Gamifying Employee Training

Tommi Tuominen

University of Tampere
Faculty of Natural Sciences
Software Development
M.Sc. Thesis
Supervisor: Timo Poranen
May 2018

University of Tampere
Faculty of Natural Sciences
Software Development
Tommi Tuominen: Gamifying Employee Training
M.Sc. Thesis, 43 pages and 11 index and appendix pages
May 2018

Video games have become one of the most important forms of entertainment in recent years. Games have challenges and other features that motivate and engage the player to overcome them. Gamification implements these motivating elements into non-game contexts, such as e-Learning. Combined with modern day technology, gamified e-Learning can make training programs much more appealing and fun. This thesis examines gamification and e-Learning and presents a case study regarding a gamified training system that was developed for an international company. This thesis tries to answer two questions: 1) How effective is gamified training? 2) How successful is the gamified training system? The first question tries to determine the benefits of gamifying employee training in general. The second question evaluates the relative success of the project presented in this thesis based on feedback that was gathered from a test group.

The analysis of the feedback shows promising results regarding initial motivational gains from the gamified training. The feedback also suggests that the gamified training system may be most effective in a synchronous learning environment where peers can play and learn together.

Keywords: gamification, e-Learning, serious games, motivation, learning, software development, training.

Table of Contents

1. INTRODUCTION

Companies from all fields want to train their employees to work safer and more efficiently. Well-conducted training programs have long-term effects that alter the behavior and working methods of the trainees and increase the profits of the company. Training is often organized as traditional classroom style sessions and on-site teaching sessions led by senior workers. However, there are some difficulties with traditional training programs as they may become overly time consuming and difficult to conduct in companies with international business and multiple on-site locations. [Guiney, 2015]

E-Learning is a great alternative, or a supplement, to traditional training methods as e-Learning programs are often on the Internet and let trainees access the training material without restrictions. E-Learning includes all types of multimedia and can simulate real-world environments to provide authentic work situations and conditions [Guiney, 2015]. E-Learning can also be enhanced by gamification. Gamification is a concept that seeks to induce better motivation, engagement, and enjoyment by incorporating design elements that are usually found in games. Gamification has become very popular but proof of its effectiveness over non-gamified systems needs further investigation. [Dicheva et al., 2015]

This thesis explores the concepts of gamification and e-Learning and presents a gamified training system as a case study. The gamified system was designed and developed for an international company for the purposes of employee training. This thesis looks deeper into the process of making the gamified system and analyzes the feedback that was gathered from a test group. This thesis tries to answer two questions based on the feedback: 1) How effective is gamified training? 2) How successful is the gamified training system? The first question is about determining the effectiveness of gamified training in general. The second question is based on the technical implementation and the pedagogical usefulness of the gamified training system.

Chapter two focuses on gamification and its components: motivation, engagement, and the concepts of games and play among other topics that are necessary for understanding gamification. Chapter three introduces e-Learning and the Kirkpatrick method of evaluation [Kirkpatrick & Kirkpatrick, 2006]. Chapter four contains examples of gamified systems. Chapter five introduces the case study. Chapter six analyzes the data that was gathered from the test group. Chapter seven concludes the thesis.

2. GAMIFICATION

The rising popularity of video games in recent years has made them one of the most important forms of entertainment. Video games engage and motivate players so efficiently that the idea of harnessing that potential for non-game applications sounds very appealing. Gamification tries to fill this gap between games and non-game applications with the integration of game design elements.

Even with the increasing popularity of gamification, there is still no commonly accepted definition for it [Sailer et al., 2017]. A Popular and widely accepted definition for the term describes it as the use of "*game-like elements in non-game contexts"* [Deterding et al., 2011, p. 1]. However, this definition excludes the main goal of gamification, increased motivation. Perhaps a better definition for gamification would be that it is a *"process of enhancing services with motivational affordances in order to invoke gameful experiences and further behavioral outcomes"* [Hamari et al., 2014, p. 3026]. Gamification has been used in numerous non-game contexts across multiple domains such as education and training, consumer loyalty, finance and governance, worker productivity, development, marketing, business communications and advertising [Fuchs et al., 2015]. The demand for gamification seems high and an increasing number of companies base their whole business model on providing gamification services. However, more empirical results are required for determining the true effectiveness of gamification [Hamari et al., 2014].

This chapter explains the main elements of gamification, starting from motivation (2.1), engagement (2.2), and the concepts of games and play (2.3). Section 2.4 looks at four player types. Section 2.5 introduces serious games. Section 2.6 describes commonly used game design elements. Section 2.7 looks at gamification design. Section 2.8 discusses criticism of gamification.

2.1 Motivation

The game design elements of gamification seek to induce better user motivation. Motivation is a theoretical construct that is used to identify and explain a wide range of human behaviors. It is a highly important factor in learning because it determines the attention and effort of the students. For this reason, teachers should plan their courses and study materials to improve learner motivation as high levels of motivation can enhance performance and bring out positive outcomes. The opposite of motivation is amotivation, which is the state of unwillingness to act. An unmotivated person does not value an activity or does not believe it will bring a desired outcome. Feelings of incompetence can also result in amotivation. [Buckley & Doyle, 2016]

Motivation can be divided further into varying degrees regulated by autonomy and self-determination. There exist two main categories of human motivation: intrinsic and extrinsic motivation. Figure 1 further illustrates the different forms of motivation arranged from amotivation to intrinsic motivation. [Ryan & Deci, 2000]

2.1.1 Intrinsic motivation

Intrinsic motivation arises from an individual's need for competence, autonomy, and social relatedness. The need for competence refers to feelings of efficiency for working towards an accomplishment and the satisfaction that comes from a successful completion of a difficult feat. The need for autonomy refers to freedom of choice and completion of tasks without external pressure or enforcement. The need for social relatedness refers to an individual's desire for belonging, attachment and the desire to integrate with the social environment. [Sailer et al., 2017]

Intrinsic motivation can also stem from the learner's sincere interest towards a subject and the desire to perform a learning activity. Students with intrinsic motivation are often more engaged, creative and are able to retain more information. [Harlen et al., 2003]

2.1.2 Extrinsic motivation

Extrinsic motivation is associated with stimulation that is external to the learner. A learner with extrinsic motivation sees the process of learning as a necessary step towards a certain goal. Learners can also become extrinsically motivated from the need to satisfy an external demand or from having to meet an externally set standard. [Ryan & Deci, 2000]

Extrinsic motivation is presented in four separate forms of regulation distinguishable by the person's autonomy: external, introjection, identification and integration. The first form, external regulation, refers to extrinsic rewards and reactance. The second form, introjection, describes regulation by pressure to avoid guilt or to enhance self-esteem. Regulation through the third form, identification, means that a behavior has personal importance to the person and it regulation is chosen willingly. The last form, integrated regulation, refers to the act of assimilating identified regulations into uniformity with one's values and needs through self-examination. Integrated motivation is close to intrinsic motivation but is still extrinsic because the motivation stems from a presumed practical value related to a separate outcome of a behavior. [Ryan & Deci, 2000]

