relaxing, humorous, simulative interactions to provide a pleasurable experience while fulfilling some serious goals like educating/informing users on specific topics or collecting useful input.

Ferrari et al. [2009] uses manually generated drawings on top of photos to help reconstruct the shape of objects on the photos. With similar intentions, Russell et al. [2007] developed the *LabelMe* tool that helps to annotate specific objects identified in images using graphic tools, also providing a way to facilitate collaboration with the Amazon Mechanical Turk workers. These tools, however, lacked motivational positioning since they offer neither intrinsic nor extrinsic benefits for contribution.

The more user-friendly *Zooniverse*<sup>3</sup> projects use crowdsourcing to explore numerous space, earth and underwater world images to locate desired objects Raddick et al. [2010]. For example, the *MoonZoo* project requires contributors to locate craters and indicate their type and shape using special graphical tools provided by the web program interface. The tasks are relatively easy to comprehend and execute. Similar in its approach is the *Boodleian Project*<sup>4</sup>, which asks contributors to describe the covers of more than four thousand digitized music scores using specifically designed web interface.

Also, there are applications that use a business model and provide benefits to the public by allowing users to benefit from their own contributions (i.e. *DuoLingo*<sup>2</sup> language learning environment). DuoLingo allows users to learn languages for free in a playful

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<sup>1</sup><http://www.insemtives-links.net/>

<sup>2</sup><http://slaveryfootprint.org>

<sup>3</sup><http://www.wahl-o-mat.de>

<sup>3</sup><https://www.zooniverse.org>

<sup>4</sup><http://whats-the-score.org>

<sup>2</sup> <http://duolingo.com/>

environment while helping to translate websites and other documents that match the skill level of users.

Following playful content sharing applications, the next on the way to intrinsically motivating applications that collect human input (figure 2.2) are human computation games and gamified applications, which are discussed in section 2.6 below.

## 2.6 Collective Intelligence and Games

The development of web 2.0 spurred the rise of *gamification*, defined by Deterding [2011] as "the use of game design elements in non-game contexts." Today there are platforms that integrate playful gamification in everyday challenges like healthy eating, exercising, performing, geotagging (*Noah Project*<sup>1</sup>), ecological living (social network game *Ecotopia*<sup>2</sup>), and other routine but useful tasks.

*Human computation games*, as part of this gamification wave, emerged in 2005 in the form of *games with a purpose* (GWAP)<sup>3</sup> and were defined by their founder Von Ahn [2005a] as an attempt to "... use human effort to perform tasks that computers cannot yet perform, in an enjoyable manner."

So far, game designers applied human computation games to the following domains:

- Ontology creation
- Human-computer interaction research
- Spatial reasoning
- Geotagging

In addition, human computation games vary in terms of their setup parameters (mechanics):

- |                              |                       |                   |                  |
|------------------------------|-----------------------|-------------------|------------------|
| <b>1. Number of players:</b> | a) single-player      | b) two-players    | c) three or more |
| <b>2. Agreement system:</b>  | a) sync. agreement    | b) majority vote  | c) system        |
| <b>3. Location:</b>          | a) non-location based | b) location based |                  |
| <b>4. Game genre:</b>        | a) gamified tasks     | c) game           |                  |

There are games designed as a single player (1a), two player (1b) and three or more player (1c) systems. The rewards can be gained by reaching instant agreement with

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<sup>1</sup> <http://www.projectnoah.org/users/NeilDazet/patches>

<sup>2</sup> [http://conservation.org/newsroom/pressreleases/pages/Ecotopia\\_Launch\\_Announcement.aspx](http://conservation.org/newsroom/pressreleases/pages/Ecotopia_Launch_Announcement.aspx)

<sup>3</sup> <http://gwap.com>



co-players (2a), by matching the decisions made by majority (2b) or by creating input that remains within borders set up by the system (2c). In some cases, when games involve the coordination of real life actions, players have to be at the same location (3b); most games, however, don't require it (3a). In addition, some systems will contain goals and missions built entirely around the serious task in mind, although with metaphoric analogies or playful interaction (4a), or go as far as to incorporate scoring, ranking, and other elements typical for classical games (4b).

Below we give an overview of various human computation games that are classified according to their domain of application and the above stated criteria.

### 2.6.1 Ontology and Data Labeling

- *Two players/majority vote/non-location based/game:*

The first widely known games with a purpose (GWAP) were developed by Luis von Ahn. Their mechanics consisted of 2-player synchronous cooperative gameplay where both players have to agree on a certain decision with each other in order to progress through the game. GWAP's most successful tasks included image tagging (*ESP Game* [Von Ahn and Dabbish, 2004]), and common sense knowledge collection with games like *Verbosity* [Von Ahn et al., 2006a] presented in figure 2.3, *Squeegle and Peekaboom* [Law and Von Ahn, 2009]. The latter two games allowed object identification within an image using two different methods.



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FIGURE 2.3: Collecting linguistic ontology data through VerboCity by Von Ahn et al. [2006a].

The game setup proved to be a successful mechanism of data quality filtering. In addition, only when agreement on the same tag was reached 3 times would the tag be

retained in the database, which ensured very good quality control. The success of the game spurred the appearance of the games that intended to improve the original setup or use it for different purposes. *Matchin* game offered users to guess the preferences of the other player [Hacker and Ahn, 2009]. Takhtamysheva et al. [2009] used a two-player synchronous game to generate a variety of phrases that describe the same physical actions. *Thumbs-Up* game [Dasdan et al., 2009] used the same set-up to rank search results. *MuSweep* game [Chang et al., 2011] was designed to collect mutually exclusive concepts like "food" and "furniture" to contribute to the Never-Ending Language Loop project (NELL) where these concepts have to be entered manually [Carlson et al., 2010]. Conversely, *Curator* game [Walsh and Golbeck, 2010] uses a standard two-player output agreement setup but increases the number of possible matches by proposing a more flexible approach where users compare a collection of items, instead of just 2 options. Siorpaes and Simperl [2011] presented their series of simple 2-player human computation games under the *OntoGames* umbrella: *OntoPronto* for semantic annotation of texts; *TubeLink* and its predecessor *SpotTheLink* for aligning ontology; and *OntoTube* for video tagging.

- *Three or more players/synchronous agreement or majority vote/non-location based:*

Ho et al. [2009] slightly modified the original 2 player GWAP set up, bringing in a third player (*KissKissBan* game). The role of the 3rd player was to push further the borders of complexity of the task that the two players can agree on. Another three-or-more player setup was introduced in the game *HeardIt* [Barrington et al., 2009], which aimed at collecting audio annotations in which players were awarded points for reaching majority consensus.

- *Two players/synchronous agreement/non-location-based/game*

Vickrey et al. [2008] presented three human computation games (*Categorilla*, *Categodzilla* and *Free Association*) that were inspired by GWAP; a number of traditional non-serious games like *Scattergories* and *Taboo* games; and *Open Mind Common Sense System Collection* [Chklovski and Rey, 2003], one of the earliest web based massively collaborative ontology extension systems.

*Categorilla* and *Categodzilla* ask players to supply phrases or words which fit specific categories, i.e. "Things that fly" or "Type of vehicle". The 3rd game *Categodzilla* slightly increases the challenge by limiting users to words that start from certain letters, which, however, made her less popular than the other two games. The data the games

collected were used to augment the database of hypernyms of WordNet [Fellbaum, 1998]. For example, WordNet had a hyponym "burglary" and "fraud" for the word "crime", with the games one had an opportunity to add "homicide" and "murder" [Vickrey et al., 2008].

- ***Three-or-more players/synchronous agreement or majority vote/non-location based/game:***

*Doodling* [Kumaran et al., 2012] game is based on a popular board sketch-and-convey game that uses a graphic drawing tool where one player draws a series of objects and the other guesses the phrase behind the drawn objects.

Another game that is based on a traditional board game (*Snap*) is *PhotoSlap* [Ho et al., 2007]. Instead of cards, players use images. The players score up when other game players show no disagreement with the player's photo recognition results.

- ***Single-player/majority vote/non-location based/gamified tasks:***

The most recent *OntoGames* such as *TubeLink* [Thaler et al., 2011a] and *SeaFish* [Thaler et al., 2011b] moved away from the two-player setup and were transformed into more flexible single player games that do not stall the game or force to resort to bots when a second player is not available. Also, unlike early games that could have been regarded as two player quiz-like applications, these games have noticeably improved graphics, playful interfaces and better game dynamics.

*Phrase Detectives* [Chamberlain et al., 2008] is another text-based human computation game where players have to annotate text blocks by indicating whether a certain phrase or object has already been referenced in the text. The game utilizes the single-player format, and the points are awarded based on the consensus with the majority. The game introduces two modes: annotation generation and confirmation.

*Sentiment Analysis* game [Rafelsberger and Scharl, 2009] aims at the creation of sentiment lexicons - sentiment terms with corresponding sentiment value. The game allows players to rate words or phrases on a scale varying from *negative to positive* and awards them with points based on the consensus with the majority. The deployment of the *Sentiment Analysis* game on Facebook provides relatively high user involvement and satisfactory number of votes.

- ***Single-player/majority vote/non-location based/game:***

*OntoGalaxy* game [Krause et al., 2010] attempted to reach casual shooter game fans by introducing more dramatic game mechanics and dynamics as well as richer graphics in a single-shooter human computation game.

Also, the *Semantic Web Research Group* from Leipzig University experimented with casual game design by introducing *VeriLinks*<sup>1</sup>, a single-player verification-based human computation game that allows to simultaneously play a simple shooter game and earn bullets by fulfilling a human computation task (comparison of content of two images).

*DigitalKoot*, another single-player asynchronous agreement game [Chrons and Sundell, 2011] is a playful version of *ReCaptcha* [Von Ahn et al., 2008], which entices players to decode archival documents by interpreting phrases printed in a way that is unintelligible for computers. In one activity players enter their text interpretations, and in another they perform text verification. The game’s mission is to save a mole (eng.)/Maulwurf (ger.), which life depends on the rightfulness and promptness of the user’s input.

## 2.6.2 Spatial Reasoning and Cognition

- *Single-player/majority vote/non-location based/traditional game genre:*

Terry et al. [2009] presented *Plummings*, a single-player human computation game applied to spatial reasoning. Users have to minimize the network of ”pipes” to increase ”oxygen” pressure and thus increase its supply to the colony of Plumms. What players actually do while playing the game is designing optimized critical paths between field programmable gate array clusters.

- *Single-player/agreement with system/non-location based/gamified tasks*

Well-known human computation bio-medicine related games that also use a single-player setup with asynchronous consensus are *FoldIt* [Cooper et al., 2010], *Phylo* [Kawrykow et al., 2012] and *Eterna*<sup>1</sup>. The games’ task complexity requires the use of tutorials. The purpose of *FoldIt* is to refold proteins in the most optimal manner, something that requires unreasonably large computational power of computers. Similar to *FoldIt*, *Phylo* [Kawrykow et al., 2012] requests users to re-position genes of living creatures in the most optimal way. *Eterna*, a Carnegie Mellon University human computation game, invites users to create a large-scale library of synthetic RNA design that play an important role in controlling cells with disease-causing viruses.

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<sup>1</sup><http://aksw.org/Projects/VeriLinks>

<sup>1</sup><http://eterna.cmu.edu/>

### 2.6.3 Human-Computer Interaction Research

- *Single-player/majority vote/non-location based/gamified tasks or use of a traditional game genre:*

A series of games that aimed at researching patterns of human-computer interactions in order to improve software or interfaces has emerged. Thus, for example, an android based mobile human computation game *TypeIt* [Henze, 2012] allows to track user's typing patterns, which are then used to improve mobile keyboard interfaces. Yan and Yu [2009] presented *Magic Bullet*, another game, which is intended to train user's typing skills and aims at finding algorithms for handwriting recognition.

A social game *Passion Fruit* was run on a social network in order to study group cooperation within on-line games [Kirman, 2010].

With their sketching games *Picture-Phone* and *Stellasketch*, Johnson and Do [2009] addressed the issue of sketch image interpretation and aimed at collecting data about how people make and describe hand-made drawings. Another project in the similar direction of research presented by Wang and Yu [2012] is based on *DrawThat*, which in its turn is a digitized version of a traditional same-place group guessing game. It suggests that players guess the object behind the depicted images created by one of the game participants, which allows to collect information to be used for machine learning regarding sketching optimization.

Talton et al. [2009] explore 3d modeling patterns using multiple input in collaborative design spaces.

Ma et al. [2009] propose *PageHunt* game, the data of which can be used to improve search results by providing meta data for pages, page ranks and ways to refine queries. Alex Clemesha launched a series of Wikipedia hyper textual multiplayer games also available as mobile applications: *SpeedRace*, *Least Clicks*, *Six Degrees of Wikipedia*, *Five Clicks to Jesus*, *No United States* <sup>1</sup>. The goal of the games is to find a search path from given starting and finishing points, which can be used to study user navigation in non-directional search patterns.

Another project, *Sentence Recall Game* [Wang and Yu, 2010], is a single-player game that allows to study the usage of language patterns among non-native speakers.

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<sup>1</sup><http://thewikigame.com>

### 2.6.4 Geotagging

Improvement in mobile location-tracking technology gave rise to a series of early location based mission games like *Gopher Game* [Casey et al., 2007], *MobiMission* [Grant et al., 2007], and *Indogator* [Lee et al., 2010] where users create human computation missions and fulfill those created by other players. Cooperative human computation geo-tagging games like *EyeSpy* [Bell et al., 2009] and *GeoSnake* [Matyas et al., 2011] allow to produce images, create geo-spatial tags and verify those using the wisdom of the crowd and cooperative mechanisms.

A more advanced *UrbanMatch* game [Celino et al., 2012] is a mobile location-based human computation game, which chooses photos that are most representative for the point of interest and selects those best ranked by multiple participants.

A project by Tuite et al. [2010] called *PhotoCity* is a hybrid alternative reality mobile game with a purpose, which is played outdoors with a goal of taking pictures of buildings/objects from various angles and positions in order to recreate their 3D models. Another alternative reality game called *The World Without Oil*<sup>3</sup>, has a social goal and invites massive collaboration of network users who help to visualize world disasters and offer multiple solutions.

## 2.7 Players Response to the Playful Human Computation Platforms

The results of the study done by Nichols and Kang [2012] on human collaboration (questions and answers) involving Twitter revealed no significant connection between the degree of urgency of the information request and the number of contributions. This finding also supports the assumption that human computation games are played for the variety of personal and fun reasons rather than for the purpose of contributing to the good. Indeed, the findings of Lee et al. [2010] produced as a result of evaluation of their human computation mobile application *Indogator* revealed that perceived gratification factors, such as *information discovery*, *entertainment*, *information quality*, *socialization*, and *relationship maintenance*, were the most significant predictors of their application use.

Chronis and Sundell [2011] reported that players accomplished 2.5 million micro-tasks, and spent in total 2.740 hours playing two *DigitalKoot* mini-games (generation and approval). From 2003 to 2007 the ESP game provided 10 million image captions [Russell

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<sup>3</sup><http://www.worldwithoutoil.org>

et al., 2007]. [Vickrey et al., 2008] pointed out that within a year their games have collected 800 000 instances and at least 24 guesses per category. Within 2 years more than 200 000 volunteers had made more than 100 million galaxy classifications for the Galaxy Zoo project Raddick et al. [2010].

At the same time, as indicated further in section 4.5.2, users display a pattern of playing that fits the *power law* [Kirman, 2010], which says that only a small part of players display hard-core player behavior. This goes along with the findings of Chrons and Sundell [2011] who reported that the most hardworking 1 percent of gamers of 55 000 players of *Digital Koot*, a human computation game distributed on Facebook, accomplished almost one third of all tasks.

Chien-Ju and Kuan-Ta [2009] demonstrates that in systems with social verification (vs. machine based verification) "*sequential verification* encourages users to contribute with a more diverse and descriptive set of outcomes than *simultaneous verification*, though the latter is stronger in ensuring the correctness of verified answers". Yet, in spite of more solid simultaneous verification, the requirement of having at least two players willing to start a particular game at the same point of time poses a serious challenge to the two-player game setup. Vickrey et al. [2008] points out the necessity to use bots, which use past guesses or make imaginary guesses with a pre-calculated probability of generating a word that matches the guess of the player. However, once users realize that they play with a bot, their interest to the game decreases. To counter fight this challenge, Chamberlain et al. [2008], Chrons and Sundell [2011] propose a division of input generation and confirmation tasks into separate single-player mini-games.

Terry et al. [2009] of *Plummings game* suggest that their game will perform better if their spatial reasoning task will be divided into smaller subtasks, which games like *Eterna* and *FoldIt* have achieved. In addition, the latter games have introduced interactive mini game tutorials, which increased the understanding of the task requirement and game rules and provided handling of novice players as presented in section 3.3.1 *Maturity stages of players*. Indeed, the necessity of providing tutorials when appealing to a large non-sophisticated audience is also reflected in social network games, which offer tutorials blended into game dynamics and is indispensable for human computation games with complex tasks.

Finally, compliance with user experience and interface development guidelines is another area that improves game effectiveness, reduces gamers' confusion, and consequently positively influences the input quality. Ho et al. [2007] point out that improving the interface design of their game *PhotoSlap* increased the precision of users' input by 10 percent.

## 2.8 Conclusions

In the background of global connectedness, Web 2.0 technologies brought an opportunity to bring together global workers and global employers, making crowdsourcing and human computation indisputably feasible; and they also provide opportunities for continuous evolution of the platforms that harness the energy of netizens.

In this chapter we gave an overview of different methods of input solicitation from the perspective of user motivation (section 2.2) ranging from purely extrinsic to intrinsic factors.

In section 2.3 we covered systems that use extrinsic motivation for user contribution (crowdsourcing) and reviewed the challenges that these systems currently face. While the variety of tasks that can be fulfilled by these systems is extensive, their execution depends on immediate presence of financial resources, and a budget that increases proportionately to the number of required responses.

Section 2.4 presented content sharing systems, which use playful approaches to motivate sharing, commenting and other contributions. While users are motivated to participate by the tasks' attractiveness and its personal relevance to the user, the type of input and its amount are limited and not regulated or solicited as much as by more complex playful systems presented in subsection 2.5 and games in section 2.6.

Subsection 2.6.1 and section 2.5 cover more challenging approaches that propose to appeal to users through intrinsic motivation to fulfill a large quantity of more complex tasks that are of a little personal relevance to users. This approach assumes high fixed costs for system development, but relatively low variable costs that, unlike crowdsourcing systems, do not increase with the number of tasks and can serve research projects, which require an unlimited amount of data and when the quality of the results improves with the growth of the input data amount (ontology, linguistic databases, algorithm training data).

At the same time, most of the human computation game projects reviewed in section 2.6 display sporadic compliance with theoretical principles of game development guidelines and do not make the full use of the potential that good mechanics, dynamics and aesthetics have to offer. As a result, only a few games reached satisfactory amount of user input with many more games remaining in the prototype stage of development. Therefore, human computation games would greatly benefit from using game development approaches and design principles presented in chapter 3 and 4, and reviewing the game design process from the point of user motivation and fine-tune the proportion and quality of serious and playful tasks.



The next chapter presents the theoretical foundation of efficient game development, focuses on player's motivation, and proposes guidelines for constructing intuitive gaming environments with necessary game usability principles.



## Chapter 3

# Motivation in Games

### 3.1 Definition of Game

There are numerous definitions of games and gaming in the literature, coming from sociologists [Caillois, 2001a], philosophers [Suits, 1969], [Suits, a], game designers [Crawford, 2003] [Parlett, 1999] and game studies researchers [Zimmerman and Salen], [Sutton and Barto, 1998].

Zimmerman and Salen collected the most cited definitions and made a list of elements that these definitions mention:

Rules that limit players [Parlett, 1999], [Huizinga, 1971] [Caillois, 2001a], [Crawford, 2003], [Abt, 1987]
Goal-oriented [Parlett, 1999], [Abt, 1987], [Suits, a], [Sutton-Smith, 2001]
Involves decision-making [Abt, 1987], [Suits, a], [Crawford, 2003]
No material gain Huizinga [1971], [Caillois, 2001a]
Creates special groups [Huizinga, 1971]
Uncertain [Caillois, 2001a]
Inefficient [Suits, a]
Resources and tokens [Crawford, 2003], [Costikyan, 2002]
Conflict or contest [Parlett, 1999], [Crawford, 2003], [Sutton-Smith, 2001]
Activity process event [Sutton-Smith, 2001], [Abt, 1987], [Costikyan, 2002]
Outside ordinary life [Huizinga, 1971], [Caillois, 2001a], [Crawford, 2003]
Not serious [Huizinga, 1971]
Voluntary [Caillois, 2001a], [Suits, a], [Sutton-Smith, 2001]
Make-Believe [Caillois, 2001a], [Crawford, 2003]
A form of art [Costikyan, 2002]

The variety of terms reflects not only the difference in the authors' backgrounds, but also gives an idea of the complexity and diversity of game genres. Taking into consideration that the present work will further concentrate on social games, we take the definition that most precisely reflects the nature of this particular game genre:

**"Games are a form of art in which the participants, termed players, make decisions in order to manage resources through game tokens in the pursuit of a goal."** [Costikyan \[2002\]](#).

As the goal of this project is to undertake a challenging task of creating an engaging gaming environment with human computation elements, it is very important to understand what stands behind player's motivation to continuously involve themselves with games and try to incorporate those elements into the project.

Since there is no one dominating model of player's motivation, in the following sections we will review a variety of most important motivation models that consider different aspects of what causes intentional playing behavior and may altogether provide useful insights into game motivation that should be considered when creating social games with human computation elements.

## 3.2 Game Motivation: User-Centered Perspective

### 3.2.1 Technology Acceptance Model (TAM)

One of the first models used to explain motivation to play games was the *Technology Acceptance Model* (TAM). Originally developed for the purpose of explaining technology acceptance at work [[Davis, 1989](#)], it posited that rational users will want to engage with technology that they find useful/informative. [Hsu and Lu \[2004\]](#) applied TAM to digital games and found that perceived usefulness on its own does not motivate users to play games, since they tend to play games without a specific rationale. Moreover, TAM was extended with social elements and flow experience as seen in schema below (figure 3.1), thus demonstrating a correlation between *social norms, attitude, flow experience and intention to play* online games.

However, as rationality of gaming was found to be of secondary importance, a few more models that focused on user experience were developed. Two of the most significant models were *User Gratification Approach* [[Eisenbeiss et al., 2012](#)], which regards audience as an active group that seeks to use media to gratify their needs [[Katz and Lazarsfeld, 1955](#)], and a slightly modified *social Influence Model* (SIM) [[Dholakia and Bagozzi, 2004](#)]

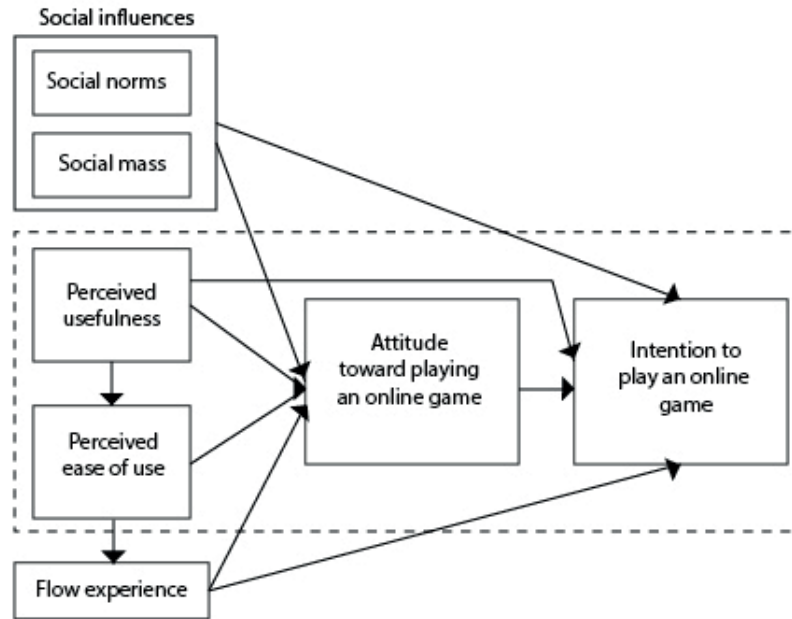


FIGURE 3.1: TAM extended with social influences and flow experience according to Hsu and Lu [2004].

that considers the importance of group thinking in individual behavior. These models are covered in greater detail below.

### 3.2.2 User Gratification Approach

User Gratification approach theory was originally developed in the 60-es to explain why people use new media like television and radio [Schramm et al., 1961]. In the era of computer games it has also been utilized to explain why people play computer games. Furthermore, the original model was extended with social determinants by Bagozzi and Dholakia [2002] and presented in figure 3.2 below.

According to this model, a wide range of factors such as *attitudes*, *anticipated emotions*, *previously built attitudes and behavior patterns*, as well as *individual* and *group norms* influence our desires and consequently our *we-intention*, which are, in fact, individual intentions that are shaped under group influences. [Tuomela, 1995] maintains that *we-intention* occurs when each member intends to perform his or her own parts contributory to the group action while believing that other group members will reciprocate, and that the intention to perform one's part is determined by some kind of obligations or prior agreement.

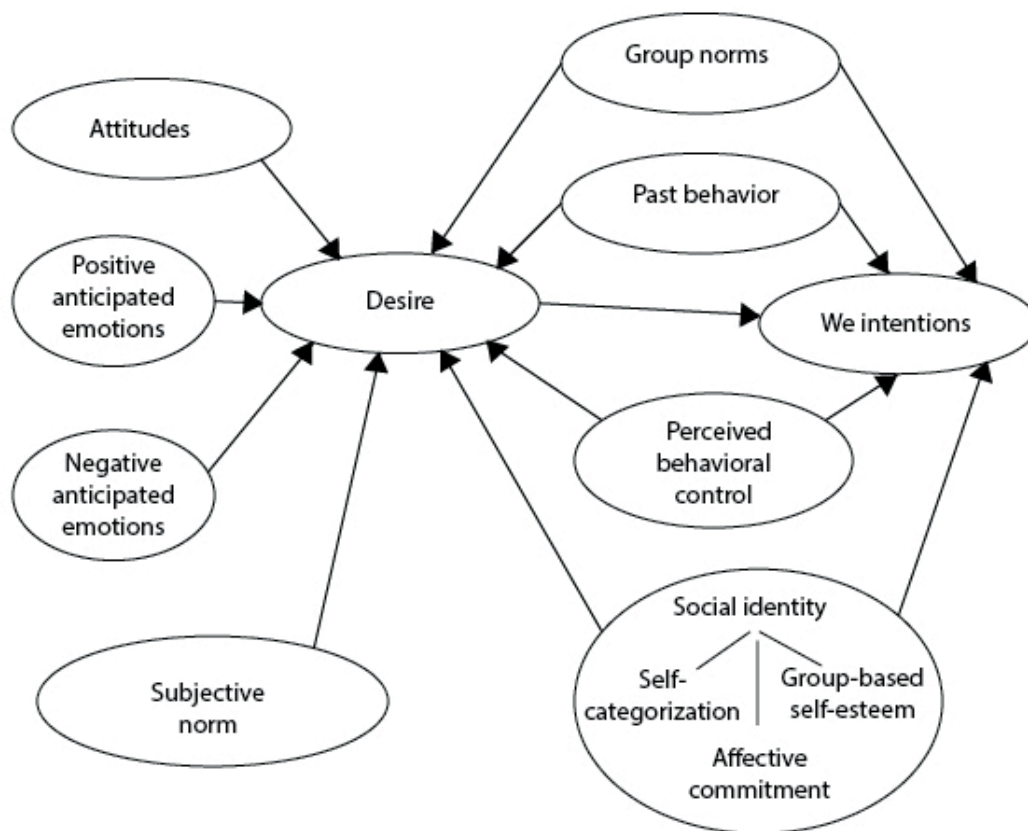


FIGURE 3.2: User Gratification Model by Bagozzi and Dholakia [2002] .

In addition, authors indicate other needs that this model covers: the *need to escape* - which varies from person to person [Grace-Farfaglia et al., 2006], and *social interaction* with like-minded others [Eisenbeiss et al., 2012, McKenna and Bargh, 1999].

The latter fits well with the *Social Identity Theory* (SIT), also presented in figure 3.2 that explains how group identity contributes to individual's self-perception through *self-categorization*, and that the sense of belongingness is also an important personal need that is shaped through *emotional commitment* to the group and *esteem* received from its members [Tajfel and Turner, 1986]. These needs can be well satisfied by computer-mediated environments [Bagozzi and Dholakia, 2002, Postmes et al., 1998] like web and game communities.

Littlejohn and Foss [2008] pointed out that this approach might not seem perfect in the use of passive media, in which users often interact in a habitual way rather than pursuing a specific need to gratify. Nevertheless, the model was useful when applied to more interactive media like websites [Stafford and Stafford, 2001], blogs [Chung and Kim, 2008], virtual communities [Ogan, 2006], and finally online games [Chang et al.,

2006], interactions people seek when having certain purposes in mind because of this media.

### 3.2.3 Social Influence Model (SIM)

The SIM model, unlike the *User Gratification Approach* - in which all factors that influence motivation are positioned with equal importance - suggests that decision making is a *direct function* of social influence and only then an *indirect function* of value perceptions, which in its turn consists of 5 specific values derived by a few authors from various communication literature sources :

- *purposive value*, derived from accomplishing some purpose (including giving or receiving information) through virtual community participation;
- *self-discovery value*, which allows to deepen the knowledge of oneself through social interactions;
- *interconnectivity maintenance*, which denotes social benefits from maintaining contacts with other people, including social support, friendships;
- *social enhancement value*, derived from gaining acceptance and approval of other members and enhancing one's social status;
- *entertainment value* derived from fun and relaxation through playing or interacting with others [McKenna and Bargh, 1999].

Furthermore, the above mentioned value perceptions shape *social identity* variables and *group norms*. The *social identity* element captures one's identification with a group and the regard of oneself as a member of the community. It is a broad term and includes *affective*, *cognitive* and *evaluative* components [Bergami and Bagozzi, 2000].

The *affective* component implies emotional involvement with the group and attachment to it. The *evaluative* component implies measurement of self-worth on the basis of belonging to a community. Finally, the *cognitive* side of social identity signifies awareness of similarities with its members and conversely dissimilarities with non-members [Ashforth and Mael, 1989].

*Group norms* grow with adoption of the groups' goals and values once one joins a specific community (in our case gaming community). Consequently, stronger group norms lead to stronger *mutual accommodation* and *mutual agreement* to participate in the virtual community and reinforces *social identity*. Altogether they influence the desire of participation in the activity, which can be applied to all game communities.

### 3.2.4 Self-Determination Theory

Self-determination theory (SDT) is another influential theory of human motivation [Deci and Ryan, 1985] that has been applied to explain game motivation. It states that human behaviors are motivated by very general human needs for *competence*, *autonomy* and *relatedness*. *Competence* motivates people to take part in activities that allow them to feel competent and effective, *autonomy* refers to the fact that we need to feel a freedom of choice of activities that we do, *relatedness* refers to the need to feel connected with other members that we interact with. In a later publication, Deci and Ryan [2000] emphasize that satisfaction of those needs is necessary for the psychological growth, integrity and well-being of people. As a classic theory, the self-determination approach has been applied to different types of human activities, including games. Ryan et al. [2006] applied the self-determination theory to explain the motivation for playing video games and the effects of playing on the well-being of people. The outcomes showed that satisfying these needs positively predicts enjoyment and future game play. In other words, enjoyment on its own is not enough to keep players continue unless the game satisfies certain needs.

The following section covers the important models of game motivation from the perspective of game attractiveness rather than human needs and social influence that pushes players to join gaming environments.

## 3.3 Game Motivation: Game Experience Prospective

### 3.3.1 Flow Theory

One of the major theories that explains the motivation behind gaming from the game experience perspective is the Csikszentmihlyi's model of *Flow*. It is used to explain the involvement and fun of engagement with various activities [Cowley et al., 2008] and was later extended for playful interaction with computers [Woszczyński et al., 2002]

Csikszentmihlyi defines at least 8 factors (extended with corresponding game elements [Jones, 1998]) that accompany the flow, although not all of them need to be experienced in order to reach the state of the flow Csikszentmihlyi and Rathunde [1992]. These factors are presented in table 3.1.

Elements covered from 1 - 4 in table 3.1 *cause* the flow state and all the others are *indicators* of the flow state. The former serve as a good basis for defining the essential elements of game and gamification. *Clarity of tasks*, *rules*, and *feedback* are combined



Element of Flow	Manifestation in a game
1. Task that we can complete (balance of challenge and abilities)	The use of levels in games provides small sections that lead to the completion of the entire task
2. Task has clear goals	Survival, collection of points, gathering of objects and artifacts, solving the puzzle
3. Task provides immediate feedback	Shoot people and they die. Find a clue, and you can put it in your bag.
4. Ability to concentrate on task	Creation of convincing worlds that draw users in. The dungeons and labyrinths in Doom II help suspend your belief systems for a time.
5. Deep but effortless involvement (losing awareness of worry and frustration of everyday)	The creation of environments far removed from what we know to be real helps suspend belief systems and takes us away from the ordinary.
6. Exercising a sense of control over their actions	Mastering controls of the game, such as a mouse movement or keyboard combinations.
7. Concern for self disappears during flow, but sense of self is stronger after flow activity	Many games provide for an environment that is a simulation of life and death. One can cheat death and not really die. People stay up all night to play these games. It is the creation of an integration of representation, problem, and control over systems that promotes this
8. Sense of duration of time is altered.	Years can be played out in hours; battles can be conducted in minutes. The key point is that people stay up all night playing these games.

