Janne Paavilainen

# DESIGN IMPLICATIONS FOR DIGITAL SCRATCH-CARD GAMES

Master's Thesis
3.7.2008

University of Jyväskylä
Department of Computer Science and Information Systems
Jyväskylä

# ABSTRACT

Paavilainen, Janne Tuomas
Design Implications for Digital Scratch-Card Games / Janne Paavilainen
Jyväskylä: University of Jyväskylä, 2008.
67 pages
Master's Thesis

This thesis focuses on studying the design implications for digital scratch-card games. These games are based on instant-win lottery format, where the gameplay is based purely on chance and the player has no influence over the outcome. The result of win or lose has been drawn before the player plays the game, which creates an interesting design challenge on how to present the gameplay in an exciting way. These games have started to appear in digital format on the Internet and they are gaining popularity.

This study is based on user centered evaluation approach where nine testees played five digital scratch-card game prototypes providing feedback from the games. The research goal of this study is to present design implications, which can be implemented in the game development process. The results of the study indicate that the digital format is a challenging and intriguing platform for instant-win lottery games.

This thesis presents 12 design implications derived from the user study, which can be used to develop exciting digital scratch-card games.

KEYWORDS: design implications, games, digital games, money games, scratch-card, instant-win lottery.

# TABLE OF CONTENTS

# 1 INTRODUCTION

Games and playing are cultural universals (Mäyrä 2008). Johan Huizinga, a Dutch culture historian and philosopher, stated that play is the preform of culture (Huizinga 1938/1971). The early anthropologists suggested that games had originated from religion and the art of divination. The random falling of stones and bones, affected by chance, had been believed to reflect the will of gods (Mäyrä 2008). The same act of chance can be seen when we throw the dice at the casino, in hope for a winning combination.

In modern times, digital games have become remarkable cultural, economical and social phenomena. Studies both in Europe and America show that in the last 15 years, games and gaming have become a multibillion dollar business (ESA 2007, BBC 2005). In 2007, Microsoft Game Studio's first person shooter game *Halo 3* [1]broke the first day sales record with $170 million dollars, making it the biggest entertainment launch in the history, beating such events as the theatrical release of *Spiderman 3* movie and novels such as *Harry Potter and the Deathly Hallows* (Boyer 2007). Later in 2008, Rockstar Games' *Grand Theft Auto IV*[2] sold 3.6 million units in one day and grossed $500 million in the first week of the release, breaking records again (Paul 2008).

Internet lottery, betting and casino games have also seen remarkable growth in the past years. The first Internet casino was opened in 1995 (Internet Casinos, Inc.), which offered 18 different casino games for play. The most popular Internet money game is poker, which started to gain popularity in U.S during the strike of the National Hockey League in 2002-2003. There are approximately 2100 websites which offer money based gaming and 489 of them focus on poker. There are no accurate numbers concerning the size of the business in

---

[1] http://www.halo3.com/

[2] http://www.rockstargames.com/IV/

revenue but rough estimates start from $10 billion dollars and up (Taskinen 2007).

Along with digital versions of the traditional casino, betting and lottery games; a new breed of money games has emerged. These new types of games are probing the possibilities of money based gaming over the Internet. Digitality allows for new type of interaction and distribution methods which are not possible with the traditional money game formats. Services such as www.king.com offer casual games with betting possibilities and monetary prizes. *Kwari*[3] and *Bet On Battles*[4] are first person shooter games which are played for money. These services and games are good examples of how the Internet money gaming is developing and emerging.

Digital scratch-card games represent the more conservative end of money games, but the digital form allows for new interaction methods that are not possible with physical scratch-card games. For example in Finland, the digital scratch-card games were launched in 2005 by the Finnish National Lottery, Veikkaus, and these games have been increasing on their popularity ever since. According to Veikkaus, the revenue for these games increased 107% in 2007 (Veikkaus 2007). These new types of money games provide interesting design challenges, which are studied in this thesis.

---

[3] http://www.kwari.com

[4] https://www.betonbattles.com/

This thesis focuses on studying the design implications for developing digital scratch-card games. The research question for this study is: *What are the design implications for digital scratch-card games?* The study is based on user tests which featured nine testees and five digital scratch-card game prototypes. Similar studies from the evaluation point of view have been made before for the traditional computer games (e.g Malone 1980, Federoff 2002, Desurvire et al. 2005, Laitinen 2006) and mobile games (Korhonen & Koivisto 2006). The structure of this thesis presents as following.

In the present chapter 1, the background of the study, the research question and the method are introduced, and the structure of the thesis is outlined.

Chapter 2 presents an overall view on games and play. It introduces various definitions and focuses later on money games. This chapter is concluded with a specific look on digital scratch-card games.

Chapter 3 presents the rationale for this thesis by explaining the background of the study along with the research goal, related works and the methodology that acts as the basis for this study.

Chapter 4 presents the user study by introducing five digital scratch-card game prototypes, the testees, the metrics, the study procedure and the analysis methods.

Chapter 5 presents the qualitative and quantitative results derived from user tests on each digital scratch-card game prototype.

Chapter 6 presents the discussion for this thesis.

Chapter 7 presents 12 design implications that were derived from the user study results.

Chapter 8 presents the conclusion of this thesis.

# 2 DEFINING GAMES

This chapter introduces the concept of games and play. The first sub-chapter 2.1 discusses various definitions of games and play. The second sub-chapter 2.2 defines digital games. The third sub-chapter 2.3 introduces the various forms of money games and the last sub-chapter 2.4 introduces the concept of digital scratch-card games, which are studied in more detail in this thesis.

## 2.1 Defining Games and Play

Both academic scholars and contemporary game designers have offered various definitions of games. One of the first academic scholars to address a definition for the word "game" was an Austrian philosopher Ludwig Wittgenstein. In his *Philosophical Investigations* (Wittgenstein 1953/2001) Wittgenstein concluded that game elements such as play, rules and competition, all fail to adequately define what games are. There are no clear boundaries as to what "game" is and what is not. Wittgenstein claims that the concept of "game" cannot be contained in a single definition, but rather suggests that it is possible to find similar features between games, and therefore games share a "family resemblance" to each other (Wittgenstein 1953/2001).

When defining games, we must also consider play. The two definite academic scholars who have written about games and play are Johan Huizinga and Roger Caillois. Huizinga, a Dutch culture historian, states that games play the preform of culture. In his *Homo Ludens* (trans. Man the Player, Huizinga 1938/1971) he defines play as free, creative activity within boundary of rules and recognizes the distinction between the ordinary life and play. When we start playing, we enter into a fictional world which is governed by the rules of its own. Huizinga poetically compares it to stepping into the *Magic Circle*, where the game is played:

> "It is 'played out' within certain limits of time and space (...) the arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the court of justice, etc. are all in form and function play-grounds, i.e. forbidden spots, isolated, hedged around, hallowed, within which special rules obtain. All are temporary worlds within the ordinary world, dedicated to the performance of an act apart." (Huizinga 1938/1971)

Roger Caillois, a French intellectuel, states that Huizinga's definition for play is too broad and narrow at the same time and also critizises Huizinga for neglecting the games of money and chance. Caillois' definition for play is sixfold; it is a *free* activity and *separate* from ordinary life with defined and fixed time and space. Outcome of play is *uncertain* and it is *unproductive*, hence it is pure waste; waste of time, energy and often money. It is *governed by rules* which suspend the ordinary laws and establish a new legislation for a moment. Finally, there exists a *make-believe* which manifests itself in a form of second reality in opposition to real life (Caillois 1958/2001).

Caillois proposes a classification for games which is based on four fundamental categories; competition, chance, simulation and vertigo. He calls them respectively *agôn, alea, mimicry* and *ilinx.* Agôn, meaning competition, contest or challenge in Greek, represents games of skill where the outcome is based on the player's performance. Field sports are a classic example where agôn is dominant. Alea, meaning game of dice in Latin, is the opposite for agôn as in alea, the player has no control over the outcome of the game. Alea represents games of chance. Mimicry, or simulation, covers games of act, such as theatre plays and role playing in general. Ilinx represents games where the players are trying to produce vertigo or dizziness to oneselfs, for example through rollercoaster rides or bungee jumping (Caillois 1958/2001).

Many games share elements from different categories. Poker for example is a game of skill and chance. The categories might also be present on different levels in one game; a horse race between contestants feature agôn and ilinx, the spectators are guessing the winner (alea) and the whole spectacle can be seen as

a one great play (mimicry). The categories dwell between the two extremes, *paidia* and *ludus*. Paidia represents free, unconditional play and improvisation whereas ludus represents formal, rule governed and organized game play (Caillois 1958/2001).

Contemporary game designers have also defined games in various ways. Crawford (1982/1997) approaches the definition with four different factors; representation, interaction, conflict and safety.

Representation means that the game is a closed formal system that represents a subset of reality. It is closed in a sense that it is perfect for its own meaning and separate from the real life. It is formal as its rules are artificial and are expected to be followed by the players. It is a system as it consists of several elements which are in interaction with each other. Lastly, the subset of reality means that the game represents a simplified phenomenon taken from real life.

Interaction means that the game receives and accepts commands from the player and acts accordingly. Respectively the player receives stimuli from the game and reacts accordingly. According to Crawford, prerequisite for the interaction is the possibility to use alternative strategies to advance in the game.

Conflict represents the interactive challenges in the game. The game should at least produce an illusion that the challenges react to the player's actions. If the challenges are not reacting, then the game is not a game at all but a puzzle instead.

Safety means that the game has no effect on the real world and it is safe to play. The player can take different kinds of risks in the game world as opposed to the real world, given that the game or its outcome does not create any danger or harm to anyone in real life.

These examples show that games and play are being approached from different perspectives. However, rather than throughly examining existing definitions, which are plenty, or trying to create one's own definition, this thesis concentrates on studying the aspects which render a particular game good or bad from the perspective of the user experience.

## 2.2 Digital Games

Digital games feature the use of computing power in the form of central processing unit, memory for saving the variable information and input (keyboard, mouse, pad etc.) and output (monitor, diplay etc.) systems to allow interaction between the game and the player. These technical constraits can be merged with either Caillois' or Crawford's definitions for games in general. I find this definition for digital games adequate for the purpose of this thesis as these definitions cover computer-, console and mobile games.

## 2.3 Money Games

According to Järvinen & Sotamaa (2002), gambling and wagering have been present in all known cultures and this tradition can be traced back to 3000 years in China, India and Egypt. Originally the games were organized by individuals but already in the Middle Ages some European city states began to organize public lotteries as a form of fund-raising. In the upcoming decades, lotteries gained much popularity and these events spread to United States with the European immigrants. By the 19$^{th}$ century, many European countries and United States had prohibited the different forms of money games however and the systematic legalizing and commercialization has taken place since as late as from 1960's to 1970's (Järvinen & Sotamaa 2002).

Järvinen & Sotamaa (2002) present the four main groups of institutionalized forms of modern day money gaming:

- Lottery games (Lotto, Bingo, scratch-card games etc.)
- Betting games (sports betting etc.)
- Casino games (card games, roulette etc.)
- Slot machines (fruit machines, one-arm-bandits etc.)

These groups can be examined from the perspective of Caillois' classification for games. Lottery games are pure form of alea, as the player has no possibility to affect on the outcome. Lottery games can be divided into two sub-groups: traditonal lotteries and instant-win lotteries. Traditonal lotteries feature a predefined time when the lottery draw is commenced and the winners announced. Lotto and Bingo are examples of traditional lotteries. In instant-win lotteries, the draw has already been made and the player can decide when the outcome is revealed. Scratch-card games are an example of instant-win lotteries (Järvinen & Sotamaa 2002).

Betting games usually feature an event outcome of which is guessed by the players. Popular events for betting games are sports for example, but other events such as politics and weather are also covered (see www.willhill.com for example). Betting games may have many forms in the sense of actors and rates. The betting may take place between individuals, or an individual can play against the house. The rates can be either fixed or flexible. Betting games feature both agôn and alea because the player's success is not entirely based on chance as knowledge from the event in consideration has a great impact on player's winning probabilities. Betting games can be seen as secondary games, as they require a primary event which is, or can be transformed into a game of itself (Järvinen & Sotamaa 2002).

Casino games and slot machines feature wide range of games which are either solely alea or a combination of alea and agôn. Roulette is pure alea, whereas Blackjack and Poker are a combination of both alea and agôn. Although the player cannot affect on the upcoming cards in Blackjack or Poker, skilled players tend to do better than novice players due their experience and ability to "read the game". Slot machines can feature different games from video poker to fruit reel games. Some slot machines with reels allow the player to lock the reels or nudge them for increasing the probability to win.

These four main groups of institutionalized forms of money gaming are also available in digital form. There are digitized versions of lottery, betting, casino games and slot machines available over the Internet. New forms of money gaming are also emerging from the domain of traditional computer and console games. World Cyber Games[5] for example is an organization which arranges competitions for both computer and console platforms. These competitions promote professional gaming with total prize money ranging from $200,000 to $448,000. However, professional gaming competitions resemble professional sports tournaments rather than institutionalized forms of traditional money gaming, hence they are often called e-sports or electronic sports and are considered as pure agôn. Internet betting companies such as the now closed Bet Online Games offered bets for popular e-sports games such as *Counter-Strike*[6] and *Warcraft 3*[7]. The system is no different from the traditional betting where the alea is built on agôn.

Another instance of money based skill gaming mixed with traditional computer games can be seen in the casual games sector. Game portals like www.king.com and www.skillroom.com offer skill games to be played with money. Websites

---

[5] http://www.worldcybergames.com

[6] http://www.counter-strike.net

[7] http://www.blizzard.com/us/war3/

such as www.paidskillgames.com are promoting money based skill gaming and games like *Kwari* and *Bet On Battles* are introducing money based skill gaming for first-person shooters, which are considered to be more hardcore genre of digital games.