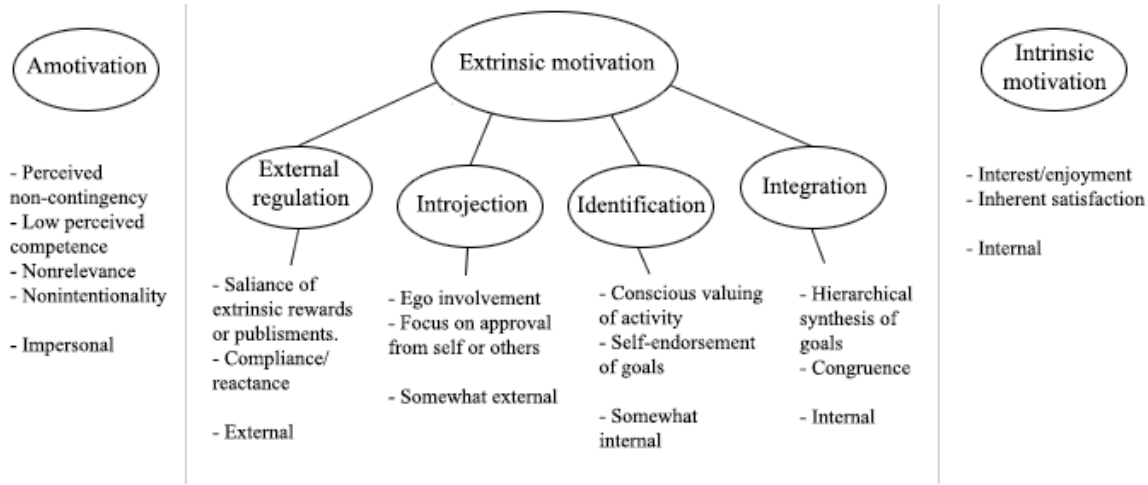

Figure 1. A taxonomy of human motivation [Ryan & Deci, 2000].

2.2 Engagement

Along with motivation, engagement is a key concept when talking about the positive effects of gamification. Engagement involves absorbing one's self into a role. Engaged workers are enthusiastic about their work and express themselves physically, cognitively, and emotionally. People can have multiple different roles throughout the day depending on their personalities, work tasks, and personal investment. By assuming a role and adjusting it, one can gain a more comfortable position within a community. When the level of physical, cognitive and emotional expression rise, the person becomes more engaged and a preferred self emerges. People invest themselves into roles by three psychological dimensions: meaningfulness, safety, and availability. [Kahn, 1990]

The meaningfulness dimension is the return of investment a person puts into their assumed role. Feelings related to meaningfulness are reinforced by challenging tasks that allow creativity and autonomy. The safety dimension considers the social environment of the workplace. Interactions within the job community must not be threatening and allow people to get involved without the fear of getting hurt or ridiculed by others. Formal and informal roles are dictated by a person's hierarchical position within a group. The safety dimension will most likely not be fulfilled if the role of the person is low within the hierarchy. The availability dimension is fulfilled if physical, emotional, and psychological resources are available for a person to form a role. Physical and emotional energy are both important for the formation of the role. Distractions like tiredness, insecurity and excessive self-consciousness at the workplace can drain these energies and have a negative impact on work performance and engagement. Depleted emotional energy can lead to a defense reaction, disengaging the person from a role due to fear of getting hurt or scrutinized. [Kahn, 1990]

2.3 Games and play

Games and gamification are based on playful activities, therefore, it is important to take a closer look at play as a concept. Huizinga [1955] defines play as a free activity that is not within ordinary life but rather something that fully absorbs the player. It is an activity that is conducted within its own boundaries and has no connection to material gains or profits. It proceeds in an orderly manner following fixed rules. According to Carse [1986], play is to have abundant energy and the motivation to engage in an activity just for fun. Playing is always voluntary, therefore unwilling participation in a playful activity cannot be called playing.

A game is a system that is based on certain rules that the player must follow. Games include unnecessary obstacles that the player must be willing to overcome to reach a wanted goal. The potential goals of a game can be put into two separate categories: prelusory and lusory goals. The prelusory goal of a game can be winning the game and the lusory goal is to have fun while playing. Even with ulterior motives like fame and money, the game could not be played without a lusory attitude. Games have a unique ability to elicit playful behavior as the player enters into a playful mindset. A playful mindset may not be achieved if the player does not accept the premise of the game. [Suits, 2005] A game must feature a structure defined by various rules but also allow some room for exploration and experimentation because if the game is too restricted by rules, the

player will feel constrained. On the other hand, if the game lacks structure, the player will feel like there is no progression, causing the game to become dull. The structure and rules of a game are often reinforced by a story, which together with interaction and decision making makes games more meaningful and interesting. [Salen & Zimmerman, 2004]

It is important to remember that sports like football and basketball are also games and so are board games like chess and mahjong. Anything can be turned into a game by adding rules and conditions for winning and losing. This thesis considers games as digital games that are played on a computer or a smart device. A person who plays a game is called a player but someone who uses an online service is called a user. When talking about a gamified e-Learning system or a serious game, the distinction between the two can get blurry. In gamified e-Learning, the player or user can also be called a student or a trainee. This thesis uses the word player to describe a trainee who is interacting with a gamified system.

2.4 Player types

Bartle [1996], has devised a model that describes four different player types based on online games of that era: achievers, explorers, socializers, and killers. The player types are categorized by the player's usual actions and behaviors within the game. The player types are theoretical abstractions and players can be put into more than one type category to a varying degree. In Bartle's model, achievers are players who regard point-gathering and rising in levels to be their top priority. Explorers like to explore the features of the game and examine how the game mechanisms work. Socialisers are interested in communicating with other players. For this player type, the actual game is not as relevant as the inter-player relationships. Killers are motivated to cause destruction and distress to either computer-controlled enemies or other players within the game. They consider the game as a competitive sport where they can test and show their skills [Kim, 2015a].

Marczewski [2015] has later modified the Bartle's player type model to better fit gamification. The main difference between the player type models is the fact that unlike games, which are played voluntarily for fun, gamification appeals mainly to two kinds of players: players who seek extrinsic rewards and players who don't. In Marczewski's model, players are motivated solely by extrinsic rewards and will do anything to get those rewards. The model contains 5 types of players: *achievers*, *socializers*, *free spirits*, *philanthropists*, and *disruptors*. Achievers are motivated by self-improvement and mastery, socializers are motivated by relatedness and interaction with others, free spirits

gets motivated by self-expression and freedom, philanthropist like helping others and are motivated by working for a bigger purpose. Disruptors seek to change the system by disrupting it or other players. [Marczewski, 2015]

In a school setting, an achiever type student is likely to be motivated by game design elements that promote personal mastery, like badges, levels, and grades. A socializer type student, on the other hand, would find social interaction and collaboration to be more motivating. A philanthropist type student would be motivated by a greater cause of helping the student community or the school. A free spirit type student is motivated by a variety of options, branching paths, and profile customization [Kim, 2015a]. Individuals have their own motivations for learning. Some learn for the pleasure of acquiring new knowledge or to satisfy their own curiosity and some learn to obtain rewards like monetary gain or a high-status job. Student's reaction to learning activities can be determined by their motivation. Some students may get motivated by gamified learning, while others get demotivated by the inclusion of gamification. Individuals can get impacted by gamification very differently. In these cases, the gamified learning solutions should be designed and used in a systematic manner that leaves no one at a disadvantage. [Buckley & Doyle, 2016]

2.5 Serious games

Serious games are games that are designed for practical purposes rather than fun and entertainment. Unlike games that focus on entertainment, serious games try to simulate the real world. A Simulation is a representation of a real-world process. Simulations are used in teaching to give the learner a better understanding of how to conduct essential procedures in a real-world working environment. A simulation can be used to train personnel for dangerous jobs without the risk of them getting hurt. A simulation type game is usually based on real-world effects and processes, omitting excessive and impractical fun-based features. Serious games favor features that are precise and truthful to the real world. Good examples of this are the gamification of military, medicine and emergency response systems [Michael & Chen, 2005]. Serious games gamify real life situations and immerse the player into the game world. The boundary between serious games and regular gamification can be blurry because both of them use game design elements to achieve similar goals. Serious games put more focus on virtual worlds, avatars, story, and narrative while gamification is applied more broadly for motivating and engaging learners. [Kim, 2015b]

2.6 Game design elements

Serious games and gamification seek to elicit better user motivation and engagement by transforming mundane tasks into game-like structures. This transformation is achieved with design elements that are commonly found in games. [Deterding et al., 2011]

Gamification has gained popularity in recent years but the concept of gamification is not new. Incentives like badges, money, military ranks, grades etc. have been used to increase motivation in several contexts for years before digital games and e-Learning [Dicheva et al., 2015]. Terminology within the gamification field is not unified. According to Dicheva et al. [2015], there are no commonly agreed classifications of game design elements. The concept of game design elements have been described in varying terms throughout different publications. Because of this lack of common classification, it is best to look at game design in a broader sense.