TABLE 3.1: Elements of flow by [Csikszentmihalyi and Rathunde, 1992] and their manifestation in games by Jones [1998].

with *balance of skills* and *challenge* [Choi and Kim, 2004], which are essential to create engaging gamified applications. Further down the list are *conflict*, *cooperation*, *uncertainty of outcome*, and *rich visual representation* that make applications transit from a gamified state into a real game state [Schreiber, 2009]. When done correctly, the resulting consequences are *concentration*, *loss of self-awareness*, *absorption into activity*, etc., - all that that qualifies the flow state.

Figure 3.3 describes a variety of states that range from *worry* to *apathy*, which depend on two major aspects: the level of *challenge* of the activity, and the *skill* level of the performer. When a player experiences none of negative states and is fully engaged with the game, then he is considered to be in the state of *flow* (figure 3.4).

According to the model, players reach the state of flow only when game tasks present a satisfactory balance between being neither too hard nor too easy (figure 3.4).

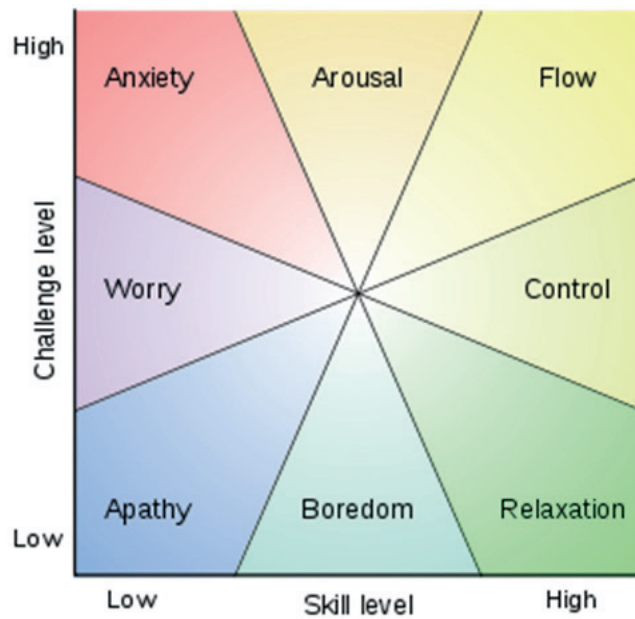


FIGURE 3.3: Flow Theory: variety of states during gaming process extended by [Woszczyński et al. \[2002\]](#).

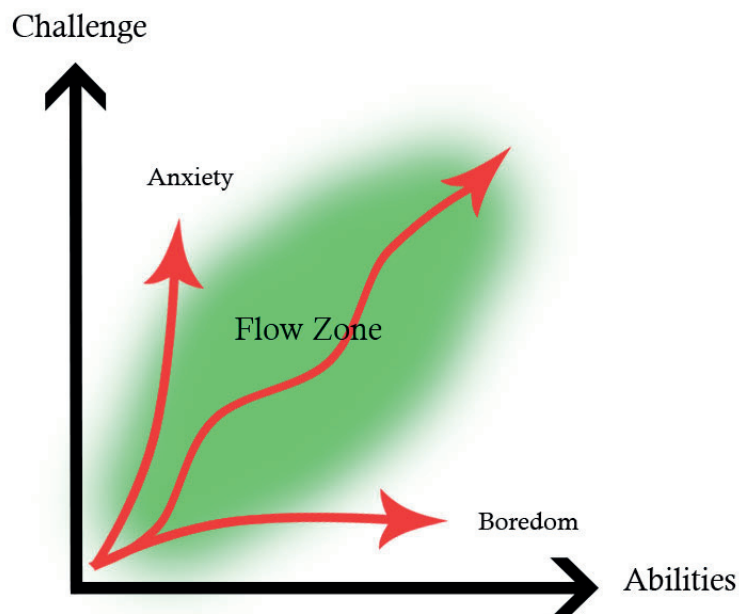


FIGURE 3.4: Flow zones for different players by [Woszczyński et al. \[2002\]](#).

While *clarity of tasks* and *feedback* are manageable to control, the balance between ability and challenge is hard to control because of the variety of skill levels of players (figure 3.5). This is particularly true for casual games, since they are designed for the generic public and need to appeal to the widest range of players' abilities [Wyman, 2011, Zimmerman and Salen].

Dreyfus and Dreyfus [1980] proposed a model of skill acquisition, which was summarized by Eraut [1994] and is presented as by 5 major degrees of skills, ranging from *novice* and continuing with *advanced beginner*, *competent player*, *proficient player* and finishing with *expert player*:

1. **Novice** players tend to adhere to set rules and plans, and hesitate to explore domains that would require exercising discretionary judgment.
2. **Advanced beginners** achieve a certain understanding of most aspects of the game, although still assign equal importance to most game elements.
3. **Competent** players are ready to manage multiple activities, have good understanding of how actions are related to goals, and are capable of planning their activities.
4. **Proficient** players are those who have reached the state when they are able to distinguish and prioritize more important game aspects, and can easily adapt to the situation at hand
5. **Expert** players acquire tacit understanding of the game mechanics, are capable of thinking beyond the scope of rules and guidelines, and are capable of constructing effective game strategies.

### 3.3.2 Variety of Experience

Chen [2006] argues that in order for a game to be appealing for broader skills of the audiences, the game has to offer a variety of experiences that can fit into potentially different flow zones, ranging from hardcore/expert to novice as shown in figure 3.5.

Consequently, Chen [2006] suggests embedding those choices into the gameplay and letting the player chose or ignore them to create a gaming experience that fits their own understanding of engaging challenge (figure 3.6).

Variety of choices might be offered by straight-forward menu questions and level selections, or it might be the part of the game mechanics that offers a non-obtrusive game flexibility where players are given freedom to chose any navigation and interaction patterns as they choose. **fOw**<sup>1</sup> is a game that exemplifies this approach.

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<sup>1</sup><http://interactive.usc.edu/projects/cloud/flowing/>

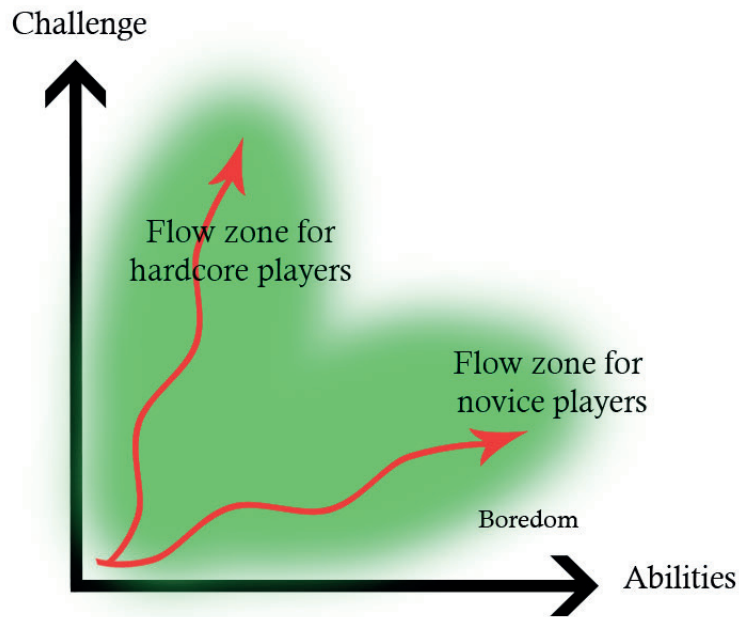


FIGURE 3.5: Elements of flow and their manifestation example in games according to [Chen \[2006\]](#).

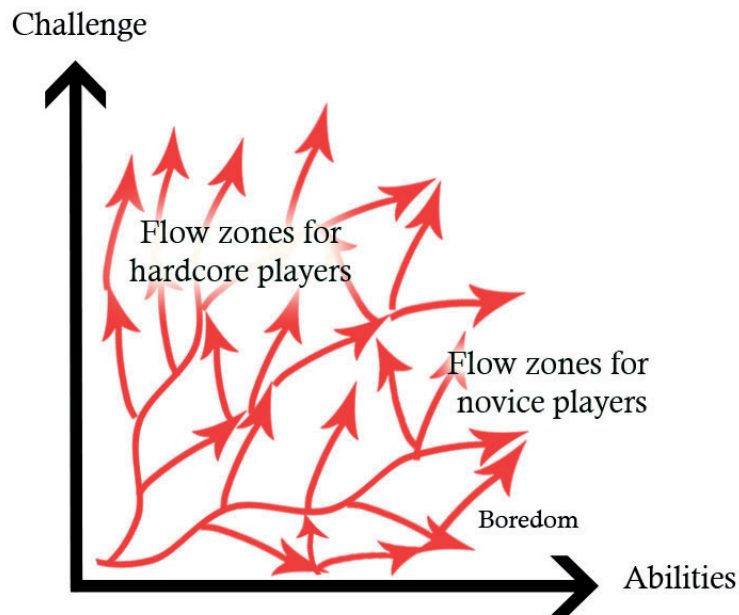


FIGURE 3.6: Variety of flow paths [[Chen, 2006](#)].

Another challenge of reaching the flow state is the variety of user personalities, and consequently, different prioritization when it comes to instincts and emotions, which are compiled by Dillon [2010] in the 6-11 framework (figure 3.7). For example, in identical game situations, some players might display the instinct of *greed*, while others will be dominated by the instinct of *aggressiveness*, which in their turn will trigger the chain of emotions that will result in different actions. Therefore, game designers should be aware of the potential range of emotions and instincts triggered by game situations and provide space to satisfy them.



FIGURE 3.7: Model of emotions and instincts in gaming process [Dillon, 2010].

### 3.3.3 Aesthetics Aspect of the MDA framework

Hunicke et al. [2004] deconstructs the process of game construction into three distinct components of game Mechanics, Dynamics and Aesthetics (MDA), which also acknowledges the variety of emotions and instincts involved in the gaming process that are united under Aesthetics.

MDA represents game experience as a one-way process where decisions made during the game construction process result in emotional responses from gamers (figure 3.8).



FIGURE 3.8: MDA Framework [Hunicke et al., 2004].

*Mechanics* describes the particular components of the game, at the level of data representation and algorithms. Adams [2010] indicates that "rules are definitions and instructions that the players agree to accept for the duration of game". They define the

semiotics of the game (the meaning and relationship of various symbols of the game), the goals of the game, the progression of activities and the game-play itself. He points out further that "the core mechanics consist of the data and the algorithms that precisely define the game's rules, manage gameplay, player decisions, keep track of everything that happens in the game world, and work with the storytelling engine to help tell the story".

[Schreiber \[2009\]](#) describes the following essential elements of game **mechanics**:

1. Rules must be made clear, intelligible and fixed. They define possible actions of players.
2. The outcome of the game must be uncertain, otherwise it loses its appeal.
3. Computer games simulate or change properties and processes of the real world.
4. Rules (mechanics) and representations (graphics) interact with each other. Even if rules stay fixed, the representations that change may affect user experience. At the same time, representations and rules should correspond (i.e. if a Ping-pong game is represented by realistically looking graphics, then the ping pong ball should not bounce off the walls and instead leave the border like it would in the physical world that the representations try to imitate).
5. Players require clear and immediate feedback to understand the relationship between action and outcome.
6. Players require a clear goal so that they can perform meaningful actions within the game.
7. Conflict and competition are essential for the player motivation.
8. The challenges of a game should match the skills of the player.

**Dynamics** describes the run-time behavior of the mechanics acting on player inputs and each others' outputs over time. [Zimmerman and Salen](#) describe dynamics as the "same-but-different" quality of a game, "when every time one plays a game, the formal structure remains the same, but the way the rules are played out are different".

**Aesthetics** describes the desirable emotional responses evoked in the player when she interacts with the game system. [Niedenthal \[2009\]](#) gives a few definitions of game aesthetics, among which is "game aesthetics is an expression of the game experienced as pleasure, emotion, sociability, formgiving, etc". The author emphasizes that there is no analytical tool that is bound to game aesthetics and it can be regarded from different perspectives such as semiotics [[Lauteren, 2002](#), [Myers, 2005](#)], media studies [[Hayward,](#)

2005] and theoretical perspective, such as the role of game aesthetics within contemporary culture [Kirkpatrick, 2007].

In addition, Schell [2008] points out that good aesthetics influence players in the ways that they are more willing to tolerate imperfections in game design. Secondly, good aesthetics help to draw players into a game they might have otherwise ignored [Niedenthal, 2009]. Andersen et al. [2011b] emphasizes how enhanced animation and aesthetics influence players' experience.

Aesthetics can represent a whole range of fun experiences, which are represented by but not limited to the following [Hunicke et al., 2004, Schell, 2008]:

1. Sensation - seeing something beautiful, hearing music, touching silk, and smelling or tasting delicious food are all pleasures of sensation.
2. Fantasy - the pleasure of creating an imaginary world and imagining yourself as something that one is not.
3. Narrative - dramatic unfolding of event sequences.
4. Challenge - one of the core pleasures of gameplay, since every game, at its heart, has a problem to be solved.
5. Fellowship - everything enjoyable about friendship, cooperation, and community. For some players, this is the main attraction of playing games.
6. Discovery - another key game pleasure.
7. Expression - the pleasure of expressing yourself through creative activities.
8. Submission - the pleasure of leaving the real world behind, and entering into a new, more enjoyable set of rules and meaning.

Schell [2008] mentions other types of pleasures, some of which are *anticipation, delight in others' misfortunes, gift giving, humor*.

It is also natural that with such a wide variety of fun experiences, which at times contradict each other, games are separated into different genres that pursue different goals and provide different kind of fun.

Lazzaro [2009] introduces a different model of pleasure by defining 4 major types of fun:

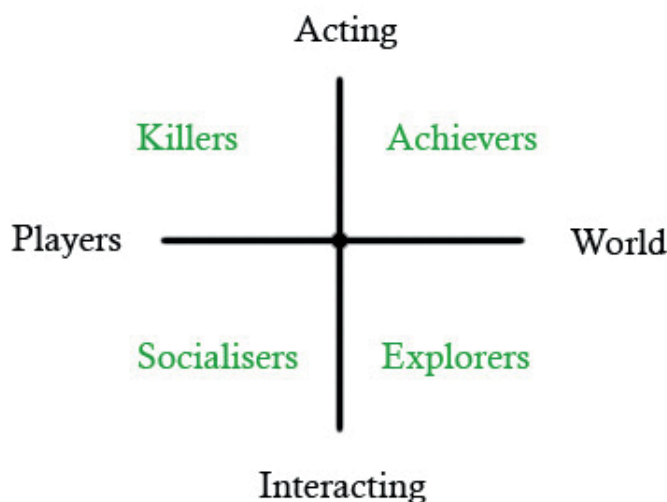
- Hard Fun - challenge and mastery that are rewarded by a game, often involving a high degree of frustration and, consequently, once past it a strong feeling of accomplishment.

- Easy Fun - fulfilling a task because of curiosity and desire to discover something without scoring pressure.
- People Fun - engaging in social interactions which often result in bonding between players. This type of fun came into prominence with the rise of social platforms and social network games.
- Serious Fun - provides a connection to the real world with the real world values, beliefs and motivators. Serious fun is most relevant to gamified applications: quizzes, health games, simulation games which are supposed to make the user excited to achieve results valuable in the real world.

This system of fun categorization seems to be correlated to another important model - Bartle's player categorization, which is discussed in the section below.

### 3.3.4 Typology of Players

Bartle, a pioneer developer of multiplayer virtual world games, proposed a typology of player types in respect to different funs that they are looking for to experience [Bartle, 2003]. Instead of approaching players from the perspective of experience and skills, he categorized them depending on their goals: *killers*, *achievers*, *socializers* and *explorers*.



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FIGURE 3.9: Four player types [Bartle, 2003].

Bartle further defined 4 major dimensions where his player categories are focusing on other *players*, on the *world*, on *interaction* or on *action* (figure 3.9). Consequently, he placed **killers** between *acting* and *players*, denoting that killers wish to kill players; **socializers** were placed so that they interact with *players*, **achievers** are more focused



on *acting in the world* and **explorers** wish to *interact* with (i.e. explore and manipulate) the *virtual worlds*. Bartle notes that a truly successful game must provide enough of the above dimensions for all four types of players.

Another model of player categorization was introduced by Yee [2006], who having conducted factor analysis of game motivators, identified three major types of players, based on the Bartles theory:

- Players who are focused on **achievement** and seeking mastery, competition and gaining power.
- Players who are focused on **socialization** and seek interaction with others and development of in-game relationships.
- Players who seek **immersion** as a way to escape real life problems and become part of the story by engaging in role-playing.

The latter will be discussed in greater detail in section 3.3.5.

### 3.3.5 Game Immersion

Flow state (section 3.3.1) in games can also be regarded in many ways as game immersion, which according to Pine and Gilmore [1999] means becoming physically or virtually part of the experience. They note that *immersion* should not be confused with *absorption*, which rather stands for directing attention to an experience. The schema of *four realms of experience* (figure 3.10) allows to define the position of the gameplay within different experience categories. According to this model, gameplay belongs to the *escapist* experience, which results from *immersion* and *active participation*.

At the same time, [Brown and Cairns, 2004] acknowledging the complexity of immersion, categorize the amount of involvement into three levels: engagement, engrossment and total immersion.

It is important to note that audiovisual elements play a very important role in facilitating *immersion* [Newman, 2005]. Yet, as Jarvinen et al. point out, besides the aesthetics, the functional and structural playability are also part of the path to immersion as they build the ground that provides the user with the familiar interaction schema, which Douglas and Hargadon [2000] believe to be the prerequisite for immersion to occur. McMahan [2003] believes that immersion may happen in a consistent game world which matches players' expectations and provides them with meaningful activities. The constructional

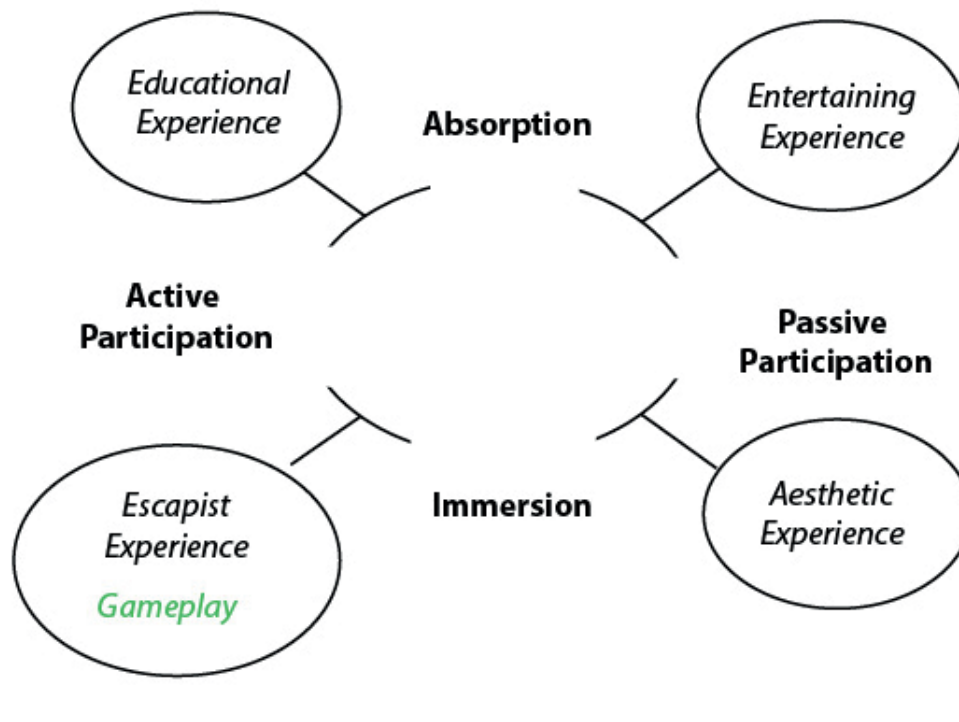


FIGURE 3.10: Four realms of experience by Pine and Gilmore [1999].

path to these parameters lies in the usability guidelines and heuristics covered in section 3.4.

While this section covered essential elements that contribute to the engaged gameplay, the following section focuses on usability issues that often trim down the effectiveness of game concepts on the implementation level, and can go as far as to overshadow the attractiveness of the game to players, resulting in early game exit.

## 3.4 General Game Heuristics: Usability and Playability

### 3.4.1 Major Heuristics systems

The study conducted by Cornett [2004] examined usability challenges faced by new players of massively multiplayer online role-playing games (MMORPGs). The results revealed that users that previously showed no interest in a particular game may become potential players. However, this game genre has a wide variety of usability issues that are hard to tackle by novice players. As a result, the games are unintentionally blocking away opportunities to attract new players. While these issues are particularly relevant to MMORPG due to their complexity, they can occur in any game genre that neglects user experience issues.

Using factor analysis, Nielsen [1993] boiled down the variety of usability issues that he could identify into 10 categories:

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Help and documentation

Laitinen [2006] has also conducted studies of game usability issues using Nielsen's heuristics and found them quite efficient. However, while Nielsen's model specifies the nature of problems, it does not offer the way to find them, which makes it a challenging approach for novice researchers. Consequently, Malone [1982] developed a set of heuristics for interfaces and focused on software design that is in general best applied to educational games and that helps to identify problems more efficiently. Later, Clanton [1998] created his set of rules, in many ways similar to Malone's set but with more focus on engagement. Federoff [2002] combined a literature overview with his empirical studies and created a set of heuristics that focused not only on engagement but also on story line and gameplay. Desurvire et al. [1992] adapted the heuristics of software development (including Nielsen's) to games. The resulting *Heuristics to Evaluate Playability* (HEP) was later refined once again into *Heuristics of Playability* (PLAY) by Desurvire and Wiberg [2009]. PLAY can be specifically applied during the game development cycle, rather than only at the evaluation stage. Finally, Pinelle et al. [2008] proposed their own heuristics system based on empirical analysis of games and, unlike HEP and PLAY, they focus less on engagement and more on usability, which deals with ability to learn, control and understand game interfaces:

- Inconsistent response to input, poor hit detection
- Ability to readjust audio/video settings, game speed

- Poor training and help
- Inadequate visual icons, indicators, representations
- Unreasonably steep learning curve
- Slow response times

Finally, [Desurvire and Wiberg \[2009\]](#) proposed a list of 49 significant game design principles divided in 3 main categories: **game play, entertainment/immersion, usability and mechanics**. We found that this set of principles is highly detailed and most relevant to the social network game development process. Therefore below we list the principles that are applicable for the projects discussed in this thesis.

### Category 1: Game Play

- Enduring Play
  - Minimize the effect of repetitiveness by varying activities so that the gameplay keeps the player's interest.
  - The players should not be penalized repetitively for the same failure.
  - The players should not lose any hard won possessions.
- Challenge, Strategy, Pace
  - The game applies pressure without frustrating and the challenges are, in fact, positive experiences that make the user want to play more rather than quitting.
  - Easy to learn, harder to master; as the user develops the mastery, the difficulty level and pacing varies.
- Goals
  - The game provides clear long and short term goals. [Amabile and Kramer \[2011\]](#) point out that however small goals are they give the feeling of meaningful work.
  - The game gives rewards that immerse the player more deeply in the game by increasing their capabilities, capacities or, for example, expanding their ability to customize.
- Variety of Players and Game Styles
  - The game supports a variety of game styles and ways to win.

- The first ten minutes of play and player actions are painfully obvious and should result in immediate and positive feedback for all types of players.
- Players' Perception of Control
  - The players have a sense of control and influence onto the game world.

### **Category 2: Entertainment/Immersion**

- Emotional Connection
  - There is an emotional connection between the player and the game world.
  - The game offers something different in terms of attracting and retaining the players' interest.
  - The game utilizes visceral, audio and visual content to further the players' immersion in the game.

### **Category 3: Usability and Game Mechanics**

- Documentation/Tutorial
  - The player does not need to read the manual or access the tutorial in order to play.
- Status and Score
  - Game controls are intuitive and follow standard industry conventions. If no industry standard exists, perform usability research to ascertain the best mapping for the majority of intended players.
  - Status score indicators are obvious, and do not interfere with game play.
- Game Provides Feedback
  - Game provides feedback and reacts in a consistent, immediate and exciting way that include the use of audio/visual/visceral feedback.
- Screen Layout
  - Screen layout is efficient, integrated, and visually pleasing.
  - The player experiences the user interface as consistent (in controller, color, typographic, dialogue and user interface design) and the game art speaks to its function.
- Navigation and Error Prevention

- Navigation is consistent, logical and minimalist. It considers the user’s possible errors and offers context sensitive help (tips, tutorials and adjustability of difficulty) to make sure that the player is not stuck regardless of player’s level of experience.
- Player interruption is supported (turn on, off, save at different states), so that upon returning the player has enough information to begin to play.
- Game Story Immersion
  - Game story encourages immersion (If game has a story component).

Another relevant set of heuristics belongs to [Korhonen and Koivisto \[2006\]](#). Originally developed for evaluating mobile games, it offers a main block of criteria that is applicable to all games in general, including social network games:

- The game provides clear goals or supports player-created goals
- The player sees the progress in the game and can compare the results
- The players are rewarded and rewards are meaningful
- The player is in control
- Challenge, strategy, and pace are in balance
- The first-time experience is encouraging
- The game story supports the gameplay and is meaningful
- There are no repetitive or boring tasks
- The players can express themselves
- The game supports different playing styles
- The game does not stagnate
- The player does not lose any hard-won possessions

This framework is more generic, compared with that of [Desurvire and Wiberg \[2009\]](#), yet it proves valuable insights for the casual game genre.

### 3.4.2 Evaluation process

Repetitive usability evaluation is vital. Cockton and Woolrych [2001] found in their studies that a game can easily have 200 usability problems, and heuristic evaluation with 5 evaluators will typically find about 150 (75 percent) of them. At the same time, Barendregt et al. [2006] revealed in their study that the set of most severe problems identified during the first game play might be very different from the set of severe problems identified after some experience with the game.

Schaffer [2008a] recommend the following steps for a single heuristics evaluation cycle:

1. Find usability experts or designate novice evaluators.
2. Evaluators separately analyze the game using the heuristics.
3. Choose a list of heuristics.
4. Evaluators separately analyze the game using the heuristics.
5. Found problems are compiled, organized, and delivered as a written and/or presented report.
6. The game team fixes problems in their respective areas.

Since heuristics evaluation allows to deliver fast results, it is particularly valuable for speedy game development models where heuristics evaluation can be done in a controlled environment before the game is open to the public [Bernhaupt, 2010]. Another insightful aspect of evaluations pointed out by Schaffer [2008a] is not to mix heuristics evaluation and user testing together, since they pursue different goals and distract one from another.

## 3.5 Conclusions

In chapter 3 we reviewed multiple aspects of game motivation. The first one is rooted in the context of man and society, and discusses games as a way to satisfy a variety of human needs, such as a need of belonging, group acceptance, self and group esteem, entertainment, curiosity satisfaction, and feeling of competence. All together these needs shape our attitude to games, build our intentions to play them and result in actual engagement.

Another perspective of game motivation presented in this chapter is rooted in the game playing experience itself: such as reaching the state of flow, experiencing a variety of aesthetic pleasures like exploration, self-expression, socialization, competition, interaction, fantasy, and emotional journeys.

An important conclusion to draw is that the process of playing games satisfies a wide range of various emotional needs of players and can be regarded as a tool with which players attempt to make larger aspects of their life more meaningful, socially, intellectually and emotionally fulfilling.

Furthermore, the chapter also discussed the challenge of providing an engaging gaming experience to a wide range of players that differ not only in their skills but in their background, preferred pleasures, emotional profiles and instincts. This issue is particularly relevant to the social games genre that aspires to target a certain category of users. A number of important concerns related to social game development arise from its necessity to explore specifics of the social gamers' category, knowledge of their demographics, awareness of their expectations, concerns, common traits, skills, interests and anticipations.

Lastly, the chapter covered the most important usability and heuristics aspects of the game construction process, the disregard of which leads to the break down in the gaming process. The nature of suggestions presented in this chapter is broad, and therefore useful for any game genre, including social games, and is particularly insightful for non-profit game developers, who cannot afford extensive user tests or cooperation with experienced game usability experts.

The next chapter will review the specifics of a social game genre. It will discuss the game mechanics, construction guidelines and heuristics that are relevant expressively to social games, yet which are rooted in general concepts presented in this chapter.



## Chapter 4

# Social Network Games

### 4.1 The Definition and Essence of Social Network Games

The use of social networks as a platform for human computation games has not received due attention, while we believe that its use for serious application offers the following advantages:

1. Access to players from various demographic layers, among which is the niche of players that would enjoy contributing to serious games.
2. Easy accessibility - social network games are within one mouse click from the profile page which users access on a regular basis.
3. The semi-playful mood established in social network environments makes users expect playful but not very sophisticated applications that also fit the segment of human computation games.
4. Typical for social network games are "never-lose" mechanics which encourage users to play repetitively, for as little as a few minutes per game session. It is also a desirable format for human computation games that benefit the most from short but repetitive game sessions.
4. Automatic access to users' profile data (age, gender and location data) provides important information to human subject studies or helps to better define the segment of players.

Social network games are single player games, with additional forms of basic multiplayer (social) elements such as asynchronous interaction with friends through "visiting", "gift-ing", and "messaging" in varying quantity and form. Also, while players can enjoy social

games without "neighbors", at some point their progress will become limited since certain items and levels become available when having a certain number of "neighbors" and activities involving interactions with them [Consalvo, 2011].

According to Research [2010], social games are "web-based games, or applications, that are similar in complexity to casual games and integrate the community-based attributes of social networks". Their closest neighbor is a virtual world game environment, which is an unstructured environment that doesn't have a particular mission-oriented narrative, defined character roles and goals [Reeves et al., 2008], but offers an active economy that is designed around the ownership of some virtual property or space [Mennecke et al., Parmentier and Rolland, 2009, Zimmerman and Salen].

Bjork [2010] defines the following principles present in most typical social games:

- publicly available players statistics (social status),
- drop-in/drop-out (leaving and entering game sessions at any point of time),
- persistent game worlds (game state is independent from play sessions),
- tick-based games (game's time progresses according to real time, i.e. Farmville),
- private game spaces (part of the game space that only a single player can manipulate directly),
- massively single player online games (making use of other players' input for each player, i.e. Mafia Wars),
- evolving gameplay design (rules of a game instance changes as gameplay takes place),
- encouraged return visits,
- pottering (management of game resources for its own sake),
- construction (changing and rearranging game elements to form more complex structures),
- visits and altruistic actions (temporary access to other players' private game spaces out of curiosity or gifting/helping),
- invites (invitations as part of game actions),
- event broadcasting (resulting in narrativity of the game).

The following description of Farmville given by [Wyman \[2011\]](#) offers a comprehensive insight into many social games' goals and motivational triggers: "Farmville is an environment where players manage a virtual farm by planting and harvesting virtual crops and raising livestock. Various crops have varying costs as well as growth times, which take place in real time. If not harvested when ripe, crops will be ruined, a mechanism that entices players to regularly visit and tend their farms. So, the major motivation for players is to collect virtual currency to buy more land, livestock and seeds, as well as embellish their land with decorative objects. Players also earn bragging rights through the accumulation of ribbons earned for various achievements in the game."

[Sung et al. \[2010a\]](#) divide social games into the following subgenres, based on types of major actions that they require:

- Farm games (Farmville, Farm town, etc.)
- Card games (Poker, etc.)
- Pet games (Pet Society, my fishbowl, etc.),
- Brain games (Brainbuddies, etc.)
- Word games (Scrabulous, Word challenge, etc.)
- RPG (Mafia Wars, Vampire Wars, etc)
- Town games (Yoville, etc.)
- Restaurant games (Restaurant City, Cafe world)
- Arcade games (Tetris, Bejeweled Blitz, etc.)

It is also interesting that the authors' empirical studies indicated that while all or most study participants indicated having playing *word* and *brain* games (90-100 percent), the frequency of their gameplay was the lowest, whereas, only 35 percent of participants indicated playing *farm* games, yet they did so with the highest *frequency* of all other game genres.

[Kim \[2011b\]](#) suggests a more general classification of social games, based on a broader behavior distinction that is needed for each subgenre:

- Manage/Simulation games, which require managing virtual spaces (i.e. FarmVille, Cafe World, Treasure Isle).
- Arcade games, which focus on competitive attitude of players (i.e. Texas HoldEm Poker, Bejeweled Blitz).

- Cultivability games, that involve and caring for a character's well being (i.e. PetVille, Happy Aquarium).
- Role Playing games (i.e. Mafia wars).

Kim's classification of subgenres results from different combination and prioritization of behavioral patterns identified by Lazzaro [2004], which include *performing, cooperating, communication, managing character's space, competing, observing the performance of others, leading, caring for pets*.

## 4.2 Social Game Heuristics and Models

Classic game heuristics frameworks of Desurvire and Wiberg [2009], Pinelle et al. [2008] (Chapter 2) cover many elements that are related to the social game genre, (which, in fact, is a subcategory of the casual game genre). However, there are elements that are pertinent to social games expressively, which influenced researchers to extend existing list of frameworks and heuristics models with those related to social network games.