## 2.4 Digital Scratch-Card Games

Digital scratch-card games (FIGURE 1) are instant-win lotteries in digital form. They resemble physical scratch-card games, but they can contain features that are not possible with physical scratch-card games. Digital scratch-card games are a new genre in the field of digital money games and they are gaining popularity. Digital scratch-card games resemble casual games, as they feature the same characteristics of fast gameplay and simplicity, which can be also seen in casual games (Kuittinen et al. 2007).

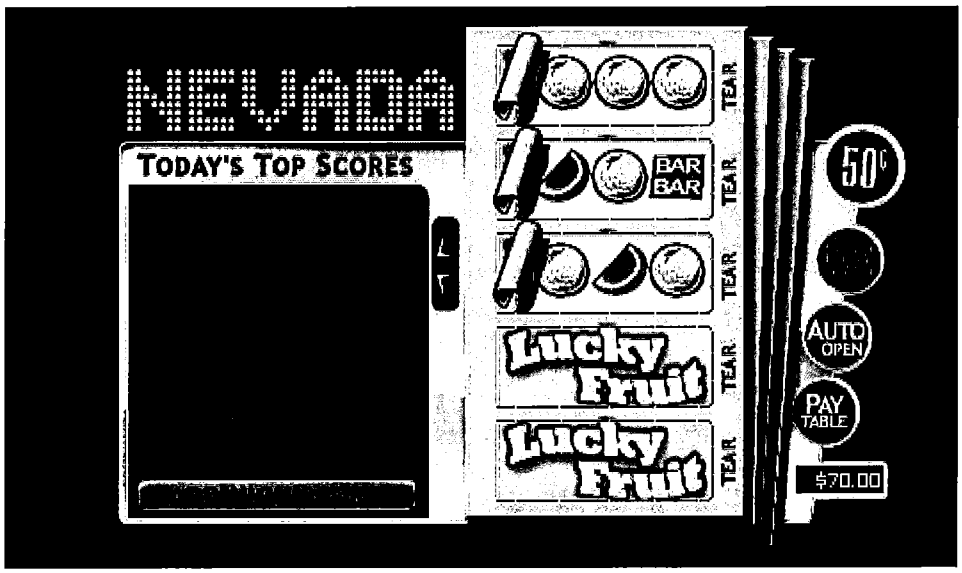


FIGURE 1. Nevada Lucky Fruit at www.scratch-cards.coml

Shown above is an example of a digital scratch-card game featuring a classic match-three gameplay mechanic. The player "tears" the pull-tabs open with a mouse click and hopes for three similar symbols for a win. The user interface resides on the right side with New Card, Auto Open (quick play) and Pay Table buttons. There are also indicators for the price of the scratch-card game on

upper right corner and the player's winnings on lower right corner. The left side is used for high scores and announcing special information. Digital scratch-card games may also mimic scratching, which is mimicked by holding the mouse button down and "scratching" the gameplay area (FIGURE 2).

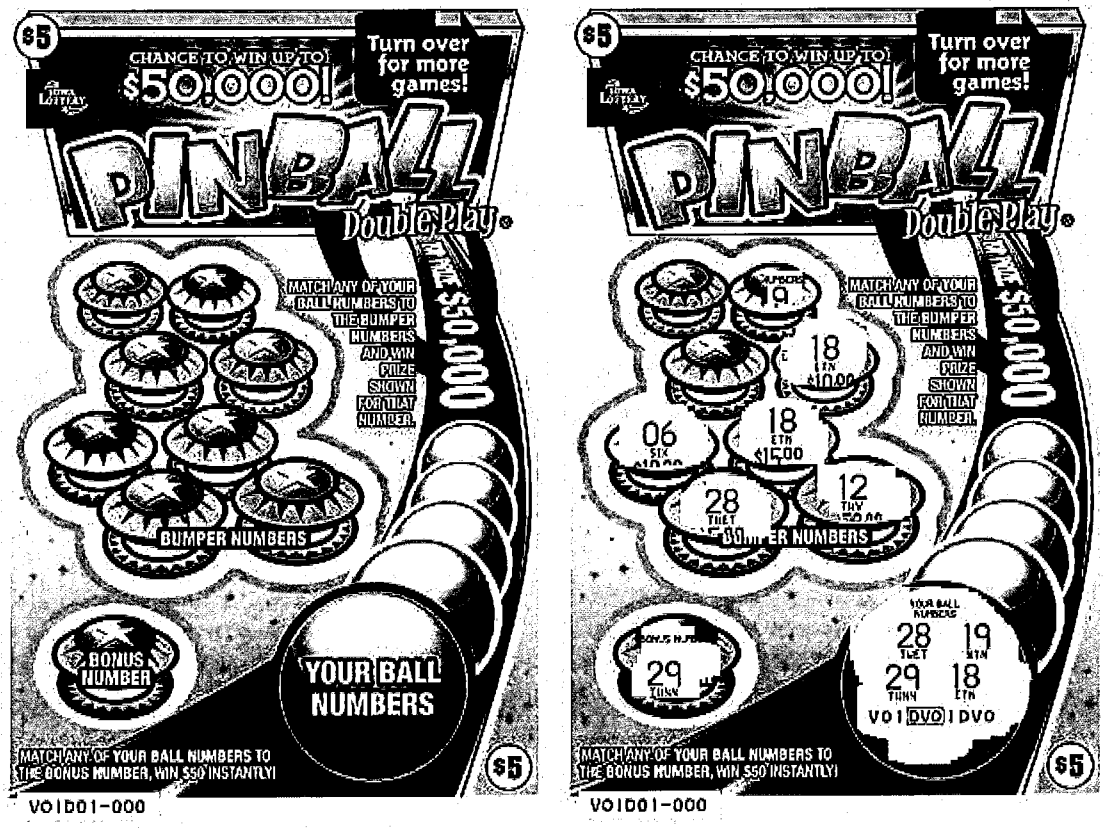


FIGURE 2. Pinball Double Play at www.ialottery.com.

The picture above shows a typical digital scratch-card game which in this case features a pinball theme. The scratch-card on the right side is partially scratched open. The player reveals his numbers which are then compared to the numbers revealed under the bumpers in this particular scratch-card game. Bonus number on lower left adds extra excitement into the game; matching the bonus number with any of "your ball numbers" guarantees an instant win of 50$. The grand prize in this game is $50,000. This game also features a backside with a pull-tab game with similar gameplay mechanics as in the *Nevada Lucky Fruit* example shown in FIGURE 1. The *Pinball Double Play* shown in FIGURE 2 is a

very traditional scratch-card game in a sense that the possibilities of the digital format have not been utilized in any way.

All scratch-card games are pure form of alea and the player cannot affect on the outcome. The draw has been made before the player decides to play the game, regardless whether the medium form is paper or digital. Digital scratch-card games may contain features which cannot be implemented into traditional physical scratch-card games. These extra features can be animation, sound and more complex gameplay mechanics. This thesis focuses especially on studying the scratch-card games that are probing these new possibilities via versatile gameplay mechanics and the rich use of animation and sound. Despite these extra features offered by the digital form, the core gameplay mechanic is still based on chance.

# 3 RATIONALE OF THE STUDY

This chapter presents the rationale of the study. The first sub-chapter 3.1 presents the background information on the study. The second sub-chapter 3.2 presents the research goal of the study and the third sub-chapter 3.3 presents the related academic work which has been considered relevant. The last sub-chapter 3.4 presents the methodology selected for this study.

## 3.1 Background

The study was commenced in the Agora Gamelab (University of Jyväskylä, Finland) research unit as an undisclosed Finnish game company ordered a playability study in the form of expert evaluation and user testing for five digital scratch-card game prototypes. The company had already made usability studies and their interests were in gameplay, user experience and development ideas. Due to the nature of the contract between the Agora Gamelab and the company, the company is kept undisclosed in this thesis and all the visual and textual references have been erased from the game prototype pictures.

## 3.2 Research Goal

The research goal of this is study is to find design implications for digital scratch-card games. This study approaches this issue from the usability evaluation perspective by identifying the related user feedback and turning the feedback into high level design implications. The studied scratch-card game prototypes represent the new form of money based gaming and the earlier studies have not focused on these kinds of games nor on the specific issues of money based games in general. The proposed design implications act as a corner stone for further works towards actual design guidelines.

### 3.3 Related Work

There are no similar academic studies carried out in the field of digital scratch-game cards. Lottery companies and such probably have their own studies in that field, but these in-house studies are not available for the public. However, there are academic studies from other types of games. These studies focus mainly on evaluating usability or playability in games, thus they are indirectly linked to design research as evaluation and design can be seen as two sides of the same coin; evaluation guidelines can be used as design guidelines and vice versa.

Malone was the first scholar to present heuristics for designing instructional computer games (Malone 1980). According to Malone, his earlier studies were centered around two questions; "what are the features that make computer games captivating?" and "how these features could be utilized in instructional computer games?". Based on the user studies with children who played different versions of the same computer game, Malone presents three essential characteristics of a good computer game; challenge, fantasy and curiosity. These characteristics contain several sub-characteristics: goal, uncertain outcome, multiple goals and hidden information (challenge); intrinsic and extrinsic fantasies (fantasy); and sensory and cognitive curiosity (curiosity). Some of the sub-characteristics contain third level elements as well. According to Salisbury (2004), Malone's findings are still relevant although they were presented over 20 years ago. Malone's studies imply that design heuristics for games can be efficiently produced based on user testing.

Laitinen (2006) showed that usability expert evaluation and testing provide novel and useful data in game development. The study focused on evaluating the game *Shadowgrounds*[8] with a group of usability specialists and testees who

[8] http://www.shadowgroundsgame.com

represented the three target groups of the game. The game developers reported that the usability expert evaluation and the test helped them in improving the game, solving problematic issues that were already known and lastly avoiding pitfalls when developing new features. The last remark is important from the perspective of this thesis, as it validates the earlier presumption that usability testing methods make it possible to develop design guidelines which are beneficial in the process of designing (Laitinen 2006).

Korhonen & Koivisto have presented the evaluation heuristics for both mobile games and mobile multiplayer games (Korhonen & Koivisto 2006, 2007). The initial evaluation heuristics for mobile games were defined after analyzing mobile phone and the context of its usage. The analysis resulted in 11 evaluation heuristics and these heuristics were validated by evaluating a mobile game. The evaluation resulted in a number of playability problems that did not match with initial heuristics. The heuristics were re-defined and resulted into a total of 29 heuristics in three categories; usability (12), mobility (3) and gameplay (14). The new set of heuristics was used to evaluate five mobile games and 235 playability problems were found in total. These heuristics were considered to be useful in evaluating mobile games and the category model is modular in a sense that categories can be added or removed (Korhonen & Koivisto 2006).

The multiplayer heuristics were defined in a similar manner. First the related studies around multiplayer games were reviewed and the initial set of six heuristics was defined. Three mobile multiplayer games were then evaluated with the initial heuristics and the evaluation revealed two new heuristics. The new set of eight heuristics was then used in an informal and brief evaluation of six commercial PC games. The results indicated that the multiplayer heuristics are useful in evaluation of both mobile and non-mobile multiplayer games (Korhonen & Koivisto 2007).

Relevancy to this study is that Korhonen & Koivisto show again that the game evaluation heuristics can be defined by finding playability problems in games. Also testing the heuristics proved to be useful as new heuristics were then emerged.

Along with the authors introduced above, similar findings have been made by Federoff (2002) and Desurvire et al. (2005). Their findings support what has been stated here but their work does not bring anything new to this subject.

### 3.4 Methodology

The methodology of this study was based on the user-centered approach and on the use of both qualitative and quantitative data. The design implications were to be built on the basis that they reflect the views of the actual player population. Technically the study resembles standard usability evaluation with games, as described by Laitinen (2006). However, rather than focusing solely on negative issues, this study encouraged the testees to find positive aspects and to present suggestions on how to improve the evaluated games. From these three groups of qualitative findings, the design implications were drawn and the development suggestions became especially valuable. Quantitative analyses were also performed in order to support the qualitative findings. Instead of naming the findings as design guidelines, they are named as design implications as they are not verified in this study, thus calling them design guidelines could give false signals about their finality.

# 4 USER STUDY

This chapter presents the user study. The first sub-chapter 4.1 introduces the evaluated games; Formula (4.1.1), Pyramidi (4.1.2), NettiBingo (4.1.3), Onnenpyörät (4.1.4) and Poko (4.1.5). The second sub-chapter 4.2 introduces the testees and the third sub-chapter 4.3 present the metrics used in the evaluation. Fourth sub-chapter 4.4 presents the evaluation procedure and the last sub-chapter 4.5 presents the analysis methods.

## 4.1 Digital Scratch-Card Game Prototypes

The digital scratch-card games evaluated in this study are all based on Flash[9] technology and run in an internet browser. They are all considered to be prototypes and some of them contain glitches or unintended features. Formula, Pyramidi and NettiBingo represent more finished prototypes, whereas Onnenpyörät and Poko represent concept prototypes with stripped-down features, especially considering their audiovisual side. All of the prototypes share the same core principle of instant-win lottery; the outcome is predefined and based on chance so the player has no control over the outcome. Technically the outcome is drawn on the server-side when the player purchases the product. In this sense, these digital scratch-card games do not differ in any way from the traditional physical scratch-card games.

### 4.1.1 Formula

Formula (FIGURE 3) features a start grid with six different formula cars viewed from above. The player selects one car and places the bet; 20 cents, 50 cents, 1 euro or 2 euros. The goal of the player is to choose the winning car of the race. The cars have different win probabilities and win rates based on their position

[9] http://www.adobe.com/products/flash/

on the starting grid. The car on the pole position has the highest win probability but the lowest win rate (2 x bet), and the last car in the starting grid has the lowest win probability but the highest win rate (16 x bet). After selecting the car and the bet, the player starts the race and a short race animation starts to run (FIGURE 4). When cars reach the finish line, the winning car is highlighted. Based on the result, the game announces if the player has won or not, and asks if the player wants to play again. The game also features a quick play button that skips the animation part and reveals the result instantly.