MDA (Mechanics, Dynamics, and Aesthetics) is a formal framework that has been developed for understanding game design. The MDA framework breaks game design into 3 core components: Mechanics, Dynamics, and Aesthetics (Figure 2).

The mechanics component is the first entry point into the game from the designer's perspective. Mechanics are what makes the game rules, algorithms, data representation. Mechanics create compelling dynamics that the player can interact with. The dynamics component describes how the game mechanics work with the inputs of the player and how the game should be played. Dynamics can make the game more challenging by creating competition or encourage fellowship by incorporating team play. Dynamics are what creates aesthetic experiences. The Aesthetics component is what the player first experiences. It evokes emotional reactions and makes the game fun and entertaining. There are multiple reasons for people to entertain themselves by playing games: sensation, fantasy, narrative, challenge, fellowship, discovery, expression, and submission. Any of these reasons can appeal to the player and there is no sure way to know what motivates a person at a given time. [Hunicke et al., 2004]

Figure 2. Understanding game design [Hunicke et al., 2004].

Gamification in general usually includes different mechanisms for rewarding the player. Reward mechanics should be designed with care because they can divert a person from the intrinsic enjoyment of performing an activity. Rewards can harm intrinsic motivation by lessening the feeling of competence and self-determination. Even though rewards can normally disclose extrinsic motivation, the feedback that comes from attaining a new reward can fulfill the player's need for competence. [Sailer et al., 2017]

Deci et al. [1999] divide rewards into two groups, informational and controlling rewards. Informational rewards are given for good performance as feedback that praises the user for his or her competence. As long as the feedback is positive, informational rewards tend to enhance intrinsic motivation. Rewards become controlling when the user is expecting to get rewarded for doing a certain task. Rewards of controlling nature pressure the user to act, think or feel in particular ways, interfering with the feeling of autonomy [Houlfort et al., 2002]. A good example of controlling rewards are tangible rewards that are given as an inducement to perform an activity the person might not otherwise take part in. Tangible rewards are perceived as less controlling if the person is not expecting to get rewarded. Tangible rewards can be divided into three different contingencies: task-noncontingent, task-contingent, and performance-contingent.

Task-noncontingent rewards are given for a reason that does not require engagement in the activity, like participation for example. Task-contingent rewards require doing or finishing the target activity regardless of how well the activity was performed. Task-contingent rewards are dependent on engagement and completion of an activity. They are given for simply engaging in an activity or for finishing a task successfully. These types of rewards can be controlling because they require not only active participation, but also the completion of the task. However, if the activity was challenging enough, completion dependent rewards can boost intrinsic motivation, counteracting the effects of control. Performance-contingent rewards are given for good performance and excellent execution of the activity, surpassing a specified criterion. Performance-contingent rewards require a certain level of performance to achieve an accomplishment, making them controlling. Getting rewarded for good performance can also enhance the feeling of competence, which counteracts control. [Deci et al., 1999]

Rewards in gamification can come in various forms: points, badges, player level, filling of a progress bar or virtual currency [Pasterfield, 2014]. Points are a very basic type of reward, they are given for completing tasks and other activities. The amount of

points can depend on the performance of the player as points are usually meant for measuring the competence of the player. Badges in gamification can be compared to real-life badges and trophies that are awarded for different achievements. Players can gain badges by completing pre-defined goals. Badges are saved to the player's account and they can be viewed and shown to other players at any times. Unlike points, badges are visual elements that are aesthetically pleasing and become a part of the player's profile and build his or her visual status. [Hanus & Fox, 2015]

Visual status is built by the player's online profile within the gamified system. It shows the player's progression and all the merits like points and badges he or she has gained. The player profile and visual status together create an *online self* or *avatar*. The rise of social media platforms has shown that maintaining one's online self can be considered a game in itself [Dragona, 2015]. While the online self is more of a realistic representation of the player's profile and statistics, avatars represent the player within the game world. An avatar can be something fictitious like a talking animal or an alien. Together with meaningful stories and team play, avatars affect experiences of social relatedness and feelings of relevance [Sailer et al., 2017]. Visual status can create social engagement, as players can compare the profiles of each other. Social factors in gamified services build communities that are committed to mutual goals. The size of the community can enhance the effectiveness of the gamified service and positively influence the outcomes of social influence, recognition, and mutuality. These social factors contribute to the perceived usefulness and enjoyment of the gamified service [Koivisto & Hamari, 2014].

Many gamified services use competition as a source of motivation. Competition is often achieved through leaderboards. Leaderboards show a ranking of all the best performing players based on rewards like points and badges [Buckley & Doyle, 2016]. Leaderboards create social engagement in the form of competition or cooperation between players or teams. Human competitors can be friends or strangers who are using the same gamified application. Players can also compete against themselves to beat a previous record or high score [Ferri, 2015].

Gamification usually gives the player a freedom of choice which refers to the possibility of choosing between challenges and how to complete them. In educational contexts, this could mean that the player can choose between writing an essay or taking part in a group project. Gamification often includes challenges that require practice through repeating trial and error that eventually leads to learning and mastery. Failure

should not be forbidden, as it is a step towards mastery. A positive relationship with failure can be maintained with rapid feedback and by keeping the stakes for learning low. [Buckley & Doyle, 2016]

2.7 Designing gamification

Gamification should not be implemented to every system and situation. It should be implemented only to act as a source of motivation. Gamification is about motivating people but trying to motivate someone who is already intrinsically motivated may result in decreased motivation. A well-built gamified e-Learning system can make a training program much more appealing to engage with. Sadly, gamification is not always implemented well enough for any of its perceived benefits to make a difference. One reason for poorly implemented gamification could be that there is not enough proof of its benefits, making it seem like a risky and experimental strategy in which companies are not ready to invest in. To counter this, the goals of gamification should be carefully planned before gamifying a system. If an e-Learning system is gamified, the goal of the gamification can be simply to increase timely homework submissions. The goal could also be to improve student grades or collaborative skills through overcoming obstacles by working as a team. Acknowledging and prioritizing these different goals can alleviate evaluation and greatly improve the development process of the gamified system. After a clear goal has been set, the target group must be taken into closer consideration. By specifying the target group, it will be easier to deliver more specific and meaningful information to that particular group. It is also important to design the game design elements to be appealing to different player types. [Kim, 2015b]

Failed attempts at gamification usually suffer from poor design and the meaningless addition of game design elements. According to Pasterfield [2014], gamification should never be expected to fix a flawed process. Implementing gamification incorrectly is just as bad as ignoring goals or not even conducting training at all. Pasterfield proposes that gamification should only be applied to an already successful process or learning platform. Deci and Ryan [2004] report similar findings. According to them, gamification is a concept that should only be applied to a system or process that is already functional by itself because the goal of gamification is only to get people motivated and more engaged to the content. Game design elements like points, levels and badges are shallow rewards that offer a relatively easy way of creating short-term engagement but fail to engage the users in the long-term. Some gamified systems

go as far as to offer real-world rewards and benefits for good performance to elicit long-term motivation. However, this proposition can be a very costly endeavor.