Having analyzed a variety of social games, Jarvinen [2009] constructed a design framework for playfulness "where interaction, social, service and game design meet" (figure 4.1). The framework extracts 4 major features of social games: *spontaneity, narrativity, sociability and symbolic physicality* (pokes, hi-fives, game rewards), which correspond with the main qualities of playfulness defined by Barnett [1991], Rao [2008].

In Facebook applications *physicality* is symbolic and is represented by "likes", "pokes", and "visits". Their purpose is to transmit human-like warmth of real life interactions into the virtual world. At the same time, Paavilainen [2010a] argues that apart from Mafia Wars most other games don't have a well-defined physicality element. Therefore, while this element is important, its definition should include wider range of actions.

*Spontaneity* is an important factor that allows for the symbolic physicality to be realized. For instance, the ease of the mouse click on a certain icon allows to perform a virtual hug action.

*Narrativity*, as Jarvinen [2009] points out, is one of the strongest advantages of the successful social games because it is not only a simple communication of the results but it also shapes the information into a narrative across the network (action updates).

*Sociability* provides means for a playful communication and exchange of information as well as the propagation and virality of games (game progress updates).

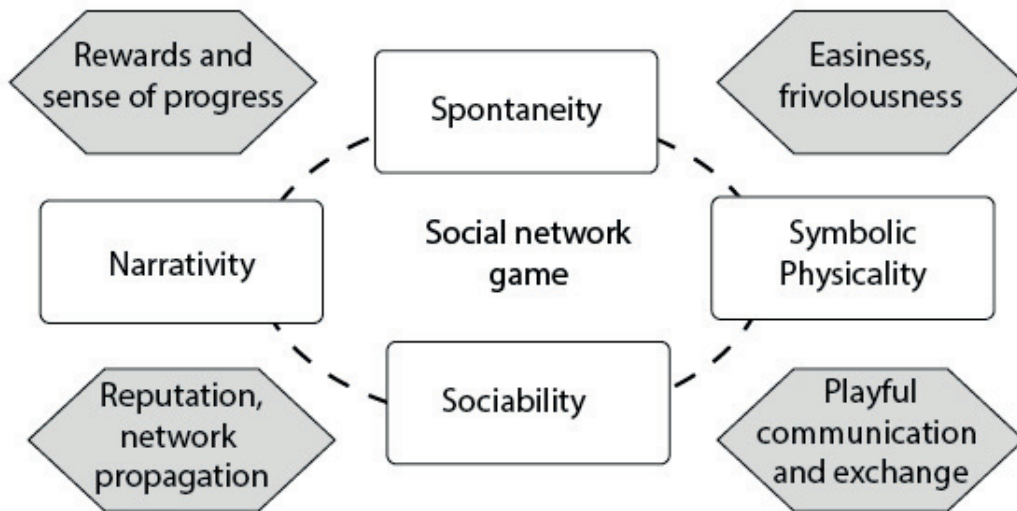


FIGURE 4.1: Social games heuristics according to Jarvinen [2009].

Ventrice [2009] presents a framework with three main objectives: *to build a persistent society* where the game is set up so that asynchronous play makes sense, *to maintain sense of discovery* (collecting items, earning unique badges), and *spread the game virally* through news feeds, which serve as reminders and interest igniters.

Paavilainen [2010a] also believes that while traditional heuristics frameworks cover lots of elements related to social games, some, such as *virality* and *narrativity*, are not included. Consequently, considering the frameworks of Jarvinen and Ventrice, he suggested a new set of heuristics for social games that includes 10 elements:

- Spontaneity. Provide easy and quick access to the game as the threshold for play should be as minimal as possible. Also, it includes the use of common and familiar themes from popular culture which can be understood easily.
- Interruptability. Use game mechanics, which support playing in short, sporadic bursts. Use interruptions as an advantage in the design.
- Continuity. Provide an asynchronous persistent game world and mechanics that allow the player to feel progress. Provide multi-level reward structures that make the player feel accomplishment in every play session and reward players for coming back into the game.
- Discovery. Provide players with new, evolving content and offer an emergent game world. Provide achievements and trophies for players to acquire.

- **Virality.** Use versatile means for direct and in-direct virality. Use a "call to action" principle, i.e. persuasive, inviting messages, for getting the attention of new players. Provide bonuses that encourage players to send requests and gifts which act as links for new players to start the game.
- **Narrativity.** Use vivid stylized narratives for describing ingame events and broadcast these narratives to engage players and elicit curiosity among others.
- **Sharing.** Provide means for players to share information and ingame resources.
- **Expression.** Allow players to express themselves in the game world. Provide means for expressing game experiences through screenshots and video clips.
- **Sociability.** Use social contacts as assets in the game and make them part of the game mechanics. Support group forming and provide bonuses for communicating and cooperating with contacts.
- **Ranking.** Provide high-score lists for competing with friends. Provide hints and tips on how to climb the ladder and provide reasons for doing so.

Other authors also emphasize a sophisticated *return mechanism* [Wyman, 2011], ample-ness of *positive feedback* and *clear game visuals* [Nick Fortugno, 2008b], *rhythm design* [Tyni et al., 2011], or *clickability* (routine but enjoyable process that can create a flow) [Jarvinen, 2010] as part of typical social network game.

Wohn et al. [2011] suggests that *interpersonal motivations* are the primary driver of initial game play on social networks and that *sharing* and *interaction*, although indirect, are useful in maintaining social network relationships.

Kim [2009] shapes a variety of social actions and integrates them with Bartle's classical player classification mode described in section 3.3.4. Social actions denote how players engage with their friends and virtual neighbors. It involves *competition* (bragging, taunting, challenging), *cooperation* (sharing, helping, gifting, greeting), and *self-expression* (customizing, selecting, designing, creating) as seen in figure 4.2.

Shin and Shin [2010] proposes a Social Game Acceptance Model, which is based on TAM (chapter 3) and is constructed against perceived *enjoyment*, *usefulness*, *security and flow*, which form a positive attitude toward it, lead to intention and result in trial of a game (figure 4.3). However, the authors don't exclude the possibility of missing some potentially important paths and the model requires further studies.

While Lazzaro [2004] identified sixteen behaviors like *cooperation*, *competition*, *commu-  
nication*, *mentoring*, *leading*, *performing*, *spectacle*, *having character*, *personalization*,

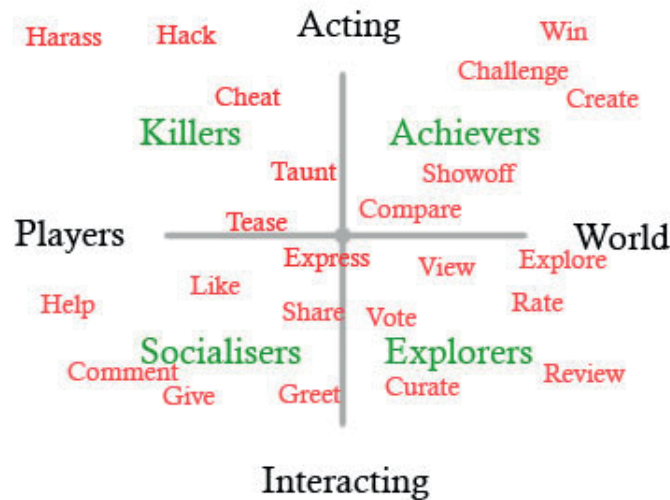


FIGURE 4.2: Combination of Bartle’s player classification model with social actions [Kim, 2009]

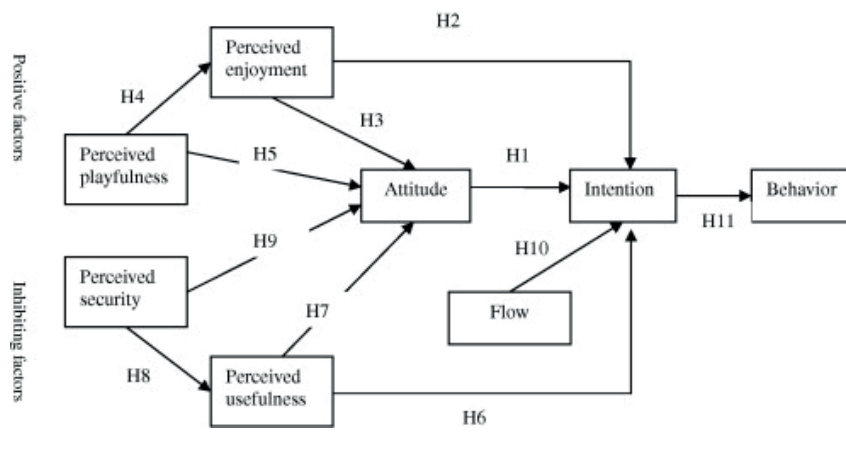


FIGURE 4.3: Social network game acceptance model based on TAM [Shin and Shin, 2010]

*open expression, joking, setting house rules, setting secret meanings, having pets, making endorsements and chatting* as major behaviors emerging in playful applications, studies conducted by Kim [2011b] at least 8 of those elements in social network games.

### 4.3 Social Network Game Construction Guidelines

Zichermann and Cunningham [2011] refer to the MDA framework in order to create a social game construction framework by incorporating social actions with dynamics and mechanics. Kim [2011a] proposes a slightly different framework, where **mechanics** include *points, levels, leader boards, badges, missions, virtual goods* and **dynamics** include *pacing, appointments, progressive unlocks, reward schedules, and dynamic systems*.

Kim [2009] singles out five major elements that contribute to game mechanics for most social games and gamified environments: *Collecting, Points, Feedback, Exchanges, and Customization* that are covered in greater detail below:

**Collecting:** Social games and gamified environments incorporate various reward systems (badges, coins, assets), in other words everything that signify certain achievements and bring some status reinforcement within the group (bragging rights). To go one step further, however, Deterding [2011] emphasizes the importance of varying tasks that earn status and collection elements not only in terms of number of points or tasks but also in terms of variety and complexity of required tasks. That aligns with the classic schedule system of reward reinforcements [Hopson, 2001]:

1. fixed time intervals rewards - expected rewards (i.e. for being present)
2. variable interval rewards - random rewards when players don't know when they might receive them
3. fixed ratio schedule rewards - deliver reinforcement after every  $n$  step(s)
4. continuous fixed ratio rewards - reinforcement follows after EVERY activity (i.e. points for each posting in forums)
5. variable ratio - reward after a random number of responses - (i.e. slot machines)

**Points:** Points and coins allow to progress through game levels and are granted for accomplishing specific tasks, missions, quests, and completing a set of badges. They can also be granted by other players for acknowledgement of their contributions (rewards for joining neighborhood). Points or coins are redeemable and can be used to purchase necessary items to continue the game play.

**Leaderboards:** In most games, levels unlock new powers and assets and drive players' behavior. Levels are related to the difficulty of the game. The major challenge is to increase the game difficulty rate so as not to disrupt the gamer's experience by tasks that are too challenging or too easy. Deterding [2011] advises to raise difficulty in a fluctuating pattern so that to give players the impression of reaching ease and mastery due to the accumulated experience. This provides enthusiasm to deal with parts that are designed to be more challenging.

**Feedback:** Feedback accelerates mastery and brings fun in games. In social environments feedback also has viral power as it drives engagement and participation (i.e. Facebook "likes" and comments attract attention and let people spread the word). Yet when it comes to casual game players, Nick Fortugno [2008b] point out that they need



significantly more feedback than hardcore players both for clarification of results and for encouragement. Social games, which are part of casual games, also tend to have clearer interfaces when it comes to displaying critical game elements, including feedback elements (centered and large). The authors also advise to observe similar simplicity when designing the flow of activities of social gamers. Also, instead of letting users navigate their own way through game screens, let the game itself control the players' movements between screens, and provide clear guidelines regarding next steps.

[Deterding \[2011\]](#), [Zimmerman and Salen](#) emphasize the importance of juiciness of the feedback so that players feel proud of their achievements (which is not as important in hard core games). The feedback should always be positive and encouraging. The importance of it is emphasized in positive psychology [[Seligman and Csikszentmihalyi, 2000](#)], which when applied to games should let the user experience being good at something, allow spending time with a desired group of people, and give a chance to be something big.

**Customization:** Games can offer customization of avatars, individual space, or interface. It is intended to provide players with a feeling of uniqueness, although its value in the user experience varies from game to game and also depends on the user's unique psychological profile. [Sung et al. \[2010a\]](#) studies indicated that space customization is correlated with player's extroversion, and lower avatar customization is correlated with high neuroticism level.

**Exchanges:** Exchanges are structured social interactions and are very important parts of social game mechanics. They can be explicit like "add friend" and implicit (i.e. making comments or "sending a virtual gift"). [Sung et al. \[2010a\]](#) found out that significantly more female players use "gifting" in their interaction with friends, partly because it is giving an impression of socialization in a multiplayer environment, although social network games are technically single player asynchronous games.

**Aesthetics:** It is the overall experience that yields emotional engagement and drives action. It includes curiosity, satisfaction, surprise, delight, trust, fun, envy, and pride, which in the light of social connections and interactions become increasingly important.

## 4.4 Maturity Stages of Players

For any game, during the first stage of playing, the users tend to blindly follow the rules [[Dreyfus and Dreyfus, 1980](#)]. The system has little meaning and presents itself mainly as a form, until players understand the system well enough to use their own judgment

in making decisions and use options and features that the game has to offer, as well as adopt unique gaming strategy.

Zichermann and Cunningham [2011] warn against overwhelming novice players with the game rule descriptions at the beginning of the interaction process and urges to make the first steps as easy as possible. The ideal degree of difficulty should be close to that of a tutorial where the players are offered to perform actions at which they can not fail.

Schreiber [2009] similarly asserts that the player should manage to understand the game rules by just interacting with the game, instead of reading manuals. Also, it is natural that in the beginning of interaction players do not necessarily know the goal of the game. They simply try different methods of interactions with the game and observe how their actions change the state of the game. Adams [2010] indicates that game learning will be a pleasurable experience if two conditions are met:

- It takes place in an enjoyable context,
- It provides useful mastery within reasonable time.

Since social networks have such a broad user base, the social network games will end up getting players that have little and no gaming expertise when making first steps playing games, and as a result will display a longer learning curve than experienced players. Therefore, most social network games start by comprehensive and seamless pre-game tutorials, require very simple actions, have comparatively easy learning curves, are designed to expect shorter game sessions as well as less efforts to master playing than some casual games [Juul, 2009].

Kim [2011a] gives a summary on the player's needs depending on their maturity: *novice players* need onboarding welcome, goal specification, progress and achievement reward. *Expert players* care more for fresh content, activities, people and also status/customization/powertools. *Master players* need exclusive access, activities, unlock.

Indeed, Zichermann and Cunningham [2011] offer to lead the novice players through a basic pattern:

- Action (of the Player)
- Reward (provided by System)
- Action
- Reward

- Join (Player)
- Invite others (System response)

Nick Fortugno [2008b] point out that novice casual gamer will not necessarily remember information that is immediately evident, even if that information is essential to successful play. Therefore it should be kept at immediate review and be visually very clear.

Once the players are acquainted with the system, it acquires more meaning for them. However, they have not yet learned to prioritize components of the game Eraut [1994]. Players are not aware of the calculation mechanisms behind the system but are on the way to understand it Zichermann and Cunningham [2011].

Zichermann and Cunningham [2011] suggest that only when the user understands the core mechanism can one start to slowly reveal the complexity of the game. This process, however, should also be guided: *Diner Dash* designers admitted that while the tutorial they provided fulfilled its purpose for beginners, it failed to provide tips for advanced gamers leaving players on their own to figure out the more complex techniques that would allow them to progress further [Wyman, 2011], which has caused many frustrated players to quit the game.

Also, one should be carefully planning challenges for the players. Meaningless challenges, however small, may result in game exit, especially if these are interfering with the primary objective Andersen et al. [2011a]. Also, as mastery increases, the risk of negative emerging behavior that has malicious intentions rises too: if a game designer creates something worthwhile then some players will try to find ways to exploit the system. Indeed, while the majority (82 percent of players in the USA and UK) have never used a hack, bot or cheat to gain an advantage in a social game, 8 percent use them regularly or occasionally [ISG, 2011]. Therefore, game designers must make sure that they encourage the right and not the wrong behavior [Deterding, 2011].

In addition, while repetitiveness and simplicity of tasks appeal to social network game players with little gaming skills [Sung et al., 2010a], there is a positive correlation between low self-efficacy and habitual playing, while high self-efficacy results in a decrease in gaming time. Therefore, one should avoid setting static goals because as the confidence of players increases, so does their self-confidence which results into lowered playing time.

Game designers fight lowered gaming time (that inevitably comes with player's maturity) not only by increasing the game complexity but also by introducing game variability. Nick Fortugno [2008b] give an example of a very simple game, *Bejeweled*, which has been originally released in 2001, but has seen continuous upgrades with new narratives and metaphors for the purpose of increasing the richness of the user's experience, which

allowed it to stay widely popular throughout a decade and it is one of the most played games on Facebook.

## 4.5 Social Game Players: Categorization and Motivation

### 4.5.1 Statistical Overview

ISG [2011] reports that out of a total of 240 million internet users in the USA, 98 million are social gamers. Also, casual social playing does not mean playing with less devotion: 68 percent of social players in the US play more than once per day, 95 percent a few times a week, and 28 percent play more than 6 hours per week [ISG, 2010]. More than half of them played for at least a year.

While the average proportion of male to female indicates a slightly larger number of females (4 - 5 percent), Berry [2011] points out that that ratio changes dramatically from game to game depending on game mechanics and theme. Thus, for example, *Treasure Isle* enjoyed 78 percent of female audience with only 22 percent of male players. At the same time, games like *Castle Age* and *Star Wars* attracted 67-69 percent of male players. The most popular *FarmVille* also demonstrated significant bias toward female players (67 percent) with the *Texas Hold'em Poker* reporting 67 percent of male players.

Nevertheless, [Magid, 2012] reports signs of slowdown in the growth of social games in the world. Thus, for example, in the category of actively playing females between 12-17 years old, only 43 percent currently play social games each week, down from 54 percent of past year records. Women ages 25-44 also showed a 4 percent decline from 40 percent of last year. However, some growth have been reported among players ages 45 and older (9 percent). The reported factors are "mild boringness and lack of novelty". At the same time, ISG [2011] indicated an increase of *avid* social network gamers in the USA and UK from 7 percent to 15 percent.

Magid [2012] further reports a drop in the money that players spend in the games - 51 dollars in 2011 compared with 78 dollars of 2010. However, not all players spend money: only 35 percent of male players purchased virtual currency with real money compared with 22 percent of females. In general, younger players are more likely to spend real money in order to buy virtual currency; and the willingness to spend decreases dramatically with age. In fact, the money spent on virtual currency and gifts will continue decreasing since the major growth of players happens through older segments of players who are least willing to purchase virtual gifts or currency with real money. Therefore, money growth will be focused mostly in the mobile gaming market [ISG,

2010] where social mobile gaming has already shown growth from 28 percent in 2010 to 33 percent in 2011.

Also, studies of ISG [2010] defy the belief that social game players are inexperienced with gaming overall, as the research shows that in the USA and UK 75 percent of males vs. 60 percent of females also play other types of video games and only 17 percent of social players claimed to have not played games on other platforms prior to trying social network games.

#### 4.5.2 Social Player Attitudes and Behavioral Patterns

A study conducted by Kirman [2010] revealed that the most active players contribute to the majority of game interactions on social networks, displaying hardcore patterns of playing. Also, social network studies carried out by Paavilainen [2010b] indicated noticeable differences between occasional and truly engaged social gamers: "fans" took games more seriously and showed willingness to make significantly more efforts to progress.

Kirman [2010] offers the following clusterization of social game players:

- *Evangelists* - heavy socializers, start more social interactions than they receive, including game requests.
- *Socialites* - experience lots of interaction with a small set of people and don't interact much outside this circle. In addition, they have a casual approach to the game.
- *Reluctants* - rarely initiate interactions, but try to reciprocate them. Can become hard core players under certain conditions.
- *Antisocials* - never start and rarely respond to interactions or game requests.

The results of Paavilainen [2010a] qualitative interview research with social game players brought out the following highlights, which might not hold true for all games or players, but signal potential issues or opportunities when developing new social games:

- Users play to kill time, fill time gaps and relax (micro breaks during the work day).
- Simplicity of the game vouchsafed its accessibility, although once having mastered the game, simplicity becomes boring.
- The audience has matured for more complex social games.

- Two important motivators to continue are novel game mechanics or good social aspect.
- At some point *grinding* becomes boring and players are interested in using accelerators.
- When friends are quitting the game, the risk of quitting the game rises dramatically.
- Enthusiastic players care for exclusive content.
- Reciprocity is a two-way sword because it may appear as spamming.
- Usability and ease of access are the key factor for impulsive buying.

Furthermore, ISG [2011] reports that 57 percent of US and UK players play social games because they enjoy the *fun and excitement*, 43 percent enjoy the *competitive spirit*; 43 percent find them as *stress-relievers*; 32 percent enjoy the *mental workout* that the games provide; 24 percent like to feel the *sense of accomplishment*; same percentage likes that it can help to *connect* with others; 9 percent believe that it improves *hands-eye coordination*; 7 percent find that the games they play help to *express their personality*; and 6 percent find games as preferred ways to *interact with social network contacts*.

## 4.6 Issues of Social Games

Paavilainen [2010a] reveals the most often reported sources of frustration among his study participants, which are *scarcity of in-game* resources, which force players to spend money - the issue also voiced by Costikyan [2010]; the *repetitive nature* of gameplay; *technical bugs*; shifts between the in-game interface and out-of-game *newsfeeds and notifications*, *spammy notifications*; and requirements to have *neighbors* in order to progress.

Indeed, the last two points allow social game developers to employ players as viral promoters of games by letting them unlock certain valuable items or levels only when a certain number of "neighbors" exists. This often results in users who are not willing to spam their own friends with game invitations to look for potential neighbours among strangers on the game forums. In fact, 41 percent and 33 percent of males and females, relatively, reported having strangers in their social game neighbors list [ISG, 2011]. This pattern increases the security issues of players, who risk to add bots and phishers [Shin and Shin, 2010]. However, studies conducted by Rossi [2011] indicate that when playing a collaborative game such as *Pet Society*, players are more likely to add new friends to their network due to their cooperative gameplay, while games that are competitive

”seem to work better as tools to manage and communicate social status within one’s already existing social network”.

Nevertheless, additional motivations like competition with friends or getting valuable items from interaction with friends through the game (by sending out notifications and reminders in the shape of ”gifts”) made the games’ player base grow exponentially [Yee, 2006]. Also, the power of social influence dictates that people use a particular system more when more people in general use it Kraut et al. [1998], which explains the reason why newsfeed game announcements from multiple friends influence users to try the games. In addition, referrals from social contacts have a stronger impact on the potential gamer’s decision to try games than traditional advertising.

At the same time, Tadhg [2012] states that essentially the evolution of social games is happening in 2 directions: linear improvement (better graphics, more objects, minor mechanics improvements) and broadening subject matter (new themes), although essentially game mechanics of new games replicate the existing ones. This brings to a high risk of user over-saturation and dropping the games altogether. The author also believes that game makers overemphasize the value of status items, space or avatar customization meant for pure decorative purposes but without any practical value involved, which often are the most significant way of linear improvement that social games utilize today.

## 4.7 Conclusions

Chapter 4 gave an overview of the perspectives of the industry and forecast of sustainability of players interest. It also covered the game development guidelines and frameworks that are relevant specifically for social network games. The most important elements are: indirect *presence of social network friends* that through asynchronous co-playing provides motivation to compete, cooperate and interact, and as indicated by Wohn et al. [2011] is a powerful tool to motivate users to come back; *powerful return mechanisms* (through loss of investment) that make users play repetitively during the day [Sung et al., 2010a]; *easy accessibility, common broad themes, relaxing, pleasurable gameplay* with *detailed and positive feedback* that altogether appeal to social game players.

Hence, conclusions arise that social games with a purpose can profit from incorporating elements that entice players to return to the game (collect on investments), shape game narrativity elements, and provide opportunities and incentives to share information and assets with friends as well as compete with them.

Nevertheless, *lack of novelty, repetitiveness, spammy* nature of notifications and invitations result in inevitable loss of interest among players.

That signifies that one should try novelty approaches (themes, interaction patterns) that differ from current social games that start experiencing fall of interest arising from lack of freshness, and try other methods of reminding players about the game without adding to the accumulated irritation.

In the next chapter we will give a more detailed overview of the few most successful social network games, and present the results of our own research on social network players' needs, views and expectations. This, combined with the information from previous chapters, will help to get a better perspective on serious social network game construction principles.



## Chapter 5

# Research Studies

### 5.1 Motivation

Our goal is to create an efficient and engaging social human computation game, which will motivate a large number of users to play with sustained interest and thus repetitively contribute with useful data.

The challenge is to integrate the human computation tasks into a social game environment with its motivational system, social involvement, and growth and development mechanisms so that it will still remain meaningful to users.

So, who are social network players? Why are social network games meaningful to players? What makes users come back and play them?

These are the questions that will help to select the most relevant elements and best practices of traditional social network games into a human computation social network game.

In order to identify factors that are important for social network players, their expectations towards social games, extra studies were conducted.

While some information on demographics of social network players is available [Berry, 2011], there are key points of player behavior that remain largely unexplored and are as follows:

1. What motivates users to start using social network games and applications?
2. Which game features and benefits motivate users to participate in games on a regular basis for many months?

3. What game mechanics are successful in keeping enduring interest of players?
4. What causes users to stop playing games?
5. How long and how often do users play and is there any correlation with any of the above mentioned factors?

To help answer these questions, different study methods were executed and presented in this chapter:

- A user study involving an anonymous questionnaire to explore motivation of users was carried out,
- An overview of the most successful games to examine their features was given.

## 5.2 User Study

### 5.2.1 Methodology

Since computer game playing may be considered a sensitive issue connected with we felt that we should use an anonymous survey mode in order to let users feel comfortable to reveal their social network gaming playing patterns. Also, as [Kreuter et al. \[2008\]](#) pointed out, *social desirability bias* is the lowest for web surveys, so we decided to conduct an anonymous online survey to find out the gaming preferences of the social network players.

As the category of social network gamers is quite heterogeneous, we decided to put no limitations in terms of demographic criteria. However, it was desirable that participants have some experience with social network games. In case participants had no experience, the survey would end sooner than for the rest of participants.

**Questions.** An online anonymous survey with 18 questions was designed.

The first six questions covered basic data: age, gender, marital status, education level, location and field of work/studies.

The remaining part covered questions related to social network gaming. The survey questions were based on the questionnaire developed by Info Solutions Group, a marketing research provider, for PopUp Games, one of the leading social network game developers [ISG \[2010\]](#). The purpose of their research was to understand the general preferences and playing patterns of social network game players, and their attitude toward games developed by PopUp Games.

For the purposes of our research, we modified their questions to focus more on the playing and quitting patterns and expanded the possible variety of factors that motivate players to stay engaged.

The final questionnaire with the full list of questions is available in **Appendix A.1**. The most important questions covered are:

- number of social network games that players tried
- the period of time their interest lasted
- reasons for playing social network games
- reasons for quitting playing social network games
- playing patterns
- factors that motivate users to play

Most questions were designed as multiple or single choice. We made sure that the possible answers included all possible options, including non-participation (i.e. "none", "have no experience"). Also, considering the ever changing nature of user interest to the subject, we tried to clarify the periods of time, which we wanted participants to focus on. For example, we emphasized in the questionnaire that the responses should be related to the recent two year period.

The question regarding the factors that motivate players to play offered answers on a Likert scale from 1 to 5, in which users had to rate the proposed factors by their relevance. We also tried to place it closer to the end of the survey as advised by [Kitchenham and Pfleeger \[2002\]](#).

**Pretests.** We tried to make sure that the questions are precise and evaluate only one aspect, to avoid two-edgedness or bias.

Preliminary internal tests (with three fluent English speakers) were used in order to evaluate the minimum time required to fill out the questionnaire; and make sure that the questions and answers are well understood and include all possible response options.

We established that the minimum response time is about 5 minutes. Therefore, for all participants and the crowdsourced respondents in particular, questionnaires that took less than 5 minutes or were unfinished were dismissed as low-fidelity data.

<b>18-25 years old</b>	<b>26-39 years old</b>	<b>40 or more years old</b>
33 percent	49 percent	17 percent

TABLE 5.1: Percentage of respondents per age group.

**Participants.** The survey was conducted in the period from the 1st July to the 5th September 2010. Two sources of respondents were used to collect data. The survey data included anonymous responses from 200 survey participants hired on a crowdsourcing platform, who confirmed playing social network games; and 64 students from the University of Bremen, Germany. The majority of participants were from the USA (41 percent) and Germany (27 percent), with the remaining 32 percent distributed among respondents from 20 countries.

Also, 51 percent of respondents were females and 49 percent males.

As a result of filtering, 13 out of 64 voluntary responses of German students and 82 out of 200 crowdsourced responses were considered low-fidelity whether because they were unfinished or respondents took less time than in pretests.

Consequently, only 169 responses were used for the analysis.

Participants whose data was considered valid were divided into three age groups; the largest one being the 26-39 years of age group, followed by 18-25 age group and the smallest group - the 40 or more years old (table 5.1). This distribution does not represent the playing population but simply reveals the age distribution of our study group.

### 5.2.2 Results

The analysis of the data allowed to receive some insights into the users' attitudes toward social network games and to shape answers to the before mentioned questions.

#### **What game genres participants prefer?**

While stereotyped belief has it that social games are targeting the niche of non-players, our study reveals that a clear majority of social gamers enjoy playing other game genres. As much as 61 percent of social game players indicated that more than half of their gaming time is spent on other game genres; 39 percent of players indicated playing *mostly* although not exclusively the social network games; and only 8 percent said they play *only* social network games (figure 5.1).

Also observations revealed that the lesser the amount of the time that the players spent playing social network games, the more time they actually spent playing other games,

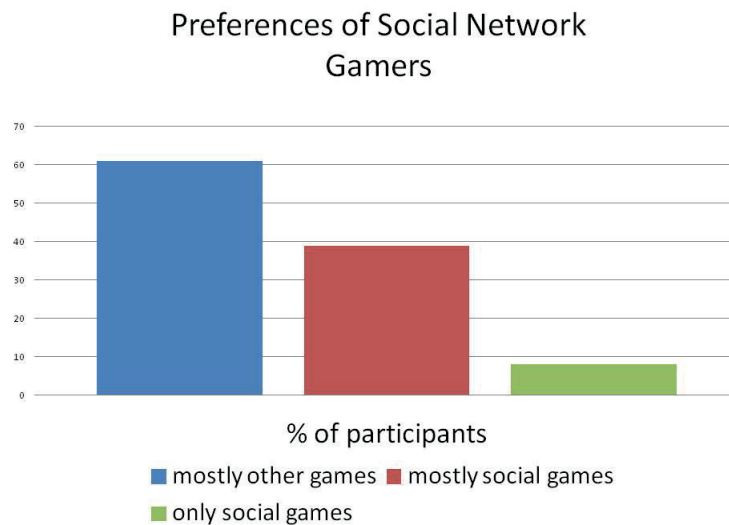


FIGURE 5.1: Proportion of social games and other game genres.

(this particularly holds true for the respondents who dedicate minimum time to the social network games, as discussed further).

The studies conducted by ISG [2010] on UK and USA social network game market (N=1202, age SD=43, 55 percent females) also revealed similar tendencies with an average 70 percent of respondents playing different game genres on different gaming platforms.

It is clear that to find out which game genres interested social gamers, we offered the following choices: *shooting and simple space exploration action games, games similar to social network games, business or process simulation, life simulation, vehicle simulation, role-playing complex adventure games, strategy games, sport games, puzzles and word games, board games, and card games.*

While no single game genre preference was statistically significant, the gamers of our study slightly favored *simple action games*, closely followed by *word and puzzle, as well as strategy and complex adventure games.*

However, the comparison of parents with single non-parents showed that parents were more interested in *puzzle and life simulation games* (54 percent and 75 percent accordingly), while singles favored more *complex adventure* (63 percent) and *shooting games* (61 percent).

The differences in game choices between male and female players depicted in figure 5.2 revealed that male participants of the study were slightly more interested in *shooting and*

*simple action games, racing, complex adventure games, and sport and strategy games*, while females preferred slightly more *social games, puzzle/word and card games*.

While no statistically significant results were received, the tendencies marked by the study allow to distinguish that male social network players preferred more dynamic, competitive, action based games elements, while females preferred games that are calmer, less competitive, and more process-oriented (5.2).

The conclusions that one can draw is that social network players enjoy playing other games and are quite multi-faceted when it comes to game genres. In addition they share gaming attitudes of the general public [Hartmann and Klimmt, 2006], where female players often opt for games that include less violence.

