The impact of gamification on intrinsic motivation

An experimental study of administrative tasks

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Title: Exploring the impact of gamification on intrinsic motivation while conducting administrative tasks – An experimental study

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Abstract

Gamification could be a solution to make office work more productive by increasing the intrinsic motivation of employees. Currently, little research exists on gamification in connection to administrative tasks. In literature the importance of designing gamified tasks to the target group is stressed. This study explores in an experiment the impact of gamification on intrinsic motivation while conducting basic administrative tasks, as well as differences between age groups. The qualitative analysis of the experiment (n = 32) reveals indications that gamification triggers positive emotions, a higher engagement and creativity. Using a mixed methods approach, the indications from the qualitative analysis could not be proven quantitatively with a statistical significance. The results further suggest, that people over 35 years tend to perceive gamification more extreme than younger ones, leading to either high intrinsic motivation or alienation.
# Table of Contents

1 Introduction .......................................................................................... 1
   1.1 Purpose............................................................................................. 2
   1.2 Research questions........................................................................... 2
   1.3 Definitions ....................................................................................... 3
      1.3.1 Gamification............................................................................. 3
      1.3.2 Intrinsic motivation................................................................. 3
   1.4 Delimitations .................................................................................... 4
      1.4.1 Geographic area....................................................................... 4
      1.4.2 Basic administrative tasks ..................................................... 4
      1.4.3 Motivation............................................................................... 4

2 Theoretical background .......................................................................... 5
   2.1 Motivation ....................................................................................... 5
      2.1.1 Extrinsic motivation................................................................. 5
      2.1.2 Intrinsic motivation.................................................................. 5
      2.1.3 Flow....................................................................................... 5
   2.2 Gamification ................................................................................... 7
      2.2.1 Defining gamification.............................................................. 7
      2.2.2 Defining parts of gamification................................................ 8
      2.2.3 Situating gamification............................................................ 11
   2.3 Player types .................................................................................... 12
      2.3.1 Bartle’s player types.............................................................. 12
      2.3.2 Balancing Bartle’s player types.............................................. 14
   2.4 Game phases .................................................................................. 14
   2.5 Game motivation – the eight core drives .......................................... 15
      2.5.1 Core drive 1: Epic Meaning & Calling................................... 16
      2.5.2 Core drive 2: Developments & Accomplishment.................. 16
      2.5.3 Core drive 3: Empowerment of Creativity & Feedback.......... 18
      2.5.4 Core drive 4: Ownership & Possession.................................. 19
      2.5.5 Core drive 5: Social Influence & Relatedness........................ 19
      2.5.6 Core drive 6: Scarcity & Impatience....................................... 20
      2.5.7 Core drive 7: Unpredictability & Curiosity............................. 21
      2.5.8 Core drive 8: Loss & Avoidance........................................... 22
   2.6 Octalysis – a gamification framework .............................................. 22
      2.6.1 White hat versus black hat gamification............................... 23
      2.6.2 Logical versus emotional gamification................................... 24
      2.6.3 Application............................................................................. 26
   2.7 Combination of extrinsic and intrinsic motivational factors
      in relation to gamification................................................................. 26

3 Methodologies .................................................................................... 28
   3.1 Research methods .......................................................................... 28
      3.1.1 Research approach................................................................. 28
      3.1.2 Research design...................................................................... 29
   3.2 Experiment ..................................................................................... 29
      3.2.1 Structure............................................................................... 29
      3.2.2 Sampling.............................................................................. 29
3.2.3 Observation .................................................................................. 31
3.3 Test conception ............................................................................... 32
  3.3.1 General test design ................................................................. 32
  3.3.2 Test for control group ......................................................... 37
  3.3.3 Test for treatment group ...................................................... 40
  3.3.4 Debriefing questionnaire ...................................................... 45

4 Results ............................................................................................... 47
  4.1 Test subjects ................................................................................. 47
  4.2 Data ............................................................................................... 47
    4.2.1 Qualitative data from observations ...................................... 47
    4.2.2 Data from debriefing questionnaire and mails ....................... 50

5 Analysis ............................................................................................. 55
  5.1 Qualitative .................................................................................... 55
    5.1.1 Research question 1: Does gamification impact
         the intrinsic motivation of people performing basic
         administrative tasks? .......................................................... 55
    5.1.2 Research question 2: Does the age of users make
         a difference in the perception and motivational
         impact of gamification? ...................................................... 57
    5.1.3 Further insights .................................................................... 58
  5.2 Quantitative .................................................................................. 59
    5.2.1 Research question 1: Does gamification impact
         the intrinsic motivation of people performing basic
         administrative tasks? .......................................................... 59
    5.2.2 Research question 2: Does the age of users make
         a difference in the perception and motivational
         impact of gamification? ...................................................... 61
    5.2.3 Further insights .................................................................... 63
    5.2.4 Overview of statistical significance ....................................... 66
  5.3 Conclusions .................................................................................. 68

6 Discussion .......................................................................................... 70
  6.1 Methods discussion ..................................................................... 70
    6.1.1 Discussion of the experiment design .................................... 70
    6.1.2 Limitations in the execution of the experiment ...................... 70
  6.2 Results discussion ....................................................................... 71
  6.3 Implications for practice ............................................................. 72
  6.4 Implications for research ............................................................. 73

List of references .................................................................................. 74

Appendices ........................................................................................... 84
Figures

Figure 1: Gamification in the hype cycle (Gartner, 2015)............................ 1
Figure 2: Flow theory (based on Csikszentmihalyi, 1990; illustration by van Gorp, 2008)................................. 6
Figure 3: The map of everyday experience (Csikszentmihalyi, 2003, p. 72) .......................................................... 6
Figure 4: Game components (based on Smed & Hakonen, 2003) ........... 8
Figure 5: Separating the term gamification (Deterding et al., 2011) ....... 11
Figure 6: Game satisfaction (based on Burke, 2014b).......................... 12
Figure 7: Bartle’s player types (based on Bartle, 1996).......................... 13
Figure 8: Dynamics between player types (based on Bartle, 1996; illustration by Caron, 2011)................................. 14
Figure 9: Octalysis (Chou, 2014) ............................................................ 23
Figure 10: White hat and black hat gamification (based on Chou, 2014) .............................................................. 23
Figure 11: Logical and emotional gamification (based on Chou, 2014) .......................................................... 25
Figure 12: RAMP theory (Marczewski, 2013) ........................................ 26
Figure 13: Process of test steps ................................................................................. 34
Figure 14: Test for treatment group matched on the Octalysis framework (based on Chou, 2015) ......................... 44
Figure 15: Game design elements addressing the eight core drives (Chou, 2014) ........................................................ 87

Tables

Table 1: Research questions and hypotheses ................................................. 2
Table 2: Levels of game design elements (Deterding et al., 2011, p. 4) ........................................................................ 10
Table 3: Game phases (Chou, 2014) ............................................................. 15
Table 4: Hard work (based on McGonigal, 2011, pp. 29 – 33) ................ 17
Table 5: Research methods ............................................................................. 28
Table 6: Sampling criteria ............................................................................. 30
Table 7: Sampling of test subjects ................................................................. 31
Table 8: Emotions for observation ................................................................. 32
Table 9: Applied game design elements ....................................................... 44
Table 10: Age groups ..................................................................................... 46
Table 11: Results - test subjects ................................................................. 47
Table 12: Examples of mails from test subjects ............................................ 49
Table 13: Raw data from debriefing questionnaire and mails ................. 52
Table 14: Average data from debriefing questionnaire and mails .......... 54
Table 15: Motivation – statistical overview ............................................... 59
Table 16: Enjoyment – statistical overview ............................................... 60
Table 17: Confidence – statistical overview ............................................... 61
Table 18: Motivation – statistics with age groups ..................................... 62
Table 19: Enjoyment – statistics with age groups ..................................... 62
Table 20: Confidence – statistics with age groups ..................................... 63
Table 21: Game feeling – statistics with age groups ............................... 64
Table 22: Wrong mail address – statistics with age groups ...................... 64
Table 23: Time – statistics with age groups ........................................ 65
Table 24: Spelling mistakes – statistics with age groups ...................... 66
Table 25: Non-decrypted words – statistics with age groups ............... 66
Table 26: Overview of statistical significance ...................................... 67
Table 27: Game mechanics and game genres (Adams and Dormans, 2012, p. 8) .......................................................... 84
Table 28: Studies on Player Types (Hamari and Tuunanen, 2014, p. 33) .............................................................................. 85
Table 29: Motivation – detailed statistics ............................................. 125
Table 30: Game feeling – detailed statistics ........................................ 126
Table 31: Confidence – detailed statistics .......................................... 127
Table 32: Enjoyment – detailed statistics ............................................. 128
Table 33: Replied to wrong mail address – detailed statistics .......... 129
Table 34: Time – detailed statistics ..................................................... 130
Table 35: Spelling mistakes – detailed statistics .............................. 131
Table 36: Non-decrypted words – detailed statistics ......................... 132

Appendices

Appendix 1  Game mechanics and game genres .............................. 84
Appendix 2  Studies on player types ................................................ 85
Appendix 3  Game design elements addressing the eight core drives ......................................................... 87
Appendix 4  Test for control group ................................................... 88
Appendix 5  Test for treatment group ............................................... 90
Appendix 6  Debriefing questionnaire ............................................. 92
Appendix 7  Experiment observations ............................................. 93
Appendix 8  Details of quantitative analysis ..................................... 125
1 Introduction

It is Friday afternoon. Steve looks at his desk to find a pile of documents that need to be executed and his mail box tells him that he has 78 unread mails. In one week all the documents need to be sent out to 300 new arriving students at the university. It is Steve’s job to arrange the arrival of the students, provide them with necessary information up front and answer open questions. For Steve, these are the same tasks for every student, repeating every semester, since he started working in the administration office of the university five years ago.

As the example of Steve shows, administrative tasks in office jobs often offer little motivation and can be perceived as not enjoyable. In many cases, the compensation in the salary keeps people working and not the excitement of the tasks, the results, or recognition of others, which are often missing in the work environment (Crawford, 2010). While there is a lack of motivation on administrative tasks, organisations have the urge of making office work more productive. For creating a productive workplace, several factors are important and can be adjusted – the environment, the people, or the tasks itself (Clements-Croome, 2006). The change of the work environment by office redesigns or virtual offices can improve productivity (Hill, Miller, Weiner, & Colihan, 1998). Yerkes and Kouzes (2007) and Bakke (2005) claim that the key to more productive and enjoyable office work is making it fun. When focusing on tasks, one possible solution to generate fun at the workplace could be through gamification (Singh, 2012).

The area of gamification has been strongly hyped in recent years. As the annual Gartner hype cycles show (Gartner, 2015), gamification is listed within emerging technologies and management frameworks with a first appearance in 2011 (see Figure 1). Even though the term of 'gamification' is new, its concept has been around for a long time. However, so far gamification lacks a clear structure and definitions of its concepts and methods. Additionally, supporters and critics of gamification argue whether it has an added value to the business. Gartner (2012) once predicted that “80% of current gamified applications will fail due to poor design” (Gartner, 2012). However, they also predict that “over 70 percent of Global 2000 organisations will have at least one gamified application” (Gartner, 2011).

\[ \text{Figure 1: Gamification in the hype cycle (Gartner, 2015)} \]
Studies already show that there is an increase in learning abilities through games (Erenli, 2013; McFarlane, Sparrowhawk, & Heald, 2002; Rodríguez-Cerezo, Sarasa-Cabezuelo, Gómez-Albarrán, & Sierra, 2014). Yet, there is no evidence and very limited research on the actual benefits of gamification in business processes and administrative tasks. Current research only suggests, that there is a benefit in applying gamification (J. Hamari, Koivisto, & Sarsa, 2014) and senior managers show an increasing interest in implementing it (Anderson & Rainie, 2012). According to Smith (2011), the rising amount of gamers creates a need for a gameful environment in the work place. From the perspective of a former professional gamer, “gamification is the bridge between generations” (Lidström, 2015). He claims a huge potential for organisations in gamification.

1.1 Purpose

The purpose of the study is to explore ways to gamify basic administrative tasks and how gamification impacts intrinsic motivation in an environment of administrative tasks and office work. It is intended to draw conclusions in this area that build a basis for further research.

1.2 Research questions

The exploratory study of the field of gamification and its relation to intrinsic motivation in the context is led by two research questions (see Table 1). Each of these research questions is linked to two hypotheses for the outcome of the experiment in this study: one that represents an expected outcome, and one null hypothesis stating that there is no difference.

<table>
<thead>
<tr>
<th>Research question 1</th>
<th>Does gamification impact the intrinsic motivation of people performing basic administrative tasks?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Null hypothesis</strong></td>
<td>The control and the treatment group execute the tasks with the same intrinsic motivation</td>
</tr>
<tr>
<td><strong>H0a</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hypothesis 1</strong></td>
<td>The gamification of basic administrative tasks increases the intrinsic motivation of the test subjects</td>
</tr>
<tr>
<td><strong>H1</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Research question 2</th>
<th>Does the age of users make a difference in the perception and motivational impact of gamification?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Null hypothesis</strong></td>
<td>The age has no effect on the impact of gamification on the intrinsic motivation of the test subjects</td>
</tr>
<tr>
<td><strong>H0b</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hypothesis 2</strong></td>
<td>Younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks</td>
</tr>
<tr>
<td><strong>H2</strong></td>
<td></td>
</tr>
</tbody>
</table>

Research question 1 – Does gamification impact the intrinsic motivation of people performing basic administrative tasks?

The first research question is based on the purpose of this study, asking:

Does gamification impact the intrinsic motivation of people performing basic administrative tasks?

This research question also includes a reasoning of the respective outcome.
Null hypothesis – H0a
The null hypothesis for research question 1 suggests that no changes occur when adding game design elements to basic administrative tasks. People execute the tasks with the same motivation as without game design elements added. Hence, gamification has no impact on the motivation of test subjects.

Hypothesis 1
Based on the insights and suggestions in literature (see section 2.7) test subjects in the treatment group are motivated to execute the test tasks. Hence, the gamification of basic administrative tasks increases their intrinsic motivation.

Research question 2 – Does the age of users make a difference in the perception and motivational impact of gamification?
According to Lidström (2015), gamification builds the bridge between generations. To explore this statement, research question two focuses on the age of people:

Does the age of users make a difference in the perception and motivational impact of gamification?

This research question also includes a reasoning of the outcome.

Null hypothesis – H0b
The null hypothesis of research question two suggests that the age has no effect on the impact of gamification on the intrinsic motivation of the test subjects.

Hypothesis 2
As suggested by Chou (2013a, pt. 20, 2014) game design elements that address people on an emotional level are more intrinsic and have a greater effect on younger people; game design elements that address people on a logical level are more intrinsic and have a greater impact on older people. The study of Bittner and Shipper (2014) further suggests a higher motivation for younger people. Hence, younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks.

1.3 Definitions
The two key terms of this study – 'gamification' and 'intrinsic motivation' – are defined in this section. More details are provided in section 2.

1.3.1 Gamification
The definition of gamification in this study is based on Burke (2014a), Deterding et al. (2011), and Zichermann and Cunningham (2011). While focusing on its roots defined by Deterding et al. (2011), the intention and goal of engaging and motivating people stressed by Burke (2014a) and Zichermann and Cunningham (2011) are considered to be a crucial part. Therefore, gamification is defined as 'the application of game design elements in non-game contexts in order to engage and motivate people'.

1.3.2 Intrinsic motivation
Intrinsic motivation is “the doing of an activity for its inherent satisfaction rather than for some separable consequence” (Ryan & Deci, 2000a, p. 56). According to Deci and Ryan
intrinsic motivation needs to be considered on both a psychological and an operational perspective, which together complement this definition. On the psychological perspective “intrinsic motivation is based in the innate, organismic needs for competence and self-determination. It energises a wide variety of behaviours and psychological processes for which the primary rewards are experiences of effectance and autonomy” (Deci & Ryan, 1985, p. 32). On the complementary operational perspective they “infer intrinsic motivation for an activity when a person does the activity in the absence of a reward contingency or control” (Deci & Ryan, 1985, p. 34).

1.4 Delimitations

1.4.1 Geographic area

The geographic area in which this study takes place is limited to the countries Germany and Sweden.

1.4.2 Basic administrative tasks

Basic administrative tasks are commonly used for all kinds of tasks in offices. In this study they are limited to corresponding via electronic mail, downloading files, reading password secured instructions, and correcting texts.

1.4.3 Motivation

This study is limited to the impact on intrinsic motivation by gamification. Extrinsic motivation is not part of this study. This delimitation is also valid for exploring ways to design a gamified solution for basic administrative tasks, which excludes extrinsic motivational factors.
2 Theoretical background

In this section, key terms of this study – 'motivation' and 'gamification' – are introduced and defined. For a better understanding of influential factors in the design of a gamified solution, player types and game phases are briefly introduced. A detailed explanation of the eight core drives in game motivation by Chou (2014) and the gamification framework 'Oc-talys' is provided, which builds the foundation for the design of a gamified solution. The theoretical background is completed with insights of existing research in the combination of extrinsic and intrinsic motivational factors in relation to gamification.

2.1 Motivation

The term 'motivation' or self-determination theory (Deci & Ryan, 1985) covers the incite-ments of performing any task. It is basically distinguished between the two types of extrin-sic and intrinsic motivation.

2.1.1 Extrinsic motivation

Extrinsic motivation is defined as “a construct that pertains whenever an activity is done in order to attain some separable outcome” (Ryan & Deci, 2000a, p. 60).

2.1.2 Intrinsic motivation

Intrinsic motivation is “the doing of an activity for its inherent satisfaction rather than for some separable consequence” (Ryan & Deci, 2000a, p. 56). According to Deci and Ryan (1985) intrinsic motivation needs to be considered on both a psychological and an operational perspective, which together complement this definition. On the psychological perspective “intrinsic motivation is based in the innate, organismic needs for competence and self-determination. It energises a wide variety of behaviours and psychological processes for which the primary rewards are experiences of effectance and autonomy” (Deci & Ryan, 1985, p. 32). On the complementary operational perspective they “infer intrinsic motivation for an activity when a person does the activity in the absence of a reward contingency or control” (Deci & Ryan, 1985, p. 34).

2.1.3 Flow

The theory of flow by Csikszentmihalyi (1990) discusses the relation of challenges and skills of an individual in a specific situation (see Figure 2). When the skills of an individual are higher than the related challenge, boredom results. On the other side, if the skills are lower than the complexity of the challenge, the result is anxiety. It is therefore important to match the challenges, which an individual faces, according to the person’s skills. This matching is called 'flow', given that the skills and challenges are not low. According to Csikszentmihalyi (1990) people are most intrinsically motivated when they are in the flow.
Csikszentmihalyi (2003) further introduces eight categories to map everyday experiences and assigns feelings that predominantly occur in these categories (see Figure 3). These eight categories are: 'Apathy', 'worry', 'boredom', 'anxiety', 'relaxation', 'arousal', 'control', and 'flow'.

Figure 2: Flow theory (based on Csikszentmihalyi, 1990; illustration by van Gorp, 2008)

Figure 3: The map of everyday experience (Csikszentmihalyi, 2003, p. 72)
2.2 Gamification

2.2.1 Defining gamification

The term of gamification has been established more than a decade ago. According to the research of Fitz-Walter (2013), gamification was coined in the years around 2003 by Nick Pelling. However, the first written appearance of the term has been in a blog entry by Bret Terril in 2008, who had the idea of increasing engagement by applying game mechanics to web properties (Terril, 2008). It was not until 2011 when gamification has been defined as “the use of game design elements in non-game contexts” (Deterding et al., 2011, p. 1).

In their definition of gamification Deterding et al. (2011) stress the distinction between playing and gaming. Only behaviours which are related to gaming are applicable toward gamification. Gaming behaviour is considered to be structured playing “by rules and competitive strive toward goals” (Deterding et al., 2011, p. 3). In contrast to this, Huotari and Hamari (2012) developed a definition, which focuses on a service marketing perspective. Their main critique and distinction to the definition by Deterding et al. (2011) is that there are no 'game design elements' that are exclusively unique to games. Huotari and Hamari (2012) argue that 'game design elements' are already existing in non-game contexts, but are not considered as situations of gamification. They further strengthen, that within gamification there is “no physical product to which value could be attached” (Huotari & Hamari, 2012, p. 2). Hence, the service context needs to be key. This leads to their definition of gamification, which they claim to focus on its goal. “Gamification refers to: a process of enhancing a service with affordances for gameful experiences in order to support user’s overall value creation” (Huotari & Hamari, 2012, p. 3).

Despite the two most spread definitions (J. Hamari et al., 2014) of Deterding et al. (2011) and Huotari and Hamari (2012), there are several other definitions of gamification. Despite the redefinition of gamification as “the process of making activities more game-like” (Werbach, 2014, p. 267), Burke (2014b) strengthens that the differences between gamification and games are more crucial than their similarities. Whereas games focus on their main goal to simply entertain people, gamification focuses on people’s motivation on an emotional level. This difference of the primary goal between entertainment and motivation disproves gamification of “making activities more game-like” (Werbach, 2014). The Gartner group has therefore redefined gamification as “the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals” (Burke, 2014a). The core of this definition goes along with the definition, that gamification is “the process of gamethinking and game mechanics to engage users and solve problems” (Zichermann & Cunningham, 2011). A different approach to define gamification is proposed by Yohannis, Prabowo and Waworuntu (2014). They define gamification from a process perspective, where both 'game elements' and 'gameless objects' are transformed into 'gameful objects'. This definition, however, is – according to the findings – not supported by any other researcher.

With the focus on the impact of gamification on the motivation of employees in this research, the definition of gamification is based on the ones of Burke (2014a), Deterding et al. (2011), and Zichermann and Cunningham (2011). While focusing on its roots defined by Deterding et al. (2011), the intention and goal of engaging and motivating people stressed by Burke (2014a) and Zichermann and Cunningham (2011) are considered to be a crucial part. Therefore, gamification is defined as 'the application of game design elements in non-
game contexts in order to engage and motivate people'. In order to fully understand this definition, all of its parts need to be defined itself.

### 2.2.2 Defining parts of gamification

In this section all parts of the definition of gamification are defined for a complete understanding.

**Game**

A trivial definition of games is provided by Yates and Wootton (2012), who say that a game is “a fun activity where we keep score and declare a winner” (Yates & Wootton, 2012, p. 24). However, there is no necessity of fun in games, even though games have the purpose of entertainment (Burke, 2014b). Also, a score and a declared winner might be also often apparent in games, but are not considered as an elementary part of its definition. For example, games like chess or soccer can end in a draw without a winner. Consequently this definition will not be further used in this document.

As stated by several researchers (Alvarez & Djaouti, 2011; Deterding et al., 2011; Groh, 2012), it is necessary to distinguish between gaming and playing, which is introduced in the classification of games by Caillois (2001). The term playing (paidia) is often addressed to both, toys and games. It refers to a free form of improvised behaviours. Gaming (ludus), however, is characterised a rule-based and goal oriented actions. Within gamification only gaming (ludus) or its related terms of gamefulness and gameful experiences are applicable.

McGonigal (2011) also distinguishes between gamefulness and playfulness. According to her, there are four defining traits that are valid for every game: 'goal', 'rules', 'feedback system' and 'voluntary participation'. Only if all of these four traits are apparent, an activity is considered to be a game. This way of approaching the definition of games is supported by Smed and Hakonen (2003), who introduce similar key components of a game and their connection (see Figure 4). Smed and Hakonen (2003) argue, that there are three main components of a game 'rules', 'goal' and 'player' aligned with most definitions in literature. They further added the two components 'representation' and 'opponent'.

![Game components](image)

*Figure 4: Game components (based on Smed & Hakonen, 2003)*
Both the approaches of McGonigal (2011) and Smed and Hakonen (2003) have the components rules and goal in common. Also the 'feedback system' of McGonigal (2011) and 'representation' of Smed and Hakonen (2003) are only different in the naming. The biggest difference lays in the fourth component. Whereas McGonigal (2011) completes the list with 'voluntary participation', Smed and Hakonen (2003) represent this trait with the distinction between 'player' and 'opponent'. However, there are games that do not require an opponent, for example puzzles or games of skill. The 'opponent' component must therefore be considered as optional. However, Huotari and Hamari (2012) point out that a player is always needed as a co-producer for a game. The absence of a player removes every value from a game.

Based on the insights of McGonigal (2011) and Smed and Hakonen (2003) a game is defined as 'an activity where one or several players agree to voluntary participate in playing according to rules, in order to achieve a defined goal and respond to a represented feedback system'.

On a more detailed level, games can be allocated into several game genres. Even though there are no universal distinctions, Adams and Dormans (2012) propose nine game genres: Action, Strategy, Role-Playing, Sports, Vehicle Simulation, Management Simulation, Adventure, Puzzle, and Social Games.