According to Nicholson [2014], gamification designers need to create systems that are based on real-world settings and engage the players in authentic ways. This means that gamified systems should be built to help players engage with existing communities and information resources that connect with the real world. Players will eventually become more adept at playing the gamified system, reducing engagement with the gamification aspect and shifting focus more to the real-world context. Trapping players into meaningless gamification like reward grind, for example, is not an encouraged design decision. Instead, the goal of gamification should be to help the players find the real-world contexts that are meaningful [Nicholson, 2015]. However, gamification may not always lead to sustainable and favorable changes in behavior as the trainees become immune to the teaching methods brought by gamification, making the game design elements lose their effectiveness [Pasterfield, 2014]. Hamari et al. [2014] claim that the benefits of gamification can fade away gradually, especially for boring tasks. This may be due to a novelty effect: a gamified class can feel exciting at first, but over time the excitement expires. If gamification became even more popular, its appeal could decrease even faster.

The novelty effect could perhaps be counter-acted by implementing more meaningful ties to real-world contexts and by diminishing gamification, as suggested by Nicholson [2015]. Tying the gamified system closer to real-world could also lead to more sustainable changes in behavior as the context and meaningfulness of the training material becomes clearer to the player.

2.8 Critique

Gamification has been criticized for reducing game design elements into simple mechanisms that are used solely for attracting and exploiting customers/players. Mechanisms like leaderboard rankings and badges are often implemented for even the simplest tasks to make the player feel gratified [Ruffino, 2014]. Implementing these simple mechanisms for gratifying the players reduces the act of playing to a stimulus-response experience instead of appealing through more complicated and meaningful design decisions. Gamification has gained a rather bad reputation among the people studying video games as it is seen merely as a shallow tool for marketing and business

interests. Gamification seems to work only according to the people who have been inventing and promoting it. [Fuchs et al., 2015]

Hamari et al. [2014], reviewed existing empirical studies to find out if gamification actually yields favorable results. They conceptualize gamification by breaking it into three parts: 1. Motivational affordances (game design elements), 2. Resulting psychological outcomes and 3. Behavioral outcomes.

With this concept, the authors focus on examining what game design elements have been implemented and what psychological and behavioral outcomes have been measured. They also investigate what kind of services have been gamified and how the effects of gamification have been studied. Behavioral outcomes were studied with experiments, statistical analyses, and survey methods. The results for psychological outcomes were collected using interviews or questionnaires. The results of the empirical review reveal that gamification does, in fact, produce positive effects and benefits. According to their research, most of the reviewed publications reported good results concerning some of the game design elements. All of the education and learning related studies reported positive outcomes for increased motivation and engagement. However, these same studies also pointed out some negative findings such as task evaluation difficulties, increased competition, and flawed game design features. The authors say that even though the results seem mostly positive, it is necessary to note that many of the quantitative publications were descriptive in nature and therefore the effects of gamification were not inferential in those papers. Some studies, on the other hand, reported mixed results arguing that gamification may not be suitable for utilitarian service environments and that the positive effects of gamification may be temporary due to a novelty effect. The research also shows mixed results concerning the actual implementations of the gamified systems. Some gamified experiences that were found positive, were also found out to be negative to some users. [Hamari et al., 2014]

3. E-LEARNING

The story of computer-based training (CBT) dates back to the 1970s, before the time of personal computers, when training software were bundled with expensive minicomputers and workstations. With the later popularity of personal computers in the 1980s, like the Apple II and the Commodore 64, CBT found its way to the classrooms. The educational programs of this era featured cartoon characters to make learning more appealing to children. Educational programs like Reader Rabbit and Rocky's Boots helped children learn reading, writing and solving logic puzzles. In 1990, with the rapid advancement of technology and falling prices, personal computers found their way to homes. At this point personal computers had become multimedia capable devices, with high quality displays and sound. The market for educational games and software was thriving [Michael & Chen, 2005]. In 1999, a company called CBT Systems coined the term e-Learning (electronic learning). The term can be spelled in various ways. Some of the most used spellings are e-Learning, elearning, eLearning, online learning and web-based learning. The purpose of the new term was to differentiate the old style CBT software from the new online training platforms. Inherently, modern e-Learning is CBT, but with lessons and study modules delivered over the Internet [Shepherd, 2012]. The rise of e-Learning was initiated by the rapid expansion of the Internet and the advancement of web-based technologies. There was no longer a need to deliver CBT courses via physical mediums like video cassettes or CD-ROMs [Nichols, 2008].

Companies have integrated a wide range of e-Learning activities to their employee training. Employees engage in learning activities such as taking part in interactive online sessions, completing assessments available in the organization's learning management system, viewing course related videos online, posting comments to online chat forums, and listening to online lectures or instructions. [Laskaris, 2015]

This chapter introduces e-Learning, synchronous and asynchronous learning (3.1), challenges of e-Learning (3.2), benefits of e-Learning (3.3) and the Kirkpatrick model for evaluating e-Learning (3.4).

3.1 Synchronous and asynchronous learning

Depending on the use-case, e-Learning can encompass two types of learning: synchronous learning and asynchronous learning. Synchronous learning refers to learning, which happens with multiple trainees engaging in learning at the same time. The participants can exchange ideas and information with each other to work collaboratively. It helps students learn from their peers as they need to listen and interact with them. Live sessions over the internet are a good example of synchronous learning. The sessions can be virtual classrooms, chat rooms or video calls with live teacher instruction. Unlike synchronous learning, asynchronous learning does not require participants to be online at the same time. This form of learning is better suited for students who want to proceed at their own pace or want to complete their work in a more flexible time frame. Asynchronous learning lets students revisit and repeat course material without giving them a fear of holding back the class. [Al-Asfour, 2012]

3.2 Challenges of e-Learning

E-Learning brings many advantages to teaching and learning but it also has its challenges. Providing well planned and high-quality study material can be challenging because the quality and successfulness of e-Learning depend on easy-to-use technology and good pedagogy. Naivety or effusive enthusiasm by the instructor often results in ineffective e-Learning [Nichols, 2008]. Over-reliance on self-study can also be a challenge for e-Learning because people usually like to interact with experts and peers [Shepherd, 2012]. The lack of face-to-face communication can make some students feel isolated and left behind, leading to lower assignment submission rates. These problems can be addressed to some degree by arranging either real or virtual classroom meetings with the teachers and students. Teachers should also be available by email or instant messages within the e-Learning application to increase communication and mitigate student isolation [Al-Asfour, 2012].

One of the biggest challenges is the cost of creating e-Learning courses and systems. Designing and developing an effective e-Learning system from the ground up often requires a huge amount of resources. Company executives and teachers are seldom familiar with the technology, learner requirements or instructional design methods needed to conduct an e-Learning course. Because of this, e-Learning projects are often outsourced to development companies that specialize in it [Kapp, 2003]. Even though developing a brand new e-Learning system may be costly, it can later turn into profit.

Effective e-Learning at the workplace can save the time of employees and reduce the costs of training significantly [Overton & Hills, 2009].