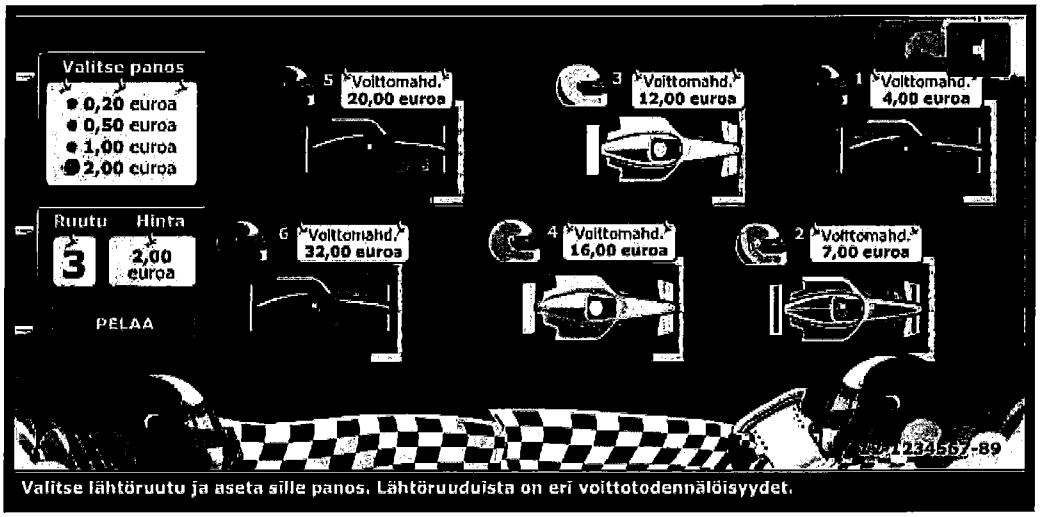


FIGURE 3. In Formula the player selects a car and places a bet.

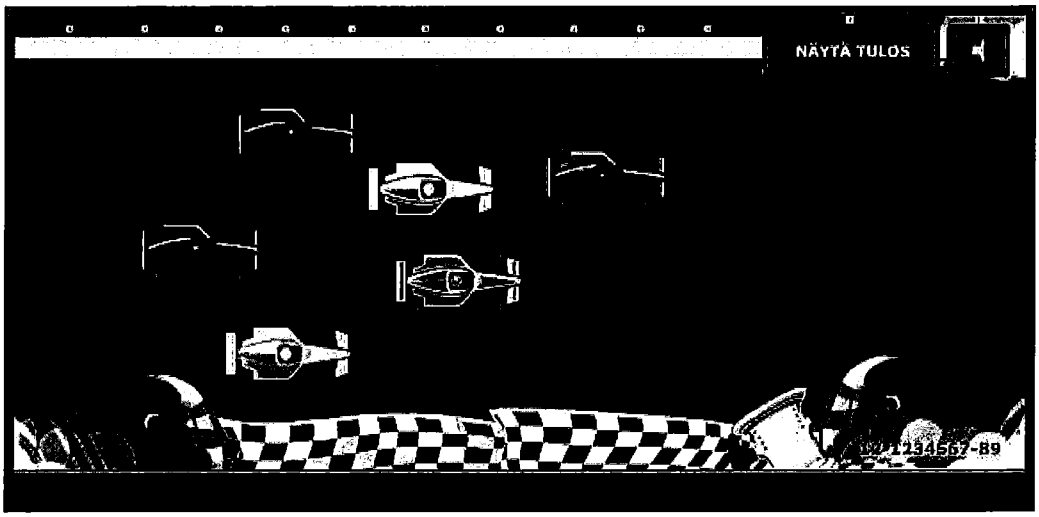


FIGURE 4. Race animation of Formula.

### 4.1.2 Pyramidi

Pyramidi features six pyramids for the player to choose from (FIGURE 5). After selecting a pyramid, player tries to find correct symbols from the faces of the pyramid. One pyramid holds four faces and each face holds six hatches, making a total of 24 hatches to choose from. The goal of the player is to find six symbols from the pyramid that are similar to the ones shown in the legend on the left side (FIGURE 6 on the next page). Player can open up to nine hatches and each hatch contains one symbol. Unlike in traditional physical scratch-card games, the player does not open all the hatches in Pyramidi, but she must choose the hatches which contain the correct symbols. The game also features a quick play button that skips the searching for the symbols. There is no betting and one game costs one euro.

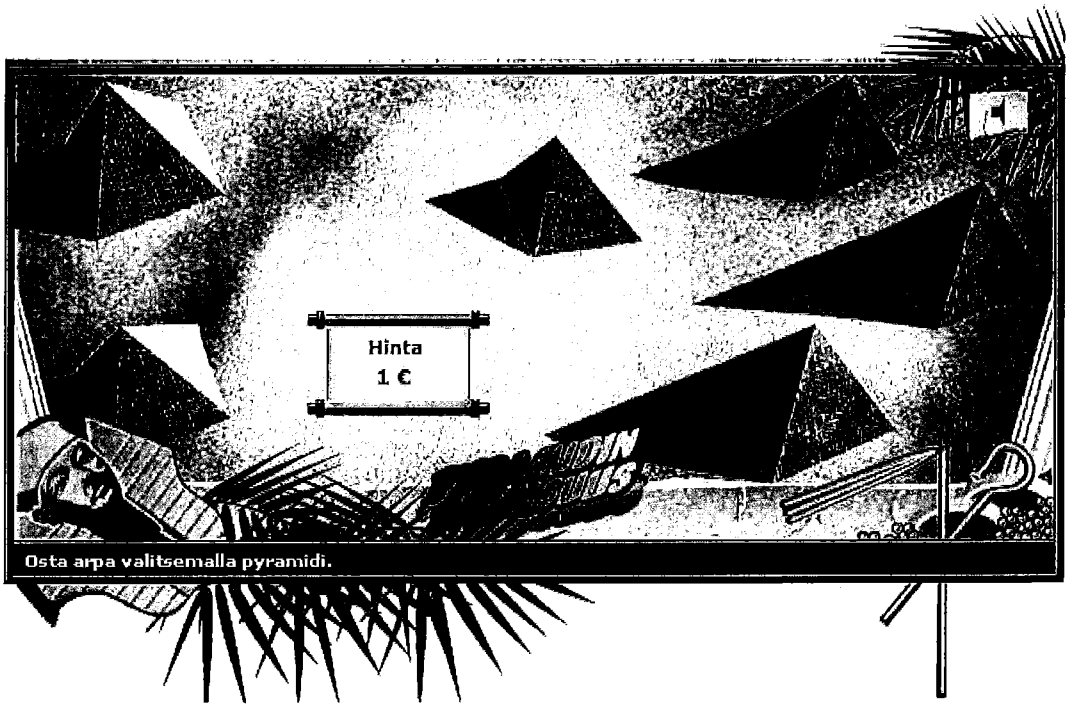


FIGURE 5. Player selects a pyramid in Pyramidi.

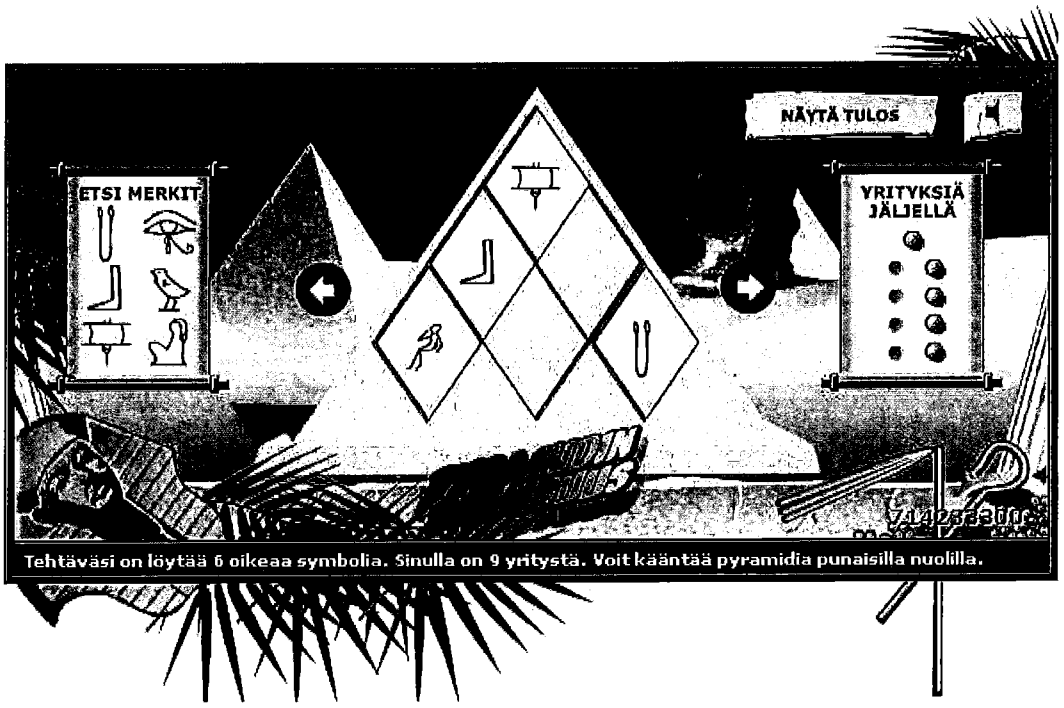


FIGURE 6. Player searching for the correct symbols in Pyramidi.

### 4.1.3 NettiBingo

In NettiBingo (FIGURE 7 on next page), the player chooses one to six numerical grids which are 5 by 5 in size. The player can bet 1, 2 or 3 euros and all the grids have the same bet, making the total bet ranging from 1 to 18 euros. After selecting the grids and placing the bet, the game begins and the announcer calls 30 numbers. The goal of the game is to get a full horizontal, vertical or diagonal straight line from the bingo numbers. The player also wins if she gets all the corners in one grid. The game ends after 30 numbers are announced or when the player gets the bingo within the rules explained above. The game marks the numbers automatically and the player can adjust the speed of the game from slow to fast. Note that the picture of NettiBingo has been edited under the disclosure agreement with the development company.


FIGURE 7. The player has selected two grids in NettiBingo.

### 4.1.4 Onnenpyörät

Onnenpyörät (trans. Wheels of Fortune, FIGURES 8, 9 & 10 on the following pages) feature nine wheels, each containing nine sectors with numbers or colors. The goal of the player is to spin all the wheels and get a three-of-a-kind. If the player gets three of the same numbers, she will win an equal amount of euros. If the player gets three of the same color (bronze, silver or gold), she get to play a bonuswheel with bigger wins. There is no betting and one game costs one euro.

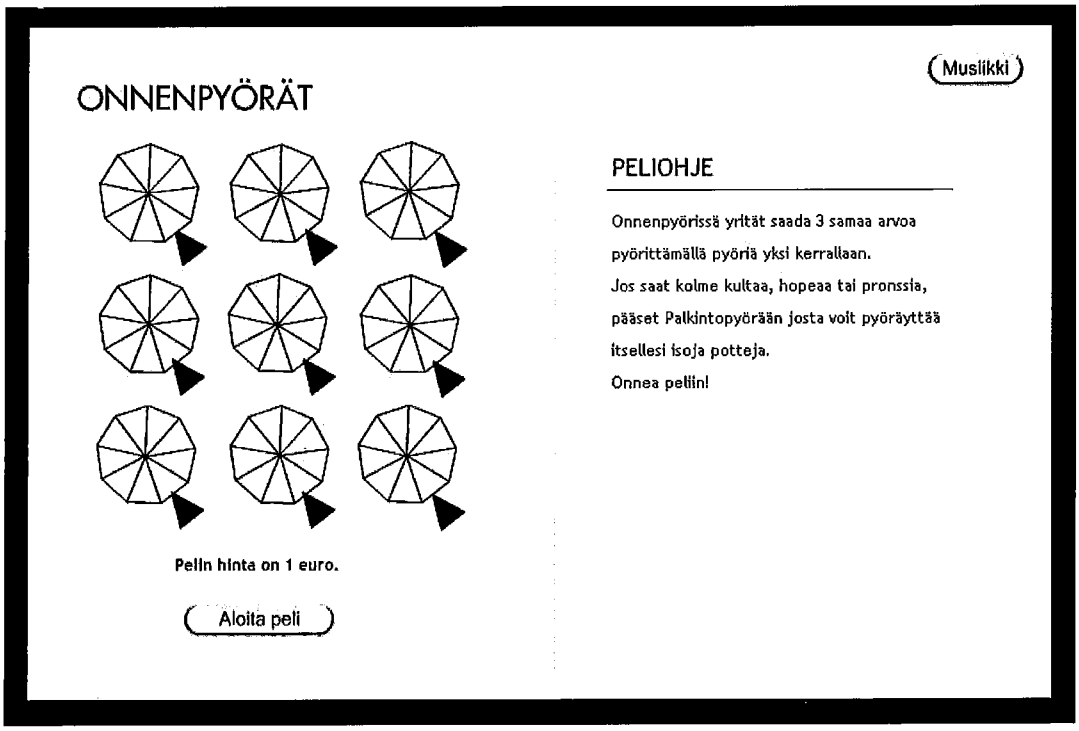


FIGURE 8. Onnenpyörät start screen.