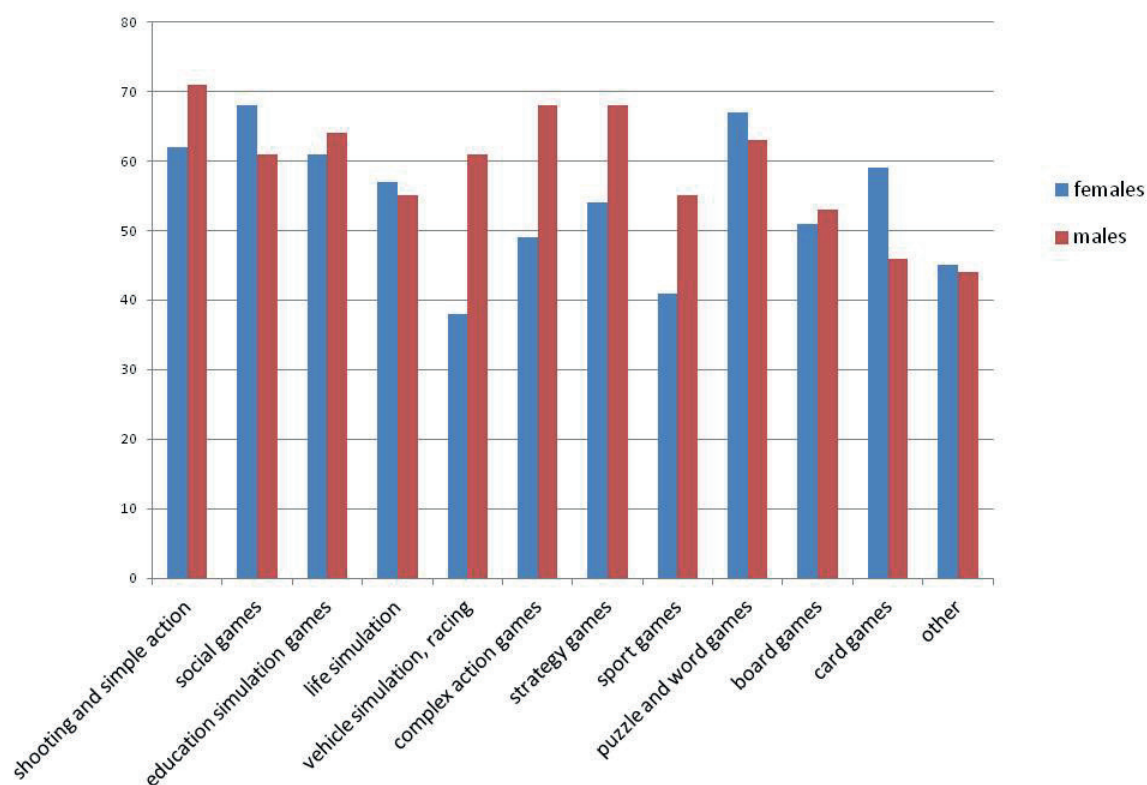


FIGURE 5.2: Game genres per gender.

In order to understand how much time dedication one may expect from users to play social network human computation games before giving in to the gaming fatigue, one should review the results of the following question.

**How long was the period you were actively involved with social network games?**

Our data revealed the presence of the wide range of players, with a significant size of loyal players segment as demonstrated in figure 5.3. The majority of study participants played for more than half a year (49 users), followed closely by the users who played between 1-6 months (47 users) and a big part of players who engaged with games for more than 1 year (43 users).

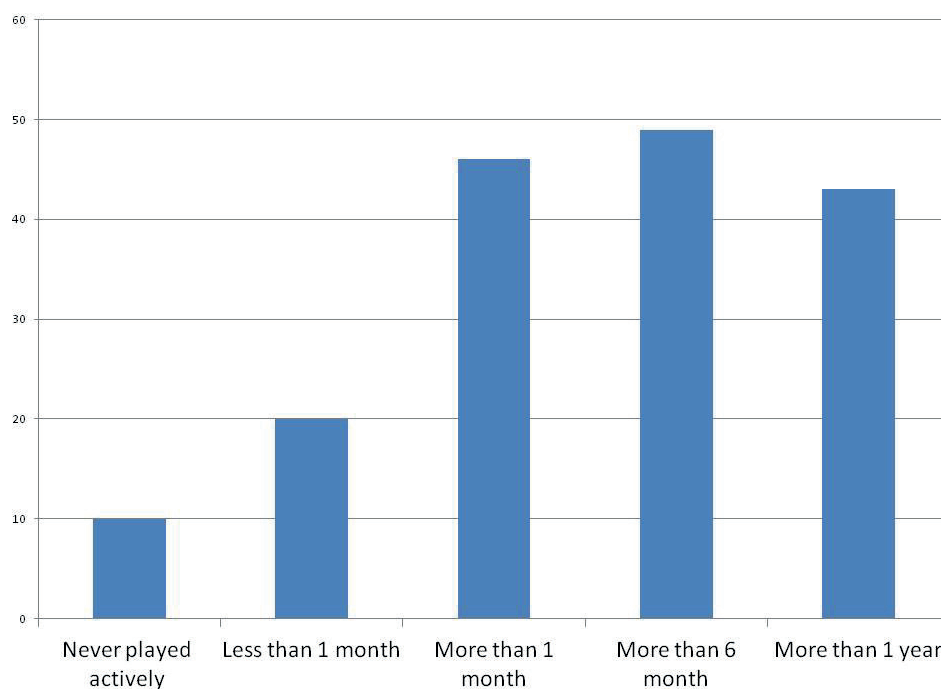


FIGURE 5.3: Active playing period.

Another important discovery is that there is a statistically significant correlation between the length of the active gaming period and the length of the gaming sessions (presented below) with correlation coefficient  $r=.332$ ,  $p<.001$ .

Overall we can conclude that once players find a social network game meaningful to them, they stay loyal for longer periods and show impressive time engagement within this period.

#### **How long were your gaming sessions during the period of your most active involvement with social network games?**

For convenience, received responses were divided into 5 clusters, as shown in table 5.2, revealing that the largest cluster of gamers played between 30-60 minutes per day. As the table indicates - the largest group is represented by the players who played between 30-60 minutes a day.

Amount of time	Group name	Number of players
Less than 10 min	Group 1	21
More than 10 min	Group 2	38
More than 30 min	Group 3	53
More than 1 hour	Group 4	32
More than 2 hours	Group 5	25

TABLE 5.2: Clustering players by gaming time.

Furthermore, an examination of the relationship between parenthood and the amount of time that users dedicate to games reveals that parents tend to play longer than non-parents, namely 46 percent of *parents* played more than 30 minutes compared to 30 percent of *non-parent singles*, as demonstrated by the figure 5.4. It can be partly explained by the fact that there were more women among parents, and, as many studies suggest, women are the primary audience for most popular continuous never-lose social games [Berry, 2011], which are covered further in section 5.3.

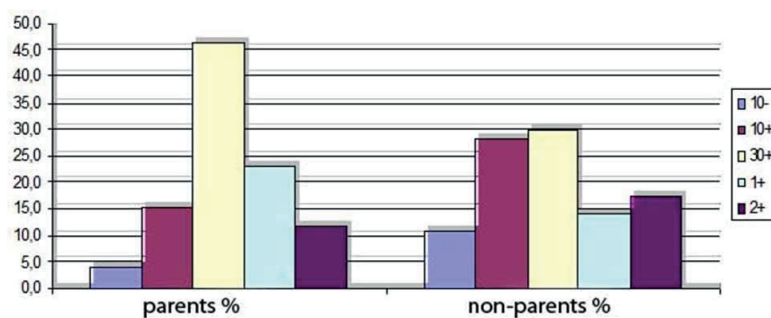


FIGURE 5.4: Distribution of time dedication categories of players among parents and non-parents.

To sum up, the players are willing to engage with the social network games for as little as a few minutes to as much as a few hours per gaming session. However, on average players are willing to give a bit less than an hour per gaming session. This results are also coherent with the findings of the ISG [2010], which revealed that the largest group of their respondents (38 percent) play from 1 to 5 hours per week.

The looming question now is what are the game features and qualities that motivated players to dedicate the indicated amounts of time to the games. The answers to the question are presented in the section below.

### What factors motivated you to continue playing?

A range of different factors was given to users to rate on the scale of 1 to 6. The figure 5.5 reveals the number of male and female respondents that gave each factor/benefit top two ranks.



Non-parametric Kolmogorov-Smirnov Z-test showed two statistically significant difference between male and female players. Namely, males demonstrated more prominent interest than women to *competition* ( $Z=1.462$ ,  $p<.05$ ) and women differentiated from men in the value the *caring* factor has for them ( $Z=1.47$ ,  $p<.05$ ). No other statistically significant differences were detected. Also, both genders gave high values to *stress relief* and *killing boredom*, as also demonstrated in figure 5.5.

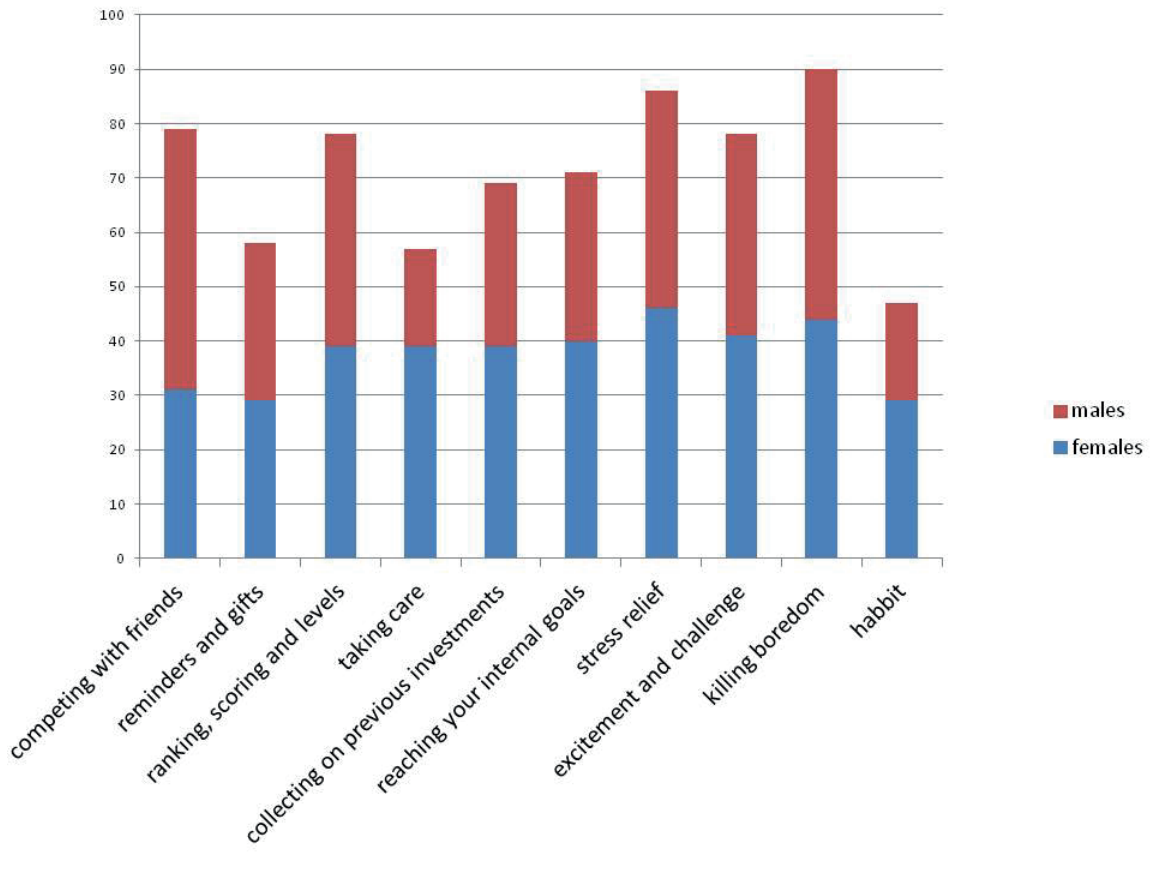


FIGURE 5.5: Importance of gaming factors across gender.

In order to get more insight into the importance of these factors/benefits to the players from the point of *user engagement*, we reviewed these factors across the categories of players presented earlier in table 5.2. As a result we built the profiles of every category in terms of game features/benefits that are most relevant to them.

In addition, in order to get a more complete picture of user categories, we enhanced these profiles by including answers to the following questions: "How many social games have you tried?", and "how much of your total gaming time is spent on social network games?".

Thus, the gamers who played *less than 10 minutes* (**group 1**) indicated that no factors other than *competition*, *ranking* and *ease of accessibility* were relevant to them. This

category of players also indicated that they did not try more than 1-3 games (18 of 21 players), and in general quit playing social games faster than other more dedicated players (after playing less than a month). Also, players from *group 1* pointed out that they play a great deal of other game genres (15 out of 21 players indicated that social network gaming takes a very small portion of their total gaming time).

The gamers who allocated between *10 to 30 minutes* to social network games (**group 2**) demonstrated more satisfaction with the benefits/features of these games. They indicated that while *killing boredom* and *competing with friends* are relatively important to them, they cared equally for *collecting their previous investments*. Singularly, while 50 percent of respondents from the *group 1* cared for *ranking*, only 35 percent of gamers from the *group 2* did so. Also only 52 percent of the *group 2* users played other game genres, with the remaining part focusing mostly on social network games - possibly the segment of infrequent gamers or non-gamers.

The gamers who played *from 30-60 minutes* (**group 3**) also emphasized the importance of *killing boredom* and *competing with friends*, yet, unlike the previous two groups, they find social games *exciting and challenging* (58 percent of players from *group 3* gave this factor the two highest ranks, compared with 36 percent of the *group 2*). Also, surprisingly, *collecting previous investments* is not as important a factor for them as for the *group 2* (35 percent versus 61 percent respectively). Instead, *group 3* is slightly more interested in the *ranking and scoring* factor (by 17 percent more than in *group 2*). Finally, compared to the previous two categories, *group 3* generally gave the highest average importance ranking to most values (factors) that social games had to offer, including *gifts and reminders from friends* that help to earn badges and improve ranking (and yet are not popular among players of other groups). Also, the *group 3* players were more willing to try new games, often having tried 4 or more games and on average having played longer than half a year.

The category of gamers that played *more than 1 hour* (**group 4**) also indicated *competition with friends and ranking* equally important as for *group 3* players. Yet it was the *killing boredom* that was rated as the most important factor (65 percent compared with 45 percent of *group 3*). Also, the *group 4* players cared for *reaching internal goals* slightly more than any of the previous three groups. Furthermore, just like users from the *group 3*, they were willing to try new games, and tended to have played social network games for longer periods of time (47 percent playing more than 1 year compared with 24 percent of the *group 3*). Finally, *gifts and reminders* were the least appreciated factors (22 percent compared with 42 percent of *group 3*).

Finally, the gamers who engaged with social games for *more than 2 hours* (**group 5**) showed amplified evaluation patterns of the last two groups (3 and 4), with increasing

interest in *ranking and competition, killing boredom, and reaching personal goals*. In general, from all 5 groups these players gave the higher ranks to all benefits of social gaming (including *collecting previous investments, managing personal space, excitement, reaching personal goals, and relaxation*), except *gifts and reminders*. This group also seems to prefer social network games over other game genres by indicating that they mostly play social network games (64 percent of *group 5* gamers).

To back up the tendencies described above, a series of non-parametric Mann-Whitney tests were run to detect statistically significant differences and results consistent with the above profiles were found:

1. Compared with group 5, group 1 cared significantly less for *taking care of game property/avatar* ( $U=153$ ,  $p<.05$ ), for *collecting investments* ( $U=146$ ,  $p<.05$ ) and *reaching personal goals* ( $U=123$ ,  $p<.01$ ).
2. Consistently with the above, group 2 also cared significantly less than group 5 for *taking care of game property/avatar* ( $U=204$ ,  $p<.05$ ), and *reaching personal goals* ( $U=195$ ,  $p<.05$ ). Also, a statistically significant difference was found in the appreciation of *excitement* factor ( $U=205$ ,  $p<.05$ ), which was a lot more relevant to group 5.
3. Group 3, compared with group 5, showed more appreciation to *game reminders* ( $U=370$ ,  $p<.05$ ) but showed less motivation to follow *personal goals* ( $U=349$ ,  $p<.05$ ), and compared to group 4 evaluated *excitement* ( $U=446$ ,  $p<.05$ ) significantly higher.
4. In addition, a correlation analysis showed a statistically significant although quite weak correlation between the amount of time dedicated to games and reaching one's personal goals and collecting previous investments ( $r=.155$ ,  $p<.05$  and  $r=.168$ ,  $p<.05$  respectively).

To sum up, it seems that the more time players engaged with the game, the more meaningful are most benefits offered by social network games; and also the more meaningful are the core activities like *collecting investments, reaching personal goals* and *taking care of the property*.

The analysis of the answers to the question about the motivational elements of the social network games suggests that the human computation games that are developed in the format of social network games must offer users the opportunities to set personal goals and engage in nurturing processes (collecting investments), which will maximise the time the users are willing to interact with the game.

The next issue that deserves attention is the patterns of engagement with social network games.

### Which pattern of engagement with social network games describes your experience the best?

The study participants were asked to choose one of the options that best describes their experience with social network games. Overwhelming the majority of players selected the option "First played a lot, now play much less or stopped" (79 users) with the rest distributed among "my gaming goes up and down" (26 users), "always played very little" (20 users) and even smaller categories presented in the figure 5.6.

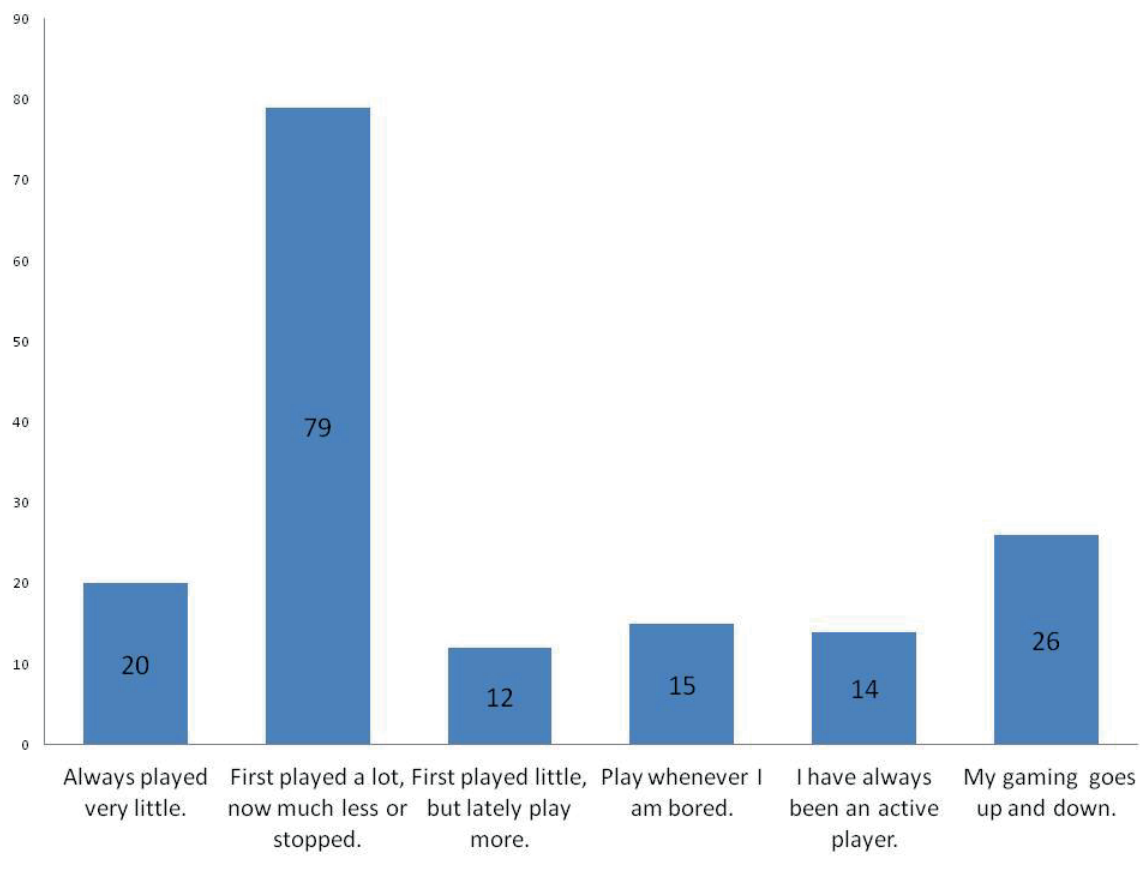


FIGURE 5.6: Patterns of engagement with social network games.

### Why did you quit playing games?

Overall, all gamers (including those who demonstrated stable interest in games) indicated that they have quit at least one social network game. Figure 5.7 indicates the options that were offered as quitting reasons and the number of responses each of them received.

As the graph suggests, the overwhelming majority of players indicated that they quit playing because games *lack variety*, are *time-consuming*, or bring the annoying number of *feeds and reminders*. Also, 64 out of 87 who indicated *time consuming* also selected *lack variety*.

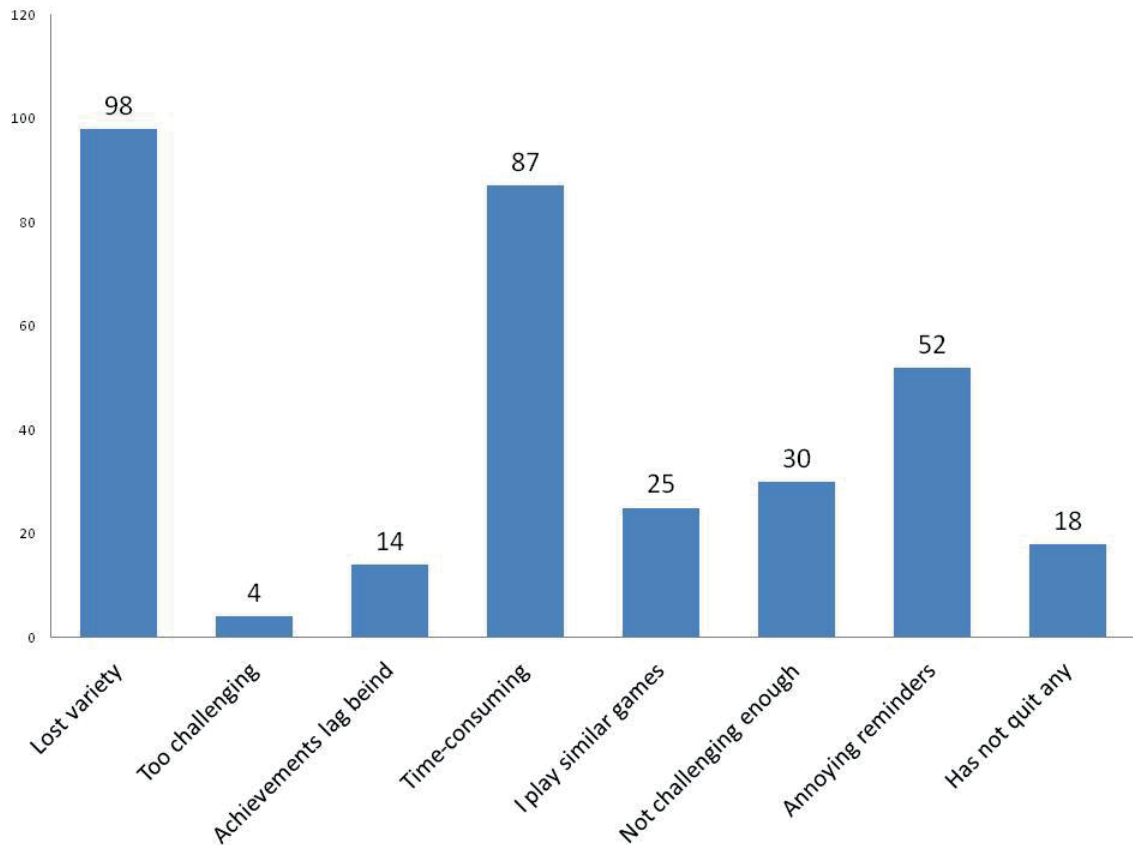


FIGURE 5.7: The reasons why players quit playing social network games.

A common problem of most casual games is lack of variety because they have to stay understandable for new-comers and therefore are limited in the complexity that they can offer. As a result, players who have reached the master phase face the boredom issue.

As a suggestion, games must offer options for activities that are not dependent on mastery level. Indeed, a social exchange environment in which the games are distributed gives room for such activities.

### 5.2.3 Conclusions and Discussion

Our participant selection method did not bring a diverse participant pool in terms of location, focusing mainly on respondents from Germany and the USA. Also, it might be possible that there is some bias due to the fact that most of the respondents were found on a crowdfunding platform (the pool that might not be representative of all the social network gamers). Therefore, instead of making conclusions regarding specific

correlations, we limited our observations in this section on general tendencies that the data showed.

To sum up, social network gamers enjoy playing not only on the social network platform but also other game genres. Moreover, gaming preferences of social network gamers reflect general tendencies of regular online gamers, where women are attracted to less competitive and less violent genres, in comparison to male players.

The outcomes of our online survey among social network game players suggest that while social games are considered casual, more than a half of the players spend significant amounts of time exploring these games, demonstrating hardcore gamer attitudes. Moreover, the study identified specific motivating factors that are relevant for each of the category of players.

Overall, *easy accessibility* to the games, their *relaxing and enjoyable nature*, *fighting boredom and stress relief* factors were important to all 5 groups of players ( table 5.2).

Another observation worth of mentioning is that while most social games are never-ending (non-goal oriented), gamers (especially those who play more than 30 minutes per day) indicated that ability to set and reach *personal goals* (emergent goals) is an important factor in playing social network games.

Also while easy accessibility, simplicity of games, connecting with friends, and time-based investments are motivating factors for users to come back and continue playing, the data suggests that the majority of players eventually lose their interest in the games due to the lack of variety and the amount of time the games might take.

The section 5.3 gives an overview of current most successful social network games, focusing deeper on those genres that offer game mechanics that are most relevant for human computation game types.

### 5.3 Current Social Network Games Overview

As ISG [2010] reports, in the USA and UK 70 percent of social network games are played on Facebook. Therefore for this review we will concentrate on the games that are offered through this platform.

The Facebook platform segments its games into the following categories:

- Simulation Games
- Action and Arcade

- Adventure
- Board Games
- Card Games
- Puzzle Games
- Quiz Games
- Strategy Games
- Sport Games
- Casino Games

While MDA framework (section 3.3.3) provides a sufficient background through which one can review these game genres, we would like to focus on a narrower list of criteria that allows us to make a decision regarding the format of the application we would like to develop. Therefore, in our review only certain parts of *Dynamics* and *Aesthetics* are covered. Each of those genres except *casino* games is reviewed in terms of their *mechanics, visual style, social components, and relevance to human computation tasks.*

### 5.3.1 Simulation Games

Most successful social network games like Farmville<sup>1</sup>, Chefville<sup>2</sup>, and Citiville<sup>3</sup> belong to the *simulation* category. The first versions of these games did not have any specific goal other than progressing with scores in building one's virtual worlds. However, as games entered the maturity stage and gaming fatigue became a noticeable tendency, game designers restructured the original game mechanics and introduced quest-like elements to match the exploratory nature of the competitive category of adventure games, described later in this section.

*Mechanics.* While quests are an important part for the 2nd generation of simulation games, they have their own unique elements, namely the time-based interactions, which make *time lapses* part of the game strategy (i.e. time required to grow a plant, clean a house, cook a dish), forcing users to calculate the returns on investment (costs/time/revenue combination) - and dutifully come back to collect the investments - the element

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<sup>1</sup><http://www.facebook.com/appcenter/farmville-two>

<sup>2</sup><http://www.facebook.com/appcenter/chefville>

<sup>3</sup><http://www.facebook.com/appcenter/cityville>

which made these games highly addictive. Another important element of game mechanics is fulfilling quests, which are explained in greater detail in the *adventure* game genre further down.

*Visual style.* Depending on purpose, some of the games use 2.5 dimensional tile-based space, where the user is represented through a customizable avatar and interacts with everyday objects like kitchenware, food, cloths, house decoration, etc.

Other games require no avatar for the player and use two dimensional space with simulated *pets* (Monster World<sup>4</sup>) or *characters* (Sims Social<sup>5</sup>) that users take care of. According to the research described in the section 5.2 and that of Berry [2011], these "nurturing" games find highest response among female players and are correspondingly reflected in games aesthetics (colors, shapes, dynamics).

*Social component.* As Facebook limited the amount and frequency of game-related news appearing on users' walls, social network games lost a very powerful viral channel of dissemination. As a result, game designers acquired a more aggressive attitude towards gamers and limit their ability to progress in the game or accomplish certain quests without involving friends. In return, however, joined friends enjoy significantly more benefits of gifts, bonuses from mutual visits and "hirings" for certain quests.

*Relevance to human computation tasks.* The time-lapse based mechanics may allow a smooth integration of human computation verification elements into the gaming process, making this game genre potentially suitable for human computation tasks. However, one must note that games rely heavily on tokens (gifted/purchased) that often serve purely decorative/status purpose, but which are very time consuming to create and therefore might need to be replaced by other elements in non-commercial human computation games.

### 5.3.2 Action and Arcade Games

In essentials, *action and arcade games* are typical casual games that have been around for some time. They were brought to Facebook because of ease of access and integration, but contain no major changes in traditionally established mechanics.

*Mechanics.* The mechanics is based on a traditional series of short game sessions where players aim at progressing through levels by clearing increasingly complex goals and maximizing scores received within each level.

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<sup>4</sup><http://www.facebook.com/appcenter/monster-world>

<sup>5</sup><http://www.facebook.com/appcenter/thesimssocial>



The most popular Facebook integrated action and arcade games put to test the *hand-eye coordination* (i.e. Angry Bird Friends<sup>1</sup>) and *pattern recognition* (i.e. Diamond Dash<sup>2</sup>).

*Visual style.* The games use simple but colorful graphics and minimal animation. To adapt to non-experienced social network players, they incorporate easier than average levels, intuitive navigation and an instant access to possible menu options often accompanied by tutorial elements and tips.

*Social component.* Users can invite friends and observe their progress. Also multi-player sessions/tournaments are available for many games where players are teamed with friends or random players.

*Relevance to human computation tasks.* While shortness of gaming sessions and simplicity of goals matches human computation tasks, the games rely on instant reward system which does not allow time lapses normally required for the verification of the human computation input. However, there are various ways of overcoming this challenge in human computation games. For example, one of the proposed approaches may be granting scores based on the majority vote [Krause et al., 2010].

### 5.3.3 Family and Adventure Games

In many ways, *adventure and family* games on Facebook are hard to distinguish from Facebook simulation games. They also spin around a distinct theme (restaurant, car, farm, casino businesses, forest, castle) that require simple management of property and activities with a purpose of maximizing one's scores, and enlargement of business. However, the slight difference between these genres is that adventure games merge the simulation genre with the action genre, introducing small action-based game sessions within their quests.

*Mechanics.* Games assign users a small virtual space and introduce a set of activities that one learns about in a do-it-yourself manner, highlighting necessary objects and giving a follow-up feedback. The game often introduces a non-player character/s that guides users through the game setup. The games employ a highly hierarchical structure that starts with a meta-goal and is segmented into sub blocks of quests and consequently mini-tasks and actions that all contribute to the main purpose of the game. Quests are dominant elements of these games and game designers attempt to constantly employ the user's time by incessantly guiding users through game activities. For example, the

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<sup>1</sup>12 million players on Nov 25, 2012, <http://www.facebook.com/appcenter/angrybirds/>

<sup>2</sup>19 million players on Nov 25, 2012, <http://www.facebook.com/appcenter/diamonddash/>

*Gnome Town*<sup>1</sup> includes traditional bubble-busting action games in their quests, or the management of the *Car Town*<sup>1</sup> is intermingled with racing mini-sessions.

*Visual style.* Compared with first generation of social network games, the current ones include more sophisticated graphics and animation, often resorting to 3D Flash technology to give the two and a half-dimensional games a more three-dimensional look. Also, game designers introduced richer worlds filled with various non-player characters that guide, assist the players or enrich the story of the game. Quests also give users opportunities to experience multiple victories within one game session instead of simply competing with friends in terms of ranks and scores.

*Social component.* If first social network games allowed only to view the "world" of one's friends, the upgraded versions of some games allow to perform actions on the neighbor's premises. Nevertheless, multi-player sessions are not usual for this genre of social network games. While Consalvo [2011] found social interactions within social network games not sustainable or deep enough, more than half of ISG [2010] survey participants indicated that games are the primary source of interaction with their "neighbors".

*Relevance to human computation tasks.* Just like in action games, the relative simplicity of the adventure game setup is well suited for human computation games. Quests make it potentially possible to insert separate blocks of human computation tasks into an otherwise playful environment by making this game genre highly appropriate for the indicated purpose.

### 5.3.4 Board and Card Games

Board and card games use digitized versions of traditional table games.

*Mechanics.* Game designs range greatly from games that employ adventure-like setups, where each mini-game session serves as an unlocking mechanism toward reaching a larger goal, to multi-player virtual casinos that mimic a real-life environment.

*Visual style.* While game mechanics of most games are borrowed from well known traditional games (solitaire, poker, okey, battleship, etc.), they benefit from colorful graphics and an extensive but non-obtrusive learning stage, which includes do-it-yourself tutorials that teach a game from scratch; and trial sessions before allowing to play with real-life players.

*Social component.* Once users acquire a sufficient skill level, they may continue to more advanced real-time multi-player interactions. Most games give a choice of playing with

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<sup>1</sup><http://www.facebook.com/appcenter/gnometown>

<sup>1</sup> <http://www.facebook.com/appcenter/cartown>

strangers or locking the games within a limited circle of friends. Often users have an option of chatting with co-players and exchanging virtual items.