3.3 Benefits of e-Learning

Online courses allow great flexibility and personalized content for students. It often lets students progress at their own pace and engage with the learning material online from any device. This makes e-Learning more compelling for non-full time students. It also provides teachers with useful assessment tools. The involvement of the teacher can change regarding the e-Learning material, most often e-Learning systems give immediate feedback and results as the student progresses through it [Ross et al., 2010]. E-Learning has become popular and more accessible as the number of smartphones and other Internet-capable devices have increased, allowing easier access to online training material. Modern technology has also enabled e-Learning courses with the ability to have more varied and complex multimedia content that enriches learning and improves student motivation [Zameer, 2010].

Computers and the Internet have proven to be very valuable tools in the classroom but educational games are still looked at skeptically. Skeptics demand proof of the alleged value games bring to education compared to traditional methods. According to Michael and Chen [2005], serious games have the potential to explore learning material more profoundly than traditional lectures, training videos or even books. Serious games provide an immediate response to the learner, giving the player valuable feedback about his or her decisions. According to Hanus and Fox [2015], games are intrinsically motivating and thus it is logical to assume that introducing game design elements into education should increase intrinsic motivation of students. The implementation of game design elements should be done carefully though because the additional rewards and competition introduced by gamification have been demonstrated to decrease intrinsic motivation. The authors explain that the decrease in intrinsic motivation occurs because of competition and tangible rewards like badges. Achieving badges or other rewards may shift a person’s motivation from intrinsic to extrinsic if the interest of the person is towards earning a reward, rather than the goal of learning the material. Based on these findings, using rewards, badges and other incentives may decrease intrinsic motivation among those who are already interested in learning. Students who are not initially interested may become intrinsically motivated because of rewards and other incentives.

Dicheva et al. [2015] reviewed 34 empirical studies related to gamification of education. From these studies, they extracted and categorized different game design elements and gamification contexts. In some of the case studies visual status, like ranks or badges, do not affect student grading but is rather implemented for the sole purpose of triggering competitive behavior among the students. Students can achieve badges as rewards by completing or taking part in various tasks. Just like the study conducted by Hamari et al. [2014], their research reveals that the majority of the case studies reported positive results from their experiments with gamified educational content. The results showed that student participation in online forums and other learning activities was significantly higher. Their study concludes that gamified activities were more motivating and easier to learn compared to non-gamified activities. The study also revealed some mixed and suggestive results about the implementation of gamification in some of the cases. Some point out that motivational elements were not properly implemented, and that a strong teaching staff is required to design the gamified assignments properly. These remarks correspond with the findings of Nichols [2008] about e-Learning's challenges, hinting that the design or pedagogy of the gamified system may have been flawed or incomplete. One of the case studies reported negative experiences regarding a gamified software engineering course. In their study they report that the students were not ready for autonomy and mastery was seen unimportant. The students reported that sufficient preparations for project work and the exam seemed unachievable. Dicheva et al. [2015] suggest that the transformation from traditional to gamified environment should be done slowly and that the gamified elements should not be explicitly named.

Hanus & Fox [2015] conducted a research where their aim was to find out how game design elements affect student motivation and ability to learn. They recruited 80 students and split them to take part in a gamified and a non-gamified course. Both courses included assignments, exams, and lectures. The gamified course included badges, leaderboards, and other incentives. The authors anticipated that leaderboards may lead to competition, which can have negative effects on learning and satisfaction. The research revealed that their prediction was right, the implemented game design elements did not improve educational outcomes. The students who took the gamified course scored lower in the final exam than the students who took the non-gamified course. This suggests that rewards and competition can have a negative impact on motivation and learning.

In their research, Buckley & Doyle [2016], try to uncover how people with different learning motivations are impacted by gamified learning activities. They

conducted the research by measuring intrinsic and extrinsic motivations of the participants. The gamified system they used for the research is a prediction market simulation that contains game design elements such as leaderboards and the natural uncertainty of the prediction market. Their research shows that participation to the gamified system correlated positively with intrinsic motivation. This could mean that the participants were initially interested in learning and therefore enthusiastic towards the learning activity. They also noticed that extrinsically motivated students were motivated by identification, hinting that the activity had some personal importance for the students. The results showed that participation did not correlate well with introjected and external regulation. The reason for this was left uncertain but the authors suggest it was caused by the gamified learning environment and the rewarding methods. This would explain the negative effect on external regulation if the participants were not motivated by the extrinsic rewards. The negative effect on introjection could be caused by the perceived difficulty of the prediction market and the pressure of learning it. Their research concludes that gamification is effective for intrinsically motivated students who are either eager to learn or motivated towards stimulation.

3.4 Evaluating e-Learning

It is important to evaluate the effectiveness of e-Learning programs because ineffective or outdated training may lead to reduced product or service quality and be an unnecessary financial expense. It is also important to know if the trainees are actually learning and if they transfer that new knowledge into job behavior. The results of an evaluation must turn out positive and gratifying, therefore much care and planning must go to designing the training program. A standard model for evaluating the success and effectiveness of training programs was devised in 1950 by Donald Kirkpatrick. The so-called Kirkpatrick model consists of four levels: reaction, learning, behavior, and results. [Kirkpatrick & Kirkpatrick, 2006]

3.4.1 Reaction

The reaction level measures how participants react to the training. Evaluation at this level focuses on eliciting student satisfaction. Positive or negative reaction towards the training can help in shaping future programs. Positive reaction alone does not ensure learning and participants who give negative reactions will most likely not be motivated to learn by attending the training.

3.4.2 Learning

The learning level measures the extent to which participants have learned from the training. Learning has been beneficial if attitudes are changed and skills and knowledge are increased. To properly evaluate this level, it is important to know the specific objective of the learning program.

3.4.3 Behavior

The behavior level refers to the change that has occurred since the participant attended the training. This level evaluates how the trainees have changed their job behavior and habits because of the training. However, it is impossible to predict when the changes would manifest since the trainee may not apply the learned knowledge or skills immediately. After deciding to use the new knowledge or skill, the trainee may come to a conclusion of liking or disliking the new behavior. External factors, like time restraints, can also hinder the usage of the new behavior.

For a change of behavior to occur it is necessary that the person is willing to change. The person must also comprehend the purpose of the training and know how to maximize its benefits. These two requirements can be fulfilled by teaching the essential skills and knowledge and by creating positive attitudes towards the wanted change. The training must also be held in a positive climate where the trainees do not feel pressured by the supervisor or the manager. They describe five different training climates:

1. Preventing: The manager forbids the participant from doing things the way they were taught in the training.
2. Discouraging: The manager gives out an impression that he or she does not necessarily like the changes brought by the training. The boss may even show bad example by not following the training him or herself.
3. Neutral: The manager ignores the training program and continues business as usual. The boss is indifferent to changes brought by the training, as long as the job gets done.
4. Encouraging: The manager encourages employees to learn and apply the skills and knowledge brought by the training. The boss wants to help the employee to apply the new skills into real-world job behavior.
5. Requiring: The manager knows what the employee has learned and makes sure

that the new skills transfer to the job. A contract can be made where the employee agrees to certain behavior after the training.

If the training atmosphere is preventing or discouraging, there is very little chance that the employee will transfer the training to job behavior. If the atmosphere is encouraging or requiring, the amount of behavioral change is dependent on the person's will to change and the understanding of the subject.

The training should also motivate the trainees with intrinsic rewards to achieve a greater impact on the positive emotions towards the training. As mentioned in the motivation chapter, intrinsic motivation is reinforced by the feelings of competence and the satisfaction of finishing a demanding task. Extrinsic rewards can also give an encouraging feeling by offering money, praise from the manager and recognition by others. This makes it very likely that the employee will transfer the learned skills into job behavior. The amount of change by encouraging and requiring conditions are dependent on the first and second condition.