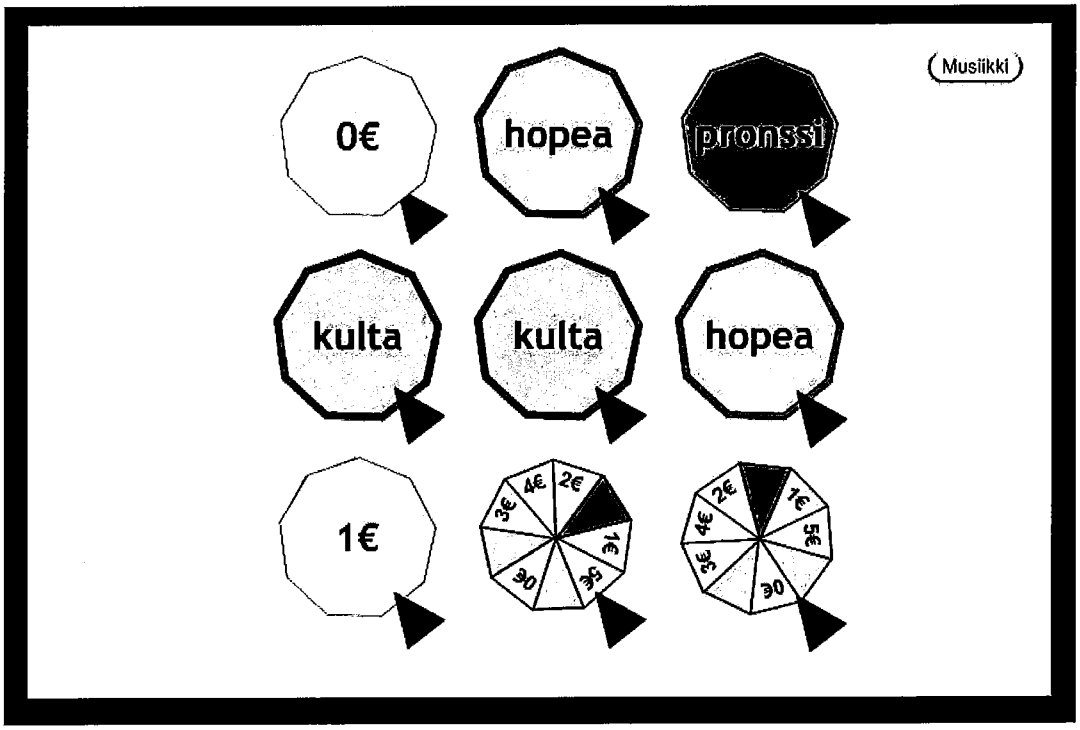


FIGURE 9. The player has two more wheels to spin.

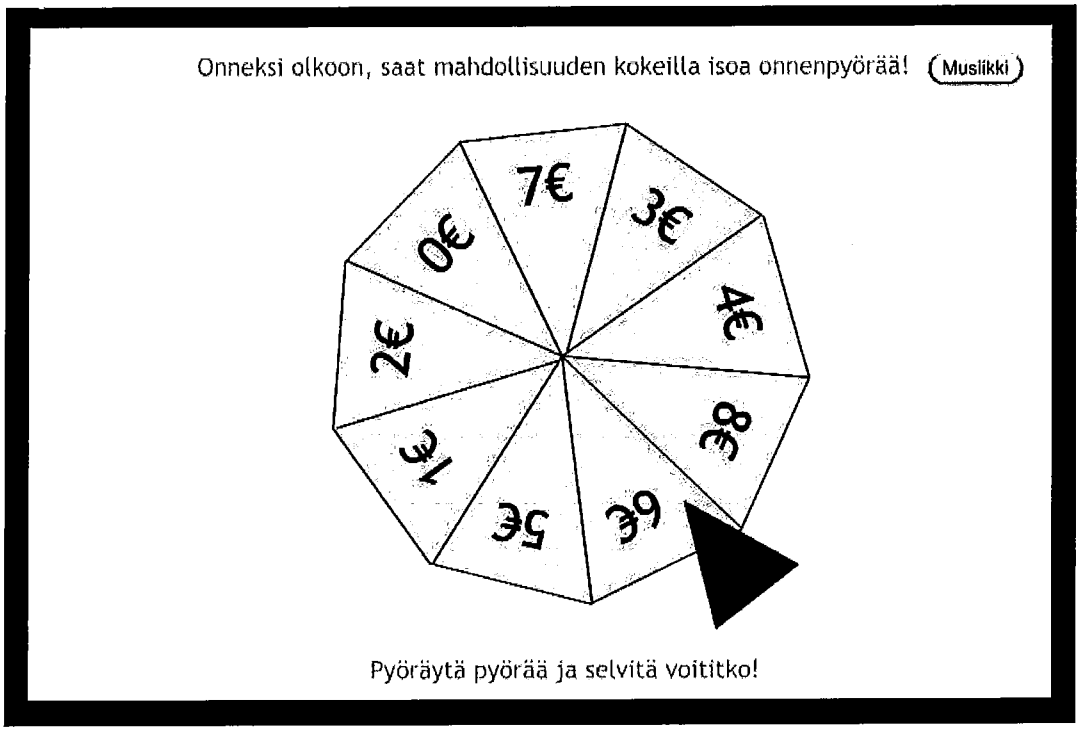


FIGURE 10: The bonuswheel in Onnenpyörät features bigger wins.

### 4.1.5 Poko

Poko resembles a mix of Yatzy and Poker (FIGURES 11 & 12 on next page). There are two rows with five numbers in each. The numbers range from one to nine. The upper row belongs to the house and the lower row belongs to the player. The player starts the game and the numbers for each row are drawn randomly. The player tries to get a better hand than the house and the possible hands are pair, two pairs, three-of-a-kind, full house, four-of-a-kind and five-of-a-kind. After the first draw of numbers, both the house and the player can re-draw the free numbers to make a better hand. After the second draw, the hands are compared and the player wins if her hand is better than the house's hand. The win amount is based on the player's hand. There is no betting and one game costs 50 cents. Note that the pictures of Poko have been edited under the disclosure agreement with the development company.

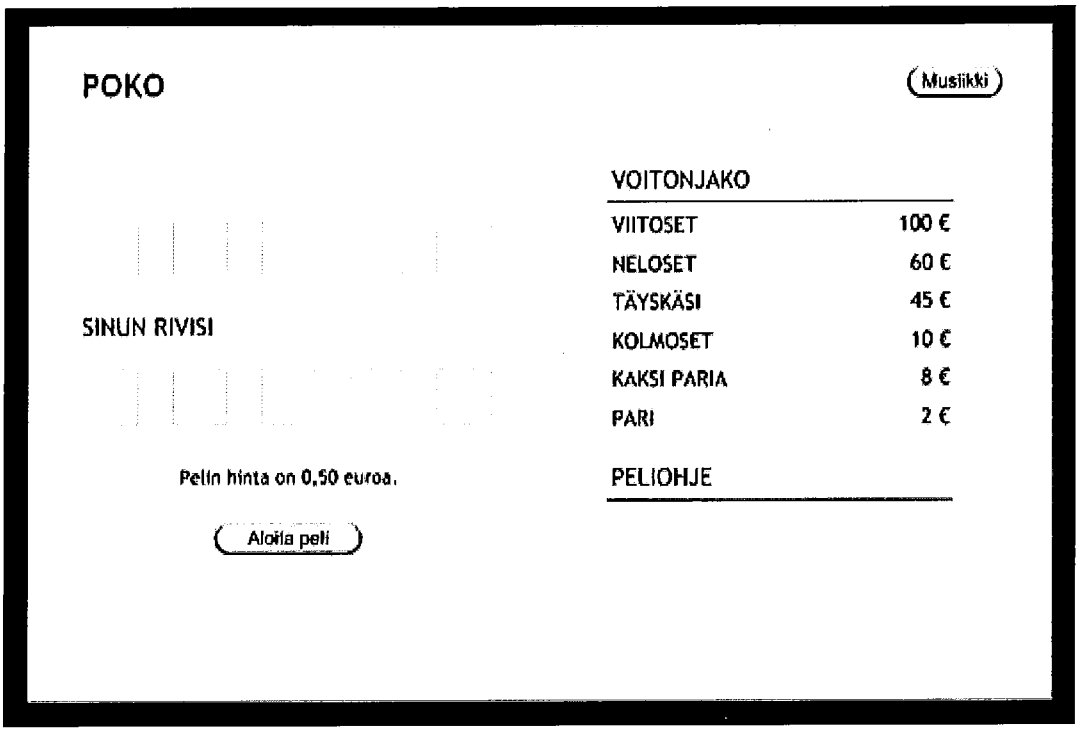


FIGURE 11. Poko start screen.

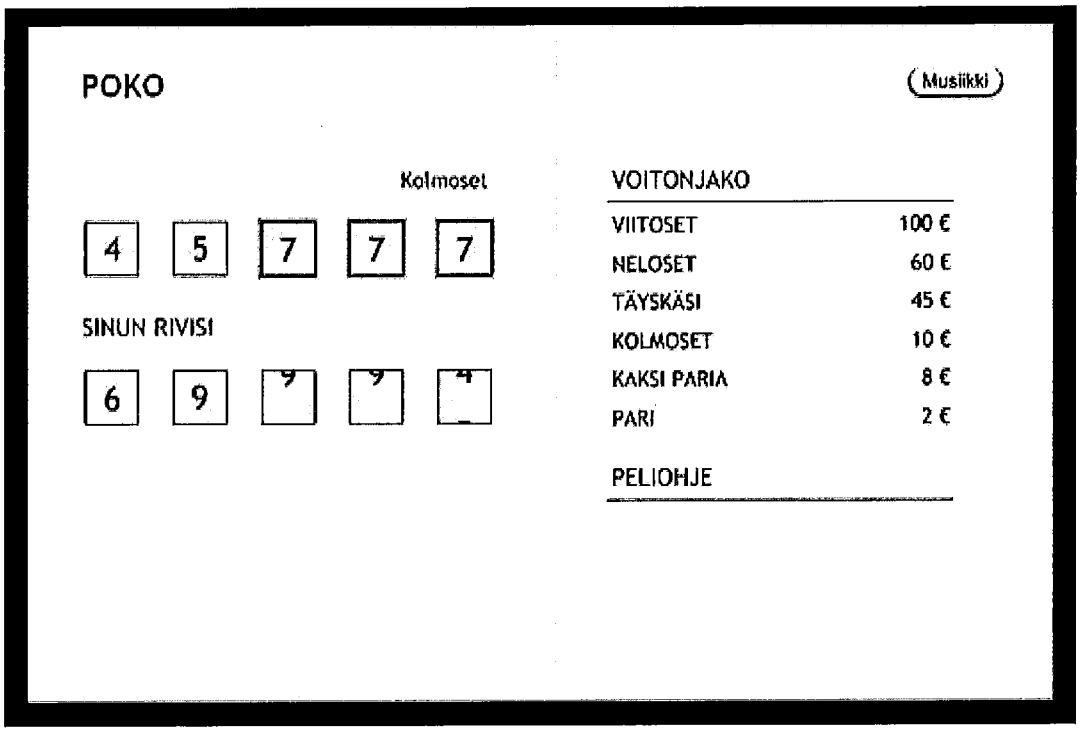


FIGURE 12. The player's row is drawn.

## 4.2 Testees

The user testing was commenced with nine testees who were all male, 22 to 27 year old students from the University of Jyväskylä. Four of the testees had earlier experience with digital money games which they had played on the Internet. The most common digital money game was the web version from the popular Pitkäveto sports betting game provided by the Finnish National Lottery, Veikkaus. This sample group represents well the profiles of Finnish digital and money gamers (Kallio 2007).

Nine testees were considered to be sufficient as Nielsen has suggested that even five testees are enough when executing usability testing (Nielsen 2000). However, Spool & Schroeder (2001) have critizised Nielsen's claims by stating that five testees are not enough, so nine testees were considered to be sufficient for the purposes of this study. This decision is also supported by Tullis & Albert (2008) who state that sample size of eight to ten testees can be sufficient for gathering usability data when acquiring larger sample size is not possible.

The testees were briefly interviewed about their gaming habits. The testee profiles are shown in TABLE 1 on the next page. The first column is the testee identification number from one to nine. The second column is the testee's age at the time of the study. Third column refers to what kind of games the testee likes to play in general and the fourth column reveals how often the testees play. The fifth column presents if the testees play traditional money games (lottery, betting and casino games) and the sixth column reveals if they play money games on the Internet. The last column presents the testee's attitude towards money games on the Internet.

Many of the testees play Flash -games or casual games on the Internet. The play frequency among the testees varies and the full spectrum from rarely to often can be noticed. Less than half (4) of the testees play money games in general, either traditional or on the Internet. Five testees have positive attitudes towards

money gaming on the Internet, three have neutral attitudes and only one testee had a negative attitude.

| Testee # | Age | Games | Frequency | Money games traditional | Money games internet | Attitude |
|---|---|---|---|---|---|---|
| #1 | 22 | Flash –games, casual | Once in a week | Yes | No | Positive |
| #2 | 27 | Flash –games, retro | Occasionally | No | No | Positive |
| #3 | 25 | Flash- games, World of Warcraft | Often, seasonally 4-5 hours per day | Yes | No | Neutral |
| #4 | 27 | Puzzle games | Rarely | Yes | Yes | Positive |
| #5 | 24 | PC multiplayer games, America's Army | Few times in a week | No | No | Positive |
| #6 | 24 | Bridge, Civilization, Heroes of Might & Magic | Often, 20 hours a week | Yes | Yes | Positive |
| #7 | 27 | Arcade and action games, Hat Trick | Occasionally | No | Tried once | Neutral |
| #8 | 25 | Flash –games, PC games | Seldom, 1 hour a week | No | No | Negative |
| #9 | 25 | Flash- and Javascript games | Rarely, less than 1 hour a week | No | No | Neutral |

TABLE 1. Testee profiles.

### 4.3 Metrics

Along with the positive and negative issues and development suggestions, the testees were asked to rate the games in five different categories. These categories were **Gameplay, Playability, Audiovisuality, Experience** and **Total Score.** These categories were considered to give a general understanding of the testees' use experience from the games.