**Design**

In this study, design is seen from a process perspective (Lawson, 2005). “Design is making sense of things” (Krippendorff, 1989, p. 9). This definition offers various interpretations, as Krippendorff (1989) points out himself. Besides the interpretation that design is creating sense to things, he favours the reading of this definition as making things meaningful and understandable to others and as a consequence objects get a subjective meaning through design. In a later publication Krippendorff (2006) explores further on this definition of design. Based on inputs from other researchers (Agre, 2000; Simon, 1996) he claims four characteristics of design:

- “Design brings forth what would not come naturally;
- Design proposes realisable artefacts to others;
- Design must support the lives of ideally large communities; and
- Design cannot avoid ethical questions” (Krippendorff, 2006, p. 25).

For Buchanan (2001) design can be distinguished into several directions, which he calls the four orders of design. The first order, 'Graphic Design', focuses on symbols and its graphical representation. The second order, 'Industrial Design', targets physical things. The third order, 'Interaction Design', focuses on actions and the fourth order, 'Environmental Design', covers the direction of thoughts. While Buchanan (2001) only introduces these different direction of design with a loosely connection, Guenther (2013) remarks, that it is crucial for success to have design approaches that include all four orders. He suggests that the four orders should be understood as being intertwined and the process of design should always focus on the outcomes from the most abstract to the most tangible.

In terms of gamification Chou (2014) further distinguishes between human focused design and technology focused design. In this context it is therefore crucial to always keep the focus on the interaction and impact on the human aspect. Consequently the third and fourth orders of Buchanan’s framework require more attention.
Element
In the Oxford Dictionary of English, an element is defined as “an essential or characteristic part of something abstract” (Stevenson, 2011). Besides multiple other meanings in natural sciences, this definition is applicable for the purpose of this paper.

Game design elements
According to the definitions of its parts, game design elements would be 'an essential or characteristic part of making sense to an activity where one or several players agree to voluntary participate in playing according to rules, in order to achieve a defined goal and respond to a represented feedback system'. More clearly speaking, game design elements are the individual characteristics used to create a meaningful game. In this context it is important to notice that game design elements are not limited to video games.

In literature 'game design elements' and 'game mechanics' are used in a similar context. The main difference between these two terms is that game mechanics focus on the interplay between different elements and its impact on the perception of the game. Game mechanics are defined as “methods invoked by agents for interacting with the game world” (Sicart, 2008). Due to their close relation, their same objective, game design elements and game mechanics will be handled as synonyms in this document.

Depending on the game genre, different game design elements are required or at least characteristic and therefore typically used. An allocation of game design elements that are typically used in the different game genres is shown in Appendix 1, Table 27 (Adams & Dornmans, 2012). Depending on the type of game design elements, Groh (2012) differentiates five levels of game design elements (see Table 2).

Table 2: Levels of game design elements (Deterding et al., 2011, p. 4)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game interface design patterns</td>
<td>Common, successful interaction design components and design solutions for a known problem in a context, including prototypical implementations</td>
<td>Badge, leaderboard, level</td>
</tr>
<tr>
<td>Game design patterns and mechanics</td>
<td>Commonly reoccurring parts of the design of a game that concern gameplay</td>
<td>Time constraint, limited resources, turns</td>
</tr>
<tr>
<td>Game design principles and heuristics</td>
<td>Evaluate guidelines to approach a design problem or analyse a given design solution</td>
<td>Enduring play, clear goals, variety of game styles</td>
</tr>
<tr>
<td>Game models</td>
<td>Conceptual models of the components of games or game experience</td>
<td>Challenge, fantasy, curiosity; game design atoms</td>
</tr>
<tr>
<td>Game design methods</td>
<td>Game design-specific practices and processes</td>
<td>Playtesting, playcentric design, value conscious game design</td>
</tr>
</tbody>
</table>
Non-game contexts

Non-game context basically refer to any situation and context that can possibly exist, which is not a game. This distinction is important since the application of game design elements in games does not gamify a game. Since game design elements are intended to be applied in game design to create an entertaining game, non-game context refer to situations other than their normal use. Therefore, non-game context only exclude explicitly the application of game design elements in the process of designing a game (Deterding et al., 2011). In most situations a game context can be identified as taking place in an unnatural environment or created world, in contrast to the everyday reality.

2.2.3 Situating gamification

The placing of gamification in the context of other constructs like serious games, is understood as situating gamification. As Deterding et al. (2011) show (see Figure 5), the main difference between gamification and games – no matter whether serious games or games for pure entertainment – is the aspect that only parts of game design are used in gamification, in contrast to a full-fledged application in games (Groh, 2012). On a second dimension the difference between gaming and playing distinguishes the gameful design of gamification from playful design.

![Figure 5: Separating the term gamification (Deterding et al., 2011)](image)

In addition to the situating of gamification by Deterding et al. (2011), Burke (2014b) introduces a differentiation between games, reward programs and gamification with a focus on the motivational level, which each of them addresses in order to gain satisfaction (see Figure 6). Games motivate on a whimsical level and player gain satisfaction through entertainment. Reward programs give a person a compensation for work done. In this case satisfaction is reached through a transactional level. Gamification addresses people on an emotional level. This can lead to intrinsic motivation for completing tasks and ultimately satisfaction.
2.3 Player types

Not every player acts similar in playing games. People are driven by different motivational factors for playing games and consequently they also enjoy different aspects of a game and play it differently. There are several ways to cluster players into player types. Juho Hamari and Tuunanen (2014) provide an overview of different player types, defined by different researchers (see Appendix 2, Table 28). The two most used player types in the research of Juho Hamari and Tuunanen (2014) are the ones of Ip and Jacobs (2005) and Bartle (1996).

The distinction between the two player types 'hardcore gamers' and 'casual gamers' by Ip and Jacobs (2005) does not significantly differ in their behaviour within the game. It rather gives an idea about intention and the importance of games to players. Whereas casual gamers only play a game on a random occasion in order to get entertained, hardcore gamers fulfil a significant part and gain high satisfaction with playing games.

2.3.1 Bartle’s player types

Bartle (1996) introduced the four player types: 'Achievers', 'Explorers', 'Socialisers', and 'Killers' (see Figure 7).
**Achievers**

Achievers are interested in acting on the world, manipulating the game. They are focused on attaining status by achieving preset goals which they are vigorously set to achieve. They are highly motivated by accomplishments and enjoy challenges, winning and creating. However, achievers have no sense for elements that do not contribute to their goal or discover the environment around them. Achievers want to master the game in the shortest possible time (Bartle, 1996; Caron, 2011; Hong, 2012).

**Explorers**

Explorers are interested in interacting with the world. They like to get surprised by the game. Driven by the discovery of the unknown, explorers are focused on understanding the environment around them. They are proud of their knowledge and gain their satisfaction from being asked by less-experienced players (Bartle, 1996; Caron, 2011; Hong, 2012).

**Socialisers**

Socialisers are interested in interacting with the other players. They want to get to know others and find out information about their characters. By doing so, they spent a lot of time chatting, commenting and helping other players. Socialisers gain satisfaction from friendship, contacts and their influence on them (Bartle, 1996; Caron, 2011; Hong, 2012).

**Killers**

Killers are interested in acting on other players, doing things to them. They enjoy demonstrating their power and superior position to other players. They are focused on ranks, winning and compete directly with other players. Killers gain satisfaction from their reputation and fighting skills (Bartle, 1996; Caron, 2011; Hong, 2012).
2.3.2 Balancing Bartle’s player types

According to Bartle (1996), there are two approaches to change the balance of the player types. The first option is to change the emphasis of the quadrants. By changing the emphasis of the two dimensions – World / Player and Acting / Interacting – the focus can be pushed towards specific player types (see Appendix 2 for exemplary ways to alter the emphasis).

The second way of balancing the player types is through the player dynamics. Based on stereotypes, presumptions or simply the behaviour, different player types like or dislike the existence of other player types within the same game. The appearance of one player type can therefore impact the number of players from another player type. Figure 8 shows the dynamics between the player types according to Bartle (1996). For a better understanding of Figure 8, please consider the following explanation:

- Red colour: decrease of players in that player type;
- Green colour: increase of players in that player type;
- Start of arrow: The change of numbers in that player type has an impact on another player type
- End of arrow: This player type is impacted

For example, the red arrow with the green end on the left leading from 'killers' to 'socialisers' is to be read as, a decrease in the number of player in the player type 'killers' leads to an increase of the number of players in the player type 'socialisers'.

![Influence Flow between Player Types](image)

**Figure 8: Dynamics between player types (based on Bartle, 1996; illustration by Caron, 2011)**

2.4 Game phases

According to Chou (2014), in the process of playing a game, the player goes on a journey through different game phases (see Table 3). Game phases are not equal to levels, where one level would need to be completed before the next level starts. The boundaries between the different phases are blurry. A precise allocation of a player to one of the phases is not necessary. However, it needs to be noted, that while a player moves through the different game phases his perception and game experience changes. A player also finds motivation from different game design elements and tasks throughout his player journey.
Table 3: Game phases (Chou, 2014)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Name</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Discovery</td>
<td>In the discovery phase the initial awareness towards the product is built. The player investigates in the reason why he should play the game and establishes an attitude towards it.</td>
<td>Motivation, Attitude, Reason</td>
</tr>
<tr>
<td>2</td>
<td>Onboarding</td>
<td>In the onboarding phase players start to like the game. They want to feel smart by achieving easy tasks and learn more about the game.</td>
<td>Easy achievements, Learning</td>
</tr>
<tr>
<td>3</td>
<td>Scaffolding</td>
<td>The scaffolding phase starts once a player has learned the basic tools and rules to play the game and has achieved the “first major win-state.”</td>
<td>Achievements, First win-state</td>
</tr>
<tr>
<td>4</td>
<td>Endgame</td>
<td>In the endgame phase the player’s motivation needs to be kept up for the longest possible time. In this phase, a player has gained all the skills and knowledge. It should therefore be designed to apply those skills in still challenging tasks. The ultimate goal of the endgame phase is to enable infinite fun.</td>
<td>Motivation over time</td>
</tr>
</tbody>
</table>

2.5 Game motivation – the eight core drives

There are a lot of games that are created with plenty of game design elements. But still, they are boring and not engaging at all (Chou, 2013a, pt. 1). In designing a game or applying game design elements to non-game contexts it is therefore important to understand how game design elements motivate people. An overview of game design elements that can be used to address the individual core drives are provided in Appendix 3.

From an objective perspective, “playing a game is the voluntary attempt to overcome unnecessary obstacles” (McGonigal, 2011, p. 22; Salen & Zimmerman, 2004). Playing a game implies the acceptance and obedience to rules not required for living the everyday life. Further, a focus on goals in games does not necessarily contribute to achieving goals outside of the game context. Why are gamers doing that? What drives them to spend their time overcoming unnecessary obstacles? Chou (2014) identified eight core drives that motivate people to play games:

- Core drive 1: Epic Meaning & Calling
- Core drive 2: Developments & Accomplishment
- Core drive 3: Empowerment of Creativity & Feedback
- Core drive 4: Ownership & Possession
- Core drive 5: Social Influence & Relatedness
- Core drive 6: Scarcity & Impatience
- Core drive 7: Unpredictability & Curiosity
- Core drive 8: Loss & Avoidance
2.5.1 Core drive 1: Epic Meaning & Calling

Game motivation

According to Chou (2013a, pt. 8, 2014), the first core drive to game motivation, epic meaning and calling, is referring to the contribution to something greater than oneself. In games, players often experience the feeling of being the chosen one, who has the ability to solve the problem or even save the virtual world. This feeling can motivate people as they get very important and also associate themselves with the heroes they admire in novels or movies.

Another way to get motivated through epic meaning and calling is 'Beginners Luck' (Chou, 2013a, pt. 8, 2014). Beginners luck occurs, when someone gets randomly into a position that makes him the chosen one. In games this usually happens at the beginning, where a gamer gets a special item or gift that others are seeking for a long time without success. This makes a new gamer feeling special and uniquely destined to contribute to something greater than himself.

Examples in a gamified environment

There are numerous examples of services, where people are motivated in order to contribute to something bigger than themselves. For instance, the free online encyclopaedia 'wikipedia.org', relies on the volunteer participation of its users (Ayers, Matthews, & Yates, 2008). While writing, updating and correcting the articles on the encyclopaedia, those people do not get paid, but they contribute to something bigger than themselves and ultimately help humanity in accessing to information (Chou, 2013a, pt. 8). Similar to wikipedia.org, the website 'freerice.com', engages users to answers questions, by donating 10 grains of rice for every right answer through the world food programme (World Food Programme, 2015). Again the users contribute to a reason of humanity, which outsizes them as individuals (Chou, 2013a, pt. 8).

Another example of the first core drive is shown in a study by Goldstein, Cialdini and Griskevicius (2008) regarding the reuse of towels in hotels. The study shows, that there was a significant increase – 9 percent of all customers – when showing a sign, claiming that a huge percentage (75%) of guests in this room reused their towels. As a result, other guests more likely want to belong to this group and do not only think of themselves as an individual (Chou, 2013a, pt. 8; Goldstein et al., 2008).

2.5.2 Core drive 2: Developments & Accomplishment

Game motivation

As Chou, 2013a, pt. 9 (2014) states, the second core drive, developments and accomplishment, is the most common drive used in games. It mostly consists of the development of the player. By getting points for accomplishing something and maybe upgrade to a next level, the player receives the feeling of moving forward. In games there usually is a high sense of development and accomplishment, where players face one challenge, one enemy, one task or stage at a time, which they have to overcome. McGonigal (2011) supports this approach by mentioning, that the structured experience in a good game is a unique way to stimulate positive emotions. In order not to frustrate a player and keep him in the flow (see section 2.1.3), the difficulty of each level should only be increased by 20 to 40 percent towards the previous stage, matching and building up a learning curve of the player (Chou, 2013a, pt. 9).
A common way to implement this core drive in games or use it as part of gamification is through applying the game design elements 'points', 'badges' and 'leaderboards'. Points and badges represent rewards and give players feedback in showing them, how much they already accomplished, rather than making someone to like something. In combination with a progress bar, it shows how close someone is to a goal and with every effort put into it, the person feels to get closer towards the next goal (Chou, 2013a, pt. 9). McGonigal (2011) calls this actionable next steps towards a clear goal 'satisfying work'.

Further, Chou (2013a, pt. 9) points out, that gamified scenarios are often not engaging, because it is too easy to get points and badges. As he states, motivation comes from an actual accomplishment, where one has to overcome a challenging task. People do not value something that is coming for free, but they do when they accomplished something for it. Since they have uniquely earned a reward that they deserve, people feel proud of it. As a consequence, the rewards earned for an accomplished task need to be aligned with its effort and difficulty – a huge reward for a little action does not motivate. These points are strengthened by McGonigal (2011). She claims that gamers are looking for so called 'hard work', which summarises different kinds of work (see Table 4). Based on Ravaja et al. (2005), on the journey to accomplish this hard work, in games “failure doesn't disappoint [players]. It makes [them] happy in a very particular way: excited, interested, and most of all optimistic” (McGonigal, 2011, p. 64). Especially when a player fails spectacularly.

Table 4: Hard work (based on McGonigal, 2011, pp. 29 – 33)

<table>
<thead>
<tr>
<th>Work type</th>
<th>Attributes</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-stakes work</td>
<td>Fast and action oriented</td>
<td>Video games like 'Gran Turismo' or 'Grand Theft Auto'</td>
</tr>
<tr>
<td>Busywork</td>
<td>Predictable and monotonous, keeps the player active</td>
<td>Social games like 'FarmVille', easy games like swapping tiles</td>
</tr>
<tr>
<td>Mental work</td>
<td>Cognitive tasks</td>
<td>Puzzles and strategy games</td>
</tr>
<tr>
<td>Physical work</td>
<td>Challenges the body (heart beat, muscles, endurance, etc.)</td>
<td>Sports games, Nintendo Wii</td>
</tr>
<tr>
<td>Discovery work</td>
<td>Investigating unfamiliar objects and spaces</td>
<td>Role-playing games</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Collaboration, cooperation and contribution to a group</td>
<td>Multiplayer video games, team sports</td>
</tr>
<tr>
<td>Creative work</td>
<td>Creative and meaningful decisions</td>
<td>Manager games, Designing homes like 'The Sims'</td>
</tr>
</tbody>
</table>

Another important aspect of this core drive is the development and accomplishment of oneself towards other people. Leaderboards are a common game design element to show the relation of one’s individual performance to the one of others. However, Chou (2013a, pt. 9) stresses, that people have a need for urgent optimism: they can accomplish a task now. Therefore, they need to see which other few users are just above or below them in the leaderboard. The motivation then comes from the achievable goal to both, go pass the ones just above, and not getting passed by the ones below. Showing only the overall leaders, however, can be demoralising and demotivating, since these users are often way too far away and not reachable.
Example in a gamified environment

The 'Nike+ FuelBand' is a great example of applying the second core drive in a gamified environment (Blohm & Leimeister, 2013; Chou, 2013b). Users of the band get fuel points for every movement they do (Nike Inc., 2015). Those points are rewards aligned to the actual work the users accomplish. Furthermore, it can motivate them to increase their daily movements in a gamified way, since they get more focused on the fuel points than on the healthy aspect of movements. Basic analysis tools further allow to analyse one’s fuel points over time and compare it with other people (Guo, Li, Kankanhalli, & Brown, 2013; McDowd, n.d.). It literally “turns life into a sport” (Nike Inc., 2015).

2.5.3 Core drive 3: Empowerment of Creativity & Feedback

Game motivation

As Chou 2013a (pt. 10, 11, 2014) presents, the third core drive of game motivation is empowerment of creativity and feedback. This lies in the nature of the human species, as people are creative creatures (Feist, 2004). But in order to get motivated by their creativity, they need to get feedback in order to test whether their creativity is working. As Chou (2013a, pt. 10) notes, this core drive is one of the hardest to implement into a game or other product. The reason for this difficulty lies in the dependency on others who are involved into the game or product. The designers of the product are reliant on the users as co-producers. This, however, requires a lot of commitment from the users and a lot of things can just be implied, but not explicitly stated. Hereby, the risk is big to lose control over the product.

In games, one way to empower the creativity of players is in giving them the possibility to create or at least customise items within the game, like cars, clothes, or even the whole virtual world. The motivation behind this is, to empower players to do everything they can imagine. But not only visual parts of a game can address the creativity of players. A major part of a player’s creativity can be expressed in their strategy and approach to solve a task in an efficient way. For instance, in tower defense games, where you have several different defense elements, that the player can place along a path to prevent the enemy units from passing, players have many different ways to solve that problem, applying different strategies to a standardised situation and try out their own solution. A typical example of this game situation is chess.

According to Chou (2013a, pt. 11) the best way to implement this core drive is by giving people a lot of choices or options to solve one problem. This can even include some game design elements called 'Boosters'. Boosters are elements that do not contribute the solving of the problem directly, but make other things more effective. As a consequence, the player needs to be creative in developing a strategy for solving the task more efficient. The power of this core drive is expressed in the engagement that many gamers show in developing their own strategy. Some of them even calculate in spreadsheets to perform better in games.

Another game design element that can achieve engagement of the players is 'Milestone unlock'. Continuously after reaching a milestone – for instance by finishing a level or collecting a specific amount of points – the player unlocks a new element that gives him a total different possibility to address a problem and express his creativity. Often this element has saviour characteristics, as the previous stage would have been so much easier if this element would have just been available. As a consequence, players get motivated to try out this new element and their new possibilities. In a good designed game this process continuously reoccurs and provides a high engagement over a long time (Chou, 2013a, pt. 11).
Examples in a gamified environment

On a basic level, the possibility of adjusting the colour scheme in an application or furnishing an office with plants and pictures addresses the core drive and empowers people to use their creativity. On a bigger scale, crowdsourcing projects empower its participants to solve a common goal using different approaches and strategies. An example is “Foldit”, a crowdsourcing project that is built as a visual puzzle game in order to find new protein structures in process of curing AIDS. The surprising outcome of Foldit is, that gamers managed to find a solution to a problem within 10 days, which scientific researchers failed to solve in over a decade (Chou, 2013a, pt. 11; Good & Su, 2011; Peckham, 2011).

2.5.4 Core drive 4: Ownership & Possession

Game motivation

According to Chou (2013a, pt. 12, 13, 2014), the fourth core drive of game motivation, ownership and possession, covers a player’s feeling of having possession of something. This ownership makes people attached to it and motivates them to improve it further and earn more of it. Consequently, the longer a game lasts, the more attached players are to objects in it and have an intense feeling of ownership and possession. The relation to extrinsic objects and rewards, makes this core drive the least intrinsic, but still, the feeling of attachment to one’s possession makes it an intrinsic motivation (Chou, 2013a, pt. 13). Avatars, “computer generated visual representations of people or bots” (Nowak & Rauh, 2005), give a high sense of ownership. Since people are linked to their avatar, they develop it over time, feel attached to it and can get engaged to enhance it (Chou, 2013a, pt. 12).

Examples in a gamified environment

There are several game design elements that foster ownership and possession. For instance, 'collecting sets' motivate to complete a set of something. The focus on getting some rare parts of the set and owning a complete set is often more motivating than a possible end reward one gets for the complete set (Chou, 2013a, pt. 13). With the collection of stickers, the company Panini used this game design element to create their whole business strategy in a gamified way (The Economist, 2014).

The game design element “building for scratch” focuses on the attachment of people towards an object they own. As Chou (2013a, pt. 12) states, people value things more when they built it themselves and spent time in doing so, than if they get something that is already made. Consequently, they have a more intense feeling of ownership towards that object (Kleine & Baker, 2004). The company IKEA leverages the effects of this game design element in the assembly process of furniture. This results in a more attached feeling of the customers to the furniture, because they spent time and contributed in the building process (Lowry, Franssen, & Lowry, 2011; Zhang, 2008).

2.5.5 Core drive 5: Social Influence & Relatedness

Game motivation

The fifth core drive of game motivation is social influence and relatedness (Chou, 2013a, pt. 14, 2014). As he explains, people get motivated to do things, different from their original intention, based on social pressure and what other people say about them. This can be in order to impress other people, belong to a group and be conform to its social norms, or in order to avoid being excluded or mocked (Cialdini & Trost, 1998). However, in games this core drive is mainly addressed in a way of teamwork, where they need or get help from

The game design element of 'group quests' gives players a task they can only accomplish as a team. The power of this element is both in the motivation and satisfaction to belong and contribute to a group, and to make the game more popular. Because the players need others to complete tasks, they tend to invite friends to play the same game, so that they solve the problems together. The engagement of actually inviting others to the game comes from the understanding the reason of doing so. They know how this benefits themselves. This same motivation can be found in games applying the game design element 'social treasure'. Through social treasure players can get certain elements or resources, like an extra life or a rare object, if someone else gives it to them. As Chou (2013a, pt. 14) observed, this can lead to an economy of generosity.

**Example in a gamified environment**

Chou (2013a, pt. 14) introduces the game design element 'social prodding' as the smallest amount of action to establish a connection. For instance an endorsement on the online platform 'LinkedIn' does not require more than one click of a user to endorse a skill of another user who is connected to him. This little action strengthens the relatedness between these users. Additionally, the fact, that only other users can endorse a skill makes this little action a social treasure. Even though the actual content value of an endorsement might be not much worth (Wilson, 2012), this can be motivating to stronger engage with the platform, relating with others in the hope of getting actions back (Chou, 2013a, p. 14; Colon, 2012).

**2.5.6 Core drive 6: Scarcity & Impatience**

**Game motivation**

Chou (2013a, pt. 15, 2014) introduces scarcity and impatience as the sixth core drive of game motivation. It is built on the paradigm, that a person wants something, just because this person cannot have it, at least not in that precise moment. Also, people want something that is just out of their reach way more, than if the exact same thing would be just there and accessible. This especially occurs when people are in competition for it (Cialdini, 2001).

According to Chou (2013a, pt. 15), the game design element 'frottles' is often used in games, in order to slow players down or even stop them from doing what they want to do. They cannot continue playing the game at that very moment, because they for instance need another life, a specific object. This situation of not being able to play, motivates people to play the game. In contrast, people tend to lose interest if there is no scarcity they can play whenever they want. The fact of having no control of the situation is both frustrating at some times, but also scarcity is highly motivating to take action and play the game, when a player is able to do so (Chou, 2013a, pt. 15; Cialdini, 2001).

**Examples in a gamified environment**

When showing people something they want, but cannot get at that specific moment, they often have two options offered. On the one hand, they can get it with investing time, for example reaching another 1000 points in a game to unlock a certain item. Or they are offered a shortcut that usually leads to the aspired thing through payment. In this example, the player can unlock a certain item by paying a fee. In any case, because of the scarcity companies or game designers get paid immediately or having their users spending a lot of
time in their desired path, doing their desired actions, while the users are engaged and motivated to do so (Chou, 2013a, pt. 15).