3.4.4 Results

The results level evaluates the overall impact and results of the training. The results may include improved production efficiency, better quality, job safety or higher profits. Results are the reason why training programs are made and it is hoped that the results will turn tangible in time. Some results are very difficult to assess like the improvement on leadership, communication, motivation, decision making, empowerment or managing change.

4. EXAMPLES

This chapter introduces four educational applications that have been gamified with various game design elements. The fourth example is a paid service that offers a platform for easy gamification of existing applications.

4.1 Lifesaver

Lifesaver [2017] is a crisis simulator that teaches players the basic steps in responding to a situation where someone suffers a cardiac arrest or choking. The simulator fuses acted live-action film with interactivity and gamification. The Lifesaver simulator is available for free online and can also be accessed with a mobile app (Figure 3).

The Lifesaver simulator throws the user into interactive and immersive scenarios, where he or she has to help a person who is in a crisis. Each scenario has its own characters and story. The player has to make right decisions within a certain time limit to save a life. New scenarios get unlocked as the player advances through the game and gain points by doing the right decisions (Figure 3). The game also features a competitive aspect, as game progress can be shared with others online.

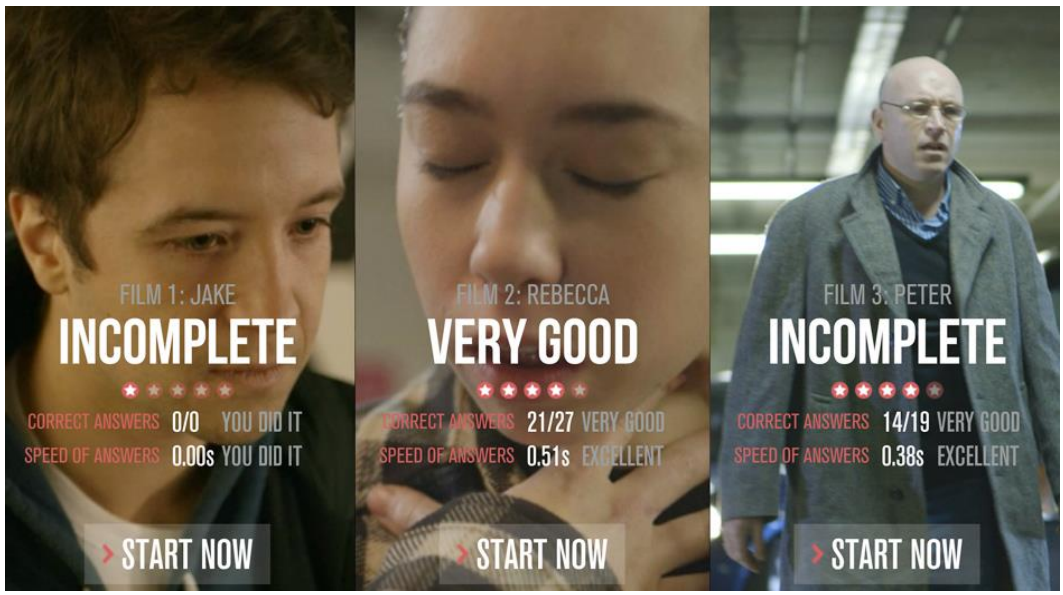

Figure 3. Three different ending screens showing feedback [Lifesaver, 2017].

4.2 Duolingo

Duolingo [2017] is a service that offers free language courses that can be accessed via a web-browser or a mobile app (Figure 4). It provides its users with easy-to-understand language courses and assessment exams. The courses include written lessons and speaking practice for advanced learners. In 2016 Duolingo offered 68 courses in 23 different languages. The mobile app is available for all the common smartphone brands with up to 150 million registered users worldwide. [Solis, 2015]

The gamified aspect of Duolingo includes different mechanisms for conveying the progress of the learner. Progress is shown in a form of a skill tree (Figure 4) which the learner progresses through. A skill is learnt after all of the lessons associated with it are completed. Users gain experience points for answering questions correctly and lose one point for each wrong answer. Lessons are validated after the user reaches 10 points. Each skill also has their own strength bar which indicates the system's estimate of how fresh the lessons are in the learner's memory. The strength bars start to fade after a certain duration of time, giving the user a hint to revisit the lesson. The system analyzes users strengths and weaknesses to use a data-driven approach to more customized and personal learning experiences. [Solis, 2015]

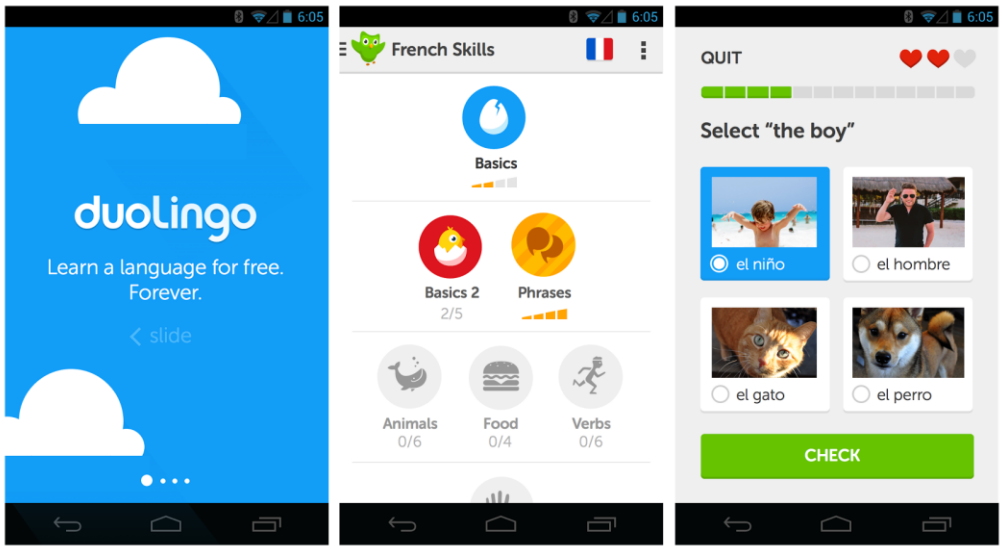

Figure 4. The main screen, skill tree and the strength bar [Duolingo, 2017].

4.3 McDonald's Till Training Game

McDonald's Till Training Game, is designed to be a safe environment for practicing the till without the customers getting frustrated. The aim of the training is to simulate real-world situations and develop the trainee's speed and precision operating the till. The game was designed to target the trainee's skill and knowledge while also being addictive and fun to play. The game puts the trainee into real-world situations, where he or she has to take customer orders, converse with the customer and operate the till while being timed. Additional gamification elements like, lifelines; bonuses and badges were implemented to further engage the trainee (Figure 5). [Kineo, 2014]

The results of the training game were really positive. The game had 145,000 visits within its first year and 85% of the trainees reported that the game had taught them practical knowledge about the new till system and that the game will continue to be useful in the future. The business gains brought by the new gamified training environment were also impressive. Till service times were reduced by 7.9 seconds which resulted in an increase in customer spending (average increase of £18,000 per restaurant). The game received recognition by winning silver and gold awards in the 2014 LPI Learning Awards and 2014 E-Learning Awards respectively. [Kineo, 2014]

Figure 5. Screenshot of the McDonald's till training game [Kineo, 2014].