Gameplay is said to be the "heart of the game". Gameplay refers to the interaction possibilities offered by the game to the player. Gameplay occurs

when the player interacts with the game through its game mechanics. Game mechanics refer to the core game rules, which define possible actions in the game (Korhonen & Koivisto 2006). Gameplay can be also considered as the functionality of the game. Poor gameplay leads to boredom whereas good gameplay makes the game exciting to play.

Playability could be considered as the usability of a game. However, the term usability is from the utility software domain where it is descibed by its three fundamental factors; user satisfaction, effectiviness and efficiency (ISO 1998). These factors do not render onto games very well as an "efficient" game would be boring to play. According to Pagulayan et al (2003), utility software and games differ in many ways including in their purpose, goal, challenge, system consistency, user base, input devices and use of audiovisual stimuli for example. For the purpose of this study, it is sufficient to say that playability measures how well the gameplay elements are accessible to the player and if they are fun to use. From this perspective, playability could be seen as a merger of gameplay and usability.

Audiovisuality refers to the graphics, animation, sounds and music. Audiovisuality covers the whole spectrum of aural and visual stimuli offered by the game.

Experience refers to the enjoyment and excitement of the player and is closely related to the immersion of the game. Immersive games make one forget about the real world as they enter the state known as the flow. The flow is a mental state of operation in which an individual is fully immersed in a feeling of energized focus, full involvement, and success in the process of the activity (Csikszentmihalyi 1990). Player enjoyment has been said to be the single most important goal for a game (Sweetser & Wyeth 2005), and the games were evaluated on the basis of how well they produced exciting experiences.

Total Score represents the final score for the game, interwoving all the previous categories into a one single grade.

These five categories were rated with one of the four possible grades; poor (1), mediocre (2), good (3) or excellent (4). It was considered that the four possible rating values are sufficient for evaluating the game prototypes and adding up more values would not be beneficial whatsoever. Ultimately, the games can either be poor, mediocre, good or excellent.

### 4.4 Procedure

The user study was commenced in the facilities of Agora Gamelab, University of Jyväskylä. The test session was conducted with one testee at a time and the testing started with the testee filling up the backround information onto the feedback form (see Appendix). After the testee had written down the necessary background information, the interviewer explained the background of the study, the testing procedure and an oral confidentiality agreement was made. The interviewer continued with questions about the testee's gaming habits (see TABLE 1 on p. 30) and explained the categories and the metrics used in the evaluation.

The testees played one game at a time and each game was played for five to ten minutes in random order. The testees were instructed to speak aloud what they were thinking while playing the games. This technique is called *think aloud* but it has a weakness as the testees tend to forget to speak (Jones & Marsden 2006). This problem was dealt with the interviewer asking probing questions, if the testee stopped talking for too long period of time. Laitinen (2006) warns about interrupting the testees too often as then they might not be able to concentrate on the game. The games evaluated in this study were very simple however, thus the risk of biasing the study with the probing questions was small. The testees were asked to bring up positive and negative issues, and especially development suggestions. After each game, the testee evaluated the game by

filling up the feedback form with the metrics explained in the previous chapter. The test session ended with a summarizing discussion with the testee.

During the tests the interviewer wrote down notes and the whole session was recorded with a video camera. The games were played on an Acer Travelmate 529ATXV lap-top computer, featuring a 900 MHz CPU, 128 megabytes of memory and Windows XP operating system. Screen resolution was set to 1024 x 768 pixels with 32 bit color depth. Additional hardware included a basic two button Logitech mouse and Labtec stereo speakers. The games were tested on Internet Explorer 6.0 internet browser except for the Pyramidi, which was only working with Opera 8.5 internet browser.

Depending on the testee, one test session lasted approximately from 50 to 70 minutes. After the session, the testee was rewarded with a movie ticket.

### 4.5 Analysis

The analysis was based on both qualitative and quantitative data. Qualitative data was retrieved from the interviews via recorded video material and interview notes. Quantitative data was retrieved from the feedback forms, which were filled by the testees and also by quantifying the qualitative data. In regards to the goal of this study, qualitative data was considered more significant and the quantitative data played a supportive role.

Qualitative data was retrieved from the interviews by analysing carefully the recorded video material and the interview notes. The relevant testee statements were documented as key comments, creating a database of 533 key comments. The comments were diveded between the games as follows: Formula 110, Pyramidi 119, NettiBingo 105, Onnenpyörät 93 and Poko 106 comments. The comments were organized by each game and a digital version of an *affinity diagram* was built. The affinity diagram organizes the individual comments captured from the notes and videos into a hierarchy revealing common issues and themes (Beyer & Holtzblatt 1998). Normally the affinity diagram is built

with paper inserts where each insert contains one comment that is put up on a physical wall, but in this case the comments were organized within a digital document. The hierarchical structure groups similar issues so that all the data relevant to a certain theme are shown together, creating a consensus from the user feedback. The affinity diagram is a bottom-up tool, where the user comments form groups and the groups are titled afterwards based on their content (Beyer & Holtzblatt 1998). The titles of the groups were turned into key findings from each game.

Two forms of quantitative data were analysed. The primary source for quantitative data was the feedback form filled by the testees, which provided numerical data from each game's evaluated categories. The secondary source for quantitative data was the key comment database.

From the feedback form data it was analysed how the type of the game affected on the five dependent variables, which were the categories of Gameplay, Playability, Audiovisuality, Experience and Total Score. The five different types of games formed an independent variable with five levels (Formula, Pyramidi, NettiBingo, Onnenpyörät and Poko). The effects of game types on dependent variables were analysed with repeated measures analysis of variance (ANOVA). In cases where there was a statistically significant difference between the game type and the dependent variable, further analysis was conducted between all the game types in paired comparison with the repeated measures ANOVA method. The results were considered significant with p-value $< 0,05$, marginally significant with p-value $0,05 - 0,08$ and insignificant with p-value $> 0,08$.

However, as it was expected that the differences might be subtle or non-existent due to the low number of testees, the data was also analysed by calculating the arithmetic mean, the mode and the standard deviation for each game in each of the five categories. The arithmetic mean would indicate a suggestive face value for each of the measured category. The arithmetic mean can be deceiving if the

testees' opinions are widely dispersed, so the mode and the standard deviation were also calculated. The mode would indicate how the majority rated the category in consideration and the standard deviation was used to analyse how much the opinions differ within one category. Low standard deviation would mean that the testees are unanimous in their opinion whereas high standard deviation would mean that the testees are not unanimous in their opinion. There is no definite line between the two but in this study it was considered that the standard deviation under 0,60 would reflect that the testees would be unanimous in their opinion. In case if the arithmetic mean and the standard deviation would not give a clear view from the general opinion, the mode would reveal the opinion of the majority.

Lastly the qualitative data from the comment database was transformed into quantitative data with *thematical categorization*. In thematical categorization, each key comment in the database was tagged as positive, negative or neutral depending on its content. With the tagged key comments, it was possible to analyse which game received most positive or negative comments and make comparisons between the games.

Due relatively low number of testees in this study, it can be expected that the gathered data would be noisy. However, with several different analysis methods, this noisiness can be mitigated and a clear picture can be given on the testees' opinions and attitudes (Albert & Tullis, 2008).

# 5 RESULTS

This chapter presents the results of the user testing. The first sub-chapter 5.1 presents the results from the test session interviews. The second sub-chapter 5.2 presents the results from the repeated measures ANOVA. The third sub-chapter 5.3 presents the results of calculating the arithmetic mean, the mode and the standard deviation. The last sub-chapter 5.4 presents the results of the thematical categorization.

## 5.1 Test Session Interviews

The feedback results are presented in the following order; positive aspects, negative aspects and development suggestions. Results from each game are presented in their own sub-chapters with the tables containing the key findings.

### 5.1.1 Formula

Formula was considered to be an easy, fast paced and simple game with good audiovisual features. Generally the sounds and graphics were liked and the style of graphics was described as "comical" or "candy-like". Especially the sounds were able to create an atmosphere of a real formula event and the game content fit well with the theme. The game idea was generally liked and one testee described the game as "a topical, seasonal game". Three testees reported that they would like to try the game on the Internet for real money. The quick play button works well and none of testees said anything negative about it.

Testees reported that the best features in Formula were the simplicity, theme and the option to place various bets. Fast gameplay and different win probabilities were also mentioned. One testee reported that the audiovisual presentation was the single best feature in the game.

Five testees had some doubts when starting the game. Testees were not sure how the game works and while one testee doubted if he should steer the

selected car, the other wondered if different cards have different attributes. One testee concluded that there is no point in selecting the last car on the start grid. The testees did not like the fact that the player has no control over the outcome of the game and the players' choices were considered meaningless. Although simplicity was praised, the game was considered to be too simplistic at the same time. Two testees stated clearly that the game is boring. Testees found a win rate bug where both the car and the bet had to be re-selected after each game in order to get the correct pay table and it was considered to be very irritating. Also the separate "start" screen was considered pointless. The race animation was considered too simple due to the lack of curves on the race track and sometimes one could predict too early if the selected car was not going to win. This resulted into a poor gaming experience. Although the sounds were good in the beginning, they turned into irritating after a while. Especially the lack of audio feedback at the end of the game was considered to be a negative. When the race animation stops, the audio stops as well and the outcome is presented out of the blue without any audio feedback. One testee reported that as he is not interested in formulas, the game did not interest him either. Other comments by single testees included the lost of sounds due unknown bug, typo in help text and that the indicator for the selected car was not visible enough.

Testees wanted more complex gameplay along with more choices that would be meaningful in the sense that the player could affect the outcome of the game. Longer, more exciting race animation was also suggested. One testee wished for random crashes and this was actually featured in the game but the crashes happen rarely and the particular testee had not seen this happen. Pit stops and adjustable car attributes were also suggested, but they were also considered as too complex features for a scratch-card game. Two testees mentioned that the game should either have personalized drivers with a viewable driving history or that the game should be seamed with real formula events, so that you would have better chances to win if you follow the formula scene. Two testees wondered if a multiplayer option would be possible. Single suggestions

included a turbo button that would be usable once during the race or that the player would be able to drop one car from the starting grid. Other suggestions included better indicators for the selected options and better audiovisual feedback at the end of the race. The core gameplay was considered to be versatile and as a good base for further development. The game theme could be any sport orientated game from javelin throw to horse race. TABLE 2 presents the key findings from Formula.

| Positive features | Negative features | Development Suggestions |
|---|---|---|
| • Easy<br>• Simple<br>• Fast paced<br>• Audiovisual content<br>• Betting options | • Player has no affect on the outcome<br>• Too simple<br>• Separate "start" screen<br>• Bet option bug<br>• Poor race animation<br>• Lack of audio feedback at the end of the game | • More complex gameplay<br>• Meaningful choices for the player<br>• More exciting race animation |

TABLE 2. Key findings in Formula.

### 5.1.2 Pyramidi

The audiovisual quality and the easy gameplay were the two main positive findings from the testees. Audiovisuality fit well into the game theme and two testees related the theme to the Indiana Jones franchise. Comments from the gameplay related to the easiness of the gameplay and to the good playability. The gameplay in terms of functionality was praised also and one testee stated that the player's choices initially felt meaningful. It was considered that the player was offered a lot of possibilities. Five testees said that they would play the game for real money on the Internet.

Testees stated that the gameplay mechanics and the polished audiovisual content were the best features in the game. One testee reported that the use of several screens was the single best feature.

There were several features in the game which were unclear to the testees at first. One testee wondered if the choice of the pyramid at the beginning was of any significance. The quick play button was considered to be odd and its operation was considered dubious. It did not cause any confusion for testees familiar with the quick play button featured in Formula. Turning the pyramid was percieved as confusing too. One testee was not sure how to do it and another one thought that it will cost one "move" when it is done. The absense of pay table also raised questions about the possible winnings in the game.

The negative comments revolved mainly around three issues; gameplay mechanics which rendered the game boring after a while, meaningless choices which downgraded the experience and the quick play button which was considered to be a very bad feature in this game. The quick play button reveals the fact that the player has no control over the outcome, which on the other hand is implicitly suggested as the player can choose which hatches are opened and which are not. In this case the quick play button breaks the illusion of meaningful choices which leads to poor game experience. Other issues mentioned were the absense of the pay table and the startling one euro wins as the game itself costed one euro according to the introduction text. Single negative comments included that the music got repetitive after a while, instructions texts were too small and the outcome was presented poorly.

Testees wished for a betting option and there were several suggestions how this could be implemented. Betting could be done manually in a similar way to Formula where the player selects a bet from a predefined list. Betting could also be implemented in the way that the different pyramids represent different bets. The size of the pyramid could also affect on the amount of hatches in the opening phase. There were also suggestions that the size of the win would be related to the time used for finding the correct symbols. This would reward players that find the correct symbols quickly. Another option was to correlate the win with the amount of opened hatches so that the players with good ratio between the opened hatches and the correct symbols would benefit from their

success. Testees wished that the players' actions would have meaning in the game and one testee said that even an illusion from meaningful actions would be enough. Currently the quick play button reveals that the game has been already drawn and the player's task is just to open the hatches to see if he won or not. The removal of the quick play button would fix this problem or then changing the whole game concept so that the player opens all the hatches like in traditional physical scratch-card game. Instead of a quick play button, a tip button was suggested by three testees. Either the tip button would tell if there is a win or not or it would tell how many correct symbols are in the whole pyramid or in the current face of the pyramid. The presence of a traditional pay table was also suggested. There were three single comments regarding the usability of the game. The pyramids in the beginning and the speaker icon for turning off the sounds could be more visible and the game could feature better instructions. TABLE 3 presents the key findings from Pyramidi.

| Positive features | Negative features | Development Suggestions |
|---|---|---|
| • Audiovisual quality<br>• Easy gameplay<br>• Gameplay mechanics (which later became boring) | • Boring gameplay<br>• Meaningless choices<br>• Quick play button<br>• Absense of pay table<br>• 1 euro wins | • Betting option<br>• Meaningful choices<br>• Tip button instead of quick play button |

TABLE 3. Key findings in Pyramidi.