Another example of applied scarcity is to make things exclusive, for example by price or by making a product or service available only to a few people and exclude the rest. For instance, the social platform 'facebook' started by allowing only few students from the Harvard University to join and created a scarcity and exclusiveness. Then it later first opened to other universities and at some point to everybody, people were motivated to join the platform, because they finally could do so (Chou, 2013a, pt. 15; Phillips, 2007; Stone, 2007). The same goes for pricing strategies. Despite the customer behaviour suggested in the traditional demand curve in economics (Hillman, 2014), sometimes more people buy something when it gets more expensive. Because of a higher price, the service or product seems to be more valuable. This occurs, due to the fact that people do not always act rational, they do not always have the perfect information as required for applying traditional economic theory, and the value of a product or service also depends on its scarcity and the willingness on people to get it. For instance, a poor service with a high price, is often chosen over a better service with a lower price, just because the price implies a better service and consequently a higher value (Chou, 2013a, pt. 15).

2.5.7 Core drive 7: Unpredictability & Curiosity

Game motivation

The seventh core drive, that Chou (2013a, pt. 16, 2014) presents, is unpredictability and curiosity. The concept behind this core drive is because someone does not know what happens next, this person is constantly thinking about it. Especially in the gambling industry this core drive is heavily used. Even though most of the players know, that statistically they have bad chances to win, they still want to know what happens next. The possibility, that they might win, makes the game interesting and motivates to play it.

As research shows, animals and people get engaged to perform actions, because they are curious and the outcome of their action is unpredictable to them. This hypothesis is supported by the experiment of the 'skinner box'. In this experiment an animal in a special cage gets food, when it presses a button. After some iterations, the constant reward of food changes to a variable and it becomes random whether the animal gets food or not, when pressing the button. This results in constant pressing of the button, caused by curiosity (Skinner, Ferster, & Ferster, 1997).

Examples in a gamified environment

The core drive of unpredictability and curiosity is found in various examples outside of games. For instance, it is one of the main motivational factors, why people watch movies or read books (Chou, 2013a, pt. 15; Wigfield & Guthrie, 2000). They are curious and want to know what happens next. If they know it of spoilers – telling contents of stories – people are less interested in the book or movie (Chou, 2013a, p. 15; Jenkins, 2006). Also, in fortune cookies not only curiosity but also unpredictability about the little note motivates people to get one and read the message (J. Lee, 2008).

Another example of where the seventh core drive shows its effect is in advertisements at the super bowl, the final game of the National Football League in the United States. Whereas normally people try to avoid advertisements and turn away from it, at the super bowl it is the opposite, people turn towards the advertisements. There are even viewers, who are not interested in the sports or game itself, but due to their curiosity about the ad-
vertisements, they watch the game (Chou, 2013a, pt. 15; Pavelchak, Antil, & Munch, 1988; Yelkur, Tomkovick, & Traczyk, 2004).

2.5.8 Core drive 8: Loss & Avoidance

Game motivation

The eighth core drive identified by Chou (2013a, pt. 17, 2014) is loss and avoidance. As he explains, people get motivated in order to avoid a loss. Cialdini (2001) supports this core drive, saying, that “people seem to be more motivated by the thought of losing something than by the thought of gaining something of equal value” (Cialdini, 2001, p. 205). As Chou (2013a, pt. 17) goes on, this insight to a person’s motivation can be stimulated by a simple change of phrasing something. For instance, instead of offering a reward for doing a task, telling the user that he already has the reward, but will lose it, if he does not do a certain task, more likely motivates him to move forward and do the task. Including a time pressure, for example that the user has to do the task within the next five minutes, strengthens the motivation.

Trying to avoid a loss can lead to irrational behaviours. For instance, the game design element 'sun caused tragedy' appears when players play a game for a long time and it is not fun to them anymore. The fact, that they put in a lot of their time and built up huge accomplishments within the game creates a feeling of losing everything, if they would stop playing. As a result players often do not quit playing the game, but continue spending their time with it, achieve more and just increase the sun caused tragedy (Chou, 2013a, pt. 17).

Examples in a gamified environment

Outside of game contexts coupons are an example that can lead customers to irrational behaviour driven by the core drive of loss and avoidance. The customers often do not care too much about the product or the opportunity to buy it, but they are afraid of losing this opportunity forever, if they do not take action now. The expiration on coupons stimulates exactly this feeling. Even though the customer knows from a rational perspective, that he will probably soon get another coupon offering him the same, there remains the fear of losing something if he does not take action now (Chou, 2013a, pt. 17).

Building something the user could lose into the product is another way to address this core drive. For instance, the online platform 'facebook' builds a connection between users, provides them information about each other, and often is the only way to keep in contact. As a consequence, users of online platform 'facebook' fear losing all these connection, if they would stop using it – a phenomena also called 'digital suicide' (Chou, 2013a, pt. 17; Karppi, 2011).

2.6 Octalysis – a gamification framework

Based on the eight core drives of game motivation, Chou (2014) built the framework 'Octalysis' (see Figure 9). This framework can be used as a tool in applying gamification and analysing a gamified product or service. The main benefit of this framework is the connections between the core drives and its facilitation in balancing them.
2.6.1 White hat versus black hat gamification

The eight core drives in Octalysis can be divided into two groups regarding their motivational urgency. They are called white hat gamification and black hat gamification (see Figure 10). It is crucial to always balance game design elements from both groups depending on the targeted outcome (Chou, 2013a, pt. 19).
White hat gamification

The group of white hat gamification contains the three core drives that are on the top side of Octalysis – Epic Meaning & Calling (CD-1), Developments & Accomplishment (CD-2), and Empowerment of Creativity & Feedback (CD-3). The core drives within white hat gamification provide people the feeling of being empowered and inspired. They tend to feel really good. Everything they do is in their control and they can decide on the pace of work. However, with white hat gamification people do not feel any sense of urgency. Consequently, white hat gamification facilitates long term motivation and engagement, but lacks in short term motivation and immediate results (Chou, 2013a, pt. 19, 2014).

Black hat gamification

The group of black hat gamification contains the three core drives that are on the bottom side of Octalysis – Scarcity & Impatience (CD-6), Unpredictability & Curiosity (CD-7), and Loss & Avoidance (CD-8). The core drives within black hat gamification create a high motivation for immediate tasks and drive short term results. It can also lead to addictive behaviour of the users. However, the fact that people are not in control and feel to be stipulated to do certain tasks, a bad taste remains after the action. This leads to issues in the long run, because users try to escape from black hat gamification elements, when they can, and eventually they leave the game or the gamified process (Chou, 2013a, pt. 19, 2014).

Black hat gamification is not necessarily bad or should be avoided. As stated, it can create a huge engagement and motivation, but it comes along with risks. It is therefore important to always have some white hat gamification elements following black hat gamification elements.

Neutral zone

The two core drives in the middle of Octalysis – Ownership & Possession (CD-4) and Social Influence & Relatedness (CD-5) – do not belong exclusively to white hat or black hat gamification. Those two core drives can go in both ways, depending on the applied game design elements and circumstances around the gamified process (Chou, 2013a, pt. 19, 2014).

2.6.2 Logical versus emotional gamification

Besides white hat and black hat gamification, Octalysis also allocates the eight core drives according to the way they stimulate motivation and engagement in either a logical or an emotional way. Chou (2014) refers in a symbolic way to the logical core drives as 'left brain gamification', which are also placed on the left side of the octagon in Octalysis, and the emotional core drives as 'right brain gamification', placed on the right side. Even though the left side of the human brain is responsible for logical thinking, emotions and creativity occur in the right brain side (Mintzberg, 1976), to avoid misunderstandings with brain science, I further refer to those two sections as 'logical gamification' and 'emotional gamification' (see Figure 11).
Logical gamification

The core drives on the left side of the octagon in Octalysis – Developments & Accomplishment (CD-2), Ownership & Possession (CD-4), and Scarcity & Impatience (CD-6) – stimulate motivation in a logical way, using motivation techniques that are more extrinsic. For instance, points and badges belong to this category. According to Chou (2013a, pt. 20), people who are overachievers tend to focus and enjoy these logical core drives more, as they strive for achievement.

Chou (2013a, pt. 20) phrases the hypothesis, that older people tend to be more attracted and motivated by logical gamification. He argues, that older people are in the working place since a long time and want extrinsic rewards for their work. He further states, that lots of them have been disappointed too much during their career, in order to still believe in visions that their work is meaningful enough to make significant changes.

Emotional gamification

The core drives on the right side of the octagon in Octalysis – Epic Meaning & Calling (CD-1), Empowerment of Creativity & Feedback (CD-3), Social Influence & Relatedness (CD-5), and Unpredictability & Curiosity (CD-7) – stimulate motivation in an emotional and creative way, using motivation techniques that are more intrinsic. In contrast to Chou (2014) the first core drive – Epic Meaning and Calling – is also added to the group of emotional gamification, since it addresses motivation on an exclusively emotional way. According to Chou (2013a, pt. 20), people, who like to enjoy life, see the beauty in it and do not need a reward for their task, are more likely being motivated and engaged by these core drives. In contrast to its logical counterpart, motivation caused by emotional gamification is much more sustaining and long lasting.

Chou (2013a, pt. 20) phrases the hypothesis, that younger people tend to be more attracted and motivated by emotional gamification. He argues, that younger people are just at the beginning of their working life and have not experienced many disappointments. They have dreams, visions, and long term goals. He states, that younger people therefore tend to
have a need for the self-expression of their creativity, and extrinsic rewards are yet not that important.

**Ambivalent core drive**

The core drive on the bottom of Octalysis – Loss & Avoidance (CD-8) – can be both intrinsic and extrinsic, according to Chou (2013a, pt. 20). For instance, if extrinsic rewards are given randomly, people can be more intrinsically engaged to the possibility of getting the reward, than to the reward itself.

### 2.6.3 Application

When applying the Octalysis framework, Chou (2014) recommends a balance between all eight core drives. Since there is no silver bullet or solution that fits all circumstances, it is important to design a gamified solution according to the targeted group. Therefore a goal needs to be clarified and defined. Black hat gamification has great effects when urgency is required. According to Chou (2014), however, employee motivation should not have too much black hat gamification, as this could have bad impacts on the long run. However, “the ‘transfer’ of a design element from a ‘play’ context into another usage context likely does not necessarily lead to the same motivational affordances” (Deterding, 2011, p. 3).

### 2.7 Combination of extrinsic and intrinsic motivational factors in relation to gamification

Extrinsic and intrinsic motivational elements have an effect on each other when applied together. Especially extrinsic rewards can diminish intrinsic motivation (Ryan & Deci, 2000b). If people get a separable outcome (reward) for doing a task, they do not want to do it anymore for free (F. D. Davis, Bagozzi, & Warshaw, 1992). However, extrinsic rewards can represent a value to people and attract them to a task. This attraction should lead to an intrinsic experience, where extrinsic rewards not matter anymore (Nicholson, 2012; Wu, 2011). For gaining an intrinsic experience, according the RAMP-theory (see Figure 12) of Marczewski (2013), the gamified task needs to offer relatedness, autonomy, mastery and purpose (Denny, 2014; Marczewski, 2015a, 2015b; Pink, 2009).

![The Intrinsic Motivation RAMP](image)

*Figure 12: RAMP theory (Marczewski, 2013)*
Gamification can be designed for both, extrinsic and intrinsic motivation (Chou, 2014; Deterding, 2012). The literature review of J. Hamari et al. (2014) further supports the hypothesis that gamification works and can impact the intrinsic motivation of people. Studies in an educational environment show that the gamification of lectures can trigger positive reactions and increase the intrinsic motivating of students (Banfield & Wilkerson, 2014). This results in a higher engagement and better learning outcomes (Kapp, 2012; Muntean, 2011). In a work place environment the experiment of Singer and Schneider (2012) show, that gamification can increase motivation as well. However, they applied mainly extrinsic game design elements and targeted short term goals. Blohm and Leimeister (2013) claim, that “gamification supports and enables the transformation of organizational value and creation process” (Blohm & Leimeister, 2013, p. 276).

The study of Bittner and Shipper (2014) shows, that gamification in product advertisement has a positive impact on intrinsic motivation. This study further indicates, that older people perceive less intrinsic incentives than younger ones. These findings support both hypotheses of this study. In another study by Mekler, Brühlmann, Opwis and Tuch (2013) a motivational increase through gamification has been found, however caused with extrinsic game design elements, leaving a knowledge gap regarding intrinsic motivation.
3 Methodologies

In this sections the methodologies of this study are explained and developed. The section covers the research methods, the experiment, and the test conception.

3.1 Research methods

An overview of the research methods used in this study is shown in Table 5. The following sections provide a detailed reasoning of the chosen research methods.

Table 5: Research methods

<table>
<thead>
<tr>
<th>Research part</th>
<th>Chosen methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research approach (data collection and analysis)</td>
<td>Mixed methods (sequential procedures)</td>
</tr>
<tr>
<td>Research approach (intention)</td>
<td>Exploratory</td>
</tr>
<tr>
<td>Research design</td>
<td>Experimental</td>
</tr>
</tbody>
</table>

3.1.1 Research approach

The research approach can be seen as a two-dimensional construct, with the approach towards 'data collection and analysis' as one dimension and the 'research intention' as the second dimension.

Data collection and analysis

According to Creswell (2013), there are three approaches to research: quantitative, qualitative and mixed methods. A 'quantitative approach' can focus on “post positivist knowledge claims, experimental strategy of inquiry, and pre and post test measures of attitudes” (Creswell, 2013, p. 20). A 'qualitative approach' contrasts with a focus on “constructive knowledge claims, ethnographic design, and observation of behaviour” (Creswell, 2013, p. 20). As a combination of these two approaches, the 'mixed methods approach' contents “pragmatic knowledge claims, [and a sequential] collection of both quantitative and qualitative data” (Creswell, 2013, p. 21).

In this research study, a mixed methods approach with a 'sequential procedures' (Creswell, 2013) strategy is chosen. This approach allows to collect qualitative data from literature and observations of behaviour first, followed by a quantitative analysis from an experiment. The significance of the outcomes in the quantitative analysis is determined with an unpaired t test, providing a two-tailed p value (Vogt, 2011). Following recommendations of Vogt (2011), the significance level is set at a p value lower than 0.05. The ecological validity (Heiman, 2000) of the conclusions and their generalisability is discussed in section 6 – Discussion.

Research intention

The approach towards the intention of the research is strongly dependent to theories and frameworks. There is currently no framework or theory regarding the impact of gamification on intrinsic motivation in administrative processes. As a consequence, a deductive research approach (Denzin & Lincoln, 2011), in which a theory would be tested is not applicable in this case. This study also does not intent to build and provide a new framework or
theory in an inductive approach (Denzin & Lincoln, 2011). The intention of this research study is to explore in the field of gamification and its impact on intrinsic motivation. As a result, an exploratory research approach (Creswell & Clark, 2007) is chosen.

3.1.2 Research design
Creswell (2013) offers two research designs for mixed methods approaches: survey design and experimental design. In order to get valuable data in a research of intrinsic motivation, people must experience competency and their behaviour (Ryan & Deci, 2000b). In a survey design people can be asked regarding their opinions, but their experience on intrinsic motivation cannot be ensured. In the experimental design, however, test subjects can be set in a situation, where they experience competency and their behaviour, to give valuable feedback on their intrinsic motivation. This experiment tests “the impact of a treatment on an outcome, controlling for all other factors that might influence that outcome” (Creswell, 2013, p. 156).

3.2 Experiment
In this section the structure and the targeted test subjects of the experiment are introduced.

3.2.1 Structure
To answer research question RQ1, the impact of gamification on intrinsic motivation in the environment of administrative tasks needs to be examined. Targeting this in an experiment requires a test scenario with gamified administrative tasks. Additionally, in order to pinpoint the test subjects’ intrinsic motivation on the impact of the gamified solution, a second control test is necessary. This control test needs to be equally designed and run, with the only difference in the absence of game design elements. This experiment method is commonly named A/B testing (Christian, 2012; Doctorow, 2012).

The concept of testing with a treatment group and a control group is furthermore a practice in testing medications and medical treatments. In medical studies, there is a further distinction in the procedure of how the experiment is run: open, single-blind, or double-blind. In an open study “both the experimenter and the research participants or subjects know the purpose of the study and which experimental treatment has been applied to which individuals” (Colman, 2008b). This practice can therefore have subjective influences as a result. To increase objectivity in the experiment a blind study should be undertaken (Petrie & Watson, 2013). Blind studies can be single-blind and double-blind. A single blind study is defined as “a research design in which the research participants or subjects do not know until after the data has been collected, but the experimenter does know, which experimental treatment has been applied to which individuals” (Colman, 2008c). This study practice avoids preconceptions of the test subjects. In a double-blind study “neither the experimenter nor the research participants or subjects know, until after the data have been collected, which experimental treatment has been applied to which individuals” (Colman, 2008a). This study practice avoids preconceptions of both the test subjects and the experimenter. It hinders a contamination of the data from subjective observations. The experiment in this particular study is therefore designed as a double-blind study.

3.2.2 Sampling
The sampling process for test subjects of the experiment is explained in this section. First, sampling criteria are developed that fit the purpose of the experiment in this study. Then,
the sampling method of the test subjects and their allocation to either the control group or the treatment group is specified.

**Sampling criteria**

The selection of possible test subjects is limited to several criteria (see Table 6). Research question two requires to perform the test with test subjects of a different age. With the focus on executing administrative tasks, test subjects from the age of 15 until 70 offer a range that has contact with administrative tasks and would therefore represent acceptable values.

The gender of the test subjects does not matter in answering the research questions, resulting in no gender delimitations. However, the gender of the test subjects will be noted for possible remarks for further research. In further parts of this study the test subject is also referred to in the male form. This, however, is exclusively for reasons of convenience in reading and has no value or delimitation of the test subject, as the test subject represents both genders equally. Both the religion and the nationality of the test subject does not matter in this study and has therefore no delimitation and will not be noted.

The geographic location, where the test subject lives and the experiment is undertaken does not relate to the research questions. Consequently, there is no delimitation in acceptable location. To avoid differences in the experiments, it is only conducted in English language. Consequently, test subjects need to be familiar with speaking the language English.

The last criteria regarding the occupation of the test subjects can accept people that are familiar with basic administrative tasks, since otherwise the test result might be changed due to a possible lack of competency or excitement over new and unfamiliar tasks.

*Table 6: Sampling criteria*

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Accepted values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range</td>
<td>15 – 70</td>
</tr>
<tr>
<td>Gender</td>
<td>Female and male</td>
</tr>
<tr>
<td>Religion</td>
<td>No delimitation</td>
</tr>
<tr>
<td>Nationality</td>
<td>No delimitation</td>
</tr>
<tr>
<td>Geographic location</td>
<td>No delimitation</td>
</tr>
<tr>
<td>Language skills</td>
<td>Familiar with speaking English</td>
</tr>
<tr>
<td>Occupation</td>
<td>Familiar with basic administrative tasks</td>
</tr>
</tbody>
</table>

**Sampling method**

In the section, the sampling methods for the test subjects and their allocation to either the control or the treatment group is specified.

*Test subjects*

The sampling of test subjects is mainly conducted on the campus of Jönköping University in Sweden. The main business language at the university is English and all people on the campus – students, lecturers, and office agents – are considered to be familiar with basic administrative tasks. The sampling criteria are therefore fulfilled for people in this environment. The sampling method is stratified random sampling (Patton, 2002; Vogt, 2011).
Both stratas – test subjects of 35 years and test subject younger than 35 years – have been sampled randomly. On a random occurrence people are asked to perform the test. Consequently there is no specific pattern of selecting people to the sample of the experiment.

As shown in Table 7. In the actual experiment the age range is further limited to 20 until 60. This represents people who are in their working life or about to start this one soon. For feasibility reasons, the experiment is only undertaken in the geographic locations of Sweden and with people known to fulfil the sample criteria in Germany. Due to the fact that these countries are not English native speaking countries, the test subjects need to be familiar with speaking the language English. For feasibility reasons the experiment is limited to students, lecturers and office agents.

### Table 7: Sampling of test subjects

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Accepted values</th>
<th>Chosen values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range</td>
<td>15 – 70</td>
<td>20 – 60</td>
</tr>
<tr>
<td>Gender</td>
<td>Female and male</td>
<td>Female and male</td>
</tr>
<tr>
<td>Religion</td>
<td>No delimitation</td>
<td>No delimitation</td>
</tr>
<tr>
<td>Nationality</td>
<td>No delimitation</td>
<td>No delimitation</td>
</tr>
<tr>
<td>Geographic location</td>
<td>No delimitation</td>
<td>Germany, Sweden</td>
</tr>
<tr>
<td>Language skills</td>
<td>Familiar with speaking English</td>
<td>Familiar with speaking English</td>
</tr>
<tr>
<td>Occupation</td>
<td>Familiar with basic administrative tasks</td>
<td>Students, Lecturers, office agents</td>
</tr>
</tbody>
</table>

**Group allocation**

The allocation of the test subjects to either the control group or the treatment group is based on simple random sampling (Patton, 2002; Vogt, 2011). The allocation will further be done by the test subjects themselves in choosing one of two provided envelopes. This way, a possible influence of the experimenter is eliminated and it enables a double-blind study. With this method, there is the possibility that all test subjects get allocated into the same group, but this is statistically unlikely. An even number between the groups is not necessary for the analysis of the experiment, as the qualitative analysis will give only indications, which will be tested in the quantitative analysis with mean values.

### 3.2.3 Observation

The observation observations during the experiment are based on the experimenter’s perception. However, the experimenter is not specially trained in this field and the interpretation of emotions are based on perceptions, rather than scientifically grounded. Due to this fact, the observation is focused on obvious emotions defined in this section. The emotions are divided into positive, negative and neutral emotions. An overview of these, both shown and stated emotions is provided in Table 8.
Positive emotions

For positive emotions, only obvious emotions during the experiment are in the focus of the observation. These emotions are smiles, laughter and happiness of the test subjects. In addition to these shown emotions, also emotions that are stated by the test subjects are observed. The stated positive emotions are 'fun' and 'happy'.

Negative emotions

For negative emotions, only obvious emotions during the experiment are in the focus of the observation. These emotions are frustration and madness of the test subjects. In addition to these shown emotions, also emotions that are stated by the test subjects are observed. The stated positive emotions are 'not exciting' and 'demotivating', 'boring' and swear words.

Neutral emotions

If there are no or only few emotions shown by a test subject, it is considered as neutral emotions. In addition to that, if there are no words spoken or only short statements like “It's ok” is is considered as neutral stated emotions.

3.3 Test conception

The conception of the test in this experiment consists of four parts: the general test design, the specific test for the control group, the specific test for the treatment group, and the debriefing to gather important information.

3.3.1 General test design

The general test design is the skeleton for both the control and treatment group. It covers all necessary prerequisites and delimitations, the scheme of tasks to perform, and the procedure of how the test is to be undertaken.
**Prerequisites**

There are several prerequisites in the conception of the test to ensure that the data will be valuable:
- excluding extrinsic motivational elements / game design elements;
- having the same tasks for the control and treatment group;
- random selection of control and treatment group;
- blind observation.

The focus on intrinsic motivation in this study requires the test to exclude extrinsic motivational factors. This applies to both the game design elements used in the treatment group and also for the experiment as a whole. The offer of a separable outcome, for instance, in order to attract people to participate in the test could have an impact on their motivation during their performance in the test. It is therefore crucial, that all test subjects participate on a voluntary basis. On top of that, with the exclusion of extrinsic motivations factors, the test subjects can be observed and asked regarding their motivation in general. This makes explanations and possible confusions of the difference between extrinsic and intrinsic motivation unnecessary, since all their motivation is based on intrinsic factors, telling about their intrinsic motivation.

In “controlling for all other factors that might influence that outcome” (Creswell, 2013, p. 156), the test in this experiment requires having the same tasks for both the control and treatment group. To ensure this, the test scheme is developed first, before the specific tests for both groups are shaped. This is necessary to create meaningful observations in possible differences between the groups, caused by the only factors changed – gamifying the tasks for the treatment group with intrinsic game design elements. However, not only the tasks, but also the used technology, instructions and behaviour of the experimenter, and the environment need to be the same. In order to prevent subjective influences from the experimenter, the test should run totally automatic, requiring no interaction between the test subject and the experimenter.

Further controls for possible influencing factors need to address the assignment of test subjects into either the control or the treatment group. In order to prevent conscious or subconscious influences of both the test subject and the experimenter, a random assignment to the groups and a blind observation is required. This means that the experimenter does not know either to which group the test subject belongs until after the debriefing. This makes the test a double-blind study.

**Specifications and assumptions**

As specified earlier, basic administrative tasks in this study are limited to corresponding via electronic mail, downloading files, reading password secured instructions, and correcting texts. Test subjects are intended to face common tasks, which they are able to perform easily. Further, the basic administrative tasks are not considered as to be exciting as they occur on a frequent basis in the test subjects’ life. To stress the factor of performing unexciting tasks, some tasks will be performed several times in this test.