*Relevance to human computation tasks.* While the multi-player set-up used in this game genre has also been used in existing human computation games, its challenge lies in heavy dependence on the presence of available online players at any point of time, which might create a bottleneck problem for the game in the early promotion stage. Also low game commitment and unexpected exits of one player are not controllable and can ruin the gaming experience of the whole team. Therefore, this set-up is most relevant to well-established games that enjoy an extensive gaming audience or games that are capable of utilizing pre-recorded moves simulating real player interactions.

### 5.3.5 Puzzle, Trivia, and Word Games

Although placed in separate sections on Facebook, due to their inherent similarity these genres are presented here under one section.

The games can sometimes be assigned to the *adventure* category, since they often tend to use rich interactive worlds with story-telling elements that incorporate traditional games like *object discernment and pattern recognition* into their questing activities (i.e. Hidden Chronicles<sup>1</sup>, Bubble Age<sup>2</sup>, TripleTown<sup>3</sup>). The difference lies perhaps in the higher prioritization and specificity of the mini-game session in this category.

*Mechanics.* More sophisticated games utilize a well-established structure consisting of a major goal, minor quests, and mini-games within these quests (along with some minor activities like making purchases and inviting friends) described in the adventure category (section 5.3.3). They can also employ an interactive story-unfolding pattern with puzzle solving as an unlocking mechanism. A large number of games, however, are constructed in the traditional level-based format.

*Visual style.* Some of the games in this category, namely object recognition games, rely on visuals as as strategic elements of game mechanics and therefore they use impressively enhanced visual design. Also the puzzle mini-games are often more intellectually challenging than those employed in adventure games.

*Social component.* While similar in game design to adventure games, they rely less on the presence of friends and neighbors, allowing for more solitary exploration. Nevertheless, they encourage wall posts and invitation distributing free game elements for promotional actions.

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<sup>1</sup><http://www.facebook.com/appcenter/hidden-chronicles>

<sup>2</sup> <http://www.facebook.com/appcenter/bubbleage>

<sup>3</sup><http://www.facebook.com/appcenter/tripletown>

*Relevance to human computation tasks* is same as in section 5.3.2.

### 5.3.6 Strategy

Strategy games are also very similar to simulation and adventure games. However, normally they put more emphasise on territorial supremacy and growth and involve more aggressive audio and visual elements in order to define their scope of their activities.

*Mechanics.* This category contains both types of games: those that are migrated casual strategy level-based games, or the games that are developed specifically for Facebook audience, which have simplified format, contain strict hierarchy of activities, exhaustive do-it-yourself tutorial stage, and hints that guide users though the game with quest requests (i.e. Empires and Allies<sup>3</sup>, Galaxy Life <sup>3</sup>).

*Visual style.* The games often include 3D elements (more often applied to characters) and more sophisticated graphics than other game genres because they attempt to appeal to the male category that may already be sufficiently experienced with the sophisticated advanced strategy games on other game portals. In addition to construction, purchasing behavior typical to *adventure and simulation* games and *strategy* games involves elements of *shooting* games in the parts where users are required to enter into aggressive actions of territorial defense/attack.

*Social component* and *relevance to human computation tasks* are similar to subsections 5.3.1 and 5.3.3.

### 5.3.7 Sports

*Mechanics, Aesthetics, Social component.* The sport genre on Facebook presents a wide mix of different types of games that in reality belong to one of the game genres described above. The highest ranked games in this category are pool or soccer games, which can well fit into the *action* game category (if they involve eye-hand coordination) or into the *simulation or strategy* genre when they are designed around building and managing a sport team. The game matches are often presented in a text-based form due to the fact that web games are limited in the amount of interactive and visual complexity that they can offer.

For *relevance to human computation tasks*, please see section 5.3.2.

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<sup>3</sup><http://apps.facebook.com/empiresandallies/>

<sup>3</sup><http://www.facebook.com/appcenter/galaxylife>

## 5.4 Conclusion

We have to mention the high emphasise of social network game makers on *monetization* of their games. The employed strategies severely limit players' ability to progress without financial investments or friends invitation and often result in game drop-out. However, this side of the games is not touched in this review since it is not relevant to the research purpose of this work.

In this chapter we attempted to get an overview of existing social network games and user attitudes to them with a purpose of bringing the most useful elements of existing games into future social network human computation games.

In section 5.2 we reviewed the results of a study with 169 social network game players. The analysis indicated that users vary greatly in the amount of dedication that they show to games (from less than 10 minutes to more than 2 hours with the average player staying on the range of 30-60 minutes per day during the most active gaming period, which can also vary greatly are: from less than 1 month to more than a few years. The more dedicated the users are the more meaningful for them are the benefits that are offered by social network games with some differences between male and female players. However, most players are concerned about time consumption and quit games at the point when the lack of variety becomes dominant.

Section 5.3 gave an overview on social network game genres and attempted to distinguish the mechanics that are most suitable for social network games with human computation elements. The most successful social network games so far employ a simple story telling technique that involves moving through the game by fulfilling guests and mini-games, and simple interaction with friends (invitation, gifting, visiting, competing) in order to attain higher goals. Also, certain types of games involve direct multi-player interactions.

In spite of the fact that social network games differ in their genres (as the review in section 5.3 showed), in the essentials of game mechanics and visual elements the games are very similar. Also, the industry experiences a strong mirror effect. There are dozens of farms, restaurants, and city construction games that often differ only in the name of the publishing game company. The reason is that companies try to increase their portfolio of products mimicking those of their competitors in the attempt to match each other's positions in every game category to maximize market shares in this young but booming social network game industry.

As a result, players reach the over saturation stage sooner than normally expected (one of the important reasons of the industry-wide decline in 2011-2012) resulting in users' persistent complaints about lack of variety mentioned in the research studies in section

5.2.2 in spite of impressive upgrading waves exemplified in figure 5.8 <sup>1</sup> (the vertical scale indicates the number of subscribed fans). The wave of impressive interest to the upgraded version of *Farmville* reaches its peak between 6th August and 20th August of 2012 and quickly subdues, demonstrating further steady decrease of interest.



FIGURE 5.8: Socialbakers.com: *Farmville* Facebook statistics June 2012 - November 2012.

In the next two chapters, we will present the practical works and their evaluations that are constructed using frameworks and guidelines presented in chapter 3 and 4, based on the social network game elements and conclusions shaped in chapter 5 for certain serious tasks that were presented in chapter 1.

<sup>1</sup><http://www.socialbakers.com/facebook-applications/102452128776-farmville>

## Chapter 6

# Playfulness in Serious Applications

### 6.1 Introduction

In the previous chapter (section 5.3), we gave an overview of the social network game genres with an intention of distinguishing the mechanics that are most suitable for a possible social network game with a purpose (human computation tasks). We found out that many games across different genres are built using similar mechanics that involve a storytelling technique, which directs a player through the game using quests and mini games.

This approach is essentially different from the approach so far applied to most human computation games presented in chapter 2, namely in sections 2.5 and 2.6, where games in their entirety are dedicated to serious tasks with no story telling mechanisms or other playful activities.

Therefore, we propose to use a game concept with a structure that consists of the playful activities mixed with serious tasks that are integrated into playful game elements.

We aim to test whether this approach will receive the attention of typical social network game players who are otherwise not inclined to play serious games/human computation games. Indeed, the results of the research described in section 5.2 suggest that if a game presents a relaxing and pleasurable environment which offers simple game tasks, and involves competing with friends as well as a care for the property, some users are willing to dedicate significant amounts of time to play the social network games.

Moreover, a modular inclusion of extra quests and mini-games can allow adjusting the proportion of playful vs. serious tasks, or allow introducing additional serious tasks even after the game is published.

However, there are a few questions related to this approach that require in-depth research:

- 1. The playfulness of the game may result in unpredictable interactions. The seeming irrelevancy of the story of the game, and masking of the tasks itself behind playful game elements, may sway players away from the real "hidden" purpose of the game. As a result, users may interact with the game objects based on their aesthetics rather than on their "serious" values.**
- 2. The playfulness may render users seemingly careless in regards to the quality of data that they are expected to contribute, thus greatly undermining the purpose of the proposed approach.**

Therefore, before embarking on a long game construction project, we built, tested and analyzed a smaller application that was designed to address those questions and give us insights regarding the design of a bigger project.

## 6.2 Playful Questionnaire

The playful application *Bake your Personality* was created with the purpose of studying the influence of the aesthetics on the users' perception of the serious task (in this case - survey questions).

Also we planned to create a playful questionnaire that can be distributed via social network environments to see whether participants are intrinsically motivated to participate in the survey (fun factor), thus potentially helping to solve another issue - gaining a sufficient number of responses without involving extrinsically motivating tools (i.e. financial remuneration) as presented in section 2.3.

### 6.2.1 Design Principles

#### Playful Version

The playful version of the *Bake Your Personality* contains six serious questions regarding the gaming preferences of the users. Following guidelines that have proved successful in the development of social network applications (section 3.4 and chapter 4), the playful



questionnaire was developed relying on the *universal theme* that a wide audience can connect with; in this case the process of cooking.

Furthermore, the application was designed in the form of a single game quest (which can potentially be part of a bigger game), where the questions of the application are asked using a metaphorical concepts of the ingredients' selection, mixing and cooking a cake.

We considered the usability heuristics presented in section 3.4.1 when creating this application. While some elements presented in the works of Desurvire and Wiberg [2009] and Pinelle et al. [2008] were not relevant (complex game interactions), others concerning *feedback, layout and visual style* proved to be useful. Namely, we started with the simplest questions/actions, gradually increasing the complexity of the tasks. Secondly, we made sure that the system provides sufficient audio and visual feedback to ensure that the user understands whether he/she failed or succeeded with the task. Finally, we selected a visual style with simple vector graphics, the majority of which had direct relevance to the interaction process in order not to overwhelm inexperienced users with unnecessary visual details.

For example, figure 6.1 presents a snapshot of the 3rd task, which requires the selection of the three most favorite game genres.



FIGURE 6.1: Snapshot of the 3rd question in *Bake Your Personality* questionnaire.

Each question is presented as a mini-task; answers are represented by items that users interact with in order to solve the task. At the final stage, the product is submitted

for an approval to a game character. Based on the "taste" the users receive personality reports while their input data is recorded in the database.

In the background, the decisions made by users are recorded in a database.

### Standard Version

In order to evaluate the validity of the recorded data and reception of the *playful questionnaire* by users, a *standard questionnaire* with an identical set of questions was developed (figure 6.2).

The standard questionnaire contains single and multiple choice questions that correspond to the same questions and answers that are embedded in the playful application and provides similar personality reports as the playful version.

**Gender**  
 female  male

**Age**  
 13-18  19-25  26-35  36-45  46 or more

**Game genres that you play**  
Please, select 3 of your favorite genres

educational games  sport games  
 chess and board games  social network games  
 complex adventure games  strategy games  
 word and puzzle games  simple run and jump games  
 life simulation games  card games  
 racing games

**Your most favorite genre**

educational games  racing and sport games  
 chess and board games  social network games  
 complex adventure games  strategy games  
 word and puzzle games  simple run and jump games  
 life simulation games  card games  
 racing games

**Amount of time you play**  
 hours per week

FIGURE 6.2: Standard questionnaire snapshot.

The major differences between these two questionnaires thus lie in the visual style, presence of storytelling, and the amount of time necessary to complete the questionnaire - the playful application requires around 3 minutes on average, while the simple application may take less than 1 minute to finish.

### 6.2.2 Quality Control

The earnestness of the answers provided is checked by introducing a *control question* that is asked twice but at different points of time and phrased differently (figure 6.4).

In our case the *4th task* asks users to rank their game genres and at the *6th tasks* asks users to select the most favorite game genre, which when correct must coincide with the genre ranked first in the forth question.



FIGURE 6.3: Quality control: ranking genres in terms of preference.

In addition, both surveys collect age and gender data that are compared with the Facebook profiles of the participants.

Finally, players are told that after completion of the survey they will be awarded with the personality readings. Naturally, it means that the truthfulness of their answers shapes the degree of correctness of the reports.

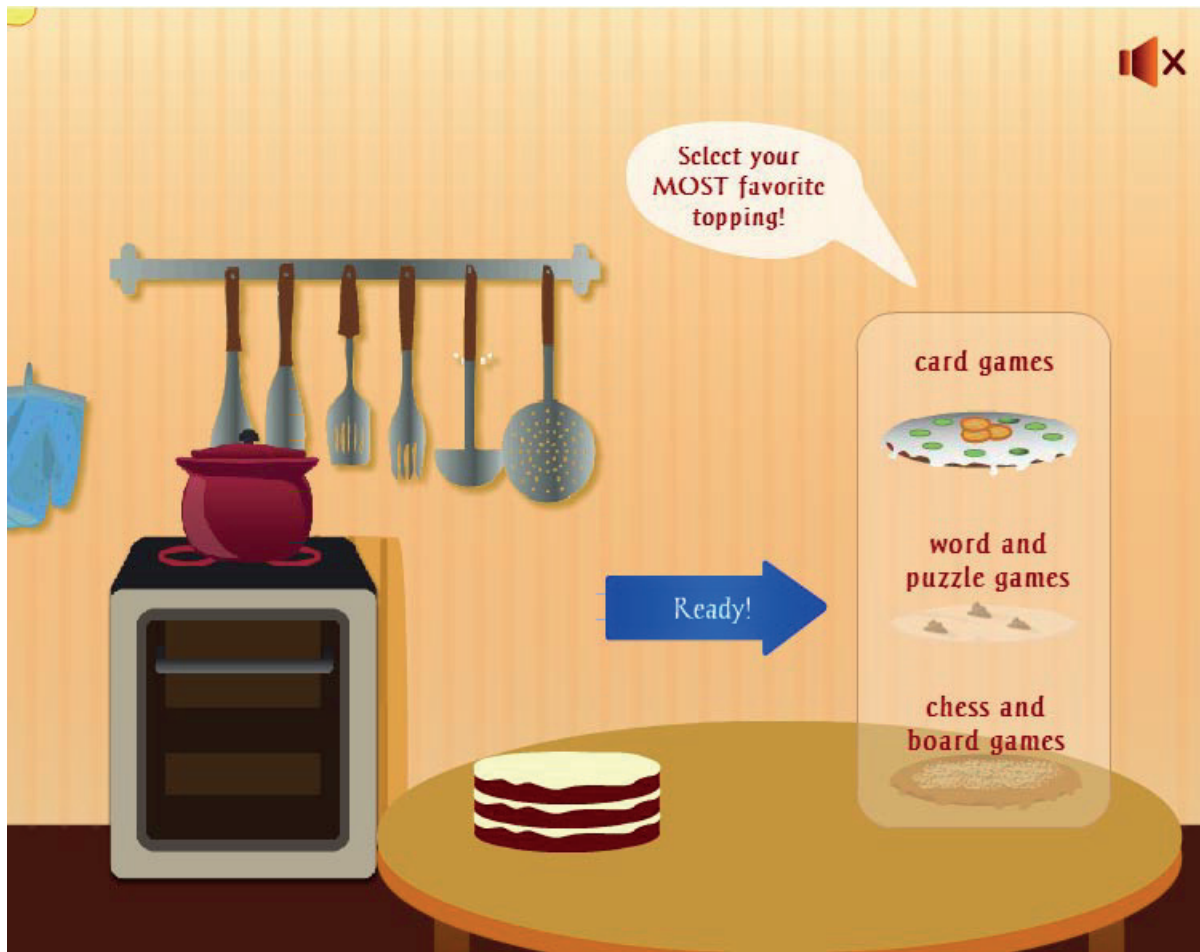


FIGURE 6.4: Quality control: requesting to select the most favorite genre (ideally must match the answer from the question asked in figure 6.4).

### 6.3 Controlled Evaluation

The evaluation of the playful questionnaire involved 20 students from 15 different study departments of the University of Bremen. The participant pool consisted of 10 males and 10 females, ranging in age from 20 to 35 years ( $M=25$ ,  $SD=3.3$ ,  $N=20$ ). In order to counterbalance the order in which subjects participated in the conditions, the sequence was randomly selected. Once participants completed both applications, they were asked to complete separate feedback forms for each application, where answers were represented on the scales of 5 possible degrees of latency, and which covered the following questions:

1. *Whether the playful elements of the playful questionnaire distracted them from the major task.*

2. *How users perceived each of the two applications: as a survey, serious personality report, playful personality report, or a game.*
3. *Would users recommend any of the two applications to friends on a social network, (or verbally if they have no social network account).*
4. *Which one of the two versions the users would prefer to use in the future.*

In addition, in order to evaluate the complexity of the tasks included in the playful questionnaire (required interactions, intelligibility of instructions), a slightly modified SUS questionnaire was used (omitted question 5 and replaced question 10 due to their little relevance to the evaluated applications). As a result, the maximum score to be achieved was 90. Users had to rate each answer on the scale of five from *strongly agree* to *strongly disagree*. The detailed presentation of the questionnaire is presented in [A.2](#), and the modified one contained the following questions:

1. *I think that I would like to use this system frequently*
2. *I found the system unnecessarily complex*
3. *I thought the system was easy to use*
4. *I think that I would need the support of a technical person to be able to use this system*
5. *I thought there was too much inconsistency in this system*
6. *I would imagine that most people would learn to use this system very quickly*
7. *I found the system very cumbersome to use*
8. *I felt very confident using the system*
9. *My answers were biased by visual elements*

The following subsections cover the results of the evaluation. Sections [6.3.1](#) - [6.3.5](#) cover questions posed in the feedback forms and section [6.3.6](#) presented results of the SUS evaluation.

### **6.3.1 Self-evaluated distraction of playful elements**

The participants were asked whether the visual elements of the playful application notably distracted them from the major task of answering the serious questions. The results were compared to the responses given to the same question concerning the control application. A Wilcoxon Signed Rank test was run to test the significance of the difference between the self-reported amount of influence of aesthetic and ludic elements

on the answers provided by the users. The test did not show any statistically significant differences between the degrees of distraction of these two applications:  $Z=1.26$  (Mdn=4)  $p > .05$  and showing a mild effect:  $r=.21$ .

### 6.3.2 Perception of Applications

The analysis of the responses received regarding the question "How do you perceive the application?" - with the suggested answer options: *game*, *playful personality report*, *serious personality report*, *survey* and *undecided*, revealed significant differences in how participants perceived both applications ( $Z=-3.88$ ,  $p < .05$ ). The majority of players perceived the playful questionnaire as a *playful personality report*, closely followed by *game*. The other version was perceived mostly as a *survey*. The distribution is displayed in the figure 6.5.

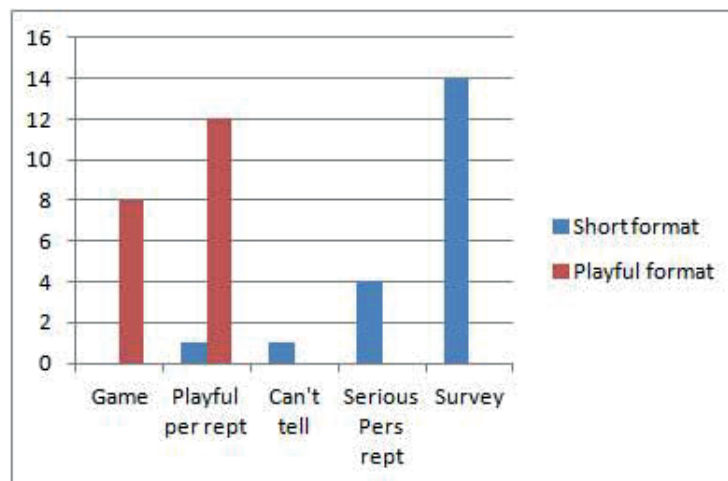


FIGURE 6.5: How users perceived each of the two applications.

### 6.3.3 Latency to Recommend

The question "Which of the applications would you recommend to a friend on a social network?" revealed significant differences in replies ( $Z=-2.67$   $p < .05$ ), with the majority of participants being positive about the idea of spreading the playful questionnaire further to friends, while showing no significantly less intention of doing so regarding the short questionnaire (figure 6.6).

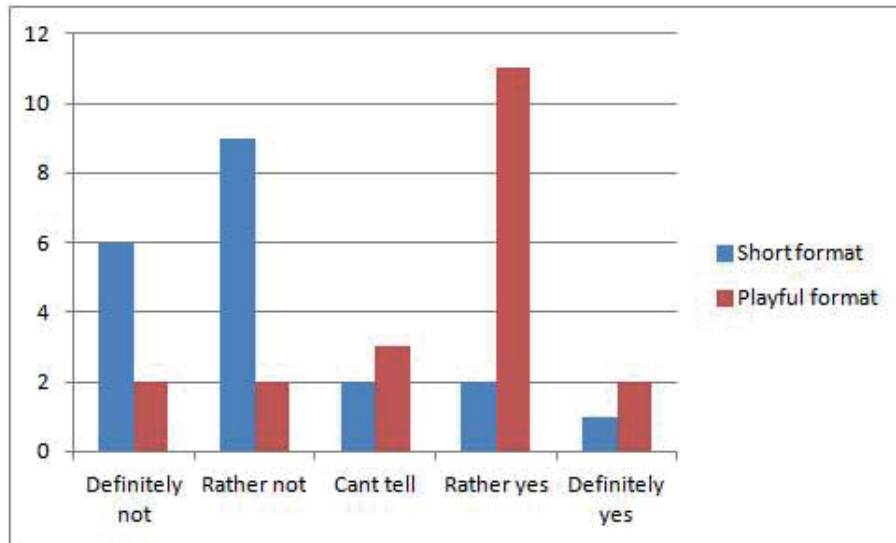


FIGURE 6.6: Would users recommend any of the two applications to friends.

### 6.3.4 Application Preference

Concerning the question "Which application would you prefer to deal with?", most females expressed a preference of the playful questionnaire, while male players could be divided into two categories: those who would prefer the playful format and those who would distinctively prefer the short format as shown in the figure 6.7.

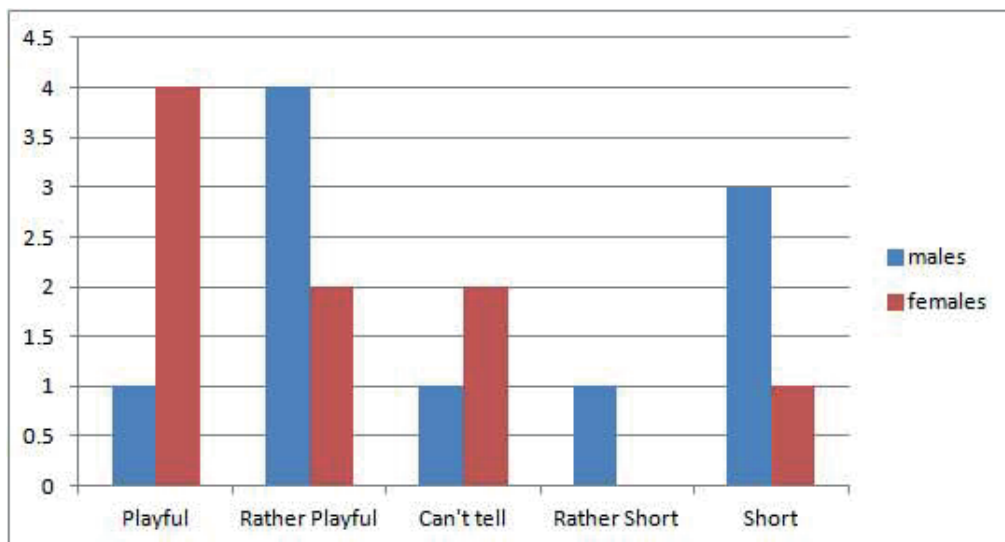


FIGURE 6.7: Which one of the two versions the users would prefer to use in the future.

The verbally expressed reason behind this decision was the *speed* of the execution of the standard survey. This response triggered an additional experiment described in the section 6.3.7 - *performance in the time-constrained environment*.

### 6.3.5 Earnestness in Responses

Finally, the data presented in the figure 6.8 gives an insight into the question how users estimated the degree of earnestness while interacting with each application. The majority believed that they considered their answers more seriously when filling out the short survey, rather than when interacting with the playful questionnaire.

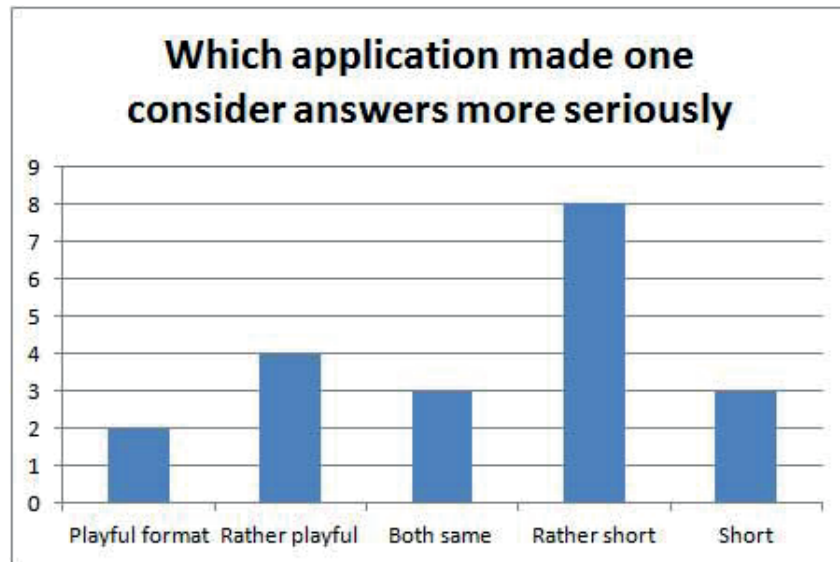


FIGURE 6.8: Whether the playful elements of the playful questionnaire distracted users from their major task.

While self-reported accounts of earnestness are bound to be biased, the observed difference can likely be explained by the playful mood of the playful questionnaire that inevitably sets a more relaxed approach to answering questions. However, it is the control questions that can account for the true quality of the input data.

### 6.3.6 Usability Issues

The evaluation of the SUS questionnaire revealed the following average scores:  $M=79$  out of 90 possible points ( $SD=7$ ) for the standard questionnaire, and  $M=69$  out of 90 possible ( $SD=15.3$ ) points for the playful version, which according to the T-test results shows a statistically significant difference between the means of the scores:  $t(19)=3.358$ ,  $p < .05$ .

The large SD value of the latter is also explained by a larger variance where the minimum score was 33 and the maximum score was 90, while for the short questionnaire the smallest score on the sample was 63 and the maximum was 90.



The differences in the SUS scores suggest that the participants perceived the standard format easier to use than the playful format. However, all participants managed to finish the playful questionnaire without external help or noticeable difficulties. In addition, observation of the user performances allowed to make the following remarks:

- users had slight difficulties switching from one mode of interaction (clicking) to another (dragging) in order to accomplish a task;
- constant guidance of the user through popup texts and button tips proved useful because there were moments when some users looked puzzled regarding their next movements until new instructions appeared;
- at the same time, some test participants tended to rush further without finishing reading the tips, if they believed that they understood what action was required;
- although we shaped the application as a step-by-step interaction with feedback animation and sound effects to help reduce confusion level, users still seemed a bit overwhelmed by the new environment. This observation supported our idea to let users focus on one thing at a time, leaving little chance of their missing important clues, once we develop a more complex playful application.

### 6.3.7 Performance in a Time-Constrained Environment

The verbal feedback to the question "Which application would you to deal with?" indicated that additional research is required on the performance rate in the time-constrained environment.

Therefore, a small experiment was conducted that was dedicated to the issue of the performance with the playful questionnaire in the time-constrained environment.

**Participants.** We limited our user base to one country and selected forty Amazon Turk members (12 males and 28 females) from the USA. Study participants were paid for the task and not per hour and therefore were motivated to accomplish the task rather fast.

**Methodology.** Participants were asked to experience one of the two applications. In addition, they were asked to fill out a small feedback questionnaire created on the crowdsourcing platform itself in order to indicate that the task is accomplished. The actual participation was intentionally non-controlled and users were well aware that they are paid automatically upon completion of the feedback form, regardless of the interaction with the applications.

**Results.** The analysis of the recorded data showed that out of 20 respondents who were invited to interact with the playful questionnaire, only 12 actually actually did so (only 12 playful data entries were recorded in the database) while the feedback form was filled out by all 20 participants of the experiment. At the same time, all 20 users who were asked to interact with the standard questionnaire actually participated in it and filled out the feedback forms.

**Conclusion.** The results allowed us to conclude that time constraints may have significant influence over the willingness to participate and provide honest responses in the case of more time consuming (even though more fun) playful questionnaires.

## 6.4 Facebook Studies

In order to run real life studies and evaluate the attractiveness of the playful questionnaire with the users from wide demographics, we ran three Facebook studies.

The first study focused on measuring the general attractiveness of the approach to Facebook users across different age groups and countries.

The second test focuses on the quality of the input and credibility of the answers within the targeted gender (females) analyzing the answers to the control question as well as age and gender indications that can be verified through Facebook profile.

The third test involves participants of both genders and focuses on the comparison of their behavior.

### 6.4.1 First Facebook Study: General Evaluation of the Playful Application's Performance Among Female Facebook Users

For the first test, the playful version of the application was run from February 15 to April 15th, 2015 (52 days). It targeted users from 7 countries (Australia, Belgium, Denmark, Great Britain, Netherlands, India and United States). Following the results of the controlled test presented in chapter 6, we exposed our application mainly to female English speakers, aged from 18 to 65, who interacted at least with one Facebook game within 14 days.

We tracked that the application was exposed to 15124 Facebook users out of whom 542 clicked on the game and 429 actually got to the end of the application, publishing their results on their news feeds. While the click rate depends rather on the attractiveness of the announcement than on the application itself, the relatively high completion rate (80

percent) indicates that the users were well engaged with the process. The application received 25 likes and shares.

Facebook promotional mechanisms required creation of an advertising message and offered exposure to the application through side bars or as a news-feed content. The promotional budget consisted of 2-3 euros per day.

Figure 6.9 indicates the Facebook controlled distribution of the announcement across countries - with the absolute dominance belonging to India. The unexpectedly large Indian user base might have resulted due to the complex Facebook Ad distribution and pricing policy, in which exposure to India is cheaper than to other countries that we selected, and therefore is automatically prioritised. In addition, advertisers bid on the promotional space and it is highly possible that our bidding level was best matched with the offers of the Indian market niche over the other 6 countries.

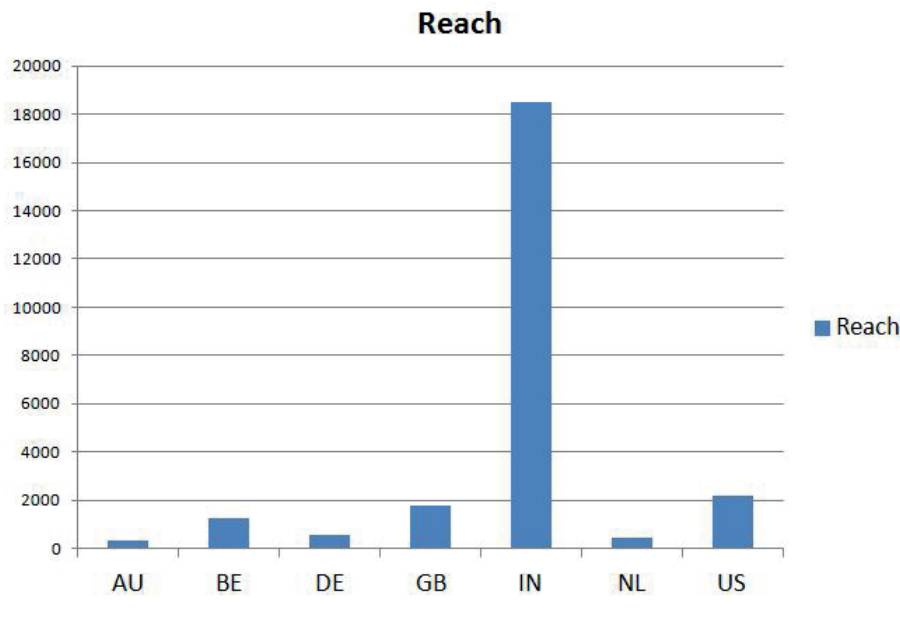


FIGURE 6.9: Number of people that clicked on the ad across 7 countries.

In addition, because we had little control over the exposure strategy on Facebook, we also had disproportionate distribution across different age categories. Figure 6.10 indicates the reach of the application (the number of people that the application was served to). However, to understand better the interest displayed by the users in relation to the exposure rate, we decided to compare *actual clicks* (total number of clicks on the application) and the *projected clicks* (what the clicks should have been had they been fully proportional to the *reach* data). Figure 6.11 demonstrates *actual* and *projected* clicks regarding the interest demonstrated by different age groups.