4.4 Badgeville

Badgeville [2017] is an online service that offers a premade platform for easy gamification. The platform has built-in support for badges, points, leaderboards and visual elements like avatars and progress bars (Figure 6). It also comes with a so-called *Reputation center* that keeps track of individual learning activity and accomplishments, turning them into personal value and reputation. [Carr, 2014]

Kaplan University has gamified many of their courses with the aid of the Badgeville service. Feedback from the initial pilot group was very promising, leading to further testing with a bigger group of 700 students. Results from a gamified programming course showed a 9% increase in grades, probably due to higher participation rate on seminars and forums. Students were also provided with additional challenge assignments that pushed them to work harder. The number of students who failed the course dropped significantly by 15.76%. [Carr, 2014]

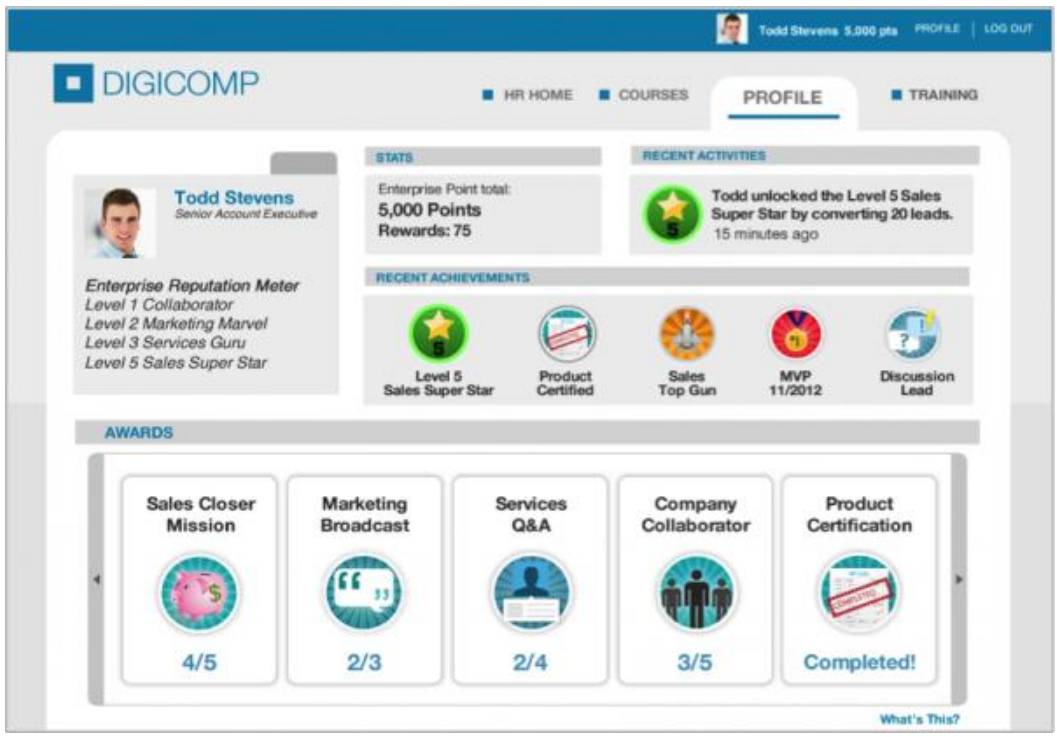

Figure 6. An example of a Badgeville product [Badgeville, 2017].

5. CASE STUDY

This chapter introduces the gamified training system that is used as a case study in this thesis. The gamified training system will be referred to as the game going onward. The game was developed for an international company that was looking for new and interesting ways to train their employees. The game is based on a maintenance manual and its main goal is to teach the contents of the maintenance manual in an interactive and motivating manner. The game adds additional value and appeal by putting the player into immersive 360-degree panoramic photographs that contain gamified content. The game works great on any modern web-browser, making it easily accessible for the employees. The description and data regarding the case study is from a pilot version of the game that was developed as a proof-of-concept.

The development team consisted of four people with varying responsibilities such as project lead, photographing, image editing, game design, graphic design, content creation, server-side and client-side programming. The author of this thesis programmed the client-side game logic and designed some of the graphics. The development process was carried out in close collaboration with the training division of the client company. The game was not developed to gamify a previously existing product or service, it was rather developed to enhance and function alongside existing employee training. Following the guidelines of design science, the game can be considered to be a viable and purposeful artifact that has been developed for a relevant business problem [Hevner et al., 2004].

The images and terms describing the main concepts of the game have been changed for the sake of this thesis as the client company wants some of the information to stay classified. All of the images in this chapter have been fabricated to resemble the actual game with minor alterations. Descriptions regarding the used game design elements remain accurate.

5.1 Description of the game

The game is fully web-based and created using traditional web development languages. It was developed mainly for mobile devices like smartphones and tablets but it works well on any device with a modern web browser. It is hosted on a web-server and requires login. After logging in, the player is sent to the main screen. From the main screen, the

player is able to access the leaderboards and account information. The game is split into two self-contained modules that are designed to follow the procedures of two separate maintenance visits. The game starts when the player selects the wanted module from the main screen of the game. The game world itself is built to run on a panorama viewer that lets the player look around 360 degrees and zoom freely (Figure 7).

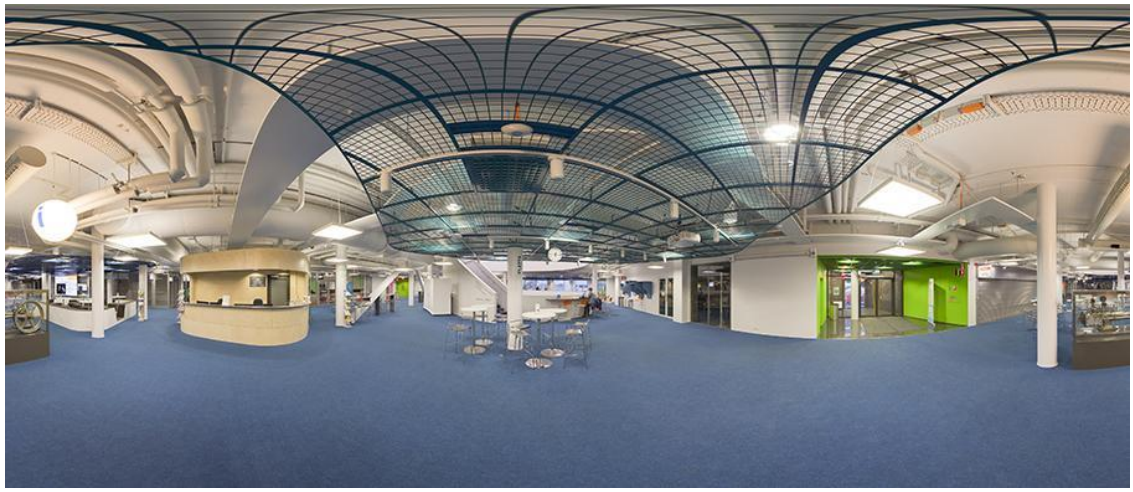

Figure 7. An example of a panoramic image.

The game world consists of multiple panoramas that are linked together, giving the player a sense of traveling within a bigger location. The individual panoramas are game areas that are filled with different tasks that the player must complete to travel to the next area. The game consists of 12 panoramic images which were all shot in actual working environments to deliver a more plausible and realistic experience. For this reason, the game can be considered to be a serious game that simulates real-world locations and working methods. The main mechanics of the game are expressed through tasks that are visually presented as hotspots that can be interacted with by touching or clicking. The game progresses in a linear fashion and does not allow the player to interact with hotpots that are not related to the current state of the game. The different types of hotspots are question, tool, movement, and warning hotspots.