**Scheme**

The scheme of the test consists of eleven steps and is the same for all test subjects, regardless of their belonging to either the control or the treatment group. The process is visualized in Figure 13.
Figure 13: Process of test steps
**Step 1: Selection of an envelope**
The test subject has to select one of two identical looking envelopes. The envelopes will be closed, but not sealed. This grants the test subject easy access to the contents of the envelope. One of the envelope will lead the test subject into the control group, the other one into the treatment group. The test subject and the experimenter must not know, which envelope leads to which group. This assures a random assignment of the test subject to either of the groups. Additionally, the test subject is not informed regarding the purpose of the two envelopes.

**Step 2: Read message inside the envelope**
Inside the envelope, the test subject will find a piece of paper, which contains a message giving short instructions regarding their next task. The tasks of the test subject is to read and understand these short instructions.

**Step 3: Send a mail**
The short instructions of step 2 advise to send a mail to a specified mail address. The task of the test subject is to write and send a mail to the specified mail address.

**Step 4: Receive and read mail**
After sending the mail in step 3, the test subject receives an automatic mail in reply. This mail contains further information and instructions. The task of the test subject is to read this mail.

**Step 5: Follow link**
The information and instructions in step 4 contain a link that leads to further instructions, which the test subject is asked to follow and open in a web browser. The test subject’s task is to follow and open the link in the mail.

**Step 6: Download and open file**
The link opened in step 5 leads to a password protected document that cannot be displayed in the browser. However, the possibility of downloading the file is advised. The test subject’s task is to download the file and then open it.

**Step 7: Insert password**
When trying to open the document in step 6, the test subject is required to insert the correct password in order to access the document. The task of the test subject is to enter the correct password.

**Step 8: Read further instructions**
After inserting the correct password in step 7, the test subject accesses a document containing further information and instruction, and also a task to do. The test subject’s task is to read these information and instructions.

**Step 9: Decrypt text**
The instructions and task specified in the document, which the test subject has read in step 8, request the test subject to decrypt a given text, which obviously is the test subject’s task in this step.

The given text is encrypted with a method, where the first and the last letter of each word remain untouched at their position in the word, whereas all other letters of the word are in
random order. Researcher at Cambridge University suggest, that people can read texts like this without problems (M. Davis, 2012; Rawlinson, 1976). This is claimed to be so, because the human brain read words as a whole and does not read each single letter sequentially. The terminology for this method is 'Typoglycemia' (Drayton, 2012).

Step 10: Send a mail
Once the text has been decrypted in step 9, the test subject has to send the decrypted text to a mail address, which is specified in the instructions. This mail address is different from the first one, which is both for technical reasons and makes it necessary to read all instructions carefully.

Step 11: Receive and read a mail
After sending the mail in step 10 the test subject receives another mail. This mail contains no more tasks and after reading it, the test is over.

Procedure
The procedure of how the test is undertaken has to be the same on every time, in order to make the results and observations comparable.

Test explanations
Before the test subject starts the test, the experimenter has to give some general explanations on how the test will be undertaken. These explanations are listed in the following:
- information about the technology used in the experiment;
- the test starts with picking one of the two envelopes;
- the test subject will get all necessary information from the point of opening the envelope;
- the experimenter will only observe what the test subject does and how the test is done; hence there will be no interaction or questions answered by the experimenter;
- there is no time limit for the completion of the test;
- all data gathered in this experiment will be used anonymously.

Observation
The observation of the experiment needs to be in person, in order to provide the possibility to observe as many expressions as possible. Consequently, a conduction of the experiment via a video connection online is not allowed. During the test the experimenter has to be placed in a position where he can see the face of the test subject, but not the computer screen, in order to stay blind regarding the group in which the test subject is. The experimenter should also sit in a position that does not create a stressful or dominant situation that might influence the test subject’s behaviour. Without mentioning the experimenter measures the time the test subject needs for the whole test.

The main focus of the observation will be face expressions of the test subject during the tasks, their ability on performing the tasks, and noting what the test subject is saying during the test. Regarding face expressions, especially things like smiling, laughter, concentration, anger, or curiosity shall be observed. The observation of the ability to perform the tasks focuses on errors the test subject makes, like sending to a wrong mail address, troubles with the password protection, and whether the test subject struggles to decrypt all words.

After the final step of the test, the experimenter has to undertake an interview based on the debriefing questionnaire. This interview will be a mix of a structured (Firmin, 2008) and
semi-structured (Ayres, 2008) interview. After this interview the experimenter takes the envelope of the test subject and notes the group type – control or treatment.

**Final explanation**

The data collection part of the experiment ends with the finishing of the debriefing questionnaire. Afterwards the final part of the experiment follows, where the experimenter explains the purpose and motivation of the experiment to the test subject. This final explanation includes the general topic of gamification and its impact on intrinsic motivation, the two research questions, the control and treatment group, and also what the basic administrative tasks in the tests were. This step of the final explanation has no effect on the results of this study. However, for reasons of fairness and authenticity towards the test subject this final explanation is part of the experiment.

### 3.3.2 Test for control group

The test for the control group is based on the scheme of the general test design. This section therefore covers the specialised design of each step of the test scheme for the control group. The final version of the whole test of the control group is shown in Appendix 4. All information to the test subject in the control group are provided without a name, signed by the pseudonym 'the test supervisor'.

**Step 1: Selection of an envelope**

There must not be any speciality for the control group in this step, since the selection of the envelope decides about the assignment to the groups. Both envelopes must look identical.

**Step 2: Read message inside the envelope**

Message in the envelope:

```
Please send a mail to the following address with the given subject and specifying your name:
Mail address: thesis.test.jibs@gmail.com
Subject: “Thesis test”
Content: specify your name

You will receive further information via mail afterwards.

Your test supervisor
```

The message inside the envelope contains clear instructions regarding what to do next and also how this should be done. The test subject is required to send an electronic mail to the address specified in the message – 'thesis.test.jibs@gmail.com'. In order to avoid possible technical errors and not to require any creativity, the subject of the mail – 'Thesis test' – is already specified in the message and the content of the mail shall specify the test subjects name.

The test subject can also read in the message that further information will follow via mail. This way clarity about what will happen after the mail is sent is provided and uncertainty can be avoided.
Step 3: Send a mail

This step is only the execution of the instructions given in step 2. Consequently, a mail with the subject 'Thesis test' has to be sent to the mail address 'thesis.test.jibs@gmail.com' specifying the test subject's name in the mail content.

Step 4: Receive and read mail

Response mail:

Dear mailer,

thank you for your cooperation. The instructions for your task are stored at a central place. Please press the following link and download the document:
https://app.box.com/s/0z3x836tmpt83z2safrfibqlskxtc6zi

The password for accessing the document is: snake

After reading, please complete the assignment and send the result to the following mail address:
thesis.test.jibs.reply@gmail.com

Sincerely
Your test supervisor

The reply mail to the test subject’s mail address will be sent automatically as a response to his mail. It therefore includes the same content for each test subject, regardless of the information this test subject has written in his first mail.

In this mail the test subject is informed that the information for his presumably actual task are stored on a central place and he therefore needs to follow a link and download the document there. Since this document is password protected, the test subject gets the password – 'snake' – told in this mail as well. As a result, the test subject is totally informed about what happens next and how he has to do it. Furthermore, this mail already contains the instructions to which mail address – 'thesis.test.jibs.reply@gmail.com' – the final mail with the result of the task has to be sent.

Step 5: Follow link

Following the link, which the test subject has received in step 4, he will find a document with the title 'Test instructions'. As already explained in the general test design, this document is password protected and cannot be opened in the browser. There are no more specifications for the control group in this step.

Step 6: Download and open file

There is no specification for the control group in downloading the file and opening.

Step 7: Insert password

The password – 'snake' – to access the file has been provided in the instructions of the received mail in step 4. After inserting the password, the content of the document is accessible.
Step 8: Read further instructions

Instructions:

Studies suggest, that people can read texts, if only the first and last letter are in their right positions. All other letters of the word can be in random order and the text can still be read. This encryption method has been applied to the following text. Your task is to decrypt it and write the text in the correct way:

“Old fidnres psas aaww, new fnierds apaer. It jsut lkie the dyas. An old day ps-ass, a new day aviers. The inturpaat tnbig is to mkae it meingfnal: a minfneagl furied - or a meginfnal day. Wben wwe meet real teadgry in life, we can recat in two wyas - eitehr by lowing hpoe and fnillag into stef-deiexctne bibats, or by nisig the cel-ganlb to fnid our iennr stegntgh” The Dlaai Lmaa

Please send the decrypted text to the following mail address:
thesis.test.jibs.reply@gmail.com

Sincerely
Your test supervisor

The document contains information regarding the Typoglycemia encryption method (see section 3.3.1). The test subject is told, that studies suggest, that people can read these kind of texts; also the way this method works and how the text is encrypted. The instructions for the test subject is then to decrypt a given text and write it in the correct way. The result of this task shall be sent to the specified mail address – 'thesis.test.jibs.reply@gmail.com'.

Step 9: Decrypt text

The text to be decrypted in the control group is a quote from the Dalai Lama. In plain text the quote is the following: “Old friends pass away, new friends appear. It is just like the days. An old day passes, a new day arrives. The important thing is to make it meaningful: a meaningful friend – or a meaningful day. When we meet real tragedy in life, we can react in two ways – either by losing hope and falling into self-destructive habits, or by using the challenge to find our inner strength. The Dalai Lama” (Lama & Cutler, 2009).

Step 10: Send a mail

After decrypting the text in step 9, the test subject has to send the decrypted text to the specified mail address – 'thesis.test.jibs.reply@gmail.com'. It is worth mentioning that this mail address is slightly different from the mail address the test subject sent the first mail to. This mail address was provided twice to the test subject, in the received mail (step 4) and the instruction document (step 8).

Step 11: Receive and read a mail

Confirmation mail:

Dear mailer,

we have received the submission of your assignment. We will review it in the next days. Thank you for your participation.

Sincerely
Your test supervisor
The test for the test subject in the control group ends with a final mail, which is automatically sent after he sent the decrypted message in step 9. This final mail again uses neutral and emotionless language, informing that his mail has been received and will be reviewed in the next days.

### 3.3.3 Test for treatment group

#### Basic environment

The main focus in the design of the test for the treatment group is the implementation of game design elements. These, however, are limited to intrinsic ones that offer the test subject no separable outcome. There are multiple ways of gamifying the experiment in this study, all with their own benefits and shortcomings. In the test conception for the treatment group a scenario has been chosen, where the test subject becomes the hero in a story, which is about helping a captain of a space ship far away from earth. This scenario makes it obvious to be made up, but still interesting enough to engage people, since it is uncommon in a person’s daily life to interact with a space ship.

#### Detailed design

The test for the treatment group is based on the scheme of the general test design. In this section each step of the test scheme is therefore conceptualised for the treatment group. The final version of the whole test of the treatment group can be retrieved in Appendix 5.

**Step 1: Selection of an envelope**

Like the test of the control group, there must not be any speciality for the treatment group in this step, since the selection of the envelope decides about the assignment to the groups. Both envelopes must look identical.

**Step 2: Read message inside the envelope**

Message inside the envelope:

*Far away from earth Captain Crash is on a secret mission. Recently, he got a problem on his space ship. You are one of the few people, who are capable to help him solving this problem.*

*To get further insights and information, you have to contact Captain Crash directly by sending him a mail on the following address: your.secret.quest.jibs@gmail.com*  

*He already appreciates your support in this quest.*

After selecting an envelope in step 1, a message is revealed, telling that a so called ‘Captain Crash’ is on a secret mission far away from earth and has problems on his space ship. The mentioning of a name – Captain Crash – adds a social element of friending to the test. Stating that the mission is secret, adds importance and meaning to the story and puts the test subject in an elite position of only few people who are granted knowledge about this secret mission.

Further in the message, the test subject is one of the few people who can help this Captain Crash. Besides the general narrative and storytelling, this information puts the test subject into a hero-like role, since he can help. The expression that the test subject is 'one of the few people' and not the only one is supposed to take away pressure, but also has a subconscious effect, that there are others as well. A social factor comes in play, where the test sub-
ject tries to prove that he is capable of doing the test, as presumed, and also satisfies a desire to be better than others. The second part of the sentence – 'help Captain Crash' – gives the whole effort and tasks of the test a higher meaning. The test subject does not act for himself or the experimenter, but helps a higher ranked person – captain – on a presumably important quest.

The friending with Captain Crash is intensified by the possibility to get in contact with him directly. The test subject does not have many information at this point of the experiment, but in the message he is offered a way to receive further information by sending a mail to a specified address – 'your.secret.quest.jibs@gmail.com'. However, there are no instructions or further hints regarding the content of this mail.

The message ends anonymously, but with a note that Captain Crash already appreciates the test subjects help in this quest. This starts to establishe a thank you economy in the communication.

**Step 3: Send a mail**

After reading the message in step 2, the test subject is supposed to send a mail to the provided mail address – 'your.secret.quest.jibs@gmail.com'. However, due to the absence of further instructions the test subject is required to use his creativity in composing the mail.

**Step 4: Receive and read mail**

Response mail:

*Greetings my fellow rescuer,*

*it is a pleasure to have your support on this quest. We recently got into some troubles on our space ship 'Aurora Star' and are stranded on a lonely planet far away from earth.*

*Unfortunately I cannot share too much details on this insecure line. I placed details about your quest at a save location you can access on the following link: [https://app.box.com/s/4vm6lo50y2no7rj9jej9jk9ksxio7kaw](https://app.box.com/s/4vm6lo50y2no7rj9jej9jk9ksxio7kaw)*

*To access this document, I need you to pass another security check. You can figure out the password by entering the animal that is least like the other four in the following selection: dog, mouse, lion, snake, elephant.*

*Best of luck*

*Captain Crash*

As a response to the sent mail in step 3, the test subject automatically receives a mail from Captain Crash as an instant feedback to his previous action. The aims of the first sentence is to intensify the social connection between the test subject and Captain Crash via friending and a thank-you economy. While repeating the information from the first message, in this mail Captain Crash adds information regarding the name of the ship – 'Aurora Star' – and the location where they have the problem – 'lonely planet'. This way the narrative and storytelling continues.

The message of Captain Crash continues with a reasoning for the limited information – 'insecure line'. This reasoning also explains why the next steps in the experiment are necessary. Furthermore, the mentioning of the insecure line strengthens the meaning and importance of the quest and therefore the heroic role of the test subject. The promise of re-
Receiving the final information by following the link gives directions for the next task and possibly increases the test subject’s curiosity.

The elite status of the test subject is strengthened by the necessity of another security check. Having limited information by not being told the password directly, but rather having a mini-quest, where the test subject has to figure out the correct password. This is designed to be engaging and creating satisfaction from the completion of a necessary mini-quest.

**Step 5: Follow link**
Following the link, which the test subject has received in step 4, he will find a document with the title 'Briefing for your secret task'. As already explained in the general test design, this document is password protected and cannot be opened in the browser. There are no more specifications for the treatment group in this step.

**Step 6: Download and open file**
There is no specification concerning the treatment group in downloading the file and opening.

**Step 7: Insert password**
The opening of the document in step 6 requires the test subject to enter a password. Since the correct password is not provided directly, the test subject has to figure it out in a mini-quest. This is designed to be engaging and creating satisfaction from the completion of a necessary mini-quest. The answer to this question – 'animal that is least like the other four in the following selection: dog, mouse, lion, snake, elephant' – of the mini-quest is 'snake'. There are several reasons for this answer, for example it is the only animal in the selection without legs, and it is not a mammal. After inserting a password the test subject receives an instant feedback, whether it is correct or not.

**Step 8: Read further instructions**
Briefing for secret task:

One week ago we lost our contact man who had valuable information regarding the route towards our target in 'Destiny Heights'. We do not know which route we need to take to safely get there. We cannot leave the lonely planet without these information. The last message we received from our contact man is encrypted. I need you to decrypt this message, so that I can give the information to our navigator:

The ptah twaodrs detsniy hiegths is cervoed wtih amubhises and tarps. The safjet way is by fylnig anuord the oribt 2, tehn you aiwvd the eivl topros in suqare 1. Aeffr psas-nig the red plenat, it is ipmrotnat to not etenr the mzae of srats. Floow the lihgt of veags untill you neeb the gern palnet. From tehre you can use light seepd and go dri-etly to dsetny hiehgts.

You can get in contact with me for sending the decrypted message to the following secure mail address:

solved.secret.quest.jibs@gmail.com

Best of luck

Captain Crash
After the test subject has inserted the correct password in step 7, the access to the document is granted, which gives him another elite status. The message in the document continues the narrative and storytelling, providing again some further information. Repeating the need of the test subject’s help and his ability to solve the task renews the hero status and the higher meaning.

The information about the next task of the test subject is provided by stating that he is needed to decrypt the text and that he can contact Captain Crash again via mail. However, the information are limited in a way that it is not explained how the encryption method works. This part is left to the creativity of the test subject.

**Step 9: Decrypt text**

The text to be decrypted in the treatment group continues the narrative and storytelling. Since there is no information provided regarding how the message is encrypted, the test subject needs to be creative and figure the decryption method out himself. The decryption itself represents another mini-quest in the test.

In plain text the decrypted message is the following: 'The path towards destiny heights is covered with ambushes and traps. The safest way is by flying around the orbit 2, then you avoid the evil troops in square 1. After passing the red planet, it is important to not enter the maze of stars. Follow the light of vegas until you reach the green planet. From there you can use light speed and go directly to destiny heights.'

**Step 10: Send a mail**

After decrypting the text in step 9, the test subject has to send the decrypted text to the specified mail address – 'solved.secret.quest.jibs@gmail.com'. It is worth mentioning that this mail address is slightly different from the mail address the test subject sent the first mail to. This mail address was provided to the test subject in the briefing document (step 8). The content of this mail, besides the decrypted message, is up to his creativity.

**Step 11: Receive and read a mail**

Confirmation mail:

Thank you for your help!

Myself and the whole crew of the 'Aurora Star' appreciate your efforts and support. Thanks to you we can leave this lonely planet and make our way safely to destiny heights.

Thankful

Captain Crash

As an instant feedback the test subject receives an automatically sent mail as a response to his mail with the decrypted message. This mail is the last step of the test. Content wise this final message, continues the narrative and storytelling, but also reinforces the higher meaning of the tasks and the test subject’s feeling of being the hero. Additionally, the thank-you economy is being kept up by the thanking of Captain Crash and also his whole crew.

**Applied game design elements**

The test of the treatment group has been gamified with several game design elements (see Table 9 – based on Appendix 3, Figure 15). The chosen game design elements focus exclusively on intrinsic and emotional gamification (see section 2.6.2). Further, there is a mix be-
between black hat and white hat gamification in the test for the treatment. Matching this test
to the Octalysis framework (see section 2.6), the focus on the emotional side and the mix
of white hat and black hat gamification is visualised (see Figure 14).

Table 9: Applied game design elements

<table>
<thead>
<tr>
<th>Core drive</th>
<th>Game design element</th>
<th>Applied in step(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD1 – Epic Meaning &amp; Calling</td>
<td>Elitism</td>
<td>2, 4, 8</td>
</tr>
<tr>
<td></td>
<td>Hero</td>
<td>2, 4, 8, 11</td>
</tr>
<tr>
<td></td>
<td>Higher Meaning</td>
<td>2, 8, 11</td>
</tr>
<tr>
<td></td>
<td>Narrative</td>
<td>2, 4, 8, 9, 11</td>
</tr>
<tr>
<td>CD2 – Development &amp; Accomplishment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD3 – Empowerment of Creativity &amp; Feedback</td>
<td>Voluntary Autonomy / Creativity</td>
<td>3, 7, 8, 9, 10</td>
</tr>
<tr>
<td></td>
<td>Instant feedback</td>
<td>4, 7, 11</td>
</tr>
<tr>
<td>CD4 – Ownership &amp; Possession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD5 – Social Influence &amp; Relatedness</td>
<td>Friending</td>
<td>2, 4</td>
</tr>
<tr>
<td></td>
<td>Social proofing</td>
<td>2,</td>
</tr>
<tr>
<td></td>
<td>Thank-you economy</td>
<td>2, 4, 11</td>
</tr>
<tr>
<td>CD6 – Scarcity &amp; Impatience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD7 – Unpredictability &amp; Curiosity</td>
<td>Mini-quests</td>
<td>4, 7, 9</td>
</tr>
<tr>
<td></td>
<td>Storytelling</td>
<td>2, 4, 8, 9, 11</td>
</tr>
<tr>
<td></td>
<td>Limited information</td>
<td>1, 2, 4, 8, 9</td>
</tr>
<tr>
<td>CD8 – Loss &amp; Avoidance</td>
<td>Status quo Sloth</td>
<td>9</td>
</tr>
</tbody>
</table>

Figure 14: Test for treatment group matched on the Octalysis framework (based on Chou, 2015)
The test for the treatment group follows the flow theory (see section 2.1.3). The intended path of the test subject’s feelings is supposed to alter from 'relaxation' via 'control' to 'flow'. In the experiment the skill dimension covers not only ability skills, but also the understanding of the situation. In the beginning, the test subject has few information regarding the test. Picking an envelope (step 1) does not require any skills, and also sending the first mail (step 3) is considered to be simple. Up to this point of the experiment, the test subject is in the 'discovery' phase (see section 2.4). An attitude and reasoning towards the test situation is built. For the next steps, until opening the document the test subject has to follow instructions, while understanding the situations more and more – his skill level and understanding of the experiment rises. Figuring out the password (step 7) requires the solving of a mini-quest and is considered to be more difficult than acting according to given information. Solving the mini-quest and entering the correct password concludes the 'onboarding' phase, as the test subject learns more and more about the test situation and has his first achievement in solving the mini-quest. At the climax of the experiment, the test subject has all information regarding his tasks in the test after reading the document (step 8), following by the most difficult task in the experiment – the decryption (step 9). The decrypted message represents an achievement and is the first win-state. It therefore concludes the 'scaffolding' phase of the experiment. The last two steps break the direction of the flow theory as they are again considered to be simple. However, due to the fact that those two tasks end up the test, they are considered less as tasks but more as feedback. Since the test in this experiment cannot be time unlimited, there is no 'endgame' phase. The motivation over a longer time period is therefore not measured.

The test in this experiment does not offer any possibility to interact with other players or other test subjects. There is only an interaction with the created world in the test possible. Consequently, people of the player types 'socialiser' and 'killer' (see section 2.3) are not targeted and might be not attracted by this test. However, people of the player types 'achiever' and especially 'explorer' can discover and interact with the test world, and are consequently addressed by this experiment. Since most of the people do not exclusively belong into one of the four player types, but to some degree to several (Caron, 2011; Juho Hamari & Tuunanen, 2014), this targeting on only two player types is considered to not impact the test result significantly.

### 3.3.4 Debriefing questionnaire

Besides the observations from during the test, the debriefing questionnaire serves as a basis for an interview after the test to fetch information from the test subjects and what they are thinking. This section covers the conception of the debriefing questionnaire. As explained earlier, the interview is a mixed version of structured and semi-structured. The questionnaire consists of three different types of questions: general data, closed questions, and open questions. The whole debriefing questionnaire can be viewed in Appendix 6.

**General data**

The general data section is necessary for collecting data to distinguish the answers and observations of the experiment according to several categories. General information about the test subject is noted. These consist of the group the test subject was tested in, his gender, the needed time, and the age. Since the precise age is not necessary for the results in this study, test subjects are put into age groups, not revealing their exact age. The age range of the age groups are defined as shown in Table 10.
### Table 10: Age groups

<table>
<thead>
<tr>
<th>Age range</th>
<th>Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 – 24</td>
<td>Students, before starting their working life</td>
</tr>
<tr>
<td>25 – 34</td>
<td>Students and professionals at the beginning of their working life</td>
</tr>
<tr>
<td>35 – 44</td>
<td>Professionals, established in the working life</td>
</tr>
<tr>
<td>45 – 54</td>
<td>Senior professionals, established in the working life</td>
</tr>
<tr>
<td>≥ 55</td>
<td>Senior professionals, getting closer to their retirement.</td>
</tr>
</tbody>
</table>

### Closed questions

Closed questions offer a limited range of possible answers in a questionnaire (Chandler & Munday, 2011a). The results are therefore easy to quantify. However, there might be a mismatch between the respondent’s opinion and the specified answer choices. Relating to the research questions in this study, it is crucial to ask the test subject regarding their motivation during the entire test. For this question a response scale from 1 – not motivated at all – to 10 – totally motivated – is specified. This scale requires the test subjects to think about their motivation. There is no middle value that could be picked for reasons of convenience. Also distinctions in the answers are possible.

Another closed question in the debriefing questionnaire targets the test subject’s confidence about his abilities to solve the tasks in the test. For reasons of simplicity and alignment, the scale is from 1 to 10, with 10 being absolute confident. This scale is the same as in the question regarding the motivation.

Due to the fact that the test of only one of the groups has been gamified, it is interesting whether the test subject felt like being in a game or not. This possible answers to this question are limited to 'Yes' and 'No'. The result of this question shows whether the gamified tests creates a game-like environment and whether there is a difference to the control group.