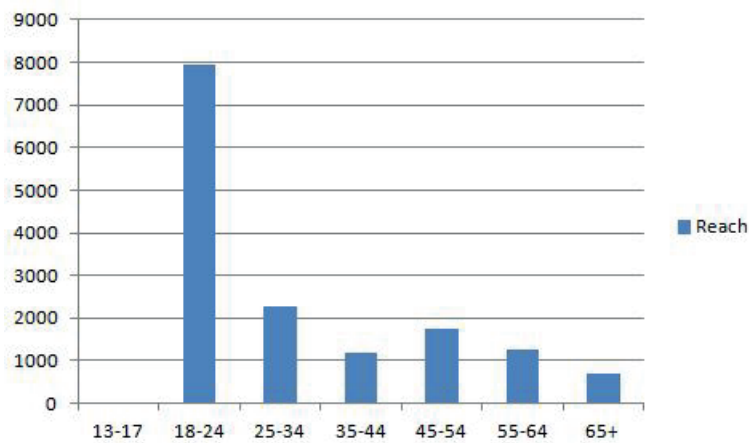


FIGURE 6.10: Number of people that were exposed to the app.

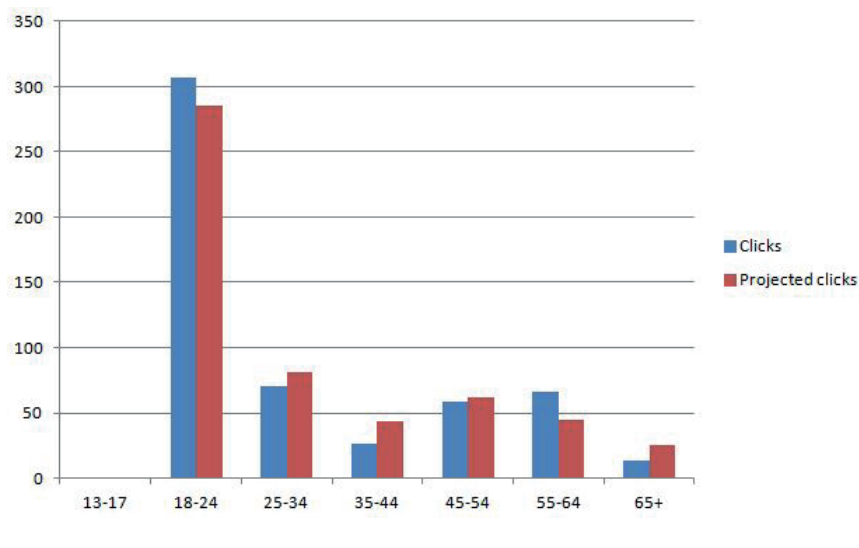


FIGURE 6.11: Number of people that started the app.

It is obvious that the data in both figures indicates a well correlated interest throughout all age groups. It is also supported by statistically significant Spearman Rank Order Correlation Coefficient  $R = .9922$ , ( $p < .05$ ).

In addition, by looking at the projected and actual clicks, we see that the 18-24 and 55-64 age categories outperformed expectations set by the *Reach* data. While we find it predictable that the 18-34 age category may have interest in such applications, we found the interest demonstrated by the 45-54 age group. We may only presume that this group consists of the late adopters of the social network users and are trying themselves at new applications offered by Facebook.

While the information above allows to see the extend of the user interest to the playful activities and possibly forecast the interest to similar applications in the future.

To review the quality of the entered data, we reviewed the answers to the control question of our questionnaire described in section 6.2.2. It asks users to select the most favorite genre, which should logically correspond to the highest rated game genre selected at an earlier stage. If the user selects a different game genre at the 2nd stage, then the risk that the entire entry is random is high.

The analysis showed that the number of answers to the control question that were not matched with the answer given at the previous stage was as high as 44 percent (189 out of 429 users). While it does not necessarily mean that the user input was completely random, it certainly increases the chance of it. In fact, besides the assumption of random answers, there might be other unforeseen reasons that contributed to such results. First of all, some category of users might not have initially had any game genre preferences and indicated the game ranking of the previous question in random manner ('I like them all'). Consequently, when answering the control question, they may have randomly selected one of the equally favorite game genres. Another possible reason might be that users believed that they should deliver answers that are specifically different from the previous ones ('I don't think I should repeat myself').

In order to elaborate on this issue, we felt it is necessary to run an extra study, where, in addition to the control question, we recorded the *age* and *gender* from the user profile page and compared it to the data entered by users inside the playful application.

#### **6.4.2 Second Facebook Study: Performance Comparison of Plain and Playful Applications Among Female Users**

In order to investigate further the truthfulness of the users' answers, we ran a second Facebook study, in which we utilized both playful and plain questionnaires. The study ran from April 25 to April 30 2015. The applications were exposed to female Facebook users from 6 countries: India, United States, Great Britain, Australia, Belgium, Denmark, and Netherlands. Figures 6.12 and 6.13 depict the images that were used as an exposure material. Although the plain format contained no graphics, according to the Facebook policies, the text can take only 20 percent of the image space; therefore, we were forced to use images in order to receive permission to expose the applications to users, thus possibly creating a bias regarding what users may expect in the process of interaction.

The results of the study are displayed in table 6.1. Although the plain questionnaire was exposed to a larger number of users, more people opted for the playful version. The table 6.1 suggests that out of 53 participants who started the plain application, only 30 finished it and out of 82 playful application users, 45 reached the end. Also, since



FIGURE 6.12: Facebook message for the playful questionnaire.



FIGURE 6.13: Facebook message for the plain questionnaire.

Facebook can provide only an approximate number of people who will be exposed to the application, we ended up getting different reach numbers (6268 vs. 5528 Facebook users). Therefore, we corrected the value of the playful questionnaire in order to project how many clicks the playful questionnaire would have received had it been exposed to the same number of users as the plain questionnaire.

	Plain Questionnaire			Playful Questionnaire		
	Reach	Unique clicks	Finished	Reach	Unique clicks	Finished
Actual values	6268	53	30	5528	82	45
Corrected values				6268	93	51

	Plain Questionnaire			Playful Questionnaire		
	Reach %	Unique clicks %	Finished %	Reach %	Unique clicks %	Finished %
Actual values	100	0.85	0.48	88	1,48	0,81
Corrected values				100	1,68	0,92

TABLE 6.1: Actual and corrected values of clicks and *finished sessions* for plain and playful questionnaires from the second Facebook study.

We can forecast that the playful format would receive roughly 44 percent more clicks (53/93-1) than the plain format and 40 percent more users of the playful application than the plain one would finish the entire process (30/51-1) had the playful questionnaire been exposed to 6268 users.

Most importantly, we retrieved the *age* ranges (less than eighteen-years-old, eighteen to twenty-years-old, twenty one years-old or older) and *gender* that were recorded on Facebook profiles and compared them to the data entered manually in the applications. In addition, we reviewed the answers to the control question.

The discrepancies in the responses are displayed in table 6.2.

Discrepancies in the Responses					
Plain App - total entries	30	%	Playful App - total entries	45	%
age mismatches	4	13	age mismatches	1	2
gender mismatches	3	10	gender mismatches	2	4
control question mismatches	13	43	control question mismatches	21	47
total filtered out	15	50	total filtered out	21	47

TABLE 6.2: Actual and corrected values of clicks and *finished sessions* for the plain and playful questionnaires from the second Facebook study.

According to table 6.2, the number of mismatches for all three control questions did not reveal any significant differences between both applications (with 50 percent and 47 percent of the answers containing at least 1 mismatched answer). Also, we would like to note that 47 percent of mismatches in the 2nd study of the playful application came

close to the 44 percent of the mismatches in the the first Facebook study described in section 6.4.1.

### 6.4.3 Third Facebook Study: Comparison of the Performance of the Plain and Playful Applications for Both Genders

In order to verify the results received in the controlled environment study described in section 6.3, it is important to measure the attractiveness of the plain and playful formats for male players too. Therefore we ran a short study from May 5 to May 12th, 2015 (7 days) in which both female and male participants were exposed to the questionnaire announcements.

Also, as stated earlier, since we couldn't influence the exposure to the application across countries and our data does not let us filter age or gender according to the location, we decided to omit the heavily dominated Indian Facebook user base and to collect more data across the remaining countries: US, Great Britain, Australia, Netherlands, Denmark and Belgium, where the number of English speaking users is high.

The table 6.3 demonstrates the differences in the number of the *reach*, *unique clicks* and *finished sessions* between the study described above in section 6.4.2 (April 25 - May 30, 2015) and the current 3rd study (May 16 - 23, 2015). Although the length of both studies was the same (7 days), due to the exclusion of Indian users from the participant pool, we have a smaller total exposure/reach number: only 3921 users compared to as many as 11796 users from the 2nd Facebook study. Consequently, this affected the number of responses we received: 25 and 29 unique clicks for plain and playful formats respectively, and out of them only 7 and 15 finished sessions.

	Plain Questionnaire			Playful Questionnaire		
	Reach	Unique clicks	Finished	Reach	Unique clicks	Finished
April 25-May30	6268	53	30	5528	82	45
May 16-May 23	1725	25	7	2196	29	15

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TABLE 6.3: Actual values of *clicks* and *finished sessions* for plain and playful questionnaire from 2nd and 3rd Facebook studies.

At the same time, the data shows that in the 3rd Facebook study more users were exposed to the playful format than to the plain format (only 1725 vs. 2196), which was not the case in the 2nd study. Therefore, just like for the 2nd study we readjusted the values of the playful questionnaire in order to compare its *clicks* and *finished sessions* values to those of the plain questionnaire. The readjustments are reflected in table 6.4.

After readjusting the value of the playful questionnaire's reach to the same number as that of the plain questionnaire (1725 users), we can see that the playful questionnaire



scored slightly less participants (by 2 clicks) than the plain questionnaire; however, the completion rate for the playful questionnaire was almost double as high (12 users versus 7 users of the plain questionnaire).

		Plain Questionnaire			Playful Questionnaire (corrected)	
	Reach	Unique clicks	Finished	Reach (corr.)	Unique clicks (corr.)	Finished (corr.)
April 25-May30	6268	53	30	6268	93	51
May 16-May 23	1725	25	7	1725	23	12

		Plain Questionnaire			Playful Questionnaire (corrected)	
	Reach %	Unique clicks %	Finished %	Reach % (corr.)	Unique clicks % (corr.)	Finished % (corr.)
April 25-May30	100	0.85	0.48	100	1.68	0.92
May 16-May 23	100	1.45	0.4	1725	0.13	0.7

TABLE 6.4: Actual and corrected values of *clicks* and *finished sessions* for plain and playful questionnaire from 2nd and 3rd Facebook studies.

In order to get insight on the gender differences, it is important to consider that Facebook exposed both applications, to a greater number of females than males, as reflected in figure 6.14. We can see that the number of females exposed to the playful format was almost 70 percent higher than the number of females exposed to the plain questionnaire, while the plain questionnaire was exposed to 23 percent more males than than the playful one. Also, as stated previously, the total number of exposures differs significantly for both applications (table 6.3): 1725 plain format participants vs. 2196 playful format participants (20 percent difference).

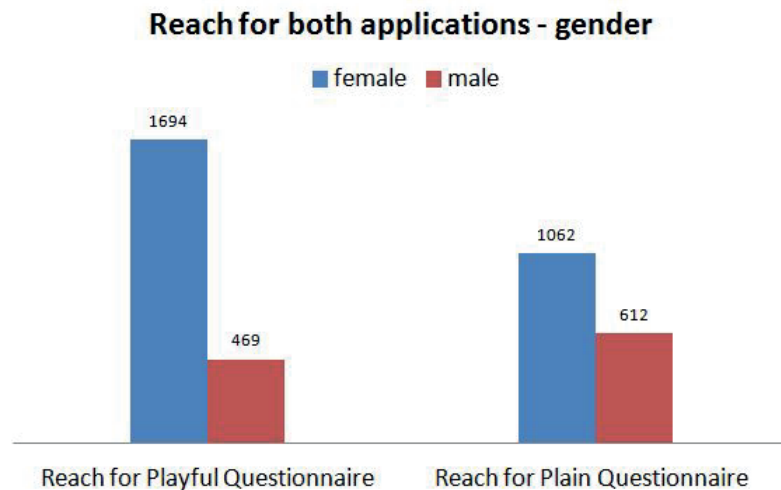


FIGURE 6.14: Exposure of the applications to Facebook users in terms of the gender.

Figure 6.15 demonstrates the actual and projected click (proportional to the reach displayed in figure 6.14 for both applications). According to the data in both applications males underperform (compared to the number of males reached). However, the difference between projected and actual clicks for males in the plain questionnaire is still

smaller than the gap of projected and actual male clicks of the playful format. In both cases, females perform better than expected (according to the reach data).

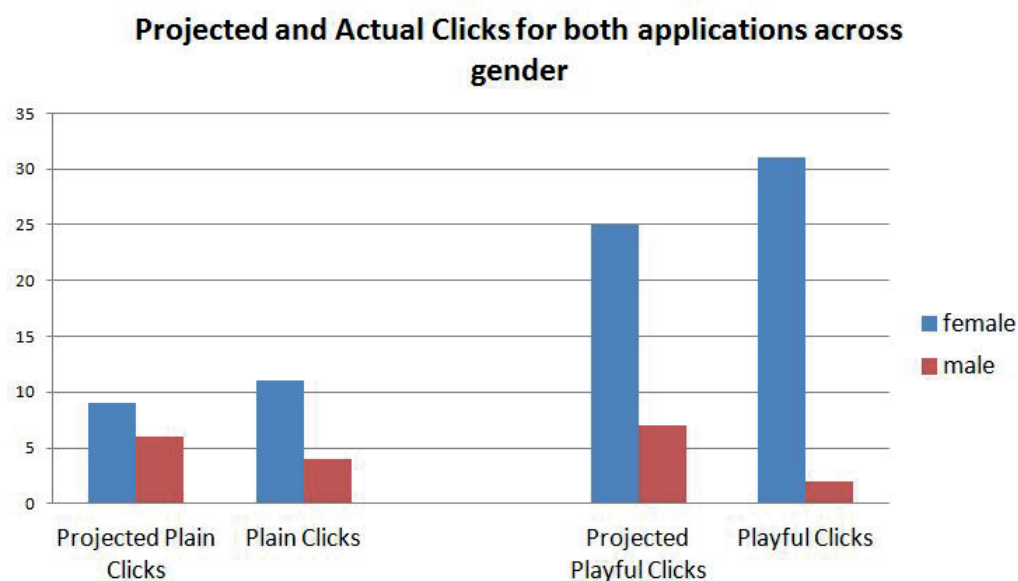


FIGURE 6.15: *Projected* (proportional to the *reach*) and *actual* clicks for both applications across gender.

Furthermore, upon the review of the database entries, we saw that out of 7 users who finished the plain format, 2 were male participants and only 1 out of 15 playful questionnaire entries was done by a male participant. Therefore, we can see that the tendency revealed in the controlled study (section 6.3.4) was also supported by the third Facebook study - males are likelier to go for the plain format rather than for the playful format.

In terms of quality of entries, in both versions the age and gender claimed by the participants matched the data from their Facebook accounts. As for the control question, the playful questionnaire entries revealed 6 out of 15 and the plain one 3 out of 7 discrepancies.

Finally, figure 6.16 focuses on the interest to the playful questionnaire across participant countries and contains data collected from 2 Facebook studies: the female only study (till May 17, 2015) and both genders study (May 17-22, 2015) across 6 countries excluding India. We can see that the *reach* data from the Netherlands, Denmark and Australia is significantly lower than the reach in the other three countries (controlled by Facebook Ad policy).

Nevertheless, the graphs in the bottom part of the figure 6.16 indicate the difference between *actual clicks* and *projected clicks* (proportionate to the reach) in *percentage*. We see that in Belgium, inspite of one of the highest *reach*, the *actual clicks* are noticeably lower than what could have been expected with indicated *reach* data. Similar

tendencies are observed in the Netherlands and Germany. Australia and Great Britain demonstrated better *actual click* data than could have been expected with their *reach* data, while USA's clicks were proportional or slightly lower than expected by the *reach*.

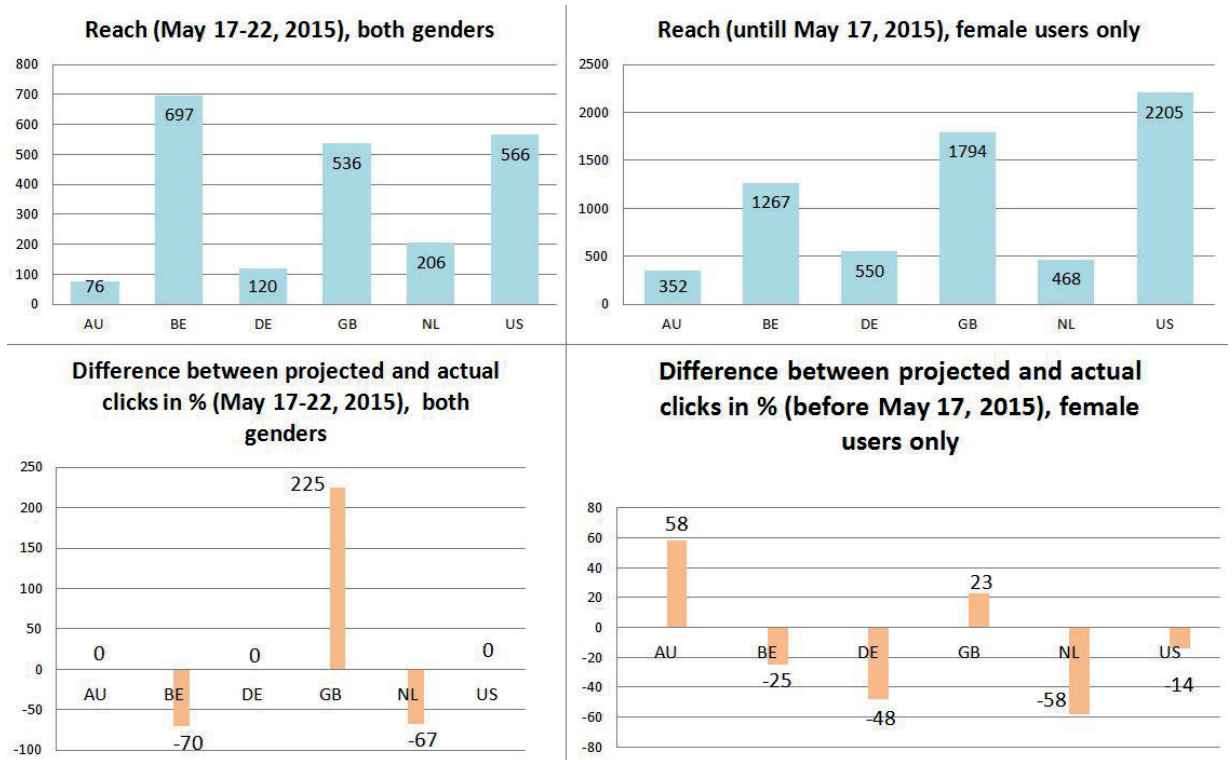


FIGURE 6.16: *Reach* and *click* of two studies by countries (excluding India).

A possible explanation might be that the language proficiency has some influence over the engagement in the countries where English is not a state language since United States, Australia and Great Britain scored higher than other countries, and two of them even higher than the expected performance (*projected clicks*).

## 6.5 Conclusions and Discussion

We ran 5 different studies on the subject of playful questionnaires:

- controlled environment study to get qualitative feedback
- crowdsourced platform study to evaluate user performance under a time-constrained environment

- general Facebook study with female users to see if there is indeed any interest from the target audience
- data entry evaluation study that focused on the analysis of the validity of the Facebook data entries
- gender differentiation study that measured differences in the interest displayed by male and female users

The studies allowed us to summarize the observations and make the following inferences.

1. The results of the usability evaluation and observation (section 6.3.6) allowed to draw the following conclusions:

- keeping the interaction method consistent throughout the game (i.e. either dragging, or clicking);
- giving users clear clues regarding their next steps using textual guides or animated elements instead of letting them guess;
- minimizing the use of text as much as possible because users tend to skip through instructions and prefer to follow the hints given by graphics.
- letting users concentrate on one element at a time instead of overwhelming them with a bundle of tasks.

2. The control study and the test run in the time constrained environment indicated that there are users who prefer to deal with the standard version due to the faster speed of execution (sections 6.3.4 and 6.3.7). Also, the results of the time-constrained experiment (section 6.3.7) showed significant influence on the performance rate of the playful questionnaires (more mismatches). Therefore the playful storytelling version might be used in the situations when users are seeking fun and have allocated a certain time for the experience, rather than in the situations when they are facing external time constraints and are wishing to get done with the survey as soon as possible.

3. At the same time, the female only studies showed that once the participants start either of the formats, there are only slight differences in the completion rate (section 6.4.2 table 6.1). While, the study that involved both genders indicated significantly higher completion rate of the playful format (table 6.4). It is also vital to pay attention to the fact that a visual style of the exposure message introduces a certain bias in the data.

4. While males also participated in some of the studies, more women than men showed interest towards both applications. Nevertheless, there were more men who participated in the plain questionnaire study than in the playful one (section 6.4.3), thus supporting the finding reported by a control group study in section 6.3.4 (study participants answering the question "which application would you prefer to deal with").

5. The playful questionnaire responses did not reveal more response discrepancies than the plain format. Therefore, we can conclude that the playful elements and metaphorical concept did not affect our participants. This finding is interesting because respondents of the controlled study (section 6.3.2) indicated that they took the plain format more earnestly than the playful one. However, both questionnaires demonstrated a relatively high number of the control question mismatches (section 6.4.2 table 6.2), which raises the importance of further research in this direction.

## Discussion

The gender differences are linked to the *theme, visual style of the application, degree of excitement/aggressiveness, and mechanics*. Therefore, before conducting playful surveys, researchers should make sure that the above-mentioned elements target the right audience.

As for controlling the quality of the answers with the *control questions*, this approach proved to be indispensable. Also, one should make sure that the application's mechanics also motivate users to be truthful, although we couldn't measure the influence of it in the real Facebook studies. In our case, the reward (the correctness of personality reading) was made dependent on the correctness of the answers entered by the players.

However, it is clear that a non-controlled environment allows people to be more careless. More studies are needed to see whether claiming a different purpose for the survey results might result in different degree of data validity.

To sum up, the project presented in this chapter helped to understand the possible issues touched by the *research question* in the beginning of section 6.1, namely *whether users are swayed away from the real purpose of the interaction and become too focused on the aesthetics of the playful application objects; and what degree of interest would such an approach entice*.

Moreover, while most playful applications mentioned in chapter 2 focused on making the interaction process more attractive and pleasurable, with our project we attempted to demonstrate that one can also import 'unrelated' story telling mechanisms and push the distance between the original meaning of the questions and their metaphorical representation further without significantly compromising the quality of user input.

Secondly, this project taught valuable lessons regarding possible usability issues of such applications and has paved a ground for the larger project presented in chapter 7. The purpose of the next project is to find answers to the *2nd research question* presented in the beginning of chapter 6, namely how to build a social network game that will counteract the carelessness of users and will encourage them to enter a high quality data while enjoying the playful elements of the game.

## Chapter 7

# Social Network Game with Human Computation Elements

### 7.1 Introduction

The evaluation presented in chapter 6, in particular the conclusions and observations summarized and discussed in section 6.5 as well as the conclusions drawn upon the analysis of the existing human computation games and the response of players to them (section 2.7, 2.8), encouraged us to take one step further and construct a more complex gamified system, called *Architect*<sup>1</sup>, which represents a serious game with social network elements that focuses on image tagging.

With this project, we attempt to explore deeper our research question agenda, presented in section 2.2, which focuses on the feedback users may give toward social network playful applications that contain classic human computation tasks within its mechanics. We are interested in knowing whether these types of games are capable of attracting the sustainable interest of players as opposed to being a subject to one-time trial play.

While the results of the research presented in chapter 6 showed that users were not distracted from serious tasks that were masked behind playful metaphores, in this chapter we want to focus on developing a system that will motivate users to provide good quality input in repeated game sessions.

Additionally, we changed the serious task from human subject data retrieval (opinion mining) to entity annotation because unlike the latter, opinion mining does not require repetitive plays, which is what we would like to explore as part of our research agenda.

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<sup>1</sup><http://hcompgames.com>

While there are a few objects that can be annotated: images, videos, and texts, we decided to select only one of them to avoid game overload, namely image tagging task. We felt that due to the fact that we want to appeal to the widest public possible, we need to avoid significant strains on users' time availability (might be the case with video tagging) or their linguistic abilities (in tasks related to text disambiguation). Both factors might be serious game flow breakers.

However, before focusing on the game mechanics, we felt it necessary to conduct extra studies regarding the ways to integrate serious tasks (image tagging) into the game.

## 7.2 Image Tagging

Image tagging has already been addressed in the games discussed in section 2.6. Most of the games presented there were based on the simultaneous interaction of two or more players interacting with each other at the same time. The game sessions were limited to a few minutes. Users would be shown images for which they had to generate tags unaware of each other's input. If a tag that one player generated is repeated by the other player, both players gain points and are given a next image to tag. So, the database retained only tags that both sides 'agreed on'. While this game set-up provided fun to the users, and allowed to generate good quality tag data, there were still a few shortcomings:

1. The set-up requires the simultaneous presence of a minimum of two players, which due to the lack of sufficient number of users entering the game simultaneously, resulted into integration of recorded sessions with the real performance, which some players regarded as dishonest because this part of the game mechanics was silenced.
2. Many valid words are laid off due to the necessity to generate identical words under a very limited time. This results in the generation of generic tags [Bry et al., 2015] because words with deeper semantic meanings are entered less often since the chance of winning with them is lower.
3. The game set-up is pretty specific and may not appeal to players that prefer other game categories.

Since the objectivity of word rejection proposed in this set-up is questionable (the validity of the tag is judged against the choices of only one randomly matched player), we would like to propose a process of tag confirmation that is based on tag recognition rather than co-creation. We believe that this set up allows the system to keep a greater number of



useful tags, and gives users freedom to describe more complex concepts with lower risk of rejection.

Thus in our concept, the image tagging is deconstructed into 2 sub tasks:

1. tag generation (by one player)
2. tag confirmation (by another player)

Both players - the tag generator (1st activity) and tag evaluator (2nd activity) - should be equally punished or rewarded in case of tag failure. This motivates both players to do their best in both roles.

Additionally, we needed to explore the following aspects of integration of image tagging into a game:

1. **Will various ways of displaying images (single and multiple) motivate users to generate different kinds of tags?**
2. **Which tag appearance methods help to ensure effective tag verification?**

Two possible options are: presenting one tag at a time or displaying all tags together (for a limited number of images).

Also we needed user feedback regarding the game including a feature that allows reversing the tag assignment/verification decision.

## **Test Methodology**

In order to answer these questions, we conducted a small study involving 8 users and a paper prototype with images and tag objects. The users were asked to participate in 2 different activities (production and verification of 24 image tags). The test drive was concluded with a small interview to collect feedback regarding suggested interaction methods.

## **Participants**

The evaluation of image tagging issues involved 3 males and 5 females ranging from 22 to 33 years old ( $M = 27.7$ ,  $SD=4.1$ ) with different educational backgrounds (business, computer science, sociology) and three education levels (Bachelor, Master and PhD).

Participants took part in the study in individual sessions. Before users started the task, we would explain to them that the quality of the tags that they generate influences the

ability of other users to confirm the correctness of these tags and thus reflects on the quality of their own input.

### Materials

Six general photo themes were chosen: food, nature, people, sports, animals, and city. Two images per theme were selected, making a pool of 12 images used for the prototype testing.

Displaying two images of the same theme together was intended in order to see how users respond in terms of differentiating images. We assumed that when displayed sequentially (unaware of what the other images are), users might give more generic tags, but when images of the same theme are displayed together, users might feel pressure to give more specific tags that will allow them to better differentiate tags from each other.

### Tasks

The study involved two stages: tag generation and tag verification.

During the first stage (tag generation) participants were asked to tag images using two different display prototypes (figure 7.1 ).

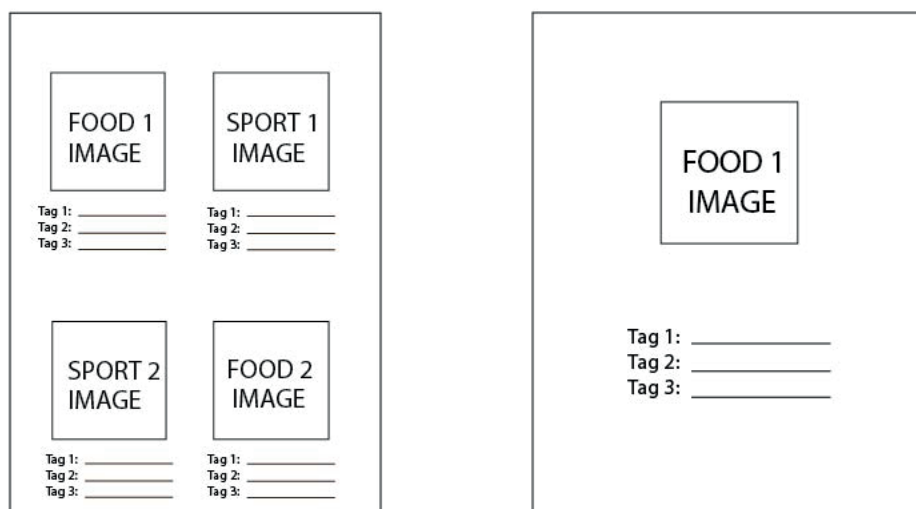


FIGURE 7.1: Two image display methods used for the study.

The pairing in the first prototype variation was introduced in order to help answer the question regarding the way of presenting images in order to motivate users to generate more specific tags.

The assumption was that by displaying thematically paired images we may encourage users to create tags that allow differentiating one image from another instead of generalizing them and thus receive a clearer answer to whether there is a quality difference

between tags generated for single and group image display method. For example, when a food related image is displayed alone as suggested in figure 7.1, users might give it a 'food' tag. Yet, when two food images are presented as shown in figure 7.1, users might avoid using food as a tag and use more specific words that would allow to more easily distinguish one food related image from another. Also, thematic pairing of images is reasonable because it covers real game situations when similar images may be loaded into the game activity at the same time.

During the second stage (tag verification), users were asked to recreate the connection between images and tags generated by other users through the group image display and through the single image display method. The mismatches of both methods were then counted. The purpose was to see whether one of these image display methods generated a higher number of mismatches.

Also during the 2nd stage, we proposed two methods of interaction with the image and tag objects: dragging tags from a hidden pool of 12 tags to one of 4 images one at a time, or assigning connections between openly visible 12 tags and 4 images. During this stage, users had to attach 3 tags to each of the 4 images that they were given to interact with. The goal of introducing two interaction methods was to find the way that participants find more user friendly. The figure 7.2 demonstrates the dragging method of assigning connections between tags and images.



FIGURE 7.2: Dragging tags to matching images.

**First task.** During the first stage, 192 tags were generated. Out of them 96 were generated through the multiple image display method and 96 through using the individual

display method. During the second stage, these tags went through the confirmation process with the same participants making sure that they work with the tags generated by other players. In addition, the first two testers had no tags to correct; therefore, they had to come back at a later point of time once again and verify the tags created by the other test participants.

During the second stage, the mismatches between the originally generated tags and the re-created combinations were collected. Out of 96 tags that were created during the first stage with the multiple image display method, 24 tags failed to be re-matched by other users. As for the single image display method, 26 out of 96 tags were not reattached to the original image. These results did not reveal any statistically significant differences between the two display methods.

We may assume that the possible reason was that users were aware that the tags would have to be verified later on by other users. Therefore they might have kept away from too general tags like "food" or "people" both in *multiple* and in *single view* options. To sum up, both methods, individual and multiple image display, demonstrated to be valid methods for the image tagging.

Therefore, we felt it is reasonable to choose the method that would better match the story and the flow of the game. In our case, in the *Architect* game we decided to use the *single image display* option.

At the same time, it is important to note that the failure of users to rematch tags to the original images should not be considered as a mistake of the users who rematched images and tags generated earlier. In fact, it is also possible that the tag-image pairings suggested during the confirmation stage might be better suited than the original tag-image combinations. However, our agenda was not in finding better pairing options but rather in understanding which method renders more mismatches. Nevertheless, if the goal of the research is the estimation of the quality of tag-image pairings, an additional third party evaluation of the original and recreated matches would be required.

**Second Task.** Seven out of 8 users indicated that the process of physical interaction with the tags and image objects (appearance, movement, attachment) is more fun than a simple indication of a connection. Also, when asked whether users prefer to see all 12 tags at the same time or to see one tag at a time, 7 out of 8 users indicated that they prefer to see all tags before making their decisions **if** their decision is irreversible; however, if they are allowed to change the tags, then revealing tags one at a time is also a viable way of presenting tags. Thus, along with the 2nd question, users helped to clarify whether we should allow reversing the decision or not.

**Conclusion** Following these results, we decided that for our *Architect* game we will select the option that displays one tag at a time, while giving users the opportunity to reverse their decisions. We believe that out of the two options it fits better into the gamification concept (allows raising suspense) as well as improves the aesthetics of the game.

Also, we observed that by the end of the experiment, the test participants were tense and by a degree tired, which did not fit into the concept of easy and pleasurable game play that we would like to create in our social network game. Therefore, we felt that we needed to take precaution and limit the number of serious tasks and intermingle them with the fun tasks. We decided to let users create three tags for one image and verify 12 tags of 4 images per game cycle. The integration of the image tagging with the game is discussed in section 7.3.

## 7.3 Architect Game

### 7.3.1 Theoretical Models of Motivation

Various theoretical models of motivation covered in section 3.2 refer to the needs of the players to be part of the social network and possibly, social network game environment. By developing a game that is distributed through a social network, we are following the *User-gratification Approach* that explains the need of users to reach out to the media world as a group (section 3.2.3). This need is deeply rooted into the life experience, established behavioral patterns and expectations.