### 5.1.3 NettiBingo

NettiBingo received various positive comments from the testees. Six testees reported that the game mimics real-life bingo very well. Automated number marking was a good feature along with the speed slider and with the graphical alarm effect when bingo was close. Audiovisual content was considered to be good overall, except for the background image. Playability received positive comments from four testees. Other than that, the announcer voice was considered to be clear.

Best features according to the testees were the adjustable speed, simplicity and easiness, and the quality of the sound. The automatic number markering was also mentioned.

Most confusing feature for the testees was the male announcer voice. The testees expected a female voice as there was a picture of a young woman at the bottom of the screen. The end condition was also confusing to one testee as he wondered if the game continues after getting a bingo. Other testee was unsure if he would have to mark the numbers by himself or not but soon realised that there was an automarker feature.

Six testees thought that the background image was horrible, described by one as "leather monster". Otherwise the graphical outlook did not receive any negative feedback. Testees compared the game to the real world bingo and stated that the digital version was lacking an important feature; social play which occurs in the same time and place. Also the gameplay felt boring as the player had nothing else to do than wait for the bingo or the end of numbers. One testee stated that the game does not work well in digital format. The game felt passive and there was no challenge. Two testees commented that the game represents bingo very well but bingo is not a very interesting game. The speed slider had a bug and you could not slow the game down. The slider was also critiqued for not being stepless and it was not possible to drag it although the

visual design implied this. There were not many suggestions on how to improve the game as the game was a perfect bingo game in a sense. Three testees desired more gameplay but were not able to point out in what form it would be exactly. One testee wanted a quick play button but the other one did not. Two testees suggested that the player should given the choice of selecting the numbers for the grids. Multiplayer version was also suggested and automarking could be more visible. TABLE 4 presents the key findings from NettiBingo.

| Positive features | Negative features | Development Suggestions |
|---|---|---|
| • Mimics well real bingo<br>• Automarker<br>• Bingo alert<br>• Speed adjustment<br>• Easy | • Boring, no gameplay<br>• Background image<br>• Speed adjustment bug | • More gameplay (undefined)<br>• Allow player to pick numbers for the grid |

TABLE 4. Key findings in NettiBingo.

### 5.1.4 Onnenpyörät

Onnenpyörät was considered to be tried and true game concept. Testees were pleased to find out that you could spin all the wheels simultaneously. Three testees reported that the gameplay was good as the player is given the choice to spin the wheels. The gold, silver and bronze special prizes along with the bonuswheel were also considered as good features. Playability received positive comments from six testees. Two testees reported that the game does not have any significant flaws and two other testees stated that the game is fair as you can see all the possible outcomes at all times. Four testees would like to try the game for real money. Other positive comments related to the good hookability and excitement of the game. Onnenpyörät was also compared to the other games and all the opinions were in favor for Onnenpyörät.

Testees reported that the best features in Onnenpyörät were the familiar idea, the bonuswheel, and the ability to spin multiple wheels at the same time. Also the excitement from spectating the wheels and the clarity of win condition were mentioned as the best features in the game.

The players generally did not have problems to start the game. One testee was not sure about how many wheels he should spin. The two main negative issues were the player's meaningless actions and the length of the game. Testees felt that the player has no control over the outcome and spinning the wheels was just one obligatory task. Testees also noticed that the wheels kept spinning for too long but this might have been a result from low processing power of the test hardware. Other negative issues were the lack of excitement and the possibility to get 0 euro wins. The game also felt scarse due to being an early prototype. The red pointers by the wheels confused one testee as he thought he must click on them to get the wheels spinning. Another testee complained about isolating the wins in the wheels by enlarging the end result, making it impossible to see the "close calls" afterwards.

Testees wished for better audiovisual content, which would make the game a lot better. Testees also wanted that the player has some effect on the spinning of the wheel. Two testees suggested that the player could set the power for the spin with his mouse and including a small randomization effect, so there would not be a single winning strategy. Betting was also suggested; by either traditonal predefined bets or that the player could choose how many wheels he spins; the less wheels the bigger the wins. Also decreasing the amount of wheels, even to one, was suggested. Other suggestions included a narrator similar to the one in the Wheels of Fortune television franchise, better explanation for the win condition and the option to double the prize in a seperate bonus game. TABLE 5 on next page presents the key findings from Onnenpyörät.

| Positive features | Negative features | Development Suggestions |
|---|---|---|
| • Familiar theme<br>• Simultaneous spinning<br>• Playability<br>• Bonuswheel | • Meaningless actions<br>• Slow (due low CPU power)<br>• 0 euro wins<br>• Audiovisual content | • Betting (various forms)<br>• Spin power would depend on the player's mouse movement |

TABLE 5. Key findings in Onnenpyörät.

### 5.1.5 Poko

Poko received less positive comments than the other games. Testees reported that the playability was good and there was long term excitement apparent when waiting for the numbers to stop spinning. The pay table was clear and well presented. Three testees stated that they could play the game for real money on the Internet. Two testees said that the lack of functionality does not bother them in this game. Audiovisual content was considered to be sufficient and the game was reported to be open for different themes. The testees were reluctant to single out the best features but the similarity with slot machines and the many ways to win were mentioned.

Testees compared Poko to the other games and Poko was generally considered as inferior to mentioned games. Only one testee reported that he would rather play Poko than Formula. Three testees reported that they would rather play real poker than Poko, which they considered to be a simplified version from poker.

Poko raised confusion among the testees. Especially the second round was surprising according to the testees and generally the testees did not understand how the game worked before they have tried it. One testee wondered if it is possible to get the same numbers in the second round. Another testee did not initially understand the concept of playing against the house. The name Poko also raised questions about its meaning.

Eight testees reported that Poko has very little or no gameplay whatsoever. Player's only task was only to click the button to make the rows spin and the game was too simple and too automated. The concept was considered to be bad and boring. The game also felt "amazingly slow", which was partly the cause of the low processing power of the test hardware. The game idea was unclear and the instructions were poor, thus the game idea was revealed only after trying the game. Three testees reported that they were not able to find anything good in Poko.

Testees suggested that Poko should have had more gameplay features and the player should be able to to decide what numbers are to be locked. Other suggestion was that the player should get to decide when the spinning stops. The game should be faster and there should be better instructions, especially considering the second round. Hiding the numbers could make the game more interesting. Two testees suggested that the quick play button might work in this game. One testee suggested that Poko could be a part of some bigger game. TABLE 6 presents the key findings from Poko.

| Positive features | Negative features | Development Suggestions |
|---|---|---|
| • Playability<br>• Pay table | • Game idea<br>• Boring<br>• No gameplay<br>• Slow (due low CPU power)<br>• Poor instructions | • Better gameplay (undefined)<br>• Better instructions |

TABLE 6. Key findings in Poko.

## 5.2 Repeated Measures ANOVA

Only the significant ANOVA results are presented with diagrams. The results on the effect of the game type on the depended variables (Gameplay, Playability, Audiovisuality, Experience, Total Score) are presented first. In cases with significant differences, the data was analysed further by comparing games in pairs in all possible combinations. Five different games result into 10 pair combinations in a symmetrical test.

The tested games were found to be significantly different in Audiovisuality ($F(4, 32) = 8{,}525$, $p < 0{,}001$) and Total Score ($F(4, 32) = 3{,}077$, $p = 0{,}030$). These results are presented in DIAGRAMS 1 and 2.

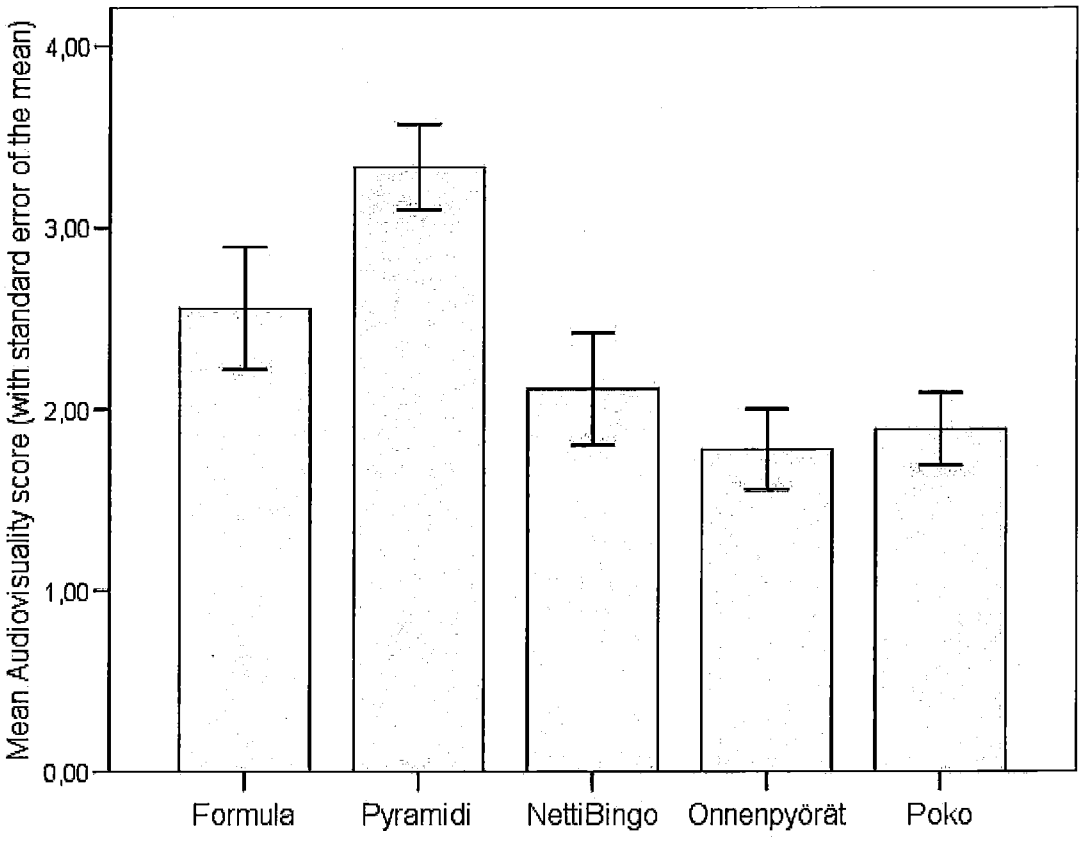


DIAGRAM 1. Audiovisuality scores (with s.e.m) for the five game types, Formula, Pyramidi, NettiBingo, Onnenpyörät and Poko.

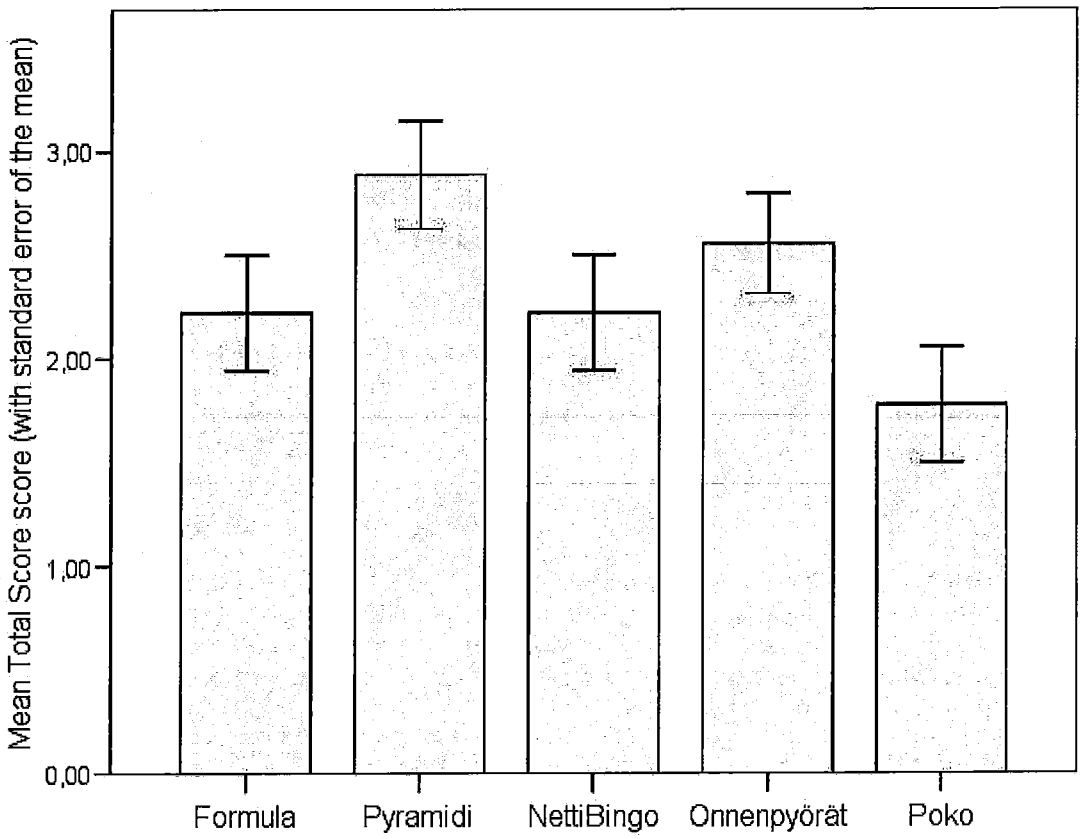


DIAGRAM 2. Total Score scores (with s.e.m) for the five game types, Formula, Pyramidi, NettiBingo, Onnenpyörät and Poko.