To confirm the answer and observations regarding the test subject’s motivation, another closed question is asked. In this question, the test subject shall tell, whether he enjoyed performing the tasks or not.

### Open questions

Open questions give the respondent the opportunity to answer freely without being limited to predefined answers (Chandler & Munday, 2011b). The results are used for a qualitative analysis and deepen the understanding of the situation. In this debriefing questionnaire, it is important to know, what part of the test especially motivated the test subject. The answer of this question can lead to insights of the motivational impact of gamification.

The test subject has also the possibility to provide any general comments about the test. There must be no limitation to this question. The general comments fetch the thought that is in the test subject’s mind right after the test and represents his most dominant feeling and opinion. There is no question asked regarding parts of the test that might have demotivated the test subject, due to the suggestion within the question. If there is anything that really demotivated or annoyed the test subject during the experiment, he can and is assumed to state this in the general comments question.
4 Results

In this section the results of the experiment are provided. It includes the test subjects, who undertook the experiment and the data gathered from the experiment. The data section is split into qualitative observations and quantitative data. The test protocols of the experiment are provided in Appendix 7.

4.1 Test subjects

The experiment has been undertaken with 32 test subjects. An overview of the test subjects and their assignment to the different groups is shown in Table 11. There is a total of 21 test subjects, which are younger than 35 years – representing the age groups '15 – 24' and '24 – 34'. Eleven test subjects are older than 35 years – representing the age groups '35 – 44', '45 – 54' and '≥ 55'. Out of 32 test subjects, 13 performed the test of the control group and 19 test subjects got assigned into the treatment group.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age &lt; 35</td>
<td>Age ≥ 35</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Gender combined</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>19</td>
</tr>
</tbody>
</table>

One of the test subjects did not finish the experiment. This test subject (#29) was female, assigned to the treatment group, and belonged to the age group '45 – 54'. After reading the first information provided in the envelope she did not proceed further and aborted the test. Information and observations of this experiment will be used in the qualitative analysis. However, this test subject will not be represented in the quantitative analysis.

4.2 Data

The detailed observation and feedback protocols of all test subjects can be found in Appendix 7.

4.2.1 Qualitative data from observations

In the experiment the test subjects have been observed. The key insights of these observations are introduced in this section. The more detailed observation protocols are listed in Appendix 7. The focus of the observation was on the emotions of the test subjects. This section is therefore structured in the parts of emotions that the test subjects showed, emotions that they stated in words, and other observations covering focus, creativity, stress and distractions of the test subjects.

Showing emotions

This section covers the observations of emotions that were expressed by the test subjects through facial and non-verbal expressions.
Positive emotions
In the experiment several test subjects showed positive emotions like smiling, laughter and happiness. During the tasks in the experiment twelve out of 19 test subjects in the treatment group (#02, #03, #04, #05, #08, #10, #14, #23, #24, #26, #29, #30) smiled and two out of 13 test subjects of the control group showed smiles (#07, #13). Six test subjects showed even stronger positive emotions and laughed during the test. In the control group two test subjects (#10, #24, #25, #30) laughed, and in the treatment group laughter of four test subjects (#02, #03, #04, #05) was observed. A less obvious positive emotion is the happiness of test subjects, which describes the mood of the person. In the experiment three test subjects (#07, #18, #28) of the control group and seven test subjects of the treatment group were observed being in a happy mood.

Negative emotions
Negative emotions such as frustration and especially madness about the test subject’s own performance were only found in the control group, shown by four test subjects (#17, #22, #27, #32).

Neutral emotions
Nine test subjects were observed, showing not many emotions at all during the test. These nine test subjects split into the control group with five test subjects (#06, #11, #15, #21, #27) and the treatment group with four test subjects (#01, #09, #19, #31).

Stating emotions
This section covers emotions of the test subjects that have been expressed through saying words or sentences.

Positive emotions
During the tasks in the experiment positive emotions have been stated in different ways. Six test subjects of the treatment group (#08, #10, #14, #16, #23, #26) and one test subject of the control group (#22) referred to the tasks by saying that “it was fun”. Test subject #04 of the treatment group repeatedly expressed being “happy”. Two test subjects of the treatment group said that they “want to do more” (#05, #24). And test subject #24 of the treatment group repeatedly cheered “I saved the space ship”.

Negative emotions
In the control group some test subjects expressed negative emotions by stating to “feel pressure” (#15), or that “sending mails was not exciting” (#06, #32). Test subjects #11 started the test asking the rhetorical question “are you kidding me?!” in the beginning of the test and later claimed, that “it’s demotivating, because [he] think[s] others are faster”. In the treatment group, two test subjects (#01, #02) described the tasks during the test as “weird”. In both the control and treatment group occasionally test subjects expressed their emotions by using swear words (#01, #27, #32).

Neutral emotions
Some test subjects were neutral in their spoken words during the test. Test subject #31 of the treatment group did not say anything during the whole test, whereas in the control group there were neutral expressions like “so...” (#21) or “it’s ok” (#13).
Other observations

This section contains observations from the experiment regarding the focus of the test subjects, their creativity, the handling of distractions, and the existence of a stressful situation.

Focus

During the first steps first eight steps of the test, which cover the basic administrative tasks of sending mails, read instructions, and download a file, but not the decryption task, nine test subjects showed a focus on the tasks. Out of these nine test subjects, seven are from the treatment group (#03, #05, #08, #16, #19, #23, #25) and two are from the control group (#06, #28). In this phase of the experiment also two test subjects (#18, #22) of the control group showed a low focus in reading the instructions.

During the decryption task nine out of 18 test subjects in the treatment (#01, #02, #04, #08, #14, #19, #25, #26, #30) and five out of 13 of the control group (#06, #17, #20, #21, #32) were highly focused on the task. Test subject #08, for instance, did not notice anything of what happened in the environment around her, while she was doing the decryption. Two test subjects, one of the treatment (#03) and one of the control group (#18), showed a low focus during the decryption.

Creativity

Several test subjects of the treatment groups showed creativity in writing the first mail. Many test subjects wrote one or two sentences, in which they greet Captain Crash and offer him their help (#04, #05, #08, #09, #16, #23, #24, #30). Some others put much effort into the composition of the first mail. The mails of three of these examples are transcribed in Table 12. These mails contain greetings, a summary of what they understood of the situation, the offering of help, and the asking for further information.

Table 12: Examples of mails from test subjects

<table>
<thead>
<tr>
<th>Test subject</th>
<th>Transcribed mail</th>
</tr>
</thead>
</table>
| #10          | “Captain Crash  
I received notice about the problems you've been having on your space ship, how tedious! I was also told that you could use my help in solving these problems and I would like you to tell me more about it. I look forward to hearing from you.  
Best Regards  
[Test subject #10]” |
| #14          | “Dear Captain,  
Let me know how we could communicate in a more efficient manner regarding your issue. Please include a background to the problem and how I can be of assistance.  
Regards,  
Your help on earth.” |
There were three occasions with test subjects of the treatment group, where the test subjects showed creative approaches and did work that was not asked or required from them. Test subject #26 did research about Captain Crash before he sent the first mail; one (#05) structured the decrypted message in his reply; and test subject #25 used help from an online word-scrambler-tool at the decryption task.

Handling of distractions

There were occasions in both groups, where test subjects got distracted by phone calls. In all four occasions of a disturbance in the treatment group the test subjects did not allow any distractions from their task (#02, #10, #24, #30). In the two situations of the control group, one test subject stayed focussed on his task as well (#15), while the other one got distracted (#21) and got back to the test afterwards.

Stressful situations

Three test subjects of the treatment group (#02, #19, #30) and one of the control group (#06) stated that they are in a stressful situation and would have plenty of other things to do as well. Both in their general comments and their evaluation of their motivation during the test, they mention that their motivation is lower because of their stressful situation.

4.2.2 Data from debriefing questionnaire and mails

The results of the data received from the debriefing questionnaire and the mails are presented in this section. In the first part the raw data is presented. The second part shows average data.

Raw data

The data collected with the debriefing questionnaire and the mails the test subjects sent in the experiment (see Table 13) is intended to be used for a quantitative analysis.

Every test subject is allocated with an identification number. This number is used to refer to answers of a specific test subject and to connect the values of the different categories. The identification numbers have a range from #01 for the first test subject to #32 for the last test subject who undertook the experiment. Each test subject has been allocated either to the control group or the treatment group by choosing the envelope. The applicable group is connected to the identification number of the test subject. There are 13 test subjects in the control group and 19 in the treatment group. As explained in the previous sections, the gender and age group of the test subject are also noted and linked to the identification number of each test subject.
The time that a test subject needed to complete all tasks of the test is noted in minutes. All values in here are rounded to full minutes. The fastest completion in the control group was in nine minutes by the test subjects #15, #18 and #22. Test subject #32 needed the most time in the treatment group with 27 minutes. As a result, the range of the time in the control group is 18 minutes (low: 9 – high: 27). In the treatment group the fastest test completion was also nine minutes by the test subjects #12 and #24, while test subject #10 needed the most time with 25 minutes. As a result, the time in the treatment group has a range of 16 minutes (low: 9 – high: 25). The whole test sample has a range of 18 minutes minutes (low: 9 – high: 27).

In the debriefing questionnaire every test subject has been asked about their motivation during the whole test, with possible answers from 1 to 10 (see section 3.3.4). In the control group, the lowest value answered for the motivation was by test subject #18 with a motivation value of 4. The highest motivation value in the control group is 10 by the test subjects #07 and #28. The range in the control group is consequently 6 (low: 4 – high: 10). In the treatment group, the lowest value answered for the motivation was by the test subjects #02 and #10 with a motivation value of 6. The highest value in the treatment group is 10 by the test subjects #05 and #23. This results in a range of 4 (low: 6 – high: 10) for the treatment group. The overall sample has a range of 6 (low: 4 – high: 10).

Besides their motivation during the test, the test subjects were also asked, which part of the test motivated them the most (see section 3.3.4). The most common answer here was the decryption task, which 22 out of the 31 test subjects replied. In the control group 10 out of 13 test subject named the decryption as the most motivating task, while two found reading the test instructions most motivating (#20, #32) and one test subjects was motivated by receiving a mail (#13). In the treatment group 12 out of 18 test subjects named the decryption the most motivating task. The other six test subjects got motivated by all different parts, like using the password (#19), figuring out what to do (#03), or having a secret task (#14).

In the debriefing questionnaire the test subjects have been asked, whether they felt like being in a game during the test (see section 3.3.4). Overall, 23 out of the 31 test subjects felt like being in a game. In the control group 7 out of 13 test subjects had a game feeling, while 16 out of 18 people in the treatment group felt like being in a game.

All test subjects have been asked how confident they were about their ability to do the tasks in the test, with possible answers from 1 to 10 (see section 3.3.4). In the control group, the lowest value answered for the confidence was by the test subjects #06 and #22 with a value of 6. The highest motivation value in the control group is 10 by the test subjects #15 and #32. The range in the control group is consequently 4 (low: 6 – high: 10). In the treatment group, the lowest value answered for the confidence was by the test subjects #01 and #23 with a value of 5. The highest value in the treatment group is 10 by test subject and #22. This results in a range of 5 (low: 5 – high: 10) for the treatment group. The overall sample has a range of 5 (low: 5 – high: 10).

In the debriefing questionnaire the test subjects have been asked, whether they enjoyed doing the tasks in the test (see section 3.3.4). Overall, 29 out of the 31 test subjects answered that they enjoyed the tasks in the test. In the control group all 13 test subjects enjoyed the test, while 16 out of 18 people in the treatment group did so.

Besides the answers of the debriefing questionnaire the results of the actual tasks have also been noted. These results include, whether test subjects have sent a mail to a wrong ad-
dress, the amount of spelling mistakes in the decrypted text and the amount of non-decrypted words. Overall, 9 out of the 31 test subjects sent a mail to a wrong address. In the control group 7 out of the 13 test subjects sent a mail to the wrong address, while 2 out of 18 people in the treatment group did so.

For the results of the tasks, the amount of spelling mistakes in the decrypted text have been counted for every test subject. In the control group, the two test subjects #06 and #18 had no spelling mistakes in their text. The highest amount of spelling mistakes in the control group were in the texts of the test subjects #22 and #32, who had 7 spelling mistakes each. The range of spelling mistakes in the control group is consequently 7 (low: 0 – high: 7). In the treatment group 7 out of 18 test subjects had no spelling mistake in their texts. The highest amount of spelling mistakes in the treatment group has been 5 in the text of test subject #23. This results in a range of 5 (low: 0 – high: 5) for the treatment group. The overall sample has a range of 7 (low: 0 – high: 7).

In the final text of every test subject the amount of non-decrypted words have been counted. In the control group, the three test subjects (#07, #20 and #28) decrypted all words of the encrypted message in their text. The most non-decrypted words in the control group were in the text of test subject #18, who had 4 non-decrypted words. The range of non-decrypted words in the control group is consequently 4 (low: 0 – high: 4). In the treatment group 10 out of 18 test subjects decrypted all words of the encrypted message in their texts. The highest amount of non-decrypted in the treatment group is 11 in the text of test subject #04. This results in a range of 11 (low: 0 – high: 11) for the treatment group. The overall sample has a range of 11 (low: 0 – high: 11) for non-decrypted words.

Table 13: Raw data from debriefing questionnaire and mails

<table>
<thead>
<tr>
<th># of test subject</th>
<th>Group</th>
<th>Gender</th>
<th>Age group</th>
<th>Time (minutes)</th>
<th>Motivation</th>
<th>Motivating part</th>
<th>Game feeling</th>
<th>Confidence</th>
<th>Enjoyed the task</th>
<th>Replied to wrong mail address</th>
<th>Spelling mistakes</th>
<th>Non-decrypted words</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Treatment</td>
<td>Female</td>
<td>15 – 24</td>
<td>10</td>
<td>8</td>
<td>Sending first mail</td>
<td>Yes</td>
<td>5</td>
<td>Yes</td>
<td>Yes</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>02</td>
<td>Treatment</td>
<td>Female</td>
<td>15 – 24</td>
<td>13</td>
<td>6</td>
<td>Decryption</td>
<td>Yes</td>
<td>7</td>
<td>No</td>
<td>No</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>03</td>
<td>Treatment</td>
<td>Female</td>
<td>15 – 24</td>
<td>15</td>
<td>8</td>
<td>Figuring out what to do</td>
<td>Yes</td>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>04</td>
<td>Treatment</td>
<td>Female</td>
<td>45 – 54</td>
<td>12</td>
<td>10</td>
<td>Helping Captain Crash</td>
<td>Yes</td>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>05</td>
<td>Treatment</td>
<td>Male</td>
<td>15 – 24</td>
<td>11</td>
<td>8</td>
<td>Decryption</td>
<td>Yes</td>
<td>9</td>
<td>Yes</td>
<td>No</td>
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<td>0</td>
</tr>
<tr>
<td>06</td>
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<td>25 – 34</td>
<td>16</td>
<td>7</td>
<td>Decryption</td>
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<td>25 – 34</td>
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<td>10</td>
<td>Decryption</td>
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<td>8</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>08</td>
<td>Treatment</td>
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<td>15 – 24</td>
<td>12</td>
<td>8</td>
<td>Decryption</td>
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<td>9</td>
<td>Yes</td>
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<td># of test subject</td>
<td>Group</td>
<td>Gender</td>
<td>Age group</td>
<td>Time (minutes)</td>
<td>Motivation</td>
<td>Game feeling</td>
<td>Confidence</td>
<td>Enjoyed the task</td>
<td>Replied to wrong mail address</td>
<td>Spelling mistakes</td>
<td>Non-decrypted words</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
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<td>---------------------------------</td>
<td>------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Treatment</td>
<td>Male</td>
<td>15 – 24</td>
<td>10</td>
<td>8</td>
<td>Decryption</td>
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<td>8</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Treatment</td>
<td>Female</td>
<td>15 – 24</td>
<td>25</td>
<td>6</td>
<td>Decryption</td>
<td>Yes</td>
<td>8</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Control</td>
<td>Male</td>
<td>15 – 24</td>
<td>13</td>
<td>6</td>
<td>Decryption</td>
<td>Yes</td>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Treatment</td>
<td>Male</td>
<td>15 – 24</td>
<td>9</td>
<td>8</td>
<td>Decryption</td>
<td>Yes</td>
<td>10</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Control</td>
<td>Female</td>
<td>15 – 24</td>
<td>15</td>
<td>7</td>
<td>Receiving the mail</td>
<td>Yes</td>
<td>8</td>
<td>Yes</td>
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<td></td>
</tr>
<tr>
<td>14</td>
<td>Treatment</td>
<td>Male</td>
<td>25 – 34</td>
<td>11</td>
<td>9</td>
<td>That it was a secret task</td>
<td>Yes</td>
<td>9</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Control</td>
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<td>15 – 24</td>
<td>9</td>
<td>9</td>
<td>Decryption</td>
<td>Yes</td>
<td>10</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
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</tr>
<tr>
<td>16</td>
<td>Treatment</td>
<td>Female</td>
<td>15 – 24</td>
<td>13</td>
<td>8</td>
<td>Decryption</td>
<td>Yes</td>
<td>9</td>
<td>Yes</td>
<td>No</td>
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</tr>
<tr>
<td>17</td>
<td>Control</td>
<td>Male</td>
<td>25 – 34</td>
<td>11</td>
<td>7</td>
<td>Decryption</td>
<td>No</td>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Control</td>
<td>Female</td>
<td>35 – 44</td>
<td>9</td>
<td>4</td>
<td>Solving things</td>
<td>No</td>
<td>7</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
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</tr>
<tr>
<td>19</td>
<td>Treatment</td>
<td>Male</td>
<td>35 – 44</td>
<td>15</td>
<td>7</td>
<td>Using the password</td>
<td>Yes</td>
<td>9</td>
<td>No</td>
<td>No</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Control</td>
<td>Female</td>
<td>35 – 44</td>
<td>12</td>
<td>7</td>
<td>Read instructions</td>
<td>No</td>
<td>9</td>
<td>Yes</td>
<td>No</td>
<td>3</td>
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</tr>
<tr>
<td>21</td>
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<td>Male</td>
<td>45 – 54</td>
<td>16</td>
<td>7</td>
<td>Decryption</td>
<td>No</td>
<td>8</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
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<td>22</td>
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<td>25 – 34</td>
<td>9</td>
<td>5</td>
<td>Decryption</td>
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<td>6</td>
<td>Yes</td>
<td>Yes</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Treatment</td>
<td>Female</td>
<td>45 – 54</td>
<td>15</td>
<td>10</td>
<td>Decryption</td>
<td>Yes</td>
<td>5</td>
<td>Yes</td>
<td>No</td>
<td>5</td>
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</tr>
<tr>
<td>24</td>
<td>Treatment</td>
<td>Female</td>
<td>25 – 34</td>
<td>9</td>
<td>9</td>
<td>Decryption</td>
<td>Yes</td>
<td>8</td>
<td>Yes</td>
<td>No</td>
<td>0</td>
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<tr>
<td>25</td>
<td>Treatment</td>
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<td>25 – 34</td>
<td>14</td>
<td>9</td>
<td>Decryption</td>
<td>Yes</td>
<td>8</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Treatment</td>
<td>Male</td>
<td>15 – 24</td>
<td>11</td>
<td>9</td>
<td>Decryption</td>
<td>No</td>
<td>10</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Control</td>
<td>Male</td>
<td>15 – 24</td>
<td>14</td>
<td>9</td>
<td>Decryption</td>
<td>Yes</td>
<td>9</td>
<td>Yes</td>
<td>Yes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Control</td>
<td>Female</td>
<td>45 – 54</td>
<td>10</td>
<td>10</td>
<td>Decryption</td>
<td>No</td>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Treatment</td>
<td>Female</td>
<td>45 – 54</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Treatment</td>
<td>Female</td>
<td>45 – 54</td>
<td>13</td>
<td>8</td>
<td>Decryption</td>
<td>Yes</td>
<td>8</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
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</tr>
<tr>
<td>31</td>
<td>Treatment</td>
<td>Male</td>
<td>≥ 55</td>
<td>19</td>
<td>8</td>
<td>Reading the story</td>
<td>Yes</td>
<td>8</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Control</td>
<td>Male</td>
<td>45 – 54</td>
<td>27</td>
<td>8</td>
<td>Read the test</td>
<td>Yes</td>
<td>10</td>
<td>Yes</td>
<td>Yes</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
**Average data**

The mean averages of the data gathered in the experiment are summarised in Table 14. The differences between the results of the control and treatment group as well as the differences between the age groups are analysed in detail in section 5.2.

*Table 14: Average data from debriefing questionnaire and mails*

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td>Number of test subjects</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Motivation</td>
<td>7.38</td>
<td>7.50</td>
</tr>
<tr>
<td>Game feeling</td>
<td>53.85%</td>
<td>75.00%</td>
</tr>
<tr>
<td>Confidence</td>
<td>7.85</td>
<td>7.63</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Replied to wrong address</td>
<td>53.85%</td>
<td>50.00%</td>
</tr>
<tr>
<td>Time (minutes)</td>
<td>13.15</td>
<td>12.13</td>
</tr>
<tr>
<td>Spelling mistakes</td>
<td>2.46</td>
<td>2.38</td>
</tr>
<tr>
<td>Non-decrypted words</td>
<td>1.23</td>
<td>1.13</td>
</tr>
</tbody>
</table>
5 Analysis

In this section the data gathered from the experiment (see section 4) is analysed and put in relation to existing research. As specified in the methodologies (see section 3), as a first step there will be a qualitative analysis, followed by a quantitative analysis. This leads to the conclusions drawn in the end of this section. Both, the qualitative and quantitative analyses, are divided into three parts. The first two parts discuss the two research questions with a proving or disproving of the related hypotheses. In the third part further insights, which have been discovered in the experiment are analysed.

5.1 Qualitative

The qualitative analysis is structured in three parts. First research question one is analysed in consideration of hypothesis 1 and null hypothesis H0a, then research question two is analysed in consideration of hypothesis 2 and null hypothesis H0b, followed by an analysis of further insights made in the experiment.

5.1.1 Research question 1: Does gamification impact the intrinsic motivation of people performing basic administrative tasks?

In this section, research question one – 'Does gamification impact the intrinsic motivation of people performing basic administrative tasks?' – is qualitatively analysed. The analysis is done in consideration of validating hypothesis one – 'The gamification of basic administrative tasks increases the intrinsic motivation of the test subjects' – and null hypothesis H0a – 'The control and the treatment group execute the tasks with the same intrinsic motivation'.

Hypothesis 1 – H1:
The gamification of basic administrative tasks increases the intrinsic motivation of the test subjects

The qualitative analysis of hypothesis one – 'The gamification of basic administrative tasks increases the intrinsic motivation of the test subjects' – is divided into two parts. First, supporting observations and feedback are analysed, followed by arguments, which oppose the hypothesis.

Supporting

In the experiments of the treatment group, the appearance of positive emotions has been higher than in the control group. The excitement of the test subjects during their tasks was often shown with smiles in the treatment group, while in the control group less test subjects smiled and only occasionally. The existence of smiles during basic administrative tasks suggests a higher level of excitement and motivation. This relation of positive emotions to gamified tasks supports the findings by H. Lee and Doh (2012), who show that 'gameful design' can enhance emotional engagement. The observation, that more positive emotions occurred in the treatment group, is strengthened by the comments and feedback of the test subjects. Various test subjects of the treatment group have seen the overall test as “fun” (#08, #10, #14, #16, #23, #26), whereas only one test subject of the control group stated the same fun experience (#22).

Several test subjects of the treatment group showed happiness and intrinsic motivation during the experiment, which was triggered by the game design element of a higher mean-
ing. This was observed mainly by quotes these test subjects said during their test. For instance, test subject #04 liked “helping Captain Crash” and #08 was “happy to help”. The most distinct expression of happiness and motivation was by test subject #24, who repeatedly praised herself with a big smile, that she “saved the space ship”.

The test subject of the treatment group showed enjoyment during the administrative tasks. Several test subjects showed and gave feedback, that they enjoyed sending and receiving mails (#05, #09, #10, #23, #24, #25, #26). In the control group, however, sending and receiving the mails has been seen as unnecessary (#06; #32). This observation is supported by the feedback of the most motivating part of the test, where most test subjects (10 out of 13) in the control group named the decryption. One test subject (#15) even stated to be not motivated at all until the decryption. In the treatment group the amount of test subjects, who also named the decryption as the most motivating part is relatively less (12 out of 18). Every third test subject in the treatment group enjoyed another part of the test more. These insights suggest that people are more intrinsically motivated to perform basic administrative tasks in a gamified environment or at least distract their focus and perception of performing a basic administrative task into an enjoyable task.

Another observation, which supports hypothesis one, is that the test subjects in the treatment group seemed to see the tasks individually, whereas the ones in the control group focused on the whole test. Multiple test subjects of the treatment group showed happiness and engagement in completing little challenges and exploring the story (#01, #03, #05, #09, #14, #21, #31).