The *Self-Determination Theory* (section 3.2.4), however, emphasizes the necessity to provide users with the opportunity to establish *competence, autonomy and relatedness* within the group environment. In other words, in order to be motivated to play a certain game, the players should be provided with the opportunities to prove one's competence, be given the personal virtual space, and be allowed to relate to other players, which corresponds well to opportunities given by many gaming platforms, including social network game environments.

At the same time, the *Social Influence Model* (section 3.2.4) focuses on group thinking and social norms as shaping tools of the individual behavior. Being part of the social environment (in our case virtual) allows users self-discovery in terms of interactions with others, provides a feeling of purpose, helps to maintain contacts with other members and serves as the source of entertainment. As a result, the motivational aspects of the *Social Influence Model* prove particularly relevant to the project described in this

chapter. The model is focused on the importance of the *interconnectivity* and *social enhancement* values, which will inevitably be established as players cooperate and/or compete with each other. The variety of social interactions in *Architect* are described further in greater detail in sections 7.3.3, 7.3.6, 7.3.8 and 7.3.9.

Moreover, considering the major challenge of human computation games, which is *perceived usefulness* or *value* of the game to the potential player (presented as part of the TAM model in section 3.2.1), we have to emphasize the *aesthetics* of games, which are presented by [Hunicke et al., 2004, Schell, 2008] in section 3.3.3. In other words, the game has to offer a variety of "fun" experiences such as *discovery*, *narrative*, *sensation*, and *challenge*, which can bring the players closer to *immersion* or at least *engagement* (covered in greater detail by Pine and Gilmore [1999] and [Brown and Cairns, 2004] in section 3.3.5).

In addition, considering the social network aspect, most games with a purpose (GWAP) published on social networks so far were not developed as social network games, typical features of which are described in greater detail in section 4.1; rather they were developed as simple casual games that utilized social platforms for the purpose of game deployment, and with even less consideration for the maturity stages of the players (section 4.4). Therefore, to construct a game, we use the guidelines for developing a classical computer game presented in section 3.4 and the additional set of heuristics for social network games covered in section 4.2.

### 7.3.2 Aesthetics, Engagement and Motivation

Although gender proportions are not crucial for the image tag quality, we decided to create a non-violent cooperative game - a viable set up for the systems where participants should verify each other's input (section 2.7) that should appeal to general public, but possibly more to the female segment of the social network game players, as they proved to be a larger part of social network player base (based on Berry [2011] and results of the study presented in section 5.2.2).

Considering the different social network game genres presented in section 5.3, we felt that a mix of the two game genres is most desirable.

For the major game workflow, we opted for the *simulation game genre* presented in section 5.3.1 Unlike sport, action and adventure games, this one does not focus on time pressure or adversary attack as a fun factor and instead gives users time to look around and consider their choices. Additionally, this genre appeals a lot to the female players, allows a great variety of themes and stories that can be easily modified and includes a

never-ending game play as well as the opportunities to set one's own goals, described in section 5.2.3 as one of the most important parameters of the attractiveness of social network games to players.

Secondly, we adopted the *light puzzle/word game genre* presented in section 5.3.5 for the serious task activities due to the fact that the tag creation and confirmation represents activities that are best described as light word challenges. Additionally, according to the questionnaire analysis (section 5.2.2), it proves to be a popular game genre among both genders, and in particular females.

Although the conclusions presented in the section 5.2.3 suggest that most social network players play games outside the social network, we nevertheless had to keep in mind that due to the unexpectedness of some features or tasks presented in our game we have a few important points that we had to focus on during the development of the project:

1. Since the game strategy is cooperative, the mistakes of one player may affect the performance of other players. Therefore, it was important to provide all necessary mechanisms to help users avoid making them and strengthen the image of the game as a cooperative place (section 2.7). Additionally, we made sure that the impact of the punishment is minimized not to discourage players from contributing further.
2. Being aware of the variety of user behaviors in general (section 4.5.2) as well as in the social network game genre (section 5.2), we created three different status accumulation points: growth as an architect (asset creation), as an investor (asset assessment and purchase) and as a gardener (delivering materials for asset creation).
3. As the models of heuristics presented by [Desurvire and Wiberg \[2009\]](#) in section 3.4 and [Kim \[2009\]](#) and [Deterding \[2011\]](#) in section 4.3 (covering the social network game construction aspects) suggest, the clarity of the progress schema is very important. We made sure to provide clear information about the goal and subgoals that the players face and small action blocks that contribute to the progress. Also, following the issues raised in section 3.3.1, we offered variety of rewards such as unlocking bonus items and assets generation tools as the progress incentives.
4. Following the observations given by the human computation game developers [Terry et al. \[2009\]](#) (section 2.7) and being aware that lengthy tutorials may result in early game drop out, we followed the suggestions given by [Zichermann and Cunningham \[2011\]](#) and [Schreiber \[2009\]](#) in section 4.4 by making instructions minimal and presenting them as game hints that lead users through the game doing actions that they can't fail at.

5. In the traditions of good game usability principles covered in section 3.4, we made sure that we provide an audio-visual feedback for every action or achievement that users made.
6. As a social network game, our game with a purpose would benefit from the typical social game construction guidelines presented in section 4.3, which include *rewards for coming back*; *interruptibility*; *using themes from popular culture*; *virality and sharing* (rewarding players for inviting and gifting friends); *narrativity* (broadcasting of in-game events as a narration on the player's social network news timeline), sophisticated *return mechanism*, *rhythm design*, ampleness of *positive feedback*, and *sharing* information and assets with friends.
7. To address the issue of keeping up with increasingly complex game assets of social games, we decided to engage the approach discussed by Kirman et al. [2008]. It suggests utilizing a user empowerment mechanism in the asset creation and management of the game, which potentially saves efforts, time and money to game developers/researchers while creating an engaging experience for players [Kirman et al., 2009].
8. In addition, one needs to consider different types of playing patterns that users display, described in section 3.3.4. According to the model presented in that section, users may have a different gaming focus such as exploring the world, reaching achievement goals, or socializing. Indeed, according to the research done by ISG [2010] and that of our own (section 5.2), social network players often enjoy seemingly contradictory aspects of gaming. For example, the same users indicated that they value the excitement of competition with friends and yet enjoy relaxed gaming to get away from the stresses of life. This leads to the assumption that depending on different mood and time the users intentions and preferences may variate too.
9. We position our serious task as one of the few playful activities rather than a primary gaming goal.
10. Playful activities were shaped as fairly independent blocks (mini-games, mini-quests) that are connected through storytelling, but can be replaced, improved or in some cases removed without destroying the game. This makes the game space more flexible for further improvement and extension. For example, the *Bake Your Personality* project described in the chapter 6 can be potentially integrated into such a game as a special "mission".
11. Serious tasks were positioned as light "puzzles" that add to the engagement of the game. Indeed, gaming reports have proven that most popular social games employ



easy-to-solve puzzles to create a sense of excitement and accomplishment without creating undue strain for an average social network user as in the games presented in (sections 5.3 and 5.4).

12. To decrease the risk of breaking the flow of the game, we followed the observations made in section 2.7 and deconstructed the tag generation process into two tasks that were separated into two game activities as presented earlier in the testing prototype described in section 7.2.
13. Also we made *users-content generation* as part of the game. We believe that social games have not quite used the creative energy of players as an engaging element of the game. At the same time, free content creation requires some guidelines and control. Kirman et al. [2008] suggest to guide the creative process as much as possible (section 3.4 and 4.3) or players may push the boundaries of what is appropriate. Consequently, we introduce content tracking and reporting mechanisms in our game.

Nevertheless, one should accept the fact that gamification can't motivate users forever Smalls [2013]. One should be aware that the freshness of any game eventually goes away, which makes essential promotion of the game in order to attract new players.

### 7.3.3 Game Activities

Guided by the review of social network games provided in section 5.3 and the feedback of social network game players collected and analyzed in section 5.2, we decided to build the game around the concept of the virtual space development (figure 7.3). Consequently, the players progress by filling out the virtual space with game assets, which allows players to set up **farms, villages, cities, states and countries** in a step-by-step process, in which the lowest construction blocks are **buildings and trees** as mentioned as a third point in section 7.3.2.

Their construction requires participation in a few activities, which are quite typical for the *simulation game genre* analyzed in section 5.3.1:

1. Buying materials;
2. Shipping materials of other players;
3. Creating house models;
4. Earning trees.

FIGURE 7.3: Welcome page of the *Architect* game.

Understanding the desire of variety covered in section 3.3.2 and the necessity to include the social interaction (emphasized in all motivational models presented in section 3.2), we created optional activities that enlarge the scope of actions and allow indirect interaction:

1. Buying and selling house models created by other players instead of constructing them;
2. Rating the works of other players;
3. Earning bonus items;
4. Sharing created content with social network friends.

The figure 7.4 presents game mechanics of the *Architect* as a loop of possible activities with the process of **image tagging** being divided between two activities: *order placement* and *shipping* (as mentioned in the point 12 of the section 7.3.2).

After users finish the order placement ( image tagging activity), they are invited to create their building model using samples of the ordered materials. Meanwhile the image-tags combination that was created during the order placement is sent to a database to be further exposed to other users for quality control and filtering (*Shipping Materials activity* in figure 7.7)

The most important game blocks are discussed in greater detail in the following sections 7.3.5-7.3.8.

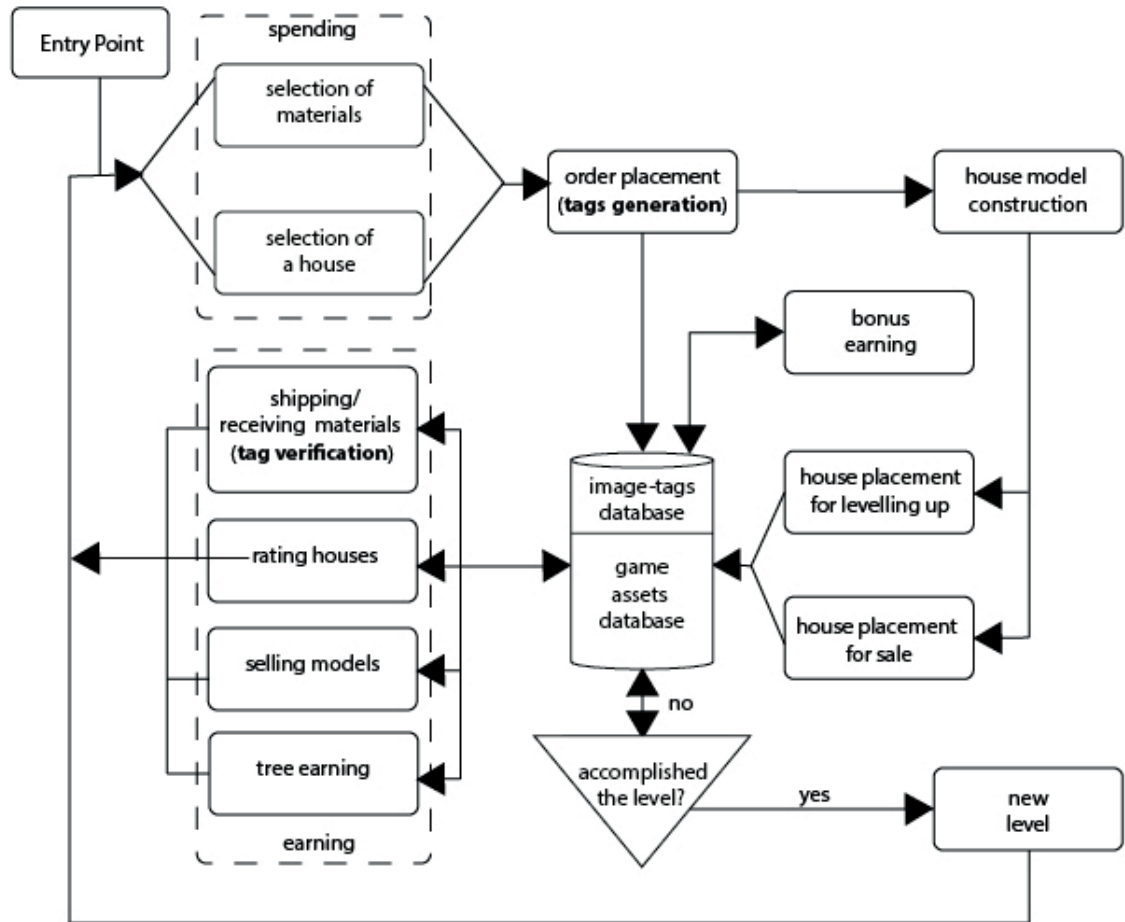


FIGURE 7.4: Architect game process diagram.

### 7.3.4 Image Database

As a test image database, a set of 1000 images was loaded into the game for tagging. The images were retrieved from *Flickr* and a certain number of them had tags created by the picture owners. While most of those were personal tags (i.e. "son", "Andy", "grandpa") or location specific tags (my back garden, Mountain Hill street, Somersberry market), for the sake of later analysis we filtered out 100 control images that had general tags (travel, pond, morning) and revealed no personal data. This set of images would later serve for testing the quality of tags acquired through the game.

### 7.3.5 Selection of Materials and Order Placement

As gamers log into the game, they are granted a certain number of coins that allow users to make their first purchase as is typical for simulation games (section 5.3.1). They are invited to start off by visiting a *Market* where one can *select materials* and *place*

an order. During the *material selection process* (figure 7.5), users have to choose up to three different materials that are used in the construction of the model. Once users select materials, they can proceed to the *order placement* (figure 7.6), which consists of labelling the shipping containers with words that match the image (presented as a unique order identifier).

The number of images per order placement was decided after a user evaluation discussed in section 7.3.5. At the same time, while there are no specific research results on which we base the choice of 3 tags per image, we felt that this is an optimal number when it comes to the tag verification process described in the following section 7.3.6.

Additionally, the entered input is checked so that users cannot enter multiple words, spaces, numbers, symbols and use foul language, which they are warned about during the data entry process (figure 7.6).

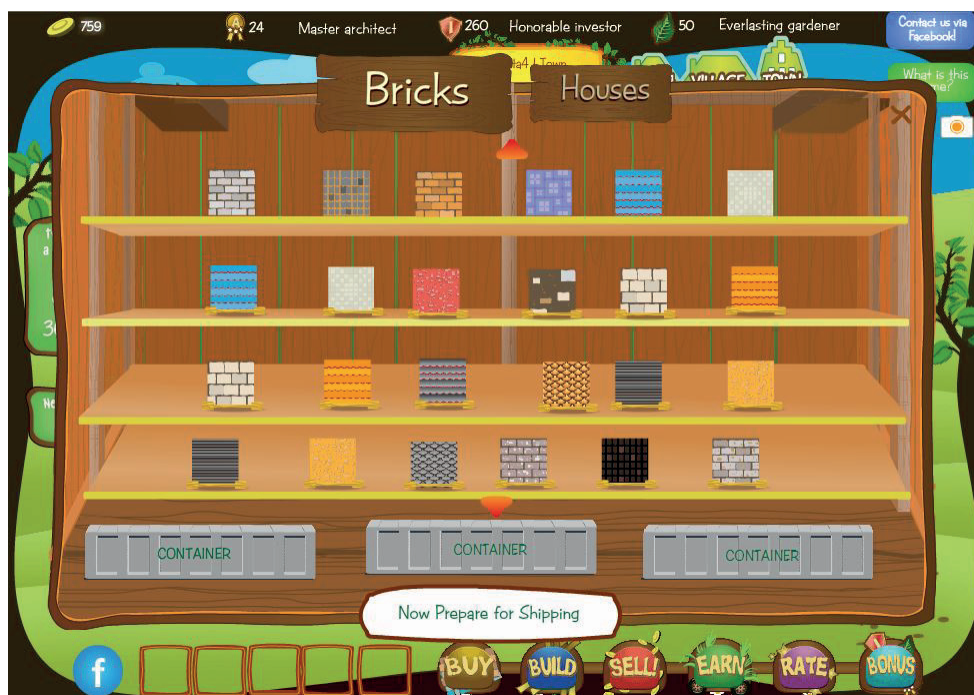


FIGURE 7.5: *Material selection activity screenshot.*

### 7.3.6 Shipping Materials Activity

To earn *coins* and *trees*, users have to use the *shipping activity* (figure 7.7) to solve light puzzles of matching tags and their respective images that were created by other players during the *Order Placement* described in section 7.3.5. Four images and twelve tags (3 per image) are loaded into the game (data collected from 4 different users, or the same users but different game sessions). The process of tag appearance was designed based



FIGURE 7.6: Creating shipping labels.

on the results of the experiment described in section 7.2. It was decided that instead of revealing all 12 tags simultaneously, we let the tags appear one-by-one while giving users a chance to reverse their decisions.

Upon activity loading, users see 4 images (presented metaphorically as trucks) and users need to click on the *warehouse* to let a new *container/tag* appear. The containers hold tags that were previously created by other players. Next, users have to drag the containers to the trucks with the most relevant shipping document image. If users do not find the tags relevant to any image, they can trash the containers without being financially punished.

The trashed tag and its image are reported to game creators and are approved or ignored by the game moderator. It is important to note that each tag is verified 3 times in order to be retained as a valid tag.

Once users are done with all 12 tags, the outcome is revealed. If the image-tags combination coincides with the original combination, both players (the tag generator and tag verifier) receive a financial reward. In case of a mismatch, the tag verifier loses the opportunity to earn coins and trees needed to progress through the level and the tag generator is charged extra coins for badly labeled containers, thus making the process of tag generation and verification mutually painful or rewarding.

FIGURE 7.7: *Shipping* activity.

### 7.3.7 Asset Construction Activity

The house modelling activity is not contributing to the image tagging but rather is a reward for fulfilling previously described activities that involve a serious task and is described in previous sections 7.3.5 and 7.3.6

Figure 7.8 demonstrates the *house model/asset construction activity*, where players are encouraged to create models using use various tools (shapes and materials). Users can also reference models built by other players in order to understand the principle of model construction and learn creative tips.

This activity accomplishes two goals: firstly, by incorporating the *user asset generation*, game creators avoid the process of game asset development; secondly, the process boosts user engagement and creativity.

Effort and mastery in this activity are encouraged by ratings and financial rewards earned from other users as described below.

### 7.3.8 Rating Activity

The rating activity allows to boost the value of the assets created by users in the house construction activity. Participating in it earns users *Investor* points and awards the

FIGURE 7.8: *Asset construction activity.*

asset creators with the *Architect* points. The purpose of the *Rating* activity is to create the feeling of interaction with other players as well as to give users the feeling of progress and acknowledgement of their efforts, the necessity of which were described in section 7.3.1. In addition, it included the content reporting feature, described as important by Kirman et al. [2008] in section 7.3.2.

### 7.3.9 Facebook Integration

To provide additional sociability as discussed in multiple points in section 7.3.2, we integrated the game into the Facebook platform and took advantage of the social features it offered; we integrated the friends list feature, which displays neighbors and their progress statistics. It also serves as a tool to invite friends. Secondly, users can publish the snapshots of their assets on their walls and also publish the snapshots of their virtual spaces on the game's page. Also, as rated assets earn users their points, users receive updates in their own news feed.

Following the issues pointed out by Paavilainen [2010a] in section 4.6 and those discovered by the study in section 5.2.2, we decided to avoid extensive news-feed notifications and requirements to have neighbors in order to progress, as these were one of the most negatively viewed features of the social network games.

### 7.3.10 Technical Aspects

From the game construction point of view, there were two strategies to follow: work with one of the existing game engines and try to fit the serious tasks into pre-built features; or create an entirely new game and thus have a freedom to design the storytelling as desired. Additionally, due to the skills set of the developer, it was desired to stay with the flash technology.

While most of the social network games presented in section 5.3 were created with 2.5 dimensional game engines, the review of similar open source engines proved that integration of the modules related to the serious task is a very complex task and would require severe changes both on the server side and front-end structure of the templates. At the same time, since most pre-built features that they offered were not related to our game and many desired features did not exist, it was decided that a better way is to create a new game using open source packages that meet our purposes.

In addition, this approach proved to be more efficient because of the iterative game development, which we realized was necessary, since numerous elements of the game were added or modified multiple times throughout the development process, in order to find the story telling solutions that are more relevant or user-friendly. Consequently, the game was developed in an iterative way. After each review cycle, additional features or enhancement of existing ones were considered and executed when needed.

We used Adobe Flash and Actionscript 3.0 to provide a front-end interaction, and an open source *Amfphp* package for a back-end server, which accepted and handled calls from the game (user authentication, error handler, user activity records, etc.), and processed MySQL queries from the database kept on a virtual host provided by *Bluehost.com*.

Additional open source packages were used to enable game features and are as follows:

1. *Sound Manager* by Rafael Rinaldi to enable audio support of the game.
2. *Greenstock Tweening Platform* to enable animation.
3. *Facebook Graph Package* by Adobe Systems Incorporated that allowed to integrate the game into the Facebook platform, and enabled user identification and tracking of the game sessions.
4. *Collision Detection Package* by Corey O'Neil to detect collision of tags with the images in the tag verification activity.
5. *Graffiti Canvas* provided by Nocircleno.com to enable tools for asset construction by players.



6. *PNG Encoder* by Adobe Systems Incorporated in order to save assets created by players in the database for further use.

We used two databases for our game. The first one was provided automatically by the Facebook developers platform. It kept track of the players' response to the game (i.e. clicks, likes), players' locations, their gender and age. The second one was created by *Architect* developers to keep track of the following data:

1. User performance tracking (scores, number of sessions, reached levels, earned bonuses, build models and their coordinates, etc.),
2. Imported and renamed image names,
3. Image tags list with the status of tag verification/confirmation,
4. Variety of bonus items and their statuses,
5. Assets created by players, their coordinates, status and ranking.

Additionally, the *Flickr* image database was used as a source of images for the tag generation activity and Flickr tags to enable a comparison study of the tag quality at the last stages of the project.

Finally, the technical development of the project was executed by two developers: one conceptual developer, responsible for the game experience, story-telling concept, visual assets and some parts of the front-end interaction, and a technical developer responsible for the back-end, Facebook SDK, and a large part of the front-end interaction.

## 7.4 Facebook User Studies

### 7.4.1 Performance with Female Users Only

The game was published on Facebook on February 15, 2015. The post about the game was exposed to 88 676 female users with 168 414 impressions (number of times the same user was exposed to the game). The game received 2 384 clicks, of them 1866 clicks were unique and the other 518 clicks were repeated. The post about the game was liked or shared 310 times.

The separation of the two databases described in section 7.3.10 did not allow us to employ a deeper analysis of the game data and players' performance. For example, correlation analysis of the data contained in both databases (for each player individually)

would have been useful since it allows exploring correlations of demographic data and of user performance. This issue could have been ammended by gaining access to the demographic data of players through the game; however, as of March 1, 2015, Facebook legally limited access to the demographics of subscribers through the Facebook SDK, unless the application fulfills certain criteria (demographic data directly relevant to the content of the game). After the review process, Facebook judged that our game does not match this criteria. Therefore, we were limited to the separate analysis and review of the demographics, and of the players' performance as described in this and the following sections.

Figure 7.9 demonstrates the number of game sessions played by all users from the period of 5th February till 5th May. Out of 1409 users, only 13 dropped immediately, while the rest explored the game. Out of 1396 users, 381 came back for the second game session (27 percent of users), 82 players came back for the 3rd session and 25 players engaged with the game at least 6 times. The user involvement follows the *power law* described by a few researchers in section 2.8.

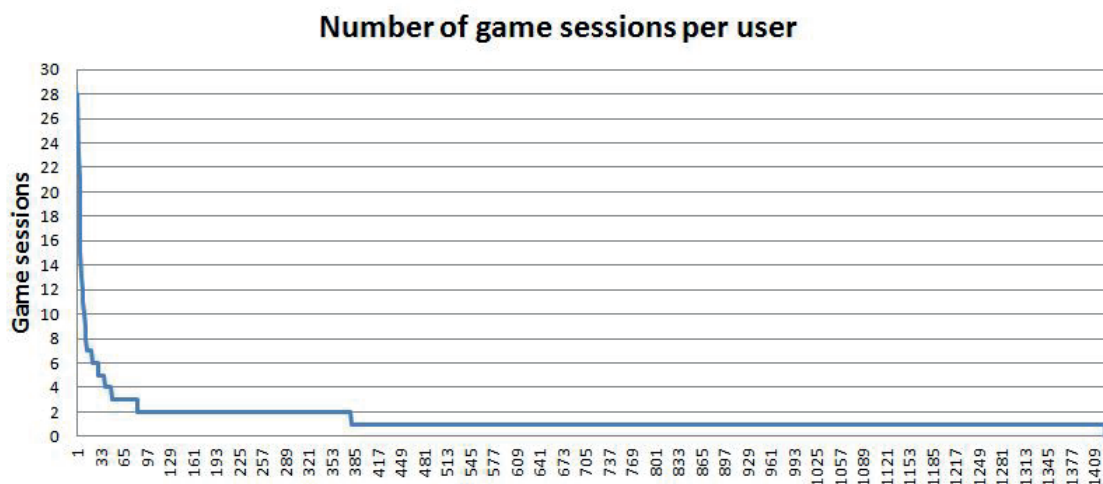


FIGURE 7.9: Number of game sessions per game player.

The figure 7.10 demonstrates the *reach*(the number of people that have seen the post), *actual and projected clicks* (calculated as proportionate to the reach) across 6 countries.

Since the promotional mechanisms that we employed were identical to the ones used for the application described in section 6.4.1, we had limited control over exposure strategy and consequently over the demographics of the participating users. As expected by the results presented in chapter 6, Facebook exposed the promotional message mostly to the users from India and noticeably less to the other targeted countries - USA, UK, Australia, Denmark and the Netherlands.

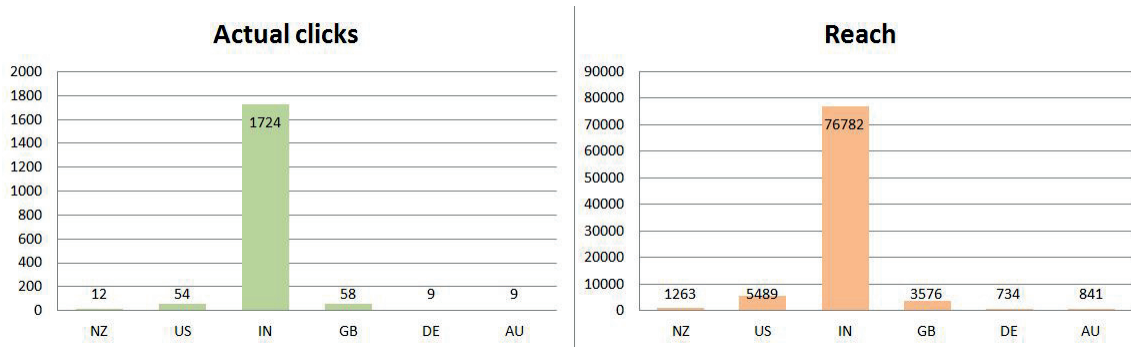


FIGURE 7.10: Reach and unique clicks distributed across six countries.

When comparing the difference between *actual* and *projected clicks* (proportionate to the number of people that saw the post about the game) presented in figure 7.10, we can see that India actually scored slightly higher while the other countries scored less than projected. Nevertheless, Great Britain scored higher than USA in number of clicks although it originally received significantly lower exposure than the US based players.

Figure 7.11 presents *reach*, *projected* and *actual* clicks across ages.

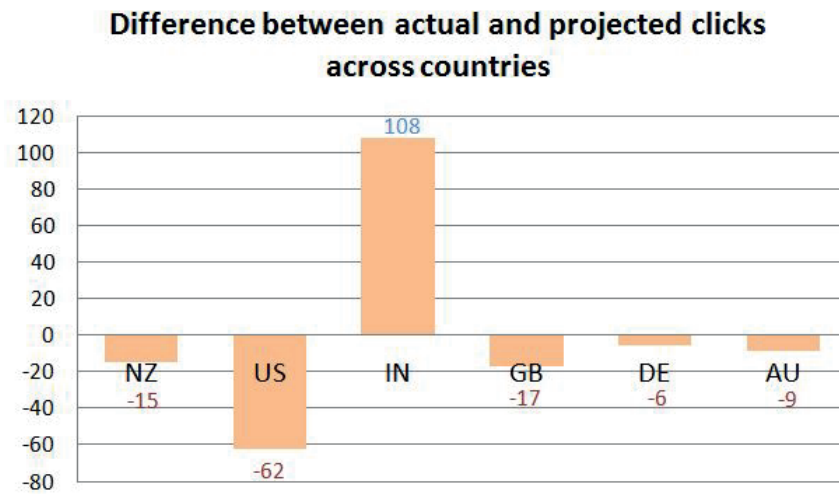


FIGURE 7.11: Reach and unique clicks distributed across six countries.

Figure 7.12 demonstrate the difference between *actual and projected clicks* across the *age* parameter. We can see that the 18-24 and 45-55 age categories performed better than expected, which makes the results similar to the performance of the *Bake your Personality* application presented in chapter 6. A possible explanation might be that these two age categories are the growing segments of the SNS and display more interest to the novelties that Facebook has to offer than all the rest. On the contrary, the 25-34 age group demonstrated significant under-performance compared to expected outcome (215 actual vs. 291 projected clicks).

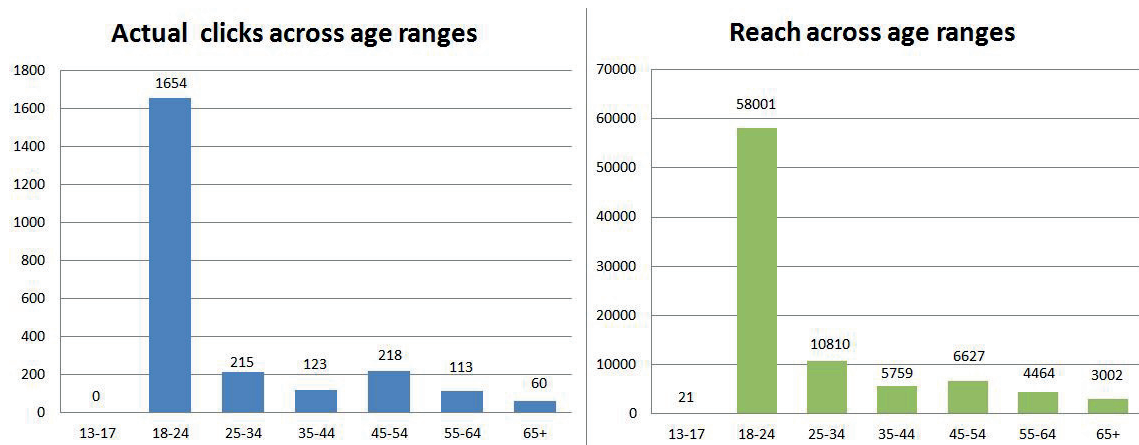


FIGURE 7.12: Actual clicks on the *Architect* game promotional material across *age ranges*.

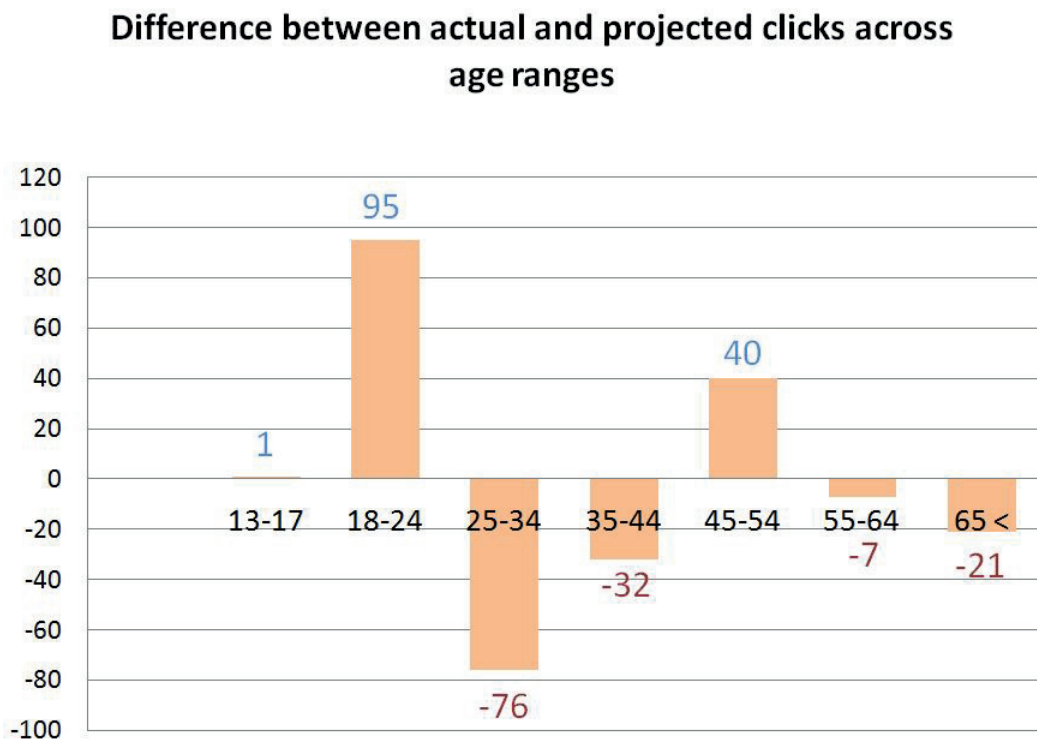


FIGURE 7.13: Difference between *actual* and *projected* clicks (clicks proportional to *reach*) across age ranges.