In the case of Playability, the differences between the games was marginally significant ($F(4, 32) = 2{,}332$, $p = 0{,}077$). Neither Experience ($F(4, 32) = 2{,}251$, $p = 0{,}085$) nor Gameplay ($F(4, 32) = 1{,}685$, $p = 0{,}178$) were significantly different between the games.

The games were compared in pairs in regards to Audiovisuality and Total Score. The differences in Audiovisuality were significant in the cases of Formula vs. Pyramidi ($F(1, 8) = 12{,}250$, $p = 0{,}008$), Formula vs. Onnenpyörät ($F(1, 8) = 7{,}840$, $p = 0{,}023$), Pyramidi vs. NettiBingo ($F(1, 8) = 9{,}308$, $p = 0{,}16$), Pyramidi vs. Onnenpyörät ($F(1, 8) = 41{,}263$, $p < 0{,}001$) and Pyramidi vs. Poko ($F(1, 8) = 67{,}600$, $p < 0{,}000$). The differences in Audiovisuality were insignificant in the cases of Formula vs. NettiBingo ($F(1,8) = 1{,}164$, $p = 0{,}312$), Formula vs.

Poko ($F(1, 8) = 4{,}000$, $p = 0{,}081$), NettiBingo vs. Onnenpyörät ($F(1, 8) = 1{,}000$, $p = 0{,}347$), NettiBingo vs. Poko ($F(1, 8) = 0{,}372$, $p = 0{,}559$) and Onnenpyörät vs. Poko ($F(1, 8) = 0{,}308$, $p = 0{,}594$).

The differences in Total Score were significant in the cases of Formula vs. Pyramidi ($F(1,8) = 16{,}000$, $p = 0{,}004$), Pyramidi vs. Poko ($F(1, 8) = 12{,}903$, $p = 0{,}007$) and Onnenpyörät vs. Poko ($F(1,8) = 7{,}840$, $p = 0{,}023$). The differences in Total Score were insignificant in the cases of Formula vs. Nettibingo ($F(1, 8) = 0{,}000$, $p = 1{,}000$), Formula vs. Onnenpyörät ($F(1,8) = 1{,}000$, $p = 0{,}347$), Formula vs Poko ($F(1,8) = 1{,}730$, $p = 0{,}225$), Pyramidi vs. NettiBingo ($F(1, 8) = 4{,}000$, $p = 0{,}081$), Pyramidi vs. Onnenpyörät ($F(1, 8) = 1{,}000$, $p = 0{,}347$), NettiBingo vs. Onnenpyörät ($F(1,8) = 1{,}000$, $p = 0{,}347$) and NettiBingo vs Poko ($F(1, 8) = 1{,}000$, $p = 0{,}347$).

## 5.3 Arithmetic Mean, Mode and Standard Deviation

The following TABLES 7, 8, 9, 10 & 11 present the feedback form grades for each game as given by the individual testees. For each evaluated category, the arithmetic mean, the mode and the standard deviation were calculated.

| Category | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | Arithmetic mean | Mode | Standard deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gameplay** | 2 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 1 | *2,11* | *2* | *0,78* |
| **Playability** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | *2,89* | *3* | *0,44* |
| **Audiovisuality** | 2 | 3 | 2 | 4 | 2 | 4 | 3 | 1 | 2 | *2,67* | *2* | *1,00* |
| **Experience** | 2 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 1 | *2,22* | *2* | *0,67* |
| **Total Score** | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 2 | 1 | *2,22* | *3* | *0,83* |

TABLE 7. Formula score table.

| Category | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | Arithmetic mean | Mode | Standard deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gameplay | 2 | 3 | 1 | 4 | 3 | 2 | 3 | 2 | 2 | *2,44* | *2* | *0,88* |
| Playability | 3 | 4 | 4 | 4 | 3 | 3 | 4 | 2 | 3 | *3,33* | *3, 4* | *0,71* |
| Audiovisuality | 3 | 4 | 2 | 4 | 3 | 4 | 4 | 3 | 3 | *3,33* | *3, 4* | *0,71* |
| Experience | 1 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 1 | *2,11* | *2* | *0,78* |
| Total Score | 2 | 3 | 2 | 4 | 3 | 3 | 4 | 3 | 2 | *2,89* | *3* | *0,78* |

TABLE 8. Pyramidi score table.

| Category | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | Arithmetic mean | Mode | Standard deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gameplay | 4 | 4 | 1 | 3 | 1 | 2 | 3 | 1 | 3 | *2,44* | *3* | *1,24* |
| Playability | 2 | 4 | 4 | 3 | 3 | 3 | 3 | 1 | 3 | *2,89* | *3* | *0,93* |
| Audiovisuality | 1 | 2 | 3 | 3 | 2 | 1 | 3 | 1 | 3 | *2,11* | *3* | *0,93* |
| Experience | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 1 | 2 | *1,78* | *2* | *0,67* |
| Total Score | 2 | 3 | 2 | 3 | 1 | 2 | 3 | 1 | 3 | *2,22* | *3* | *0,83* |

TABLE 9. NettiBingo score table.

| Category | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | Arithmetic mean | Mode | Standard deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gameplay | 4 | 4 | 1 | 3 | 3 | 2 | 3 | 1 | 2 | *2,56* | *3* | *1,13* |
| Playability | 3 | 3 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | *2,78* | *3* | *0,67* |
| Audiovisuality | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | *1,78* | *2* | *0,67* |
| Experience | 2 | 4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | *2,22* | *2* | *0,83* |
| Total Score | 3 | 4 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | *2,56* | *2* | *0,73* |

TABLE 10. Onnenpyörät score table.

| Category | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | Arithmetic mean | Mode | Standard deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gameplay | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | *1,78* | *2* | *0,67* |
| Playability | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 2 | *2,56* | *3* | *0,73* |
| Audiovisuality | 1 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | *1,89* | *2* | *0,60* |
| Experience | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | *1,44* | *1* | *0,53* |
| Total Score | 1 | 3 | 1 | 2 | 2 | 2 | 1 | 3 | 1 | *1,78* | *1* | *0,83* |

TABLE 11. Poko score table.

## 5.4 Thematical Categorization

The thematical categorization was constructed from the database of 533 key comments. From all the comments, 202 (38%) were positive, 180 (34%) were negative and 151 (28%) were neutral. TABLE 12 below presents the amount of comments by each game with percentage values.

| Game (total comments) | Positive | Negative | Neutral |
|---|---|---|---|
| Formula (110) | 37 (34%) | 36 (32 %) | 37 (34%) |
| Pyramidi (119) | 50 (42%) | 32 (27%) | 37 (31%) |
| NettiBingo (105) | 45 (43%) | 37 (35%) | 23 (22%) |
| Onnenpyörät (93) | 44 (47%) | 24 (26%) | 25 (27%) |
| Poko (106) | 26 (25%) | 51 (48%) | 29 (27%) |

TABLE 12. Summary table of thematical categorization.

# 6 DISCUSSION

The interview results indicate that the gameplay was often the bottleneck in the evaluated games. In many occasions, the testees commented that the gameplay started to feel boring after playing for a while. Scratch-card games are simple by their nature and playing them several times in a row in a fixed test setting might get tedious. The testees wanted to have the skill element present in the games. However, adding the skill element would change the nature of these games and the basic principle behind the instant-win lottery, the already drawn result, would be altered. The testees seemingly had difficulties to face these games as simple games of chance.

Playability was considered to be good in many cases, though the games' instructions were often considered to be poor and many times the testees were unsure what to do when they played a game for the first time. Familiar theme helped a lot and this could be seen in NettiBingo and Onnenpyörät where the game idea was clear right from the start with only few exceptions.

Audiovisual content was generally liked but there were few strong exceptions like the background image in NettiBingo. Onnenpyörät and Poko were early concept prototypes with simple audiovisual design so negative feedback on their part was expected.

The games were not able to provide thrilling experiences for the testees. Although some of the testees felt that the games were exciting at first, they found them boring very quickly. In Formula the testees were able to see too early if they were not going to win and the quick play button in Pyramidi destroyed the illusion of meaningful actions. NettiBingo was considered to be boring whereas Onnenpyörät and Poko were compared to monotonous clicking with the mouse.

The testees experienced the games very differently in some cases. This was most apparent in NettiBingo where the game concept divided the testees and the verbal feedback in general was very diverse. NettiBingo was also compared to the traditional bingo where the social play was considered to be the core element of fun. The digital version did not have the social play element, thus it was considered to be boring in general. This emphasizes the fact that when converting a game from one medium to another, one must understand what makes the game fun in the original medium.

Results from the repeated measures ANOVA reveal that the games had significant differences only in Audiovisuality and Total Score. The audiovisual differences are easy to explain as the amount of audiovisual content correlates with the given grades in Audiovisuality. Games with low audiovisual content, such as the early concept prototypes Onnenpyörät and Poko, were graded poorly and the games with richer audiovisual content were rated higher. The pair comparison reveals that Pyramidi had significantly better audiovisual features than any other game in the study. Formula was also considered to be significantly better than Onnenpyörät in Audiovisuality but other pairs did not feature significant differences.

Continuing with the ANOVA results, it can be stated that the games were significantly different in regards to Total Score. The pair comparison reveals that Pyramidi was significantly better than Formula and Poko, and that Onnenpyörät was significantly better than Poko. Other pairs did not feature significant differences. These results are in line with the findings from interview results presented earlier and thematical categorization (see page 54).

Playability was only marginally different between the games. All of the games had playability issues, but Poko stood out as the worst based on the qualitative and quantitative data. During the testing the testees seemed to be more frustrated with Poko than with other games.

Lastly the repeated measures ANOVA results reveal that Experience and Gameplay did not seem to have significant difference between the games. It can be speculated that the Experience did not differ, as based on the interviews all the games were considered unexciting after playing a while. There could be a correlation with Gameplay, but it cannot be stated for sure. It can be speculated that all the games had ultimately boring gameplay, which resulted into poor game experience. The boring gameplay is probably the result of basic game mechanics behind the instant-win lottery as the player's task is just to find out if he won or not. Basically all games revolved around clicking the mouse and the only real difference was the amount of clicking. The insignificances could also be the result of the low number of testees or even the use of wrong rating categories.

Analysing the arithmetic mean, the mode and the standard deviation from the tables presented in chapter 5.3 must be done cautiously as the ANOVA results indicated that only Audiovisuality and Total Score had significant differences between the games. However, some speculations can be made by analysing the presented tables and relying on the data from the interviews and thematical categorization.

Highest arithmetic means were diveded between three games, Pyramidi, Onnenpyörät and Formula. Pyramidi had highest arithmetic means in Playability (3,33), Audiovisuality (3,33) and Total Score (2,89). Onnenpyörät had highest arithmetic means in Gameplay (2,56) and Experience (2,22) and the latter was shared with Formula. However, Formula had lower standard deviation in Experience (0,67 vs. 0,83) indicating that the testees were more unanimous in favor for Formula. The results from the thematical categorization (see page 54) support these speculative findings that Pyramidi and Onnenpyörät were considered as the best games.

Highest standard deviations were seen in Formula's Audiovisuality and in Gameplay of NettiBingo and Onnenpyörät. Based on the interviews, Formula's candy-like graphics probably divided the opinions whereas in the case of Gameplay with NettiBingo and Onnenpyörät, the dividing factors were probably the game concepts. In these cases, the grades were evenly distributed from poor to excellent.

Each game received a mode of 3 (good) for Playability. In the case of Pyramidi, the mode was split between 3 (good) and 4 (excellent). This would indicate that Playability was at least sufficient in many cases and there were only two instances with all the games where the testees rated Playability as poor (1). In the case of Formula, all except one testee rated Formula's Playability as good (3), which made the standard deviation to be lowest from all (0,44).

Poko was the only game featuring a mode of 1 (poor) in Experience. The standard deviation was also rather low in this case (0,53) which would indicate that the testees were unanimous in their opinion that Poko was the worst game when it came to Experience.

The thematical categorization reveals that Onnenpyörät was highly praised in the test session interviews as 47% of all comments were considered as positive. Surprisingly NettiBingo came second with 43% value and Pyramidi third with 42% value. In case of Poko, 48% of all comments were marked as negative, NettiBingo coming second with 35% and Formula third with 32%. NettiBingo's dualistic nature is clearly shown here as it got lots of positive and negative feedback. Formula did not really stand out in this analysis as the positive, negative and neutral comments were evenly distrubuted around 32-34%.

From all the categories evaluated and rated, the Experience scored most poorly. One hypothesis for poor Experience ratings is that playing money games without money is unexciting regardless of the game. The presence of money in a form of concrete financial win or loss could have a significant impact even in a

test setting. However, implementing real money into a user testing is not without difficulties and raises ethical questions, which are not discussed in this thesis.

Based on these analyses, it can be concluded that the games had their differences but none of the games were considered excellent. Even in the best cases, the categories were rated as good but mostly the ratings hovered between mediocre and good. Based on the four different analyses, Pyramidi and Onnenpyörät were the best games, Formula and NettiBingo were in the between and Poko was clearly the worst.

# 7 DESIGN IMPLICATIONS

This chapter presents 12 design implications that were derived from study results. Each design implication is presented in its own sub-chapter with a description, examples and references to existing literature.

## 7.1 Clear Instructions

The games should feature clear and readable instructions, which should be visible before the player starts the game and also during the play. Although this is clearly a usability issue and therefore not exactly in the focus of this study, the problem with poor instructions came up in so many cases that this issue should be included in these design implications. In the beginning the instructions could be presented in a pop-up window with a "do not show again" option. During the play, the instructions should be clearly visible in a single consistent space. Allthough good instructions are necessary in all games, their role is emphasized when the players play for real money. The instructions were considered to be poor especially with Poko. Related finding is presented by Korhonen & Koivisto (2006) in their heuristics for mobile games. Their game usability heuristic GU12 (The game contains help) is related to this design implication.