The engagement and higher intrinsic motivation to do the tasks is further shown in creative approaches test subjects used in the treatment group. For instance, test subject #05 structured the answer in the last mail instead of just decrypting the message and test subject #26 sought help in the decryption task from word-scrambler-tool, for which she searched in the internet. Another test subject of the treatment group did a short online research about Captain Crash before sending the first mail. They have been neither asked nor suggested to do any of these additional tasks. And further, two test subjects of the treatment group even asked for more challenging tasks after the test (#09, #12). In contrast, none of the test subjects in the control group performed any additional tasks or asked for a more challenging task. This suggests that the gamified solution had an impact on the intrinsic motivation of the test subjects to do more than what is required.

Slight differences could be found in the way test subjects handle distractions. In both groups there were occasions, where test subjects got distracted by phone calls. In all four occasions of a disturbance in the treatment group the test subjects did not allow any distractions from their task (#02, #10, #24, #30). In the two situations of the control group, one test subject stayed focused on his task as well (#15), while the other one got distracted (#21) and got back to the test afterwards. This suggests, that the gamified tasks of the treatment group were engaging and increased the intrinsic motivation of these test subjects.

Disproving

Looking from an overall perspective, test subjects in both, the control and treatment group, enjoyed the experiment. Further, all test subjects of the control group did finish the tasks without receiving any separable outcome. This implies that with the absence of extrinsic motivational factors their intrinsic motivation was high enough to at least do the tasks.
Four test subjects of the treatment group stated that they are in a stressful situation and would have plenty of other things to do as well (#02, #06, #19, #30). Both in their general comments and their evaluation of their motivation during the test, they mentioned that their motivation is lower because of their stressful situation. One test subject (#02) showed a lot of excitement while doing the tasks and confirmed this observation with her general comments about the test. However, in relation to her stressful situation the gamified tasks seemed unnecessary and therefore lowered her motivation. This suggests that gamified tasks can impact the intrinsic motivation of at least some people negatively when applied in stressful situations.

In one of the experiments test subject #29 stated, that she does not believe in the story provided in the treatment group and does not like the secrecy. Even after initial positive emotional reactions, these mismatching game design elements to her personal preferences, lead her to abort the experiment. Hence, gamification can alienate people from performing tasks, and consequently have a negative impact on intrinsic motivation.

**Null hypothesis – H0a:**

*The control and the treatment group execute the tasks with the same intrinsic motivation*

Null hypothesis H0a – 'The control and the treatment group execute the tasks with the same intrinsic motivation' – is supported by observation, that test subjects of both, the control and treatment group, enjoyed the experiment, suggesting that they might have the same intrinsic motivation. Also the fact, that all test subjects of the control group performed the tasks without extrinsic rewards suggests the existence of intrinsic motivation for these test subjects.

### 5.1.2 Research question 2:

**Does the age of users make a difference in the perception and motivational impact of gamification?**

In this section, research question two – 'Does the age of users make a difference in the perception and motivational impact of gamification?' – is qualitatively analysed. The analysis is done in consideration of validating hypothesis two – 'Younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks' – and null hypothesis H0b – 'The age has no effect on the impact of gamification on the intrinsic motivation of the test subjects'.

**Hypothesis 2 – H2:**

*Younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks*

The qualitative analysis of the hypothesis two – 'Younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks' – is divided into two parts. First, supporting observations and feedback is analysed, followed by arguments, which oppose the hypothesis.

**Supporting**

The risk of alienating test subjects through gamification only occurred with older test subjects. While younger test subjects, with an age younger than 35 years, showed similar reactions in terms of motivation and excitement, older test subjects reacted more unpredictable. The only case of total alienation, where the test subject aborted the test, occurred with
a test subject of the treatment group in the age group of 45 to 54 years. This suggests, that the risk of a negative impact of gamification on intrinsic motivation is higher with older people than younger ones.

Disproving

Considering the total sample of the treatment group in the experiment, on average there was no big difference in the motivation between younger and older test subjects. Several older test subjects perceived the gamified tasks as a nice difference to their working practices in everyday life (#04, #23, #30, #31). Younger test subjects, however, seem to perceive the gamified tasks less special. This observation goes along with the studies, showing, that younger people are more familiar with games (Howland, Good, & Robertson, 2006; Livingstone, 2002). As a consequence, the impact of gamification on intrinsic motivation seems to be more extreme, both positively and negatively, with people older than 35 years, than younger ones.

Null hypothesis – H0b:
The age has no effect on the impact of gamification on the intrinsic motivation of the test subjects

In the observation of the experiment, no big difference in the emotions between younger and older test subjects could be spotted. While there were test subjects with plenty of positive emotions in both age categories (Age < 35: #02, #03, #05, #08, #10, #12, #14, #24, #25, #26 – Age ≥ 35: #04, #20, #23), there were also test subjects who showed less emotions apparent in both age categories (Age < 35: #01, #09, #16 – Age ≥ 35: #19, #31). This lack of differences in showing emotions supports null hypothesis H0b, claiming that the age has no effect on the impact of gamification on the intrinsic motivation of the test subjects.

5.1.3 Further insights

Besides the supporting or disproving of the hypotheses, there are more observations made in the experiment which are worth analysing in this explorative study. These observations, that are not directly linked to the proving of the hypotheses can lead to further insights in the area of gamification.

Besides the observation, that test subjects of the treatment group showed more positive emotions during the whole test, it seems that they are not just having more fun, but they are also more focused on the tasks. In the control group multiple test subjects (#06, #07, #18, #21, #22, #27, #32) did not notice, that the mail address for their reply has changed from the initial mail address. In the treatment group only two test subjects made the same mistake (#01, #25). Even though the new mail address for the reply was given twice to the test subjects in the control group, multiple test subjects did not notice this. This suggests, that the gamification of basic administrative tasks leads to a higher focus on the tasks and less errors.

It also seems, that people in a gamified environment are more satisfied with themselves. Several test subjects of the control group had mixed feelings after the test. Even though they stated, that they enjoyed the tasks, they were not satisfied about their performance. For instance, test subject #11 felt “bad, that [he] did not nail it” or test subject #32 told that he “was unlucky, because [he] did not know one word”. In contrast to that, in the treatment group test subjects showed satisfaction, even in cases where they could not figure out all encrypted words. For instance, test subject #04 struggled with eleven words, but
was not disappointed after the test. This suggests that the gamification of basic administrative tasks can lead to an increase of a person’s satisfaction with his work.

5.2 Quantitative

The quantitative analysis is structured into four parts. First, research question one is analysed in consideration of hypothesis 1 and null hypothesis H0a, then research question two is analysed in consideration of hypothesis 2 and null hypothesis H0b, followed by an analysis of further insights made in the experiment. In the fourth part, an overview of the statistical significance is provided.

5.2.1 Research question 1: Does gamification impact the intrinsic motivation of people performing basic administrative tasks?

For the quantitative analysis of research question one – 'Does gamification impact the intrinsic motivation of people performing basic administrative tasks?' – the results and feedback of the experiment (see section 4.2) in the areas 'motivation', 'enjoyment' and 'confidence' are applicable. Each of these areas is analysed in consideration of the proving of hypothesis one – 'The gamification of basic administrative tasks increases the intrinsic motivation of the test subjects' – and null hypothesis H0a – 'The control and the treatment group execute the tasks with the same intrinsic motivation'. Detailed statistics are provided in Appendix 8.

Motivation

The figures of the test subjects’ motivation received in the feedback in the debriefing questionnaire give an indication how the test subjects estimate their motivation during their test (see Table 15 – for detailed statistics see Appendix 8, Table 29). The mean average of the test subjects’ motivation in the treatment group (8.17 out of 10) is slightly higher (0.78) than in the control group (7.38 out of 10). However, in both groups the average motivation seems to be quite high. The standard deviation of 1.10 in the treatment group suggests a stronger mean value, while the standard deviation of 1.80 in the control group indicates a wider spread of answers, making the outcome less predictable. The analysis of the results of the test subjects’ motivation in an unpaired t-test (Vogt, 2011) delivers a two-tailed P value of 0.1446. As a result, the difference in the motivation between treatment and control group is considered to be not statistically significant.

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>7.38</td>
<td>8.17</td>
</tr>
<tr>
<td>SD</td>
<td>1.80</td>
<td>1.10</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.1446</td>
<td></td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td></td>
</tr>
</tbody>
</table>

The values of the motivational feedback, especially the difference of the mean values, indicate a support of hypothesis one, claiming that the gamification of basic administrative tasks can lead to an increase of a person’s satisfaction with his work.
tasks increases the intrinsic motivation of the test subjects. However, the hypothesis one cannot be proven quantitatively with the figures available from the experiment. Due to the lack of statistical significance the quantitative analysis of the test subjects’ motivation supports null hypothesis H0a – "The control and the treatment group execute the tasks with the same intrinsic motivation'.

**Enjoyment**

Another indicator of the intrinsic motivation of the test subjects during the test is the enjoyment. The figures are received from the feedback of the test subjects in the debriefing questionnaire (see Table 16 – for detailed statistics see Appendix 8, Table 32). The control group shows a 100 percent enjoyment, while only 89% of the test subjects in the treatment group enjoyed performing the tasks. This indicates, that the enjoyment, which has an impact on the intrinsic motivation (F. D. Davis et al., 1992), is not higher in a gamified environment. Moreover, it supports the findings in the qualitative analysis, that gamification can alienate people. Whereas the standard deviation of 0.00 in the control group and 0.32 in the treatment group suggest little spread in the outcomes, the unpaired t test delivers a two-tailed P value of 0.2275. The difference between control group and treatment group in terms of enjoyment is therefore considered to be not statistically significant.

<table>
<thead>
<tr>
<th>Table 16: Enjoyment – statistical overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment</td>
</tr>
<tr>
<td>Group</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>SD</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>Two-tailed P value</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
</tr>
<tr>
<td>All</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>Treatment</td>
</tr>
<tr>
<td>1.00</td>
</tr>
<tr>
<td>0.00</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>0.89</td>
</tr>
<tr>
<td>0.32</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>0.2275</td>
</tr>
<tr>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

The little quantitative difference in enjoyment between the control and treatment group and the lack of statistical significance support null hypothesis H0a, claiming that the control and the treatment group execute the tasks with the same intrinsic motivation.

**Confidence**

The third indicator of the intrinsic motivation of the test subjects during the test is confidence. The figures are received from the feedback of the test subjects in the debriefing questionnaire (see Table 17 – for detailed statistics see Appendix 8, Table 31). The difference between the mean averages of the control group (7.85 out of 10) and the treatment group (8.00 out of 10) is small. The standard deviations are similar and an unpaired t test delivers a two-tailed P value of 0.7625, which is considered to be not statistically significant. This suggests, that the gamification of the tasks in the treatment group does not have an impact on the test subjects’ confidence in their ability to perform the tasks. Consequently, any relation and impact on confidence on intrinsic motivation indicates, that there is no increase of intrinsic motivation caused by gamifying the tasks.
Table 17: Confidence – statistical overview

<table>
<thead>
<tr>
<th>Confidence</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
</tr>
<tr>
<td>Mean</td>
<td>7.85</td>
</tr>
<tr>
<td>SD</td>
<td>1.34</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.7626</td>
</tr>
</tbody>
</table>

The little quantitative difference in confidence between the control and treatment group and the lack of statistical significance support null hypothesis H0a, claiming that the control and the treatment group execute the tasks with the same intrinsic motivation.

5.2.2 Research question 2:
Does the age of users make a difference in the perception and motivational impact of gamification?

For the quantitative analysis of research question two – 'Does the age of users make a difference in the perception and motivational impact of gamification?' – the results and feedback of the experiment (see section 4.2.2) in the areas 'motivation', 'enjoyment' and 'confidence' are applicable. Each of these areas is analysed in consideration of proving hypothesis two – 'Younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks' – and null hypothesis H0b – 'The age has no effect on the impact of gamification on the intrinsic motivation of the test subjects'. Detailed statistics are provided in Appendix 8.

Motivation

The comparison of the figures of the test subjects’ motivation, received in the feedback in the debriefing questionnaire in respect to the age groups, give an indication of the difference of their motivation during the test (see Table 18 – for detailed statistics see Appendix 8, Table 29). The mean average in the treatment group is higher for both test subjects younger than 35 years (8.00 out of 10) and older than 35 years (8.60 out of 10) than their according test subjects in the control group (7.50 and 7.20 out of 10). While for younger test subjects the difference between the mean values is relatively small (0.50), it is larger for test subjects older than 35 years (1.40). This indicates, that the gamification of the tasks in the treatment group has only little impact on intrinsic motivation people younger than 35 years, but a noticeable impact for people older than 35 years. When analysing only the treatment group, the figures indicate a higher motivation for test subjects older than 25 years (8.60) than younger ones (8.00).
Table 18: Motivation – statistics with age groups

<table>
<thead>
<tr>
<th>Motivation</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td>Mean</td>
<td>7.38</td>
<td>8.17</td>
<td>7.50</td>
<td>8.00</td>
<td>7.20</td>
</tr>
<tr>
<td>SD</td>
<td>1.8046</td>
<td>1.0981</td>
<td>1.6903</td>
<td>1.0000</td>
<td>2.1678</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.1446</td>
<td>0.4019</td>
<td>0.2544</td>
<td>0.7845</td>
<td>0.3134</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

This result would not only disprove, but even contradict the hypothesis two, claiming that younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks. However, the lack of a statistical significance supports null hypothesis H0b, claiming that the age has no impact on the motivation of the test subjects.

Enjoyment

The analysis of enjoyment as an indicator of the intrinsic motivation (F. D. Davis et al., 1992) does not show big differences between the age groups (see Table 19 – for detailed statistics see Appendix 8, Table 32). The mean values between younger test subjects (92%) and older test subjects (80%) in the treatment group is considered as small. Additionally, the unpaired t test delivers a two-tailed P value of 0.4863, which is considered to be not statistically significant. A similar situation is apparent between control and treatment group within the age groups.

Table 19: Enjoyment – statistics with age groups

<table>
<thead>
<tr>
<th>Enjoyment</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td>Mean</td>
<td>1.00</td>
<td>0.89</td>
<td>1.00</td>
<td>0.92</td>
<td>1.00</td>
</tr>
<tr>
<td>SD</td>
<td>0.00</td>
<td>0.32</td>
<td>0.00</td>
<td>0.28</td>
<td>0.00</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.2275</td>
<td>0.4469</td>
<td>0.3466</td>
<td>-</td>
<td>0.4863</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

As a result, the absence of a significant and big difference between the age groups support null hypothesis H0b, claiming that the age has no effect on the impact of gamification on the intrinsic motivation of the test subjects.

Confidence

As a third indicator of the intrinsic motivation of the test subjects during the test, confidence is analysed in respect to differences between the age groups. The figures are received from the feedback of the test subjects in the debriefing questionnaire (see Table 20 – for
detailed statistics see Appendix 8, Table 31). Starting from an isolated look on the differences between the two age groups within the treatment group, the mean values suggest a higher confidence (0.83) with test subjects younger than 35 years (8.23 out of 10) than older ones (7.40 out of 10). The unpaired t test, however, delivers a two-tailed P value of 0.2772. The difference is therefore considered to be not statistically significant. The figures of the treatment group are the other way around. With a higher confidence of older test subjects (8.20 out of 10) than of younger test subjects (7.63), with a two-tailed P value of 0.4773 the difference (0.57) is also considered to be not statistically significant.

Table 20: Confidence – statistics with age groups

<table>
<thead>
<tr>
<th>Confidence</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td></td>
<td>Control</td>
<td>Control</td>
<td>Treatment</td>
<td>Treatment</td>
</tr>
<tr>
<td>Mean</td>
<td>7.85</td>
<td>8.00</td>
<td>7.63</td>
<td>8.23</td>
<td>7.40</td>
</tr>
<tr>
<td>SD</td>
<td>1.34</td>
<td>1.41</td>
<td>1.36</td>
<td>1.30</td>
<td>1.52</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.7626</td>
<td>0.3409</td>
<td>0.3972</td>
<td>0.4773</td>
<td>0.2772</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

Applying the insights of confidence to intrinsic motivation, the differences of the means in the confidence of the test subject would suggest an increasing motivation of younger people caused by gamification. However, the absence of a statistical significance and the indirect impact of confidence to intrinsic motivation supports null hypothesis H0b, claiming that the age has no effect on the impact of gamification on the intrinsic motivation of the test subjects.

5.2.3 Further insights

Besides the supporting or disproving of the hypotheses, there are more figures gathered from the experiment which are worth analysing in this explorative study. The analysis of these figures, that are not directly linked to the proving of the hypotheses can lead to further insights in the area of gamification.

Game feeling

In the debriefing questionnaire the test subjects were asked, whether they feel like being in a game (see Table 21 – for detailed statistics see Appendix 8, Table 30). While younger test subjects show no significant difference in the perception, especially test subjects older than 35 years do so. All test subjects older than 35 years of the treatment group felt like being in a game, while only 20% of the control group in the same age category did so. An unpaired t test delivers a two-tailed P value of 0.0039, which is considered to be statistically significant. Also, looking at the whole sample, the difference between the game feeling of the control group (54%) and the treatment group (89%) is statistically significant (two-tailed P value of 0.0278).
Table 21: Game feeling – statistics with age groups

<table>
<thead>
<tr>
<th>Game feeling</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
</tr>
<tr>
<td>Mean</td>
<td>0.54</td>
<td>0.89</td>
<td>0.75</td>
<td>0.85</td>
<td>0.20</td>
</tr>
<tr>
<td>SD</td>
<td>0.52</td>
<td>0.32</td>
<td>0.46</td>
<td>0.38</td>
<td>0.45</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.0278</td>
<td>0.6077</td>
<td>0.0039</td>
<td>0.0586</td>
<td>0.3820</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

The insights of the game feeling show that people perceive the gamification of the basic administrative tasks as a game-like environment. This perception is even more distinct and dominant for people over 35 years, while there seems to be no significant difference with younger people. The values further suggest, that many young people seem to perceive even non-gamified tasks as games. This suggestion supports the finding of Simpson (2005), that there is a video game generation who wants to play and tries to make everything as a game.

Wrong mail address

The indication of the qualitative analysis that the gamification of basic administrative tasks leads to a higher focus on the tasks and less errors, is based on the observation that test subjects of the control group frequently replied to a wrong mail address (see section 5.1.3). From a quantitative perspective (see Table 22 – for detailed statistics see appendix Appendix 8, Table 33), the difference (43%) between the test subjects of the control group who replied to the wrong mail address (54%) and the ones of the treatment group (11%) supports this indication. An unpaired t test delivers a two-tailed P value of 0.0085, which is considered to be statistically significant. Even further, in the age group of test subjects older than 35 years, no one of the treatment group replied to a wrong mail address. This results in a statistically significant difference of 60% (two-tailed P value of 0.0400) in this age category between the control and treatment group.

Table 22: Wrong mail address – statistics with age groups

<table>
<thead>
<tr>
<th>Wrong mail</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
</tr>
<tr>
<td>Mean</td>
<td>0.54</td>
<td>0.11</td>
<td>0.50</td>
<td>0.15</td>
<td>0.60</td>
</tr>
<tr>
<td>SD</td>
<td>0.52</td>
<td>0.08</td>
<td>0.53</td>
<td>0.38</td>
<td>0.55</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.0085</td>
<td>0.0967</td>
<td>0.0400</td>
<td>0.7511</td>
<td>0.3820</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>
With a statistical significance, the insights from the quantitative analysis of replies to a wrong mail address by the test subjects, supports the indication, that the gamification of basic administrative tasks leads to a higher focus on the tasks and less errors.

**Time**

The time test subjects needed to complete the tasks in the experiment is on average nearly the same between the control group (13.15 minutes) and the treatment group (13.17 minutes). Having a high spread with a standard deviation of 4.91 for the control group and 3.88 for the treatment group, there is no difference between the two groups of statistical significance (two-tailed P value of 0.9936). Also between the different age groups, the experiment shows no significant difference (see Table 23 – for detailed statistics see Appendix 8, Table 34).

**Table 23: Time – statistics with age groups**

<table>
<thead>
<tr>
<th>Time</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
</tr>
<tr>
<td>SD</td>
<td>4.91</td>
<td>3.88</td>
<td>2.75</td>
<td>4.18</td>
<td>7.33</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.9936</td>
<td>0.8070</td>
<td>1.0000</td>
<td>0.3619</td>
<td>0.2816</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

As a result, the quantitative analysis of the time needed to complete the tasks in the experiment indicates, that the gamification of basic administrative tasks has no impact on the time people need to complete them.

**Quality of work**

The quality of work in this analysis is limited to the decryption by the test subjects. It includes the amount of spelling mistakes and the amount of non-decrypted words.

**Spelling mistakes**

For the figures of the quantitative analysis of the amount of spelling mistakes in the decrypted test see Table 24 (for detailed statistics see Appendix 8, Table 35). Even though there is a difference noticeable between the mean values of the control group (2.46) and the treatment group (1.33), it is considered to be not statistically significant (two-tailed P value of 0.1145). While the difference within test subjects older than 35 is relatively low (0.20), the difference is especially apparent when looking into the younger age group. On average, within the results of the younger test subjects, there is a difference of 1.46 more spelling mistakes in the control group (2.38) than in the treatment group (0.92). This suggests a higher concentration and engagement of the test subjects who were performing the gamified tasks. However, the unpaired t test delivers a two-tailed P value of 0.0628, which is considered to be not statistically significant. Therefore the suggestion of a higher concentration of younger people caused by the gamification of basic administrative tasks is not proven quantitatively by this experiment.
Table 24: Spelling mistakes – statistics with age groups

<table>
<thead>
<tr>
<th>Spelling mistakes</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td>Mean</td>
<td>2.46</td>
<td>1.33</td>
<td>2.38</td>
<td>0.92</td>
<td>2.60</td>
</tr>
<tr>
<td>SD</td>
<td>2.33</td>
<td>1.53</td>
<td>2.26</td>
<td>1.12</td>
<td>2.70</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
</tbody>
</table>

Two-tailed P value

|                | 0.1145 | 0.0628 | 0.8989 | 0.8740 | 0.0651 |

Significance level of 0.05

|                | not statistically significant | not statistically significant | not statistically significant | not statistically significant | not statistically significant |

Non-decoded words

The amount of words that the test subjects could not decrypt are fairly even (see Table 25 – for detailed statistics see Appendix 8, Table 36). The biggest difference is found within the treatment group, where on average younger test subjects did not decrypt 0.69 words, while older test subjects did not decrypt 3.40 words correctly. This difference could indicate that the creativity of younger people is more stimulated by gamification than of older people. However, an unpaired t test delivers a two-tailed P value of 0.0562, which is considered to be not statistically significant. The indication is consequently not supported quantitatively by the results of the experiment in this study.

Table 25: Non-decoded words – statistics with age groups

<table>
<thead>
<tr>
<th>Non-decoded words</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td>Mean</td>
<td>1.23</td>
<td>1.44</td>
<td>1.13</td>
<td>0.69</td>
<td>1.40</td>
</tr>
<tr>
<td>SD</td>
<td>1.09</td>
<td>2.73</td>
<td>0.64</td>
<td>1.42</td>
<td>1.67</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.7918</td>
<td>0.4346</td>
<td>0.3541</td>
<td>0.6780</td>
<td>0.0562</td>
</tr>
</tbody>
</table>

Significance level of 0.05

|                | not statistically significant | not statistically significant | not statistically significant | not statistically significant | not statistically significant |

5.2.4 Overview of statistical significance

An overview of the statistical significance in the analysed areas is provided in Table 26 (for detailed statistics see Appendix 8). The significance level is at a P value of 0.05, as specified in section 3.1.2. The statistical significance has been determined in an unpaired t test in the areas motivation, game feeling, confidence, enjoyment, replies to a wrong mail address, time, spelling mistakes, and non-decoded words. In each of these categories, the results of the control group are compared with the ones of the treatment group for the whole sample size, test subjects younger than 35 years, and test subjects older than 35 years. Additionally, the age groups are compared within the control group and within the treatment group.
Most differences that are determined by the experiment are considered to be not statistically significant. Therefore, the focus in this section are the statistically significant differences. Within the control group, between the two age groups, there is no difference in the area 'enjoyment'. Since all participants of the control group stated that they enjoyed the tasks, a test cannot be performed and consequently no two-tailed P value can be calculated.

In the area 'game feeling' a statistically significant difference (two-tailed P value of 0.0278) has been found between the control group and the treatment group in the whole sample. Within the age group of test subjects older than 35 years, the difference is even statistically significant on a significance level of 0.01 (two-tailed P value of 0.0039).