Finally, while game generation activity is not directly related to image tagging, many, although not all, users have enjoyed creating game assets. Figure 7.14 demonstrates some of the assets created by users.

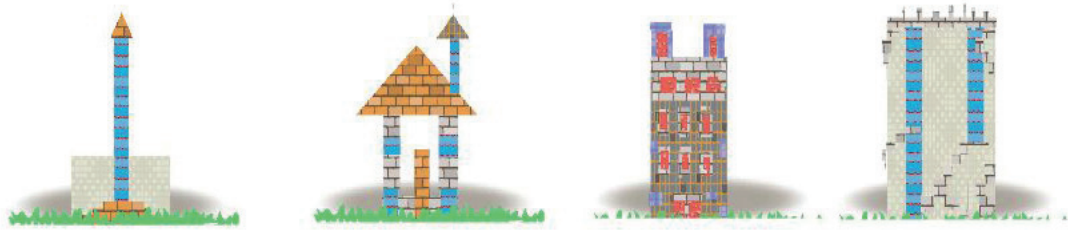


FIGURE 7.14: Assets created by the game players.

### 7.4.2 Performance with Male Users Involved

While the study above included only female players we decided to run an extra study from May 20 till June 8th that exposed the game to both genders from same countries as in the previous study. The goal was to see if there are any differences in users' behavior.

The graph below (figure 7.15) demonstrates the response rate of both genders within this time period. Out of 91 players who played the game, 35 came back again and 9 players played 3 or more game sessions.

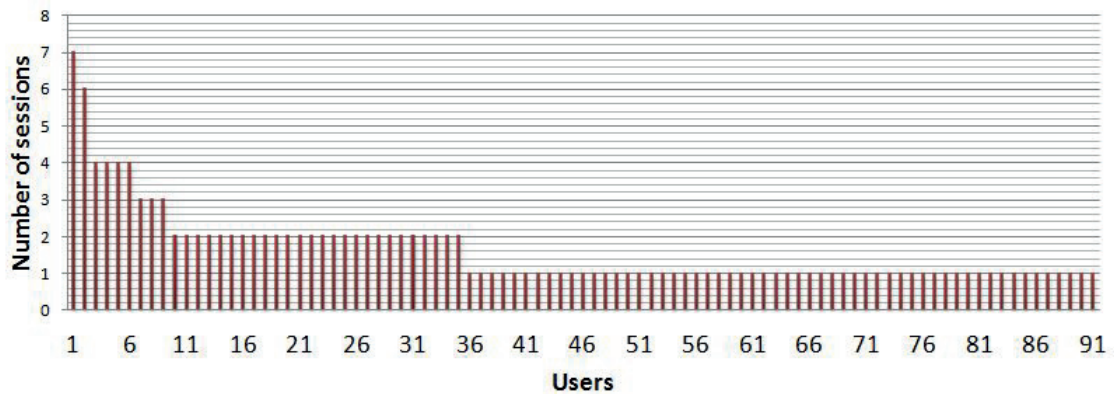


FIGURE 7.15: Total number of game sessions in the second study.

This time Facebook exposed the game to a significantly larger number of males than females (8268 vs. 4231).

Altogether, figures 7.16 and 7.17 demonstrate the playing patterns of male and female players. By comparing them we can identify that while more males than females actually got interested in the game (number of male players), their data ended up showing a slightly lower number of game sessions compared to female players.

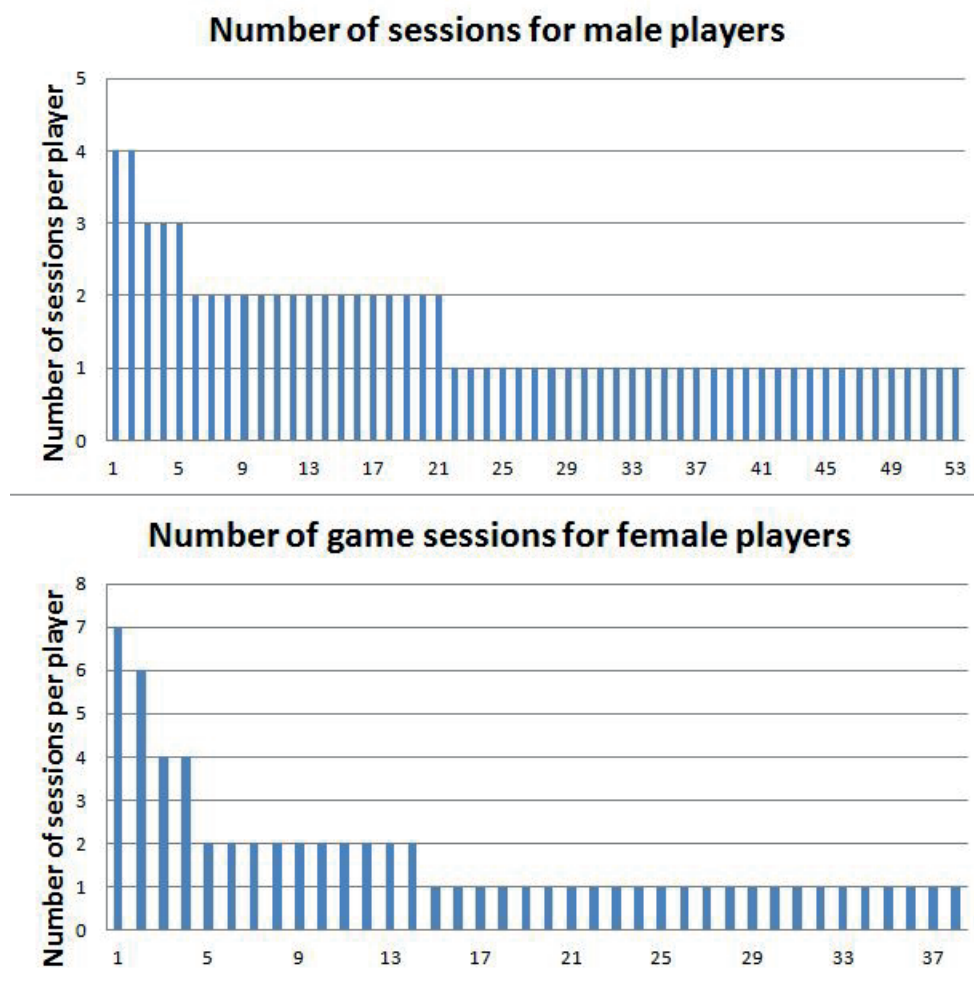


FIGURE 7.16: Number of game sessions per gender.

## 7.5 Tag Quality Evaluation

In total 1125 tags were retained in the database. The tags were considered valid after at least 3 verifications by other users.

### 7.5.1 Tag Quality Reporting

During the game testing period, users reported tags generated by other users as erroneous (through shipping activity). Approval of the reports would lead to the deletion of the image-tags set from the database and loss of coins for the player who created the reported tag. Out of 123 reported tags, 91 were not approved. The reported tags were approved or ignored after an individual review. We deleted the tags that would have been reported multiple times by different users or when tags were irrelevant to the image (i.e. "one", "two", "three").

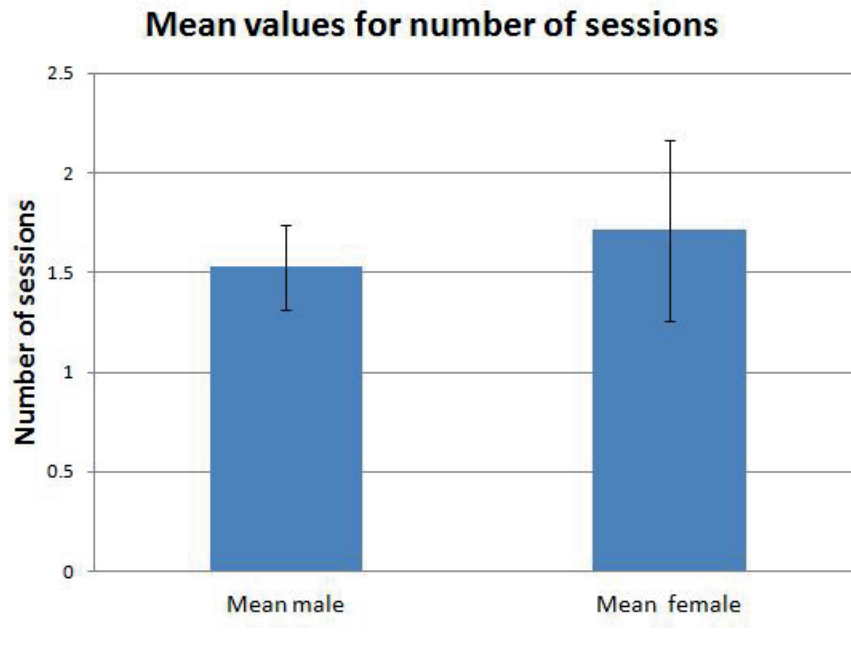


FIGURE 7.17: Mean values of female and male game sessions.

### 7.5.2 Image Quality Study

**Test participants.** In order to check the quality of the created tags, we ran a small study with one twenty-six-year-old, twenty-seven-year-old and thirty-two-year-old fluent English speakers who had no previous experience with the Architect game. The testers were given 100 control images from Flickr database that were run through our game. Looking at the images they had to select the best matching tags out of 2 group of tags: tags created by the Architect game players and tags created by the Flickr image owners.

**Test setup.** The tag comparison happened on the pairing basis, where one tag from the Flickr database was compared to another tag from the Architect game database. If the number of tags in one of the groups was greater, then the extra tags would be cut out in order to even out their number. Finally, no information was shared with the participants regarding the grouping principle or sources.

In total there were 400 tags to be reviewed. Out of two tags the user had to select only one tag and award one point to the group to which this tag belongs. In case of identical tags the users had to give points to both groups.

**Test results.** Test participants reviewed 472 tags. Out of 218 tag pairs, 72 pairs were found to be identical. Table 7.1 reveals the results of the review by three testers.

Table 7.1 shows that all three testers awarded more points to the group of tags created by Architect game users.

	tester 1	tester 2	tester 3
tags by Flickr users	221	230	232
tags by Architect game users	251	242	240

TABLE 7.1: Preferred tags by test participants.

Also, the results of the study showed that while the Flickr tags contained more contextual information (location, time, event), the tags generated through the human computation game contained a more specific description of the image content. This observation should be taken into consideration when foreseeing the possible use of images and their tags.

Although originally created tags were not always good (i.e. some users gave tags in languages other than English or consisting of a random combination of letters), we are happy with the integrated filtering mechanisms. They allowed to filter data to the degree that made it comparable to the tags created outside the game environment (by the image uploaders themselves).

## 7.6 Conclusions, Discussion and Future Work

In this chapter we discussed the process of construction and testing of *Architect*, a social network game with human computation elements. It was constructed following a variety of heuristics (general and those related specifically to social network games). Further on, the game was integrated into the Facebook environment, which allowed us to promote the game among social network players and collect user data in two different studies.

While our data collection mechanisms did not allow us to collect data for a deeper statistical analysis (section 6.4.1), and left us with descriptive statistics only, we were able to draw some general conclusions regarding our research questions (section 2.1), which are:

1. Whether social network games with a masked serious task can have a positive response from typical social network players who are normally not interested in contributing to human computation systems;
2. Whether playful elements and metaphorical storytelling have a positive, negative or neutral effect on the quality of the player's input.



Within the two month time period that the game was running on the Facebook, we reached out to Facebook users who were willing to try a new game. A certain number of them were engaged enough to come back repetitively, although the user activeness pattern follows the *power law* discussed in section 2.8. Considering the limited promotion efforts, small experiment period, and oversaturation of the social network gaming market, we consider the number of engaged players as satisfactory.

We are also happy with the quality of the tags that were created by the users. Our test studies demonstrated that the tags generated through the set up were not worse than the tags created by image owners although they had slight differences in their type (more general, less context-based). Also, our method allowed to preserve a large number of useful tags that would not have "survived" in the original ESP game setup.

Also, the following observations were made based on the comparison of *actual* and *clicks proportional to reach* in the Facebook studies:

1. The game enjoyed more attention from the users in the *less than 18* and *above 45* years old *age* category.
2. In terms of *geographical location* of potential players, Facebook users from India demonstrated higher interest than users from other tested countries. It can also be explained by the fact that the Indian user base is growing and therefore has more new members who are also willing to try new games and applications available on the Facebook platform.

Finally, since developing games of similar complexity requires significant time and resources, the Architect game can be used by various organization that have an image database that need tagging but have only limited resources for game development and promotion. At the same time, we would like to emphasize that this game approach renders gradual results, and therefore is best for the projects that do not require urgency. Yet, if such a project is to be developed again, then it is reasonable to do it for a large image database, because smaller scale projects might not return the investment.

Finally, while looking at the graph depicting the number of repetitive sessions, we have certainly wished for a better repeat rate. However, there are a few important reasons why we may have not have the desired success.

The concept of the game was developed and went into the programming stage in 2010-2011 at the time when social games enjoyed booming success. Yet in April 2010 Facebook launched updates that prevented applications from sending notifications to news feeds, thus affecting the visibility of external social applications (including games) to Facebook users. Coupled with a natural *game fatigue* and growing competition, the monthly use

rates of major social network games started their continuous decline<sup>1</sup>. For example, in 2011 Zynga, a leading social network game maker, reported a steady loss of approximately a million users per month for their major games [Forró et al., 2011], which was reflected in a dramatic double cut of revenue compared to 2010<sup>2</sup>. By the time *Architect* entered the publication stage, promotion mechanisms of Facebook apps were limited entirely to Facebook Ads, which did not allow to rely on friends' authority/recommendation as a powerful persuasion factor.

Following the exclusion of game notifications from news feeds, Facebook redesigned the profile pages in 2012, making it harder to locate games (currently they are located in a folded game section of a side bar, competing with the rest of the content, including dynamically updated centered news feed). Consequently, they can hardly allow for spontaneous choice of gaming as a possible social network activity as it was in the early stages of social network gaming.

We believe that these external factors also contributed to the lesser success rate of *Architect* than what was expected at the game production stage.

### **Future Work**

*Aesthetics, Mechanics and Dynamics.* Current social network games progressed substantially in their storytelling mechanisms. Consequently, we feel that in the future, games like *Architect* will benefit from more exploratory, mission-based elements that guide users not only at the learning stage but throughout the whole gaming experience. Also bringing in non-player characters that lead users through the game can also contribute to the emotional loyalty of the players.

In terms of the content generation feature used in *Architect*, we have observed that not all of the users were equally engaged with the *asset generation* feature. Therefore, we felt that the flexibility that we introduced by giving users the option of purchasing ready-made assets as an alternative to their creation was right. In the future, we could also provide a fixed set of assets pre-created by game designers. At the same time, we do believe that *asset generation* has an appeal that should be further utilized and can be later enhanced to match more sophisticated asset generation demands.

We cannot state that our game had a more favorable outcome than GWAP games, presented in section 2.6. However, their mechanics, development and promotional strategy as well as a promotional budget are dramatically different. The game moved away from intensiveness of the game sessions and offered a more relaxed environment that might have appealed to different category of players. Additional studies to find out if there is

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<sup>1</sup><http://www.secondshares.com/2010/05/17/zyngas-losing-streak-continues/>

<sup>2</sup><http://investor.zynga.com/releasedetail.cfm?ReleaseID=648577>

any difference between users who prefer the intense game sessions of GWAP games to creative but a slow paced environment of the Architect game would be helpful.

*Data Collection.* As we give users more time to play our game, we can collect both qualitative and quantitative data in order to better understand the players' perception of the game and the presence of *flow* and *immersion*, discussed in chapter 3.

To collect qualitative feedback a mission-like playful questionnaire that collect user feedback can be integrated into the game.

As for the quantitative feedback, longer game exposure and promotion will allow to attract a larger number of players, which would give us the opportunity to define stronger tendencies in player behavior. In addition, our database is to be improved in order to collect demographic data that for now has been separated and generalized by the Facebook performance tracking platform.

*Data Analysis.* Finally, another *Architect* research direction could focus on the semantics and variety of the image tags extracted from the playing process. Such methods as the *Taboo word* approach could be explored.

*Distribution Platform.* As an alternative to a Facebook game, Architect could have been built to be accessible through gaming portals like Kongregate.com, where users come with a purpose of gaming. We might have not enjoyed an access to the users' accounts, but due to Facebook privacy limitations established in 2015 (described in chapter 6) we have failed to access desired Facebook user information either. Nevertheless, instead of adapting the game to the Facebook platform, focusing on a different gaming community would have given us an opportunity to target users that reach out to the gaming platform specifically for the gaming purpose. Thus Architect would compete only with other games, rather than with a large range of social network activities as well as competitors' games. However, extra studies about the audience of gaming portals would have been needed as well as following readjustments in the story telling and mechanics to better meet the preferences of the user base of a specific gaming platform.



## Chapter 8

# Conclusions

### 8.1 Summary

In order to explore the issue of motivating social network players to contribute to serious tasks through a fun factor, we developed two projects: one addressing the issue of survey participation, and another the issue of image tagging.

In order to construct successful applications, we reached down to the theoretical aspects of motivation through fun and games, and explored the existing game construction frameworks and usability guidelines as well as a variety of user types and their motivations.

Focusing on a specific game genre, we explored the state of the art projects pertinent to the industry and ran user studies aimed at collecting user feedback regarding positive and negative aspects of the genre, user preferences and playing patterns. The collected information helped us to create a general understanding of social network gamers' expectations and develop a game that certain social network players might find appealing.

Based on this research, we created applications in which we attempted to shift the user's perception of the applications as *serious tasks in gamified environment* towards a *game* or at least a *playful application*.

Moreover, with the *Architect* game project, we tried to incorporate and position our serious task as secondary, introducing game activities that were not directly linked to the serious tasks but had equal importance in the progress mechanics.

## 8.2 Discussion

In section 2.1 we pointed out that the research question of this work is to explore how the gamified side of the human data collection games built as social network games influence the nature and quality of the user input and whether this approach proves to be viable to the human subject data collection systems (questionnaires and human computation games).

We can say that although this approach requires longer development time, it results in smaller promotional costs, and allows to appeal to a variable group of respondents, attracted by the fun factor rather than by the sense of responsibility, altruism, money or other external motivators.

Another important observation is that this method of data collection is valid for projects that don't require urgent results and can still benefit from a gradual data collection process.

Nevertheless, the quality review analysis of the collected tags suggested that our tag collection method may prove valid enough for generic images.

In greater detail, the aspects related to the research questions are discussed below.

*Aesthetics.* Firstly, we aimed at studying the impact of aesthetic elements of the gamified environments with serious elements on the users' perception of the serious tasks.

The first aspect of the impact that we explored was the *masking* of serious tasks behind playful metaphors. We tried to understand whether the inevitable diversion that this method produces has a negative influence on the user input. It was identified that with coherent mechanics and thorough usability, pretesting this approach may prove useful. As such, playful representation of the serious tasks may be a valid alternative to the serious approach. At the same time, we would like to emphasize the importance of incorporating control tracking mechanisms that allow to filter out random entries.

Also, a control study in section 6.3 signals that that like with traditional games, the aesthetics may influence the attractiveness of the gamified application to different categories of users (i.e. gender). Therefore application style and genre must be carefully crafted to match the tastes of the targeted audience (this is especially true in case of questionnaires and surveys that often intend to target certain segments of the population). Consequently, developers may benefit from running pretests and preliminary studies that identify the preferences of the potential users.

Secondly, we explored the importance of storytelling as an element that keeps users interacting with the gamified environment. Our usability pretests demonstrated the

strategic importance of storytelling as a guide that helps users orient themselves in the environment where the serious tasks are broken into a few activities. Altogether, good storytelling helps to change the application's perception by users shifting it from a task oriented application into a fun-oriented application.

*Mechanics and dynamics.* With the projects presented in this thesis we explored the approach of breaking down serious tasks into smaller pieces that linked with other non-serious tasks into a fairly complex story. Assuming that in order to construct an application that enjoys sustainable interest from users, we should direct attention to a specific genre and explore the mechanics that appeal to the genre's audience, we dedicated a significant part of the thesis to reviewing the heuristics and guidelines of casual game construction as well as the games that targets specifically social network game players.

Secondly, with the human computation game format presented in this thesis, we wanted to shift from the traditional simultaneous co-play approach that filters input data right at the game play (active verification by generating matched tags) and instead focus on a passive approach that records all tags and has them verified by a simple re-matching. This way we can avoid the loss of potentially "good" keywords. For this approach to succeed, instead of appealing to short-term cooperation, a game developer should encourage cooperation of unknown length that is enabled through repetitive contribution to the general pool of generated and evaluated tags. As such, a social network game genre, known for its short learning curve and yet dedicated player base, was selected. Typical for social network games, interdependence of various activities and mutual reliance of users instead of direct/immediate punishment was the approach that we felt best matched the requirements for our non-simultaneous approach that we wanted to test.

Also, as a way to enrich the dynamics of the game, we experimented with introducing a user-content generation feature, where users are given tools to create their own game assets, and thus put their own creativity to use. Projecting situations when users would prefer to deal with ready-made assets we offered optional ways to progress through the game; however, asset generation was positioned as one of the main game activities, hence the name of the game. This approach has been somewhat innovative since no other social network game has used it. As a result we encountered the challenge of developing the interface, mechanics and guidelines that will permit users to quickly understand the goal of the interaction and encourage them to make an effort. Most users successfully used it, yet we realized that this approach has a space for improvement, and may need to draw a more direct connection between the sophistication of the generated asset and the reward that one may receive from it.

*User feedback.* While we wished to have more participants than we actually had, overall we are pleased with the results of the evaluation for both applications. Although originally, our assumed main target audience were women, our additional studies that involved male participants showed that a certain number of men may also be willing to participate. In terms of age categories, the less-than-eighteen and more-than-forty-five years-old Facebook participants showed slightly higher interest than others. In terms of countries, we noticed that the experiments run in the countries where the state language is English rendered higher activeness of users. Also, it was important to note that Indian users demonstrated a slightly higher than expected activeness for both application studies (based on the comparison of actual and projected clicks across several countries). While in human subject studies the demographics of the respondents might play a strategically important role, in the case of image tagging, the location criteria is secondary, which gives us access to an even larger user base than human subject studies may have. Surely, disbalanced game promotion results in a higher number of users from a specific location, and inevitably introduces a bias in the quality and content of the tags. Nevertheless, on the positive side, due to the cross-cultural effect, we enjoyed a higher number of contributions than we would otherwise have, had we not included India on the list of game propagation countries.

When it comes to the quality of the input, in case of the survey related project, a high number of mismatches of the control questions was called to our attention (both the plain and playful formats). While there might be a few possible reasons like random input, flawed game set-up that results in the lack of relevant answers, or a misunderstanding on the side of the users, the reasons deserve a separate study. Nevertheless, the the existing results proved the presence of the control questions in such applications indispensable, as coupled with other personal questions (age range and gender), they make it easier to distinguish random answers. In the future, we would focus on the topic of control questions that would minimize the risk of accepting randomly generated entries.

Nevertheless, in case of human computation tasks, mutual filtering mechanisms allow to automatically filter out low quality data. It was interesting to note that the type of the tags that original image owners and *Architect* gamers created were slightly different. The original owners tended to give more contextual information that at times could not be easily derived from the image content, while gamers naturally focused on describing the essential elements depicted on the image. This aspect should be taken into consideration when defining the purposes of the image tag database.

*Application development.* Developing complex experimental applications might not always render an equal return. However, with the *Architect* game we tried to develop a full



scale application that can be used by various organizations that have a certain promotional and support budget in order to have image tagging done by Facebook users (since the game is closely integrated with this platform). Facebook's promotional mechanisms provide a pretty stable user base and allow to forecast the correlation of the investment (however small it might be) and the output.

To sum up, we can say that the classic human computation playful applications described in sections 2.5 and 2.6 were focused on features like *competition*, *scoring*, *rating* and *time pressure* to gamify their systems, while the projects presented in this work focused on *storytelling* as the major drive of user interest and utilized a highly metaphorical approach (i.e. the process of cooking, object modelling, judging) to gamify serious tasks like *opinion mining* and *entity annotation* (section 2.2.1).

The results of the user response analysis demonstrated that this approach is viable, and in many cases more competitive/successful than the applications presented in the chapter 6 in terms of capturing user interest because it allows to use pleasurable topics and playful visual assets that appeal to a large number of players.

Nevertheless, the projects would benefit from improvements or additional research on various aspects presented in section 8.3 that may allow to shift to a more specific conclusions or bring a better user response.

### 8.3 Future work

*Human computation game.* After evaluation of the game, we feel that rather than focusing full attention on the activities, one can motivate users by giving short term tasks (missions) that will shift the primary focus from earning points through activity participation to fulfilling a meaningful task. This approach, although requiring more complex strategy, planning and fine tuning, has a potential for delivering better results (longer game play) as the current set up has the repetitiveness of the tasks as one of the most important issues.

Finally, a longer period of tracking of a larger number of users would enable us to collect more data regarding behavior of the most loyal players and allow to build more specific player profiles.

Our data tracking mechanisms should be restructured in order to unify the game performance data and demographics information in one database in order to be able to execute deeper statistical analysis.

A qualitative study ran specifically among *Architect* players would also be useful in terms of understanding the feeling and attitudes of its players. Also, in order to learn more about our user base (and consequently better know their preferences), we would like to record a greater variety of data (hobbies, likes, marital status or profession of users). This information might reveal certain insights into players' preferences regarding our game.

In addition, it would be insightful to be able to track the network and connection among *Architect* players to be able to evaluate the social connectivity aspects of the Facebook platform, as well as better evaluate our own efforts of installing game reminder features.

*Human Subject data collection system.* The results of the input data quality evaluation call our attention to the quality control methods. We could explore the possibility of using open ended questions for the playful human subject data collection methods (playful questionnaires and surveys) as a way to identify conscious effort to answer posed questions.

Also the issue of using a more sophisticated reward system, the depth and value of which depends on the effort that users make, should be explored. Moreover, the importance of the *reward* vs.the *gameful design* (outcome vs. process) would require further investigation when it comes to the attraction of the respondents. For example, the greater importance of the rewarded outcome might reduce the importance of the playfulness, and thus allow developers to reduce the development time. In addition, analysis of our studies showed that it is important to explore this issue across gender parameter, as the results might differ for males and females.

We tried to utilize storytelling as a method to integrate serious tasks into other playful activities in order to appeal to people who are searching for playful gaming activity.

# Appendix A

## Appendix

### A.1 Content of the "Social Network Games and You" Survey

1. Identify your gender:

- Female
- Male

2. Identify your age group: Choose one of the following answers Please choose

- 12 or less years old
- 13-18,
- 18-25,
- 26-39,
- 40 or more years old

3. What is your relationship status? Choose one of the following answers

- single
- committed
- parent in committed relationship

- single parent

4. What industry do you work in?

- Agriculture
- Manufacturing and construction
- Wholesale and retail
- Accommodation, cafes and restaurants
- Transport, logistics and storage
- IT and communication services
- Business, finance and insurance
- Advertising and media
- Education
- Health and social community services
- Cultural and recreational services
- Personal and Other Services

5. Identify your education level: Choose one of the following answers

- Secondary school
- High School
- College/University

6. Country / Region you live in:

(Drop down menu)

7. How many social networks do you sign in at least once a month?

(Free input box)

8. Indicate the length of period you were actively engaged with social network games since last 2 years: (Actively means playing at least once every 3 days.)

- None
- Less than 1 month
- More than 1 month
- More than half a year
- More than 1 year
- More than 2 years

9. How many social network games did you try within last 2 years?

- None
- 1-2,
- 3-6,
- 7 or more games

10. How did you learn about the social network games that you play/ed?

- I received online invitation from a friend.
- I found the game through application search.
- I learned about the game from sources outside social network website.
- Through posted activities of my friends.
- Other. (Free input box)

11. Why do you prefer Social Network Games over other games?

- Easy accessibility just a click away from my profile page
- Competing with, and observing gaming activity of real-life friends
- More relaxing than other games that I play
- Continuous never-lose nature of games
- Feeling of owning and managing a property or an object

- Feeling of care and responsibility for something or someone
- I don't have any preferences for social network games.
- Other. (Free input box)

12. "I stopped playing certain social network games because...":

(Check any that apply and put the name of the game, or at least its short description, in the comment box, please)

- Eventually they lost variety and excitement for me. (Make a comment on your choice)
- They seemed to be too challenging. (Make a comment on your choice)
- My achievements were way behind those of my friends. (Make a comment on your choice)
- They were very time-consuming. (Make a comment on your choice)
- I already played similar games. (Make a comment on your choice)
- They were not challenging enough. (Make a comment on your choice)
- The annoying nature of game notifications and reminders. (Make a comment on your choice)
- Has not quit any game so far. (Make a comment on your choice)
- Other: (Make a comment on your choice)

13. Below are described the patterns of social network gaming behavior. Select the one that describes yours the best, within last 2 years:

- First was excited and spent lots of time playing, now much less or stopped.
- First spent very little time playing but lately involved more.
- Always played very little.
- I have always been an active social network gamer.
- My gaming time goes up and down depending on whether some exciting game comes into my attention.

- I play whenever I am bored, and then I play whatever I can find.
- Other. (Free input box)

14. How much time do/did you allocate to playing during the time of your most active involvement with social network games?

- Less than 10 minutes per day.
- More than 10 minutes.
- More than half an hour.
- More than 1 hour.
- More than 2 hours.
- No answer.

15. Rate the factors that motivate you to come back to play on regular basis: (1 - the highest importance, 5 - no importance)

- Sharing, and/or competing with friends. 1 2 3 4 5
- Reminders/gifts from your friends. 1 2 3 4 5
- Your ranking, scoring, and levels. 1 2 3 4 5
- Taking care of your virtual space/avatar. 1 2 3 4 5
- Collecting results of previous investments. 1 2 3 4 5
- Reaching your internal goals 1 2 3 4 5
- Stress relief. 1 2 3 4 5
- Excitement and challenge. 1 2 3 4 5
- Killing boredom. 1 2 3 4 5 .
- Out of habit 1 2 3 4 5

16. Since last 6 months, how much of your total gaming time is spent on social network games?

- None.

- Very small fraction of my gaming time.
- Quite a bit, but still less than half of my gaming time.
- More than half of my gaming time.
- I play only social network games.

17. For how long do you play regular computer video games?

- 1-2 years
- 3-5 years
- 6-8 years
- 8 or more
- Don't play

18. What game genres do you play? Check what applies.

- Shooting and Simple space exploration action games (i.e. Pac Man).
- Simple task-management games (similar to social network games, i.e. Diner Dash)  
.
- Business or process simulation (serious or educational games) .
- Life simulation (3D realistic worlds, i.e. Sims, Second life).
- Vehicle simulation (racing car, war vehicle simulation games).
- Role-playing adventure games (complex story driven exploration).
- Strategy games (i.e. require planning skills for winning a territory).
- Sport games (i.e. Olympic games, Pool).
- Puzzles and word games.
- Board games (Go, Chess).
- Card games.
- Other. (Free input box)



## **A.2 Feedback Materials for Playful and Plain Questionnaires**

### **A.2.1 Modified SUS Questionnaire**

Check the most appropriate from:

1. Disagree
2. Somewhat disagree
3. Neutral
4. Agree
5. Somewhat Agree
6. Agree

1. I think that I would like to use similar applications frequently:

1 2 3 4 5 6

2. I found the application unnecessarily complex:

1 2 3 4 5 6

3. I thought the application was easy to use:

1 2 3 4 5 6

4. I think that I would need the support of a knowledgeable person to be able to use this application:

1 2 3 4 5 6

5. I thought there was too much inconsistency in this application;

1 2 3 4 5 6

6. I would imagine that most people would learn to use this application very quickly:

1 2 3 4 5 6

7. I found the application very cumbersome to use:

1 2 3 4 5 6

8. I felt very confident using the application:

1 2 3 4 5 6

9. My decision were influenced by visual elements:

1 2 3 4 5 6

### **A.2.2 Feedback Questionnaire**

1. Did you perceive the short format as:

1. Entertaining
2. Somewhat entertaining
3. Neutral
4. Somewhat boring
5. Boring

2. Did you perceive the playful format as:

1. Entertaining
2. Somewhat entertaining
3. Neutral
4. Somewhat boring
5. Boring

3. Next time you would prefer to deal with:

1. Definitely short
2. Rather short
3. Can't tell
4. Rather playful
5. Definitely playful

4. You perceived the short format as:

1. Game
2. Playful personality report
3. Can't tell
4. Standard personality test
5. Survey

5. You perceived the playful format as:

1. Game
2. Playful personality report
3. Can't tell
4. Standard personality test
5. Survey

6. Which format caused you to think of your answers more seriously:

1. Playful
2. Rather playful than short
3. Both same
4. Rather short than playful
5. Short

7. Would you recommend the short format to a Facebook friend?

1. Definitely yes
2. Rather yes
3. Can't tell
4. Rather no

5. Definitely no

8. Would you recommend the playful format to a Facebook friend?

1. Definitely yes

2. Rather yes

3. Can't tell

4. Rather no

5. Definitely no

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