## 7.2 Visibility of Money

The money related information should be always visible to the player. This information includes the pay table, the current bet or the price of the game and the amount of money the player has in her account. It is also recommended that the win ratios or probabilities are visible. Formula and Poko received positive feedback regarding to this issue, where as Pyramidi fared poorly. Related finding is presented by Korhonen & Koivisto (2006) in their heuristics for mobile games. Their game usability heuristic GU4 (Indicators are visible) is related to this design implication.

### 7.3 Illusion of Influence

The games which implicitly suggest that the player has an influence on the outcome should try to uphold this illusion. When playing Pyramidi, the testees were first excited when trying to find the correct symbols. However, when it was revealed (due the quick play button) that the player's actions are meaningless, the game experience was ruined. Therefore games such as Pyramidi should uphold the illusion of meaningful actions. However, this might raise ethical questions which are not discussed in this thesis. This implication is related closely to the works of Crawford (1982/1997) as he suggests that games should at least produce an illusion that the challenges react to the player's actions.

### 7.4 Versatile Gameplay

The games should feature versatile gameplay possibilities. The games with a single game mechanic (Formula, NettiBingo and Poko) were considered to be boring to play after a while. Special features, such as the bonuswheel in Onnenpyörät or the turnable pyramid faces in Pyramidi, were considered to be exciting. Therefore games should feature additional game mechanics apart from the core game mechanic. This could mean a special bonus game or a consolation prize after the main game. Many traditional physical scratch-game cards feature two or more games in one ticket. This implication is related to the works of Malone (1980) who states that good computer games often feature several different levels of goals.

### 7.5 Consistent Audiovisuality

The game should feature consistent audiovisual content throughout the game. Formula was criticized for the lack of audio feedback at the end of the game. Onnenpyörät and Poko were criticised as well, though it was expected as they are early concept prototypes. However, this clearly shows that the players expect good audiovisual content as the digital format allows many audiovisual features which can be used enhance the gameplay. This implication is related to the works of Malone (1980) who suggest that games should provide sensory curiosity, especially as a reward element.

### 7.6 Prolong Excitement

The game should prolong the excitement as much as possible. This was especially an issue in Formula where sometimes the players saw too early that they do not have a chance to win. Malone (1980) addresses this issue by stating that games are boring if the player is certain about his win or lose.

### 7.7 Meaningful Wins

The game should only offer meaningful wins. This was an issue in Pyramidi and especially in Onnenpyörät where it was possible to get three zeros, thus succeeding in the game mechanic of match three-of-kind but not winning anything. Also the bonuswheel featured a zero win which was considered to be a bad feature as the testee felt that they had accomplished something special by reaching the bonuswheel, thus they should be rewarded. Related finding is presented by Korhonen & Koivisto (2006) in their heuristics for mobile games. Their gameplay heuristic GP3 (The players are rewarded and the rewards are meaningful) is related to this design implication.

### 7.8 Purposeful Screens

Every screen should serve a purpose. The separate start screen in Formula was consided to be useless. Players expected that after selecting the car and the bet, the game would start after pressing the play button. Instead the player needed to press a separate start button after pressing the play button. Related finding is presented by Korhonen & Koivisto (2006) in their heuristics for mobile games. Their game usability heuristic GU6 (Navigation is consistent, logical and minimalist) is related to this design implication.

### 7.9 Provide Options

The game should provide gameplay options. The quick play button (in some cases) and the NettiBingo's speed slider were seen as good features. Gameplay options enrich the game experience although they are not necessary relevant to the outcome of the game. Ability to turn off sounds, adjusting the speed of the game or changing the background image could be seen as as secondary features that enrich the game experience. Related finding is presented by Korhonen & Koivisto (2006) in their heuristics for mobile games. Their gameplay heuristic GP4 (The player is in control) is related to this design implication.

### 7.10 Automated Tasks

Tedious tasks should be automatically done. NettiBingo's automarking was considered to be a good feature. Games which involve tedious, boring tasks like keeping track on numbers should have this done automatically by the game. Related finding is presented by Korhonen & Koivisto (2006) in their heuristics for mobile games. Their gameplay heuristic GP8 (There are no repetitive or boring tasks) is related to this design implication.

### 7.11 Surpsising Events

Games should feature surprising events when appropriate. Sometimes in Formula the cars crash with each other, creating a surprising and unexpected situation. These situations were considered to be pleasant by the testees. The surprising situations should not affect the player's possibility of winning, however and it should be used as a decorative feature. Malone (1980) addresses this issue by stating that games should have cognitive curiosity in the form that the feedback should be surprising.

### 7.12 Low Price

Games should feature low price to intrique players. Low price, or bet, encourages the player to try the game, eventhough it would not be absolutely clear to the player how the game works. Although this did not come up as a positive or negative feature in any game, the testees commented in general that they could play these games for small amount of money, in hope for small winnings that could be used for other purposes. Games with low price, from five to ten cents per play for example, could be more complex and compelling as the possible financial loss is minimal but the games would feature the excitement of money game nevertheless. These micro-payments have been lately related to the genre of casual games (Kuittinen et al. 2007) which share similar features with the studied scratch-card game prototypes in regards to the simplicity and ease of play.

# 8 CONCLUSION

The research theme for this study was to define design implications for digital scratch-card games. Research goal of the study was to define tangible design implications which could be used in development to create exciting digital scratch-card games. This study presented 12 design implications which were drawn from the results of the user test where nine testees evaluated five digital scratch-card game prototypes.

The second chapter of this study introduced the concepts of games and play. Various definitions for games and play were presented, and the definition for digital games was proposed. Money based games were introduced based on the categorization by Järvinen& Sotamaa (2002) and analysed based on Caillois' (1958/2001) classification for games. The chapter was concluded with the introduction to digital scratch-card games, which were in the focus of this study.

The third chapter presented the rationale of the study. The background and the research goal of the study were explained. The related academic works and the basis for the methodology of this study were presented.

The fourth chapter presented the user study. The scratch-card game prototypes were introduced along with the testee profiles and the evaluation metrics. Description of the procedure and the analysis methods were also presented.

The fifth chapter presented the results from the user study. The qualitative feedback from each digital scratch-card game prototype was presented with the key findings and quantitative data.

The sixth chapter presented the discussion where the qualitative and quantitative data was analysed and summed up.

The seventh chapter presented the 12 design implications that were derived based on the user study. The design implications were compared with the related works from the field.

The contribution of this study is the design implications presented in the chapter six. Based on the study, designing digital scratch-card games with these implications should lead to exciting games which produce positive experiences for the players. However, as it was not possible to actually test these design implications in practice, the usefulness of the presented implications are not verified in any way.

The challenge of this study was the lack of related academic works from the field of digital scratch-card games. Studying game design from the academic point of view is a relatively new phenomenon, and this particular genre of money games, although gaining in popularity, is still considered to be a niche, thus not enjoying the academic interest. The companies developing digital scratch-card games have probably done similar studies, but these studies are not publicly available.

The next phase in continuing this study would be to verify the presented design implications. Several game prototypes should be made according to these design implications and these prototypes should be then evaluated by both expert evaluation and user testing. In case the design implications would be found useful, they could be completed with possible new implications and elevated to design guidelines for digital scratch-card games.

Other interesting topic in the field would be to study the possibilities for multiplayer scratch-card games. Social play is emerging widespreadly through popular Internet social media services such as Facebook and Flickr, and it is apparent that games have the power to connect people. Multiplayer digital scratch-card games would offer a new and exciting research area with all new design challenges.

## REFERENCES

Albert, B. & Tullis, T. 2008. Measuring the User Experience: Collecting, Analyzing and Presenting Usability Metrics. Morgan Kaufmann Publishers, p. 11-13.

BBC. 2005. Gamers in the UK: Digital play, digital lifestyles. Available online at: <http://crystaltips.typepad.com/wonderland/files/bbc_uk_games_research_2005.pdf>

Beyer, H. & Holtzblatt, K. 1998. Contextual Design: Defining Customer-Centered Systems. San Fransisco, CA, United States: Morgan Kauffman Publishers, p. 154-163.

Boyer, B. 2007. Gamasutra Industry News: Halo 3 Reaches $170 Million In First Day Sales. Available online at: <http://www.gamasutra.com/php-bin/news_index.php?story=15647>

Caillois, R. 1958/2001. Man, Play and Games. Champaign: University of Illinois Press

Crawford, C. 1982/1997. The Art of Computer Game Design. The electronic edition. Available online at: < http://www.vancouver.wsu.edu/fac/peabody/game-book/ACGD.pdf>

Csikszentmihalyi, M. 1991. Flow: The Psychology of Optimal Experience. New York, NY, United States: Harper Perennial.

Desurvire, H., Caplan, M. & Toth, J.A. 2004. Using Heuristics to Evaluate the Playability of Games. CHI 2004, April 24-29, Vienna, Austria. Available online at: <http://www.behavioristics.com/downloads/usingheuristics.pdf>

ESA. 2007. Essential Facts About the Computer and Video Game Industry: Sales, Demographic and Usage Data. Available online at: <http://www.theesa.com/archives/ESA-EF%202007%20F.pdf>

Federoff, M. 2002. Heuristics and Usability Guidelines for the Creation and Evaluation of Fun in Video Games. Master's Thesis at University Graduate School of Indiana University, Department of Telecommunications. Available online at: <http://melissafederoff.com/heuristics_usability_games.pdf>

Huizinga, J. 1938/1971. Homo Ludens. A Study of Play Element in Culture. Boston, MA, United States: Beacon Press.

ISO. 1998. ISO 9241-11 Ergonomic requirements for office work with visual display terminals (VDTs), Part 11: Guidance on usability. ISO International Standard.

Jones, M. & Marsden, G. 2006. Mobile Interaction Design. Chichester, England: John Wiley & Sons Ltd, p. 199-200.

Järvinen, A. & Sotamaa, O. 2002. Pena: Rahapelaamisen haasteet digitaalisessa mediassa. University of Tampere, Hypermedialaboratory online publication. Available online at: <http://tampub.uta.fi/tup/951-44-5411-1.pdf>

Kallio, K. P., Kaipainen, K. & Mäyrä, F. 2007. Gaming Nation? Piloting the International Study of Games Cultures in Finland. Hypermedia Laboratory Net Series 14. University of Tampere. Available online at: <http://tampub.uta.fi/tup/978-951-44-7141-4.pdf >

Korhonen, H. & Koivisto, E. 2006. Playability Heuristics for Mobile Games. MobileHCI'06, September 12-15, Helsinki, Finland.

Korhonen, H. & Koivisto, E. 2007. Playability Heuristics for Mobile Multi-Player Games. DIMEA'07, Perth, Australia.

Kuittinen, J., Kultima, A., Niemelä, J. & Paavilainen, J. 2007. Casual Games Discussion. Proceedings of the Future Play 2007 Conference. Toronto, Canada: Algoma University.

Laitinen, S. 2006. Do usability expert evaluation and test provide novel and useful fata for game development? Journal of Usability Studies, Volume 1, Issue 2, p. 64-75. Available online at: <http://www.upassoc.org/upa_publications/jus/2006_february/usability_game_development.pdf>

Malone, T. W. 1980. What Makes Things Fun to Learn? Heuristics for Designing Instructional Computer Games. Proceedings of the 3rd ACM SIGSMALL symposium and the first SIGPC symposium on Small systems. Palo Alto, CA, United States.

Mäyrä, F. 2008. An Introduction to Game Studies: Games in Culture. London, England: SAGE Publications, p. 37-38

Nielsen, J. 2000. Why You Only Need to Test With 5 Users. Available online at: <http://www.useit.com/alertbox/20000319.html>

Paul, F. 2008. Reuters: Grand Theft Auto first week sales top $500 mln. Available online at: <http://www.reuters.com/article/companyNews/idUSN0755678120080507>

Pagulayan, R.J., Keeker, K., Wixon, D., Romero, R. & Fuller, T. 2003. User-centered design in games. In Jacko, J. & Sears, A. (eds.) Handbook for human-computer interaction in interactive systems. Mahwah, NJ: Lawrence Erlbaum Associates Inc, p. 883-906.

Salisbury, J. 2004. All a question of fun: How can primary research into how videogame engage support design practice. Game Design Research Symposium and Workshop. Copenhagen, Denmark.

Spool, J. & Schroeder, W. 2001. Testing web sites: five users is nowhere near enough. Conference on Human Factors in Computing Systems. CHI'01 extented abstracts on Human Factors in Computing Systems. Seattle, WA, United States, p. 285-286.

Sweetser, P. & Wyeth, P. 2005. GameFlow: A Model for Evaluating Player Enjoyment in Games. ACM Computers in Entertainment, Volume 3, No. 3.

Taskinen, T. 2007. Kaupassa, kioskilla ja kotikoneella: Rahapelit nuorten elämässä. STAKES työpapereita 25/2007. Helsinki, Finland.

Veikkaus. 2007. Veikkaus' Year 2007. Annual Report.Corporare Responsibility Report. Vantaa, Finland, p. 44. Available online at: <https://www.veikkaus.fi/info/yritys/pdf/vuosiraportti_e_07.pdf>

Wittgenstein, L. 1953/2001. Philosophical Investigations. Blackwell Publishing.

# APPENDIX

## FEEDBACK FORM

**Name:** _____

**Age:** _____

**Sex** : **M / F**

**Have you played money games on internet before?** **Yes / No**

| Category | Formula | Pyramidi | NettiBingo | Onnenpyörät | Poko |
|---|---|---|---|---|---|
| Gameplay | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 |
| Playability | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 |
| Audiovisuality | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 |
| Experience | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 |
| Total score | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 | 1-2-3-4 |
| Additional comments | | | | | |

**1 = Poor**

**2 = Mediocre**

**3 = Good**

**4 = Excellent**