In the area of 'replies to a wrong mail' a statistically significant difference (two-tailed P value of 0.0085) has been found between the control group and the treatment group in the whole sample. This difference is even statistically significant on a significance level of 0.01. While in the area, there is no statistically significant difference within the age group of test subjects younger than 35 years, within the age group of test subjects older than 35 years, there is a statistically significant difference (two-tailed P value of 0.0400).

Table 26: Overview of statistical significance

<table>
<thead>
<tr>
<th>Source</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
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<td>13</td>
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<td>8</td>
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<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Motivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td>0.7626</td>
<td>0.3409</td>
<td>0.3972</td>
<td>0.0039</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Game feeling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td>0.0278</td>
<td>0.6077</td>
<td>0.0039</td>
<td>0.0586</td>
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<tr>
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<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Confidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td>0.2275</td>
<td>0.4469</td>
<td>0.3466</td>
<td>-</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
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<td>not statistically significant</td>
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<td>not statistically significant</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Enjoyment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td>0.0085</td>
<td>0.0967</td>
<td>0.0400</td>
<td>0.7511</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
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<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Wrong mail address</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td>0.0005</td>
<td>0.8920</td>
<td>0.1000</td>
<td>0.03619</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
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<td>statistically significant</td>
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<td>Significance level of 0.05</td>
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<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td>0.9936</td>
<td>0.8070</td>
<td>1.0000</td>
<td>0.3619</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Spelling mistakes</td>
<td></td>
<td>0.1145</td>
<td>0.0628</td>
<td>0.8989</td>
<td>0.8740</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td></td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>
### 5.3 Conclusions

Research questions 1 – 'Does gamification impact the intrinsic motivation of people performing basic administrative tasks? ' – can be partly answered positively. The analysis of the experiment results in this study suggests an impact on the intrinsic motivation caused by gamifying of tasks, which is qualitative noticeable. The appearance of positive emotions, such as smiles, laughter, fun and happiness, were found more dominant with test subjects performing the gamified tasks. They further showed an enjoyment and motivation for other administrative tasks than the decryption and occasionally even did voluntary additional tasks, performing them with a lower tolerance of occurring distractions. The figures of the quantitative analysis support the implication of these observations, however, without a statistical significance.

The impact of gamification in the intrinsic motivation can also be negative. The experiment shows, that the gamification of basic administrative tasks can alienate people. This can result in a lower motivation for stressed people or even a non-performing of the tasks. It is therefore important to know and understand the needs and situation of the target group.

Based on the data and sample size of the experiment, neither hypothesis one – 'The gamification of basic administrative tasks increases the intrinsic motivation of the test subjects' – nor null hypothesis H0a – 'The control and the treatment group execute the tasks with the same intrinsic motivation' – is proven to be true. There is only an indication that supports hypothesis one.

From a qualitative perspective there is no big difference noticeable between ages in the experiment of this study in relation to the test subjects’ intrinsic motivation. When applying game design elements to basic administrative tasks the reaction of people over 35 years seems to be less predictable. The impact of gamification on older people seems to be more extreme, leading to even a highly intrinsic motivation or an alienation with a decrease of the intrinsic motivation. From a quantitative perspective there were no significant differences between the age groups.

Null hypothesis H0b – 'The age has no effect on the impact of gamification on the intrinsic motivation of the test subjects' – is supported by the quantitative analysis. But it is disproven qualitatively, as there seems to be a difference between age groups in terms of the predictability. Hypothesis two – 'Younger test subjects in the treatment group are more motivated to perform the intrinsically gamified test tasks' – is not proven right either, as there could not be found a higher motivation within younger test subjects. The results of the ex-
perment do not distinctively answer research question two – 'Does the age of users make a difference in the perception and motivational impact of gamification?'. However, they suggest that there is a higher level of unpredictability and risk of alienation within people over 35 years old, which represents an impact of gamification.

Further insights suggest a higher focus on the basic administrative tasks, when they are gamified. A statistical significance has been found in the difference between the control group and the gamified treatment group regarding the percentage of mails sent to a wrong mail address. Additionally, the analysis of the experiment indicates a higher satisfaction of someone’s own work, when the tasks are gamified.
6 Discussion

This section contains a discussion about the methods and results of this study and its implications for practice and research.

6.1 Methods discussion

In this section the design of the experiment and delimitations in its execution are discussed. It also includes an evaluation of the ecological, external and internal validity of the experiment.

6.1.1 Discussion of the experiment design

In the designing of the experiment it has been difficult to find tasks that are applicable for both, the control group and the treatment group. The problem in finding applicable tasks, was the limitation to administrative tasks in the control group, while the actual outcome – not the observation – of the tasks is not directly important. The tasks also needed to have the possibility of being gamified with only intrinsic game design elements, in order to exclude extrinsic motivational factors. This was crucial to enable answering research question one.

All test subjects, who were contacted for undertaking the experiment, come from an academic background in an international environment. This has been chosen for feasibility reasons and also to ensure that the criteria for the test subjects (see section 3.2.2) for especially language skills are met. If the experiment would be conducted with test subjects, who have a less qualified education, the result might vary from the one in this study. This decreases the external validity (Heiman, 2000) of the results of the experiment, as the outcomes cannot be directly generalised to people with another educational background.

A factor that could have influenced the results of the experiment is the fact, that the test subjects were in a test environment during the experiment. This can lead to a higher motivation in general. The difference between the control group and the treatment group in the feedback of the test subjects regarding their motivation could have turned out smaller, caused by a motivation gained from the test environment. It also decreases the ecological validity of the experiment.

The fact, that the test subjects performed the experiment for the first time, might lead to a higher motivation due to the first-time excitement (S. Davis & Wiedenbeck, 2001). To avoid an impact of the first-time excitement, the test and its tasks in the experiment would need to be repeated several times. This has not been done in this study, due to feasibility reasons. The experiment only takes about 15 minutes in total. This could decrease the impact of gamification on intrinsic motivation, since it is supposed to show best effects in a longer time frame (Chou, 2013a, pt. 20).

6.1.2 Limitations in the execution of the experiment

Delimitations arose in the execution of the experiment compared to the specification in section 0. These delimitations address the double-blind study, the environment of the experiment, the observation skills of the experimenter, and the first-time use of the experiment of the test subjects.
Even though the test experiment was designed as a double-blind study, in some occasions comments and texts of the test subjects during the experiment signalled the experimenter the group they belonged to. For instance, comments from a test subject like “How can I help Captain Crash?” (#04) or reading out loud the instructions, made it impossible for the experimenter not to know which group this test subject belongs to. As a consequence, these tests altered into a single-blind study.

Regarding the environment, it has been important to undertake the experiments in a working environment, where the test subjects are familiar with. This comes with the delimitation that the environment of the experiment was not clinically the same for all test subjects. For instance, some experiments where done in a test room and others in the office of the test subjects. With this goes along that it is not in the control of the experimenter whether the phone of the test subjects rings or similar distractions occur. Further, some of the test subjects preferred to use their own computer, while others used a computer provided by the experimenter. The non-clinical environment, however, raises the ecological validity (Heiman, 2000) of the results, because it represent a more natural working environment.

The information gained from observations during the experiment are based on the experimenter’s perception. However, the experimenter is not specially trained in this field and the interpretation of emotions are based on obvious perceptions, rather than scientifically grounded.

Even though there were several delimitations in the execution of the experiment, the gamification of the basic administrative tasks is still the only one independent variable between the control and treatment group. Hence, there the experiment avoids confounding, leading to a high internal validity (Heiman, 2000).

**6.2 Results discussion**

The results of the study in answering research question two show a high spread in the intrinsic motivation of people over 35 years. The impact of gamification on their intrinsic motivation while conducting basic administrative tasks can be either positive or negative. Hence, the outcome is little predictable as the results of the test subjects older than 35 years show error and with only little reliability (Heiman, 2000). For test subjects younger than 35 years the results have little error and a high reliability.

In literature dominantly the positive effects of gamification are discussed. Especially the four pioneers in the field of gamification – Yu-kai Chou, Sebastian Deterding, Jane McGonigal, and Gabe Zichermann – mainly discuss the potential of gamification and how gamification could be designed. Studies already show, that there is an increase in learning abilities through games (McFarlane et al., 2002; Rodríguez-Cerezo et al., 2014). The results of this study indicate, that there is indeed a potential to increase intrinsic motivation through gamification in the area of basic administrative tasks, which can lead to a higher productivity. However, the study also shows, that there is a risk of alienating people with gamification, and consequently have a negative impact in the intrinsic motivation. This result supports the finding of Chorney (2012), that “the casual nature of gamification decreases player motivation” (Chorney, 2012, p. 9).

Gamification usually brings a short term burst of motivation and engagement (Smith, 2011), because in most situations extrinsic motivational factors are applied (Chou, 2014). The study shows, that also intrinsic motivational factors can trigger short term engagement. The potential for a long term engagement of game design elements addressing emotional
core drives (Chou, 2014) is not answered in this study. However, there is a risk of decreasing motivation and alienating people through gamification on the long run. Keeping players motivated over time in the endgame phase is considered to be the most difficult challenge in designing games, and eventually a game becomes boring (Chou, 2014; Kirriemuir & McFarlane, 2004; Ratner & Bruner, 1978). It can therefore be assumed, that gamified tasks, will also become boring over time. This assumption, however, is not part of this study and requires further research.

6.3 Implications for practice

When transferring the results of this study to organisations, it is crucial to understand, that the gamification of basic administrative tasks does not guarantee an increase of intrinsic motivation. A positive reception of gamified tasks seems to be strongly dependent on an individual’s character and player type, supporting the results of Nicholson (2012) for meaningful gamification. When designing gamified tasks, it is therefore important to analyse the target group first. As the study shows, if gamified tasks are addressed wrongly, it can lead to alienation and demotivation of conducting basic administrative tasks. As Chou (2013a, pt. 5) suggests, one way to keep people interested over time is by constantly adding more content. In an organisational environment this implies ongoing adjustments and updates to gamified tasks, including its operational costs.

There are still multiple questions unanswered in the context of applying and implementing gamified solutions in organisations. For instance, is there a dedicated employee necessary for maintaining and updating content of gamified solutions? This is probably dependent on the size of the organisation and to what extend gamification is implemented. However, from the insights of this study it is recommended to have at least one person in the organisation, who understands benefits and risks of gamification and ways to apply game design elements.

So far, it is also unanswered, whether there is an economic value in applying gamification and how it can be measured. While costs are presumably easy to gather, the benefits are hard to express in monetary terms. The insights of this study indicate that several factors like employee satisfaction, productivity and error rate of employees, and the external image of the organisation’s culture can effect the benefits of gamification.

The conclusions of this study indicate that it is important to design a gamified solution to the player types and needs of the target group. However, it is still unanswered, how this should be done in situations, in which there are different player types of the employees in one department. The outcome of research question two suggests that there might be issues especially with employees over 35 years when addressing a wrong player type, as there reaction to gamification seems to be barely predictable. It is unclear, whether it is possible to match people from different player types in one solution, or whether there is a need to have a non-gamified alternative as well.

Lastly, given the case that a gamified solution is implemented successfully in an organisation, there are no studies yet, investigating in a possible demotivation for non-gamified tasks after a certain point. The results of this study indicate that non-gamified tasks are continued to be seen as the standard and a gamified solution of some tasks is considered as special.
6.4 Implications for research

The results of the study can be used as a basis for further research in the area of gamification and its impact on intrinsic motivation for administrative tasks. The insights of the analysis give indications, which could be researched in further studies with a larger sample size to prove them with a statistical significance. To advance the knowledge in this area, it is suggested to conduct further research that especially addresses the effect of gamification in the long run with a focus on the impact on intrinsic motivation. Long term studies should be performed, in order to see the impact of repetition and possible boredom after some time. Further research is needed on the risk of alienating people, when the gamified tasks are customised to targeted test subjects.
List of references


List of references


List of references


Appendices

Appendix 1  Game mechanics and game genres

Table 7: Game mechanics and game genres (Adams and Dormann, 2012, p. 8)

<table>
<thead>
<tr>
<th></th>
<th>Physics</th>
<th>Economy</th>
<th>Progression</th>
<th>Tactical Maneuvering</th>
<th>Social Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Detailed physics for movement, shooting, jumping, etc.</td>
<td>Power-ups, collectables, points and lives</td>
<td>Predesigned levels with increasingly difficult tasks, storyline to set player goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategy</td>
<td>Simple physics for movement and fighting</td>
<td>Unit building, resource harvesting, unit upgrading, risking units in combats</td>
<td>Scenarios to provide new sets of challenges</td>
<td>Positioning of units to gain offensive or defensive advantages</td>
<td>Coordinated actions, alliances and competition between players</td>
</tr>
<tr>
<td>Role-Playing</td>
<td>Relatively simple physics to resolve movement and conflict, often turn based</td>
<td>Equipment and experience to customize a character or party</td>
<td>Story line and quests to give player a purpose and goal</td>
<td>Party tactics</td>
<td>Play-acting</td>
</tr>
<tr>
<td>Sports</td>
<td>Detailed simulation</td>
<td>Team management</td>
<td>Seasons, competitions, tournaments</td>
<td>Team tactics</td>
<td></td>
</tr>
<tr>
<td>Vehicle Simulation</td>
<td>Detailed simulation</td>
<td>Vehicle tuning between missions</td>
<td>Missions, races, challenges, competitions, tournaments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Simulation</td>
<td>Managing of resources, economy building</td>
<td>Scenarios to provide new set of challenges</td>
<td>Managing of resources, economy building</td>
<td>Coordinated actions, alliances and competition between players</td>
<td></td>
</tr>
<tr>
<td>Adventure</td>
<td>Managing a player's inventory</td>
<td>Story to drive game, locks and key to control player progress</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puzzle</td>
<td>Simple, often non-realistic and discrete, physics generate challenges</td>
<td>Short levels providing increasingly more difficult challenges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Games</td>
<td>Resource harvesting and unit building, resources spend on personalized content</td>
<td>Quests and challenges to give player a purpose and a goal</td>
<td>Players exchange in-game resources, mechanics encourage player cooperation or conflict</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 2  Studies on player types

*Table 28: Studies on Player Types (Hamari and Tuunanen, 2014, p. 33)*

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Basis</th>
<th>Methods</th>
<th>Presented player types</th>
<th>Games in the study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartle</td>
<td>1996</td>
<td>Behavioural</td>
<td>Qualitative observations &amp; Conceptual analytics</td>
<td>Achiever, Explorer, Socialiser, Killer</td>
<td>MUDs (Multi-User Domain)</td>
</tr>
<tr>
<td>Lazzaro</td>
<td>2004</td>
<td>Behavioural</td>
<td>Conceptual analytics</td>
<td>Easy fun, Hard fun, Altered states, The people factor</td>
<td>Non-exclusive</td>
</tr>
<tr>
<td>Ip and Jacobs</td>
<td>2005</td>
<td>Behavioural</td>
<td>Quantitative – factor analysis</td>
<td>Hardcore gamer, Casual Gamer</td>
<td>Non-exclusive</td>
</tr>
<tr>
<td>Hamari and Lehdonvirta</td>
<td>2010</td>
<td>Behavioural</td>
<td>Conceptual-analytical combination of qualitative observations and marketing theory</td>
<td>For example character level and classes</td>
<td>EverQuest, Habbo, Puzzle Pirates, World of Warcraft, (Online games)</td>
</tr>
<tr>
<td>Kallio et al.</td>
<td>2011</td>
<td>Behavioural</td>
<td>Triangulation of quantitative and qualitative data</td>
<td>Social mentalities, Casual mentalities, Committed mentalities</td>
<td>Non-exclusive</td>
</tr>
<tr>
<td>Stewart</td>
<td>2011</td>
<td>Behavioural, Psychographic</td>
<td>Conceptual-analytical</td>
<td>Guardian / Achiever, Rational / Explorer, Idealist / Socialiser, Artisan / Killer, Conqueror, Wanderer, Manager, Participant, Hardcore, Casual</td>
<td>The same ones as in precious studies that it combines</td>
</tr>
<tr>
<td>Tseng</td>
<td>2010</td>
<td>Psychographic</td>
<td>Quantitative – factor analysis</td>
<td>Aggressive gamer, Social gamer, Inactive gamer</td>
<td>Online games in general</td>
</tr>
<tr>
<td>Yee</td>
<td>2006, 2007, 2012</td>
<td>Psychographic</td>
<td>Quantitative – factor analysis</td>
<td>Achievement, Social, Immersion (+sub-constructs)</td>
<td>EverQuest, Dark Age of Camelot, Ultima Online, Star Wars Galaxies (MMOs)</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Basis</td>
<td>Methods</td>
<td>Presented player types</td>
<td>Games in the study</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Zackariasson et al.</td>
<td>2010</td>
<td>Psychographic</td>
<td>Conceptual-analytical</td>
<td>Progress &amp; provocation, Power &amp; domination, Helping &amp; support, Friends &amp; collaboration, Exploration and fantasy, Story &amp; escapism</td>
<td>World of Warcraft (MMO)</td>
</tr>
<tr>
<td>Williams et al.</td>
<td>2006</td>
<td>In-game demographic</td>
<td>Triangulation of quantitative and qualitative data</td>
<td>Group centrality, Size of the guild, Type of server, Faction</td>
<td>World of Warcraft (MMO)</td>
</tr>
</tbody>
</table>
Appendices

Appendix 3  Game design elements addressing the eight core drives

Figure 15: Game design elements addressing the eight core drives (Chou, 2014)
Appendices

Appendix 4  Test for control group

This section contains the full test for the control group in the experiment. It contains the message in the envelope, the response mail, the instructions in the document that is to be downloaded, and the confirmation mail.

Message in the envelope

Please send a mail to the following address with the given subject and specifying your name:

Mail address: thesis.test.jibs@gmail.com
Subject: “Thesis test”
Content: specify your name

You will receive further information via mail afterwards.

Your test supervisor

Response mail

Dear mailer,

thank you for your cooperation. The instructions for your task are stored at a central place. Please press the following link and download the document:
https://app.box.com/s/0z3x836tmpt85z2saifribq1ukxte6zi

The password for accessing the document is: snake

After reading, please complete the assignment and send the result to the following mail address:
thesis.test.jibs.reply@gmail.com

Sincerely
Your test supervisor

Instructions

Studies suggest, that people can read texts, if only the first and last letter are in their right positions. All other letters of the word can be in random order and the text can still be read. This encryption method has been applied to the following text. Your task is to decrypt it and write the text in the correct way:

“Old fidnres psas aawy, new fnierds apaepr. It is jsut likie the dyas. An old day pseass, a new day aiverrs. The imtnrpaot tnhig is to mkae it meingfnual: a minfneuagl fnried - or a meginufnal day. Wehn we meet rael teadrgy in lfie, we can recat in two wyas - ehietr by loinsg hpoe and fnillag itno slef-deisvcttrue hibats, or by usng the celganlhe to fnid our iennr stegntrh” The Dlaai Lmaa

Please send the decrypted text to the following mail address:
thesis.test.jibs.reply@gmail.com

Sincerely
Your test supervisor
Confirmation mail

Dear mailer,

we have received the submission of your assignment. We will review it in the next days. Thank you for your participation.

Sincerely
Your test supervisor
Appendices

Appendix 5  Test for treatment group

This sections contains the full test for the treatment group in the experiment. It contains the message in the envelope, the response mail, the instructions in the document that is to be downloaded, and the confirmation mail.

Message in the envelope

Far away from earth Captain Crash is on a secret mission. Recently, he got a problem on his space ship. You are one of the few people, who are capable to help him solving this problem.

To get further insights and information, you have to contact Captain Crash directly by sending him a mail on the following address:
your.secret.quest.jibs@gmail.com

He already appreciates your support in this quest.

Response mail

Greetings my fellow rescuer,

it is a pleasure to have your support on this quest. We recently got into some troubles on our space ship 'Aurora Star' and are stranded on a lonely planet far away from earth.

Unfortunately I cannot share too much details on this insecure line. I placed details about your quest at a save location you can access on the following link:
https://app.box.com/s/4vm6lo50y2no7uiqjejp9kbsxiok7wac

To access this document, I need you to pass another security check. You can figure out the password by entering the animal that is least like the other four in the following selection:
dog, mouse, lion, snake, elephant.

Best of luck
Captain Crash

Briefing for your secret task

One week ago we lost our contact man who had valuable information regarding the route towards our target in 'Destiny Heights'. We do not know which route we need to take to safely get there. We cannot leave the lonely planet without these information. The last message we received from our contact man is encrypted. I need you to decrypt this message, so that I can give the information to our navigator:

The ptah twaodrs detsniy hiegths is cervoed wtih amubhses and tarps. The sasfet way is by fylng anuord the orbit 2, tehn you aiovdu the eivl topros in suqare 1. Aetfr psasnig the red plenat, it is ipmrotnat to not etenr the mzae of srats. Floww the lihgt of veags utnil you raech the geern palnet. Form tehre you can use lgiht seepd and go dietely to dseitny hieghts.

You can get in contact with me for sending the decrypted message to the following secure mail address:
solved.secret.quest.jibs@gmail.com
Appendices

Best of luck
Captain Crash

**Confirmation mail**

Thank you for your help!

Myself and the whole crew of the 'Aurora Star' appreciate your efforts and support. Thanks to you we can leave this lonely planet and make our way safely to destiny heights.

Thankful
Captain Crash
Appendices

Appendix 6  Debriefing questionnaire

Group:
Control  Treatment

Gender:
Male  Female

Age group:
15–24  25–34  35–44  45–54  > 55

Time:

Question 1: How motivated were you during the whole test on a scale from 1 (not at all) to 10 (totally motivated)?
1  2  3  4  5  6  7  8  9  10

Question 2: Which part of the test especially motivated you?

Question 3: Did you feel like being in a game?
Yes  No

Question 4: How confident were you about your abilities to solve the tasks on a scale from 1 (not at all) to 10 (totally confident)?
1  2  3  4  5  6  7  8  9  10

Question 5: Did you enjoy performing the tasks?
Yes  No

Question 6: Do you have any general comments about this test?
Appendices

Appendix 7  Experiment observations
In this section the test protocols of all test subjects during the experiment are transcribed.

Test subject #01

General data
Group: Treatment
Gender: Female
Age group: 15 – 24
Time (minutes): 10

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 5
Enjoyed the tasks: Yes
Motivating part: Sending the first mail
General comments: “It was weird, because it was not what I expected”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 3
Non-decrypted words: 0

Observations on the performance
– Little confusion at the beginning
– “This is so weird”
– No problem with the password
– Confused looks, but no complaints
– “Fu*k” when noticing that she replied to wrong mail address
Test subject #02

General data
Group: Treatment
Gender: Female
Age group: 15 – 24
Time (minutes): 13

Answers to debriefing questionnaire
Motivation: 6
Game feeling: Yes
Confidence: 7
Enjoyed the tasks: No
Motivating part: Decryption
General comments: “It was exciting”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 0
Non-decrypted words: 0

Observations on the performance
- “What?! This is … OK”
- “This is really weird”
- Smile while figuring out what to do
- Excitement when receiving / reading the mail
- “Oh my god, seriously?”
- No problem with figuring out the password
- Focused and concentrated during the task
- Unsure whether taking a call during the test
- Test subject was very stressed and had lot of other tasks to do
Test subject #03

General data
Group: Treatment
Gender: Female
Age group: 15 – 24
Time (minutes): 15

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 7
Enjoyed the tasks: Yes
Motivating part: Figuring out what to do
General comments: None

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 3
Non-decrypted words: 0

Observations on the performance
- Interested in exploring the test
- “Oohhh...”
- Smiling when receiving information
- Difficulties finding out password
- Happy after accessing the document
- Rushing during decryption to make up with lost time
- Excited about the task
Test subject #04

General data
Group: Treatment
Gender: Female
Age group: 45 – 54
Time (minutes): 12

Answers to debriefing questionnaire
Motivation: 10
Game feeling: Yes
Confidence: 7
Enjoyed the tasks: Yes
Motivating part: Helping Captain Crash
General comments: “I wanted to help as fast as possible”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 4
Non-decrypted words: 11

Observations on the performance
– Highly engaged
– Totally part of the story
– “How can I help Captain Crash?”
– Smiling when receiving answer
– No problems with password
– Anxious about the task
– Focused for the decryption
– “Puh, I don’t know these words”
– “I hope I can still help him”
– Replying fast is more important than trying to figure out some hard words
– Very happy after receiving final mail
Appendices

Test subject #05

General data
Group: Treatment
Gender: Male
Age group: 15 – 24
Time (minutes): 11

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 9
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “Just curious what I was doing.”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 0
Non-decrypted words: 0

Observations on the performance
– straight forward with what to do
– curious and focused
– smiling while typing mails
– no problems with password
– focused when reaching the decryption task
– Does not just translate the message, but structures it into the single steps
– “This is it?! I want to do more”
Test subject #06

General data
Group: Control
Gender: Male
Age group: 25 – 34
Time (minutes): 16

Answers to debriefing questionnaire
Motivation: 7
Game feeling: No
Confidence: 6
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “Sending mails was not too exciting”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 0
Non-decrypted words: 1

Observations on the performance
– curious
– not much excited while sending mails
– focused
– not too many emotions
– takes paper for the decryption task
– struggling with one word, tries hard to find it out, eventually gives up
Test subject #07

General data
Group: Control
Gender: Female
Age group: 25 – 34
Time (minutes): 10

Answers to debriefing questionnaire
Motivation: 10
Game feeling: Yes
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was fun because it makes you feel smart”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 3
Non-decrypted words: 0

Observations on the performance
– nervous before starting
– smiling
– very curious about what happens
– focused about the task
– no big reaction while downloading
– no detailed reading of reply address
– Noticed wrong address fast
– Still in positive mood
– No struggles with decryption
Appendices

**Test subject #08**

**General data**

<table>
<thead>
<tr>
<th>Group:</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td>Female</td>
</tr>
<tr>
<td>Age group:</td>
<td>15 – 24</td>
</tr>
<tr>
<td>Time (minutes):</td>
<td>12</td>
</tr>
</tbody>
</table>

**Answers to debriefing questionnaire**

<table>
<thead>
<tr>
<th>Motivation:</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game feeling:</td>
<td>Yes</td>
</tr>
<tr>
<td>Confidence:</td>
<td>9</td>
</tr>
<tr>
<td>Enjoyed the tasks:</td>
<td>Yes</td>
</tr>
<tr>
<td>Motivating part:</td>
<td>Decryption</td>
</tr>
<tr>
<td>General comments:</td>
<td>“That was fun”</td>
</tr>
</tbody>
</table>

**Observations on the task**

<table>
<thead>
<tr>
<th>Reply to wrong mail address:</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelling mistakes in decryption:</td>
<td>1</td>
</tr>
<tr>
<td>Non-decrypted words:</td>
<td>1</td>
</tr>
</tbody>
</table>

**Observations on the performance**

- “Hmm...” with a big smile
- reading the story again
- very focused
- smile when receiving an answer
- focused while reading, happy when understanding what to do next
- starting to decrypt by change words, then changes to re-write
- highly focused and concentrated during the decryption
- reviewing everything
- “No problem, happy to help”
- “That was fun”
**Test subject #09**

**General data**

Group: Treatment

Gender: Male

Age group: 15 – 24

Time (minutes): 10

**Answers to debriefing questionnaire**

Motivation: 8

Game feeling: No

Confidence: 8

Enjoyed the tasks: Yes

Motivating part: Decryption

General comments: “Unexpected task; could be more challenging; It was fun”

**Observations on the task**

Reply to wrong mail address: No

Spelling mistakes in decryption: 1

Non-decrypted words: 1

**Observations on the performance**

– Fun when wondering what to write to Captain Crash
– no problems with password
– looks interested, but not too many emotions
– troubles with one word
– reviews the solution once more
– “Is that it?!”
Test subject #10

General data
Group: Treatment
Gender: Female
Age group: 15 – 24
Time (minutes): 25

Answers to debriefing questionnaire
Motivation: 6
Game feeling: Yes
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was fun and interesting”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 0
Non-decrypted words: 0

Observations on the performance
– “What the f*ck” with a smile
– Clueless about what to write in first mail, puts in a lot of effort in the text
– “Am I taking this way too seriously”, followed by laughing
– “This just goes round and round”
– Not sure how to decrypt or what exactly to do – did not notice that the test was shuffled at first read
– very focused into the task – no distractions allowed
– looks a bit lost
– totally connected with the story
– keeps with the task even with stress for other things
– anxious to send, not sure whether she solved the problem
Test subject #11

General data
Group: Control
Gender: Male
Age group: 15 – 24
Time (minutes): 13

Answers to debriefing questionnaire
Motivation: 6
Game feeling: Yes
Confidence: 7
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “Bad that I did not nail it”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 4
Non-decrypted words: 2

Observations on the performance
- “I'm not in a rush”
- “I'm so confused”
- “Are you kidding me?!?”
- misspelled first mail address
- “It’s demotivating, because I think others are faster”
- focused, but not too happy
- “Do I get time for the words I don't know?”, followed by direct surrendering and completion of the task
Test subject #12

General data
Group: Treatment
Gender: Male
Age group: 15 – 24
Time (minutes): 9

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 10
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “More text, more challenge”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 0
Non-decrypted words: 0

Observations on the performance

– Happy
– “What do I have to tell you”
– exciting in reading the mail / introduction
– “Seriously, I have to think?!”, then focused and concentrated
– “What is that word?”
– “You are creative”
Test subject #13

General data
Group: Control
Gender: Female
Age group: 15 – 24
Time (minutes): 15

Answers to debriefing questionnaire
Motivation: 7
Game feeling: Yes
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Receiving mail with instructions
General comments: “It was good. Instructions were clear”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 1
Non-decrypted words: 1

Observations on the performance
- not stressed
- takes every challenge and task with a little smile
- “It’s ok”
- focused, but not too excited
- struggling with some words
  - Unsure what to do with them
  - keeps on working until she finds out
Appendices

Test subject #14

General data
Group: Treatment
Gender: Male
Age group: 25 – 34
Time (minutes): 11

Answers to debriefing questionnaire
Motivation: 9
Game feeling: Yes
Confidence: 9
Enjoyed the tasks: Yes
Motivating part: That is was a secret
General comments: “It was fun”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 1
Non-decrypted words: 0

Observations on the performance
– curious, a bit clueless about first mail
– right away in the story
– happy, the he received surprisingly a mail from Captain Crash
– driving / pushing forward with the tasks
– surprised about the messages
– goes straight forward with the decryption
– focused, double checks for correctness
– happy, smiles
– rereading instructions before sending
Test subject #15

General data
Group: Control
Gender: Male
Age group: 15 – 24
Time (minutes): 8

Answers to debriefing questionnaire
Motivation: 9
Game feeling: Yes
Confidence: 10
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “Nah”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 1
Non-decrypted words: 1

Observations on the performance
– “I feel pressure”
– curious, wondering
– interested in the decryption task
– focused during the decryption – no distractions allowed
– no final re-reading
– determined
– first smile after test was over
– first not motivated at all, highly motivated from starting the decryption
Test subject #16

General data
Group: Treatment
Gender: Female
Age group: 15 – 24
Time (minutes): 13

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 9
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was fun”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 1
Non-decrypted words: 2

Observations on the performance
- looks a bit confused at first
- “OK” [let’s do it]
- thoughts about what to write in first mail
- focused while reading
- not too many smiles
- re-reading of test and instructions
- smile after sending 2nd mail
- “Is it done?”
- “That was interesting” with a smile
Test subject #17

General data
Group: Control
Gender: Male
Age group: 25 – 34
Time (minutes): 11

Answers to debriefing questionnaire
Motivation: 7
Game feeling: No
Confidence: 7
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “I would like to have some clues about the final progress”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 2
Non-decrypted words: 1

Observations on the performance
- does straight forward
- writes messages in first mail (short text)
- anticipates the process
- confident and interested
- positive mood, but no happy expressions (emotionless)
- focused during decryption
- a fain bit of frustration, when struggling with some words
- “Alright”
Appendices

Test subject #18

General data
Group: Control
Gender: Female
Age group: 35 – 44
Time (minutes): 9

Answers to debriefing questionnaire
Motivation: 4
Game feeling: No
Confidence: 7
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “I wish I would have been less stressed”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 0
Non-decrypted words: 4

Observations on the performance
- Happy mood, but stressed
- curious
- slight laughing occasionally
- excited over decryption task
- not much focused
- struggles with some words
- Re-reads the text
- leaving few words blank
**Test subject #19**

**General data**

Group: Treatment  
Gender: Male  
Age group: 35 – 44  
Time (minutes): 15

**Answers to debriefing questionnaire**

Motivation: 7  
Game feeling: Yes  
Confidence: 9  
Enjoyed the tasks: No  
Motivating part: Using the password  
General comments: None

**Observations on the task**

Reply to wrong mail address: No  
Spelling mistakes in decryption: 0  
Non-decrypted words: 0

**Observations on the performance**

- Looks a bit stressed  
- curious when reading the instructions  
- focused on the tasks  
- not too much connected with the story  
- quite emotionless
Test subject #20

General data
Group: Control
Gender: Female
Age group: 35 – 44
Time (minutes): 11

Answers to debriefing questionnaire
Motivation: 7
Game feeling: No
Confidence: 9
Enjoyed the tasks: Yes
Motivating part: Read instructions
General comments: None

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 3
Non-decrypted words: 0

Observations on the performance
- interested what it is about
- good mood
- curious
- excitement when coming to the decryption task
- concentrated, but positive emotions during decryption
- motivated to figure out tough words
- fine, but not too happy after solving
- excited when receiving one more mail
Test subject #21

General data
Group: Control
Gender: Male
Age group: 45 – 54
Time (minutes): 16

Answers to debriefing questionnaire
Motivation: 7
Game feeling: No
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was an interesting task; I can use this decryption in my class”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 2
Non-decrypted words: 1

Observations on the performance
– curious
– concentrated
– not many emotions
– let’s himself distract a little bit
– no excitement noticeable
– “So...” when done with decryption
– re-reading
– unsure about sending
– struggles with reply address
Test subject #22

General data
Group: Control
Gender: Female
Age group: 25 – 34
Time (minutes): 9

Answers to debriefing questionnaire
Motivation: 5
Game feeling: Yes
Confidence: 6
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was fun”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 7
Non-decrypted words: 1

Observations on the performance
– straight to work
– positive, but not many emotions
– focused, not sure what it is about
– task-oriented, getting it done
– excitement when finding out tough words after initial struggle
– re-reading
– sent to wrong addressing
– “No” when realising wrong sending error, bit mad
– faint smile when done
Test subject #23

General data
Group: Treatment
Gender: Female
Age group: 45 – 54
Time (minutes): 15

Answers to debriefing questionnaire
Motivation: 10
Game feeling: Yes
Confidence: 5
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was fun”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 5
Non-decrypted words: 2

Observations on the performance
– Smile
– Curios
– Enjoys the tasks
– very relaxed
– tries hard on tough words
– happy even though struggling with some words
– wants to find out everything
– “Sorry, but I cannot help you [Captain Crash] with everything, but I hope it will help you anyways”
– really happy when receiving final mail
Test subject #24

General data
Group: Treatment
Gender: Female
Age group: 25 – 34
Time (minutes): 9

Answers to debriefing questionnaire
Motivation: 9
Game feeling: Yes
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “I saved the space ship”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 0
Non-decrypted words: 0

Observations on the performance
- is in a good mood
- curious
- “And Now?”
- laughing when reading the story
- smiling
- happy about figuring out stuff
- concentrated and focused during decryption
- no distractions
- “Am I already done now?”
- Smile and happy at the end
- “I saved the space ship”
Test subject #25

General data
Group: Treatment
Gender: Female
Age group: 25 – 34
Time (minutes): 14

Answers to debriefing questionnaire
Motivation: 9
Game feeling: Yes
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “Pictures would have been nice”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 0
Non-decrypted words: 0

Observations on the performance
– Laughing: “I don't know if I do the right thing”
– Long message in first mail
– curious at the password
– Takes time to read, but seems confident about what to do
– focused but not stressed
– skips initial decryption problems
– relates to story and available information to figure out tough words
– uses google (“word scramble solver”) to figure out all words
– re-reads to check errors
– sent reply to wrong mail address, resulting in smiling and wondering
Test subject #26

General data
Group: Treatment
Gender: Male
Age group: 15 – 24
Time (minutes): 11

Answers to debriefing questionnaire
Motivation: 9
Game feeling: No
Confidence: 10
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: None

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 2
Non-decrypted words: 5

Observations on the performance
- Smile after reading
- does research on Captain Crash before sending mail
- wants to take over the control of the ship
- first scared about the password quest, relieved and happy when figured out
- concentrated when getting to the decryption task
- “It’s over”
- Missed out one sentence in decryption
Test subject #27

General data
Group: Control
Gender: Male
Age group: 15 – 24
Time (minutes): 14

Answers to debriefing questionnaire
Motivation: 9
Game feeling: Yes
Confidence: 9
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: None

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 1
Non-decrypted words: 2

Observations on the performance
  - not many emotions
  - a bit uninterested
  - focused, but looks more bored and annoyed than happy
  - struggling with some words - “Fu*k!”
  - does not want to give up
  - sent to wrong mail address, smile when figuring out
  - happy after noticing the mistake
Appendices

Test subject #28

General data
Group: Control
Gender: Female
Age group: 45 – 54
Time (minutes): 10

Answers to debriefing questionnaire
Motivation: 10
Game feeling: No
Confidence: 7
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “It was exciting”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 1
Non-decrypted words: 0

Observations on the performance
– positive, curious
– “Now we gonna send an email first.”
– Reads instructions carefully
– straight forward with starting decryption task
– concentrated and interested
– “so” determined
– After finishing test “Some will happen more now?!?” sounding not motivated
Appendices

Test subject #29

General data
Group: Treatment
Gender: Female
Age group: 45 – 54
Time (minutes): -

Answers to debriefing questionnaire
Motivation: -
Game feeling: -
Confidence: -
Enjoyed the tasks: -
Motivating part: -
General comments: “I don't like the secrecy”

Observations on the task
Reply to wrong mail address: -
Spelling mistakes in decryption: -
Non-decrypted words: -

Observations on the performance
- Smile / laugh when reading the message in the envelope
- Bit unsure / curious on what to do
- “I don't believe in this!”
- “I don't like the secrecy!”
- Did not send an email
- Aborted the test
Test subject #30

General data
Group: Treatment
Gender: Female
Age group: 45 – 54
Time (minutes): 13

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 8
Enjoyed the tasks: Yes
Motivating part: Decryption
General comments: “I was constantly thinking why and expected something different”

Observations on the task
Reply to wrong mail address: No
Spelling mistakes in decryption: 2
Non-decoded words: 2

Observations on the performance
- bit stressed in workplace
- laughing when reading the message in the envelope
- “OK” with a smile
- rereads the text and writes mail
- “What happens after I sent an email?”, curious
- reads interested
- no problems or emotional reactions with the password quest
- laughing when opening and reading instructions
- unsure about something when starting to decrypt
- focused and happy during decryption
- does not want to be disturbed
- stressed when others try to contact her
- re-reads her solution
- “OK” with a big smile
Appendices

Test subject #31

General data

Group: Treatment
Gender: Male
Age group: ≥ 55
Time (minutes): 19

Answers to debriefing questionnaire

Motivation: 8
Game feeling: Yes
Confidence: 4
Enjoyed the tasks: Yes
Motivating part: Reading the story
General comments: None

Observations on the task

Reply to wrong mail address: No
Spelling mistakes in decryption: 1
Non-decrypted words: 2

Observations on the performance

- reading concentrated
- not many emotions visible
- sends mail, curious what happens next
- no emotions at reply mail
- focused and concentrated
- no problems opening the file
- nothing spoken
- doubts his language skills, but keeps going
- works himself through, eager to figure out tough words
Test subject #32

General data
Group: Control
Gender: Male
Age group: 45 - 54
Time (minutes): 28

Answers to debriefing questionnaire
Motivation: 8
Game feeling: Yes
Confidence: 10
Enjoyed the tasks: Yes
Motivating part: Read the test instructions
General comments: “I was unlucky because I did not know one word”

Observations on the task
Reply to wrong mail address: Yes
Spelling mistakes in decryption: 7
Non-decrypted words: 2

Observations on the performance
- reads instructions carefully and concentrated
- bit annoyed after misspelling mail address
- laughing after reading instructions for decryption
- uses paper to write down password and decrypted text
- focused and concentrated during decryption task
- huge rise of engagement noticeable with starting the decryption compared to test begin
- works hard to figure out all words
- answers to wrong mail address, takes long to spot his mistake
- “Oh, Sh*t”, when realising the wrong mail address
- “Am I ready now?”
- “The mail address was the worst one.”
Appendices

Appendix 8  Details of quantitative analysis

This section provided detailed figures of the statistics used in the quantitative analysis.

Motivation – detailed statistics

Table 29: Motivation – detailed statistics

<table>
<thead>
<tr>
<th>Group</th>
<th>Control</th>
<th>Treatment</th>
<th>Control</th>
<th>Treatment</th>
<th>Control</th>
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### Game feeling – detailed statistics

**Table 30: Game feeling – detailed statistics**

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<th>Group</th>
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<th>Treatment</th>
<th>Control</th>
<th>Treatment</th>
<th>Control</th>
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Confidence – detailed statistics

Table 31: Confidence – detailed statistics

<table>
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<th>Group</th>
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<th>Treatment</th>
<th>Control</th>
<th>Treatment</th>
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Two-tailed P value
- mean difference: 0.7626, 0.3409, 0.3972, 0.4773, 0.2772
- not statistically significant

Significance level of 0.05
- not statistically significant

Confidence Interval
- Mean of difference: -0.1538, -0.6058, 0.8000, -0.5750, 0.8308
- 95% confidence interval of difference:
  - -1.1854, 0.8778
  - -1.9037, 0.6921
  - -1.2625, 2.8625
  - -2.2952, 2.1452
  - -0.7346, 2.962

Intermediate values used in calculation
- \( t \): 0.3049, 0.9769, 0.8944, 0.7357, 1.1251
- \( df \): 29, 19, 8, 11, 16
- Standard error of difference: 0.504, 0.620, 0.894, 0.782, 0.738
## Enjoyment – detailed statistics

**Table 32: Enjoyment – detailed statistics**

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<th>Group</th>
<th>All</th>
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Confidence Interval

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Intermediate values used in calculation

<table>
<thead>
<tr>
<th>t</th>
<th>1.2329</th>
<th>0.7766</th>
<th>1.0000</th>
<th>0.7127</th>
</tr>
</thead>
<tbody>
<tr>
<td>df</td>
<td>29</td>
<td>19</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Standard error of difference</td>
<td>0.090</td>
<td>0.099</td>
<td>0.200</td>
<td>0.173</td>
</tr>
</tbody>
</table>
### Replied to wrong mail address – detailed statistics

*Table 33: Replied to wrong mail address – detailed statistics*

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td>Mean</td>
<td>0.5385</td>
<td>0.1111</td>
<td>0.5000</td>
<td>0.1538</td>
<td>0.6000</td>
</tr>
<tr>
<td>SD</td>
<td>0.5189</td>
<td>0.0762</td>
<td>0.5345</td>
<td>0.3755</td>
<td>0.5477</td>
</tr>
<tr>
<td>SEM</td>
<td>0.1439</td>
<td>0.0762</td>
<td>0.1890</td>
<td>0.1042</td>
<td>0.2449</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.0085</td>
<td>0.0967</td>
<td>0.0400</td>
<td></td>
<td>0.7511</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Confidence Interval</td>
<td>Mean of difference</td>
<td>0.4274</td>
<td>0.3462</td>
<td>0.6000</td>
<td>-0.1000</td>
</tr>
<tr>
<td>95% confidence interval of difference</td>
<td>0.1180</td>
<td>0.7367</td>
<td>-0.0685</td>
<td>0.7608</td>
<td>0.0351</td>
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<tr>
<td>Intermediate values used in calculation</td>
<td>t</td>
<td>2.8252</td>
<td>1.7474</td>
<td>2.4495</td>
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</tr>
<tr>
<td>df</td>
<td>29</td>
<td>19</td>
<td>8</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Standard error of difference</td>
<td>0.151</td>
<td>0.198</td>
<td>0.245</td>
<td>0.307</td>
<td>0.171</td>
</tr>
</tbody>
</table>
## Time – detailed statistics

*Table 34: Time – detailed statistics*

<table>
<thead>
<tr>
<th>Group</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>SEM</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>13.1538</td>
<td>4.9134</td>
<td>1.3627</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>13.1667</td>
<td>3.8836</td>
<td>0.9155</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>12.1250</td>
<td>2.7483</td>
<td>0.9717</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>12.5385</td>
<td>4.1756</td>
<td>1.1581</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Age &lt; 35</td>
<td>14.8000</td>
<td>7.3280</td>
<td>3.2772</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Age ≥ 35</td>
<td>14.8000</td>
<td>7.3280</td>
<td>3.2772</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>12.1250</td>
<td>2.7484</td>
<td>0.9717</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>14.8000</td>
<td>4.1756</td>
<td>1.1561</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Age &lt; 35</td>
<td>12.1250</td>
<td>7.3280</td>
<td>3.2772</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Age ≥ 35</td>
<td>14.8000</td>
<td>4.1756</td>
<td>1.1561</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Two-tailed P value</td>
<td>0.9936</td>
<td>0.8070</td>
<td>1.0000</td>
<td>0.3619</td>
<td>0.2816</td>
</tr>
<tr>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
<tr>
<td>Confidence Interval</td>
<td>Mean of difference</td>
<td>-0.0128</td>
<td>-0.4135</td>
<td>0.0000</td>
<td>-2.6750</td>
</tr>
<tr>
<td>Intermediate values used in calculation</td>
<td>t</td>
<td>0.0081</td>
<td>0.2477</td>
<td>0.0000</td>
<td>0.9512</td>
</tr>
<tr>
<td></td>
<td>df</td>
<td>29</td>
<td>19</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Standard error of difference</td>
<td>1.580</td>
<td>1.669</td>
<td>3.490</td>
<td>2.812</td>
</tr>
</tbody>
</table>
### Spelling mistakes – detailed statistics

**Table 35: Spelling mistakes – detailed statistics**

<table>
<thead>
<tr>
<th>Group</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.4615</td>
<td>2.3750</td>
<td>2.6000</td>
<td>2.3750</td>
<td>2.6000</td>
</tr>
<tr>
<td>SD</td>
<td>2.3315</td>
<td>2.2638</td>
<td>2.7019</td>
<td>2.2638</td>
<td>2.7019</td>
</tr>
<tr>
<td>SEM</td>
<td>0.6466</td>
<td>0.8001</td>
<td>0.9274</td>
<td>0.8001</td>
<td>0.9274</td>
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<tr>
<td>n</td>
<td>13</td>
<td>8</td>
<td>5</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Two-tailed P value

- 0.1145
- 0.0628
- 0.8989
- 0.8740
- 0.0651

#### Significance level of 0.05

- not statistically significant
- not statistically significant
- not statistically significant
- not statistically significant
- not statistically significant

#### Confidence Interval

<table>
<thead>
<tr>
<th>Mean of difference</th>
<th>1.1281</th>
<th>1.4519</th>
<th>0.2000</th>
<th>-0.2250</th>
<th>-1.4769</th>
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</thead>
<tbody>
<tr>
<td>95% confidence interval of difference</td>
<td>-0.2898</td>
<td>2.5462</td>
<td>-0.0859</td>
<td>2.9898</td>
<td>-3.3124</td>
</tr>
<tr>
<td></td>
<td>-3.7124</td>
<td>-3.2769</td>
<td>2.8269</td>
<td>-3.0576</td>
<td>0.1034</td>
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</tbody>
</table>

#### Intermediate values used in calculation

<table>
<thead>
<tr>
<th>t</th>
<th>1.6272</th>
<th>1.9761</th>
<th>0.1313</th>
<th>0.1623</th>
<th>1.9808</th>
</tr>
</thead>
<tbody>
<tr>
<td>df</td>
<td>29</td>
<td>19</td>
<td>8</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Standard error of difference</td>
<td>0.693</td>
<td>0.735</td>
<td>1.523</td>
<td>1.387</td>
<td>0.746</td>
</tr>
</tbody>
</table>
## Non-decrypted words – detailed statistics

*Table 36: Non-decrypted words – detailed statistics*

<table>
<thead>
<tr>
<th>Group</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Age &lt; 35</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td>1.2301</td>
</tr>
<tr>
<td></td>
<td>1.0919</td>
<td>2.7273</td>
<td>0.6409</td>
<td>1.4167</td>
<td>1.6733</td>
</tr>
<tr>
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<td>0.6428</td>
<td>0.2266</td>
<td>0.3985</td>
</tr>
<tr>
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<td>n</td>
<td>13</td>
<td>18</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Two-tailed P value</td>
<td>0.7918</td>
<td>0.4346</td>
<td>0.3641</td>
<td>0.6780</td>
</tr>
<tr>
<td></td>
<td>Significance level of 0.05</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>

### Confidence Interval

<table>
<thead>
<tr>
<th>Mean of difference</th>
<th>All</th>
<th>Age &lt; 35</th>
<th>Age ≥ 35</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.2137</td>
<td>0.4327</td>
<td>-2.0000</td>
<td>-0.2750</td>
<td>-2.7077</td>
</tr>
<tr>
<td></td>
<td>-1.8537</td>
<td>-0.7018</td>
<td>-1.5672</td>
<td>-6.7929</td>
<td>-1.6942</td>
</tr>
</tbody>
</table>

### Intermediate values used in calculation

| t      | 2.5665   | 0.7983   | 0.9623    | 0.4264        | 2.0585         |
| df     | 29       | 19       | 8         | 11            | 16             |
| Standard error of difference | 0.802 | 0.542 | 2.078 | 0.645 | 1.315 |