Question hotspots open up question forms that are related to the current task and level. The question forms consist of single and multiple choice questions that give instant feedback after submitting the form. The feedback is given by highlighting wrong answers with red and right answers with green. A feedback text is also given, telling the player why the submitted answer was correct or incorrect (Figure 8). The question hotspot icon

changes depending on the state of the question. The default icon is blue but when the player clicks on it the state changes to incomplete because the hotspot is initiated but no answer has yet been given. The incomplete state stays if the player closes the question form without answering. The color of the hotspot is set to green after the player has completed the question successfully.

Tool hotspots are tasks that require a certain tool to be selected. To interact with a tool hotspot, the player must use the *tool belt* to select the right tool for the task (Figure 9). Figure 10 shows a completed tool hotspot giving three points and a feedback message that appears in the top part of the screen. Some tool hotspots open up a continuation question after successful completion. Tool and question hotspots have three visually distinguishable states: normal, unfinished and completed. The unfinished status is given if a wrong tool is used or a question is answered incorrectly (Figure 11).

Figure 8. An example of a question form.

Figure 9. The tool belt is visible in the bottom of the screen.

Figure 10. Selected tool is used on a tool hotspot. Score and feedback are given.

Figure 11. Normal, incomplete, and complete icons for tool and question hotspots.

Movement hotspots do not require any special attention from the player as they serve only as triggers for loading the next area. In most cases, the final hotspot that ends the current area is a hidden movement hotspot that becomes visible only after the player has completed all tasks. Warning hotspots are placed in dangerous areas where the employee must take extra care. Interacting with a warning hotspot opens up an information window explaining why the area is dangerous and how the employee can prepare for the danger. Movement hotspots and warning hotspots disappear after interaction but all other hotspot types change their visual presentation according to their status.

5.2 Used game design elements

The panoramic environments and interactive hotspots give the application a game-like aesthetic. Other game design elements like points, badges and leaderboards were also implemented to create more compelling game dynamics. The scoring system was designed so that nobody could get a negative score or fail the game entirely, giving the player freedom to fail. By completing a task without errors, the player gets full 3 points but every mistake drops the task's full score by a point to a minimum of 1 point. All of the tasks in the game can be completed, even if the player has failed them earlier. After completing a module, the player can choose to send his or her score to the leaderboards. The leaderboards are separated into three different leaderboards, two for each module and a combined one that shows the sum of both modules.

Other game design elements that were implemented with varying success were story, progress bars, rapid feedback, and badges. Earlier versions of the game had a made up story that was also supposed to act as a directive for the player. Results from preliminary testing indicated that the story was pointless because all of the test subjects had skipped it. The story was replaced with a more appealing, illustrated dialogues that show people talking. The illustrated delivery of the narrative was well received and preferred over the plain story (Figure 12).

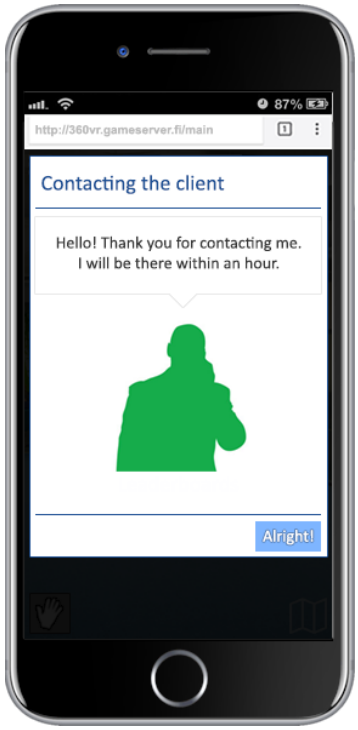

Figure 12. An example of a dialogue.

Two progress bars were implemented to give the player a sense of progression. The first progress bar was set to measure the progression in the player's current area and the second progress bar to show the overall progression within the module. Badges were not fully implemented in time for the pilot version. Badges appear only visually when a certain condition is met but they are not saved in to the player's profile. Recalling badge data is therefore impossible next time the user logs in. This makes the badges act only as visual feedback instead of being permanent rewards like they usually are in games and gamified systems. The badges were designed mainly to reward the player for completing a predefined amount of tool and question hotspots. Other badges are awarded for finishing all modules, completing a module without errors, and spinning around in one area for approximately 5.5 times. Badge visualization and descriptions are further explained in figure 13.

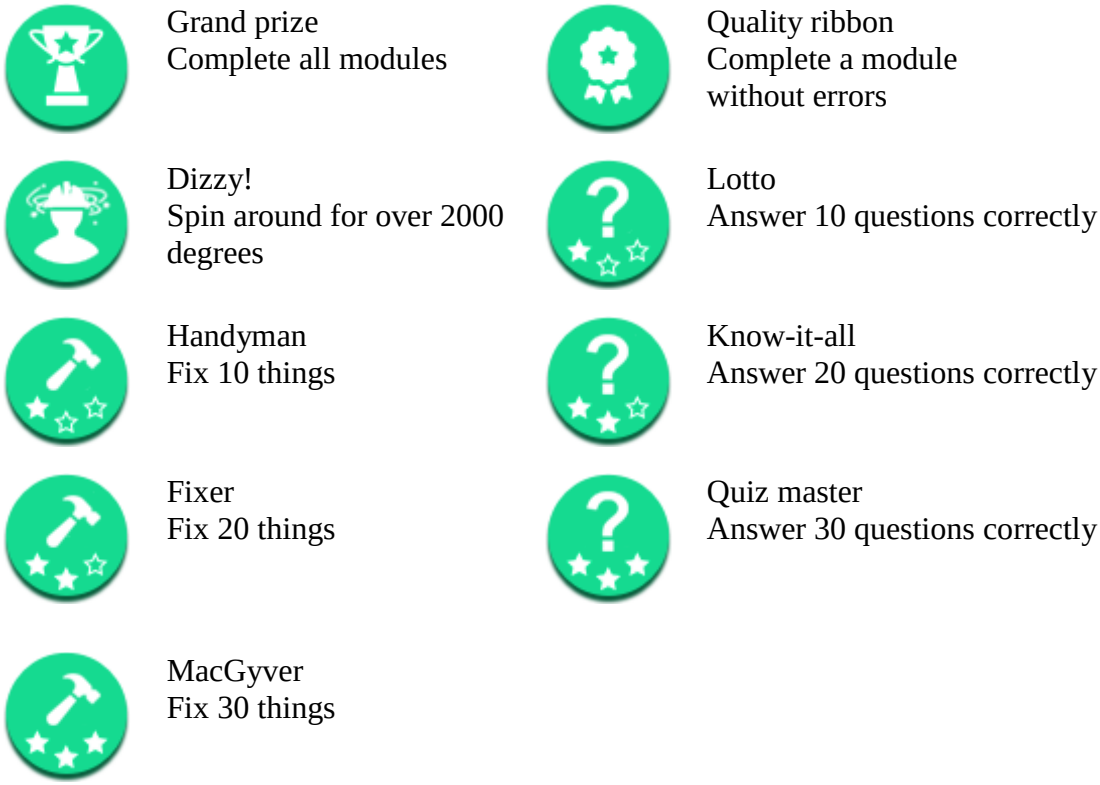

Figure 13. Badge icons, names, and descriptions.

6. RESULTS

This chapter introduces and analyzes the data that was gathered from international testing sessions. The aim of this chapter is to determine the success of the game and to contribute research data for future evaluations of the usefulness of gamified training in general. The pilot version of the game was presented in multiple testing sessions that took place in five different countries (Figure 14). Approximately 200 employees participated in the testing sessions, with an average group size of 10 people at a time. Data regarding the game was gathered from a total of 84 participants who filled out a question form after testing the game (Appendix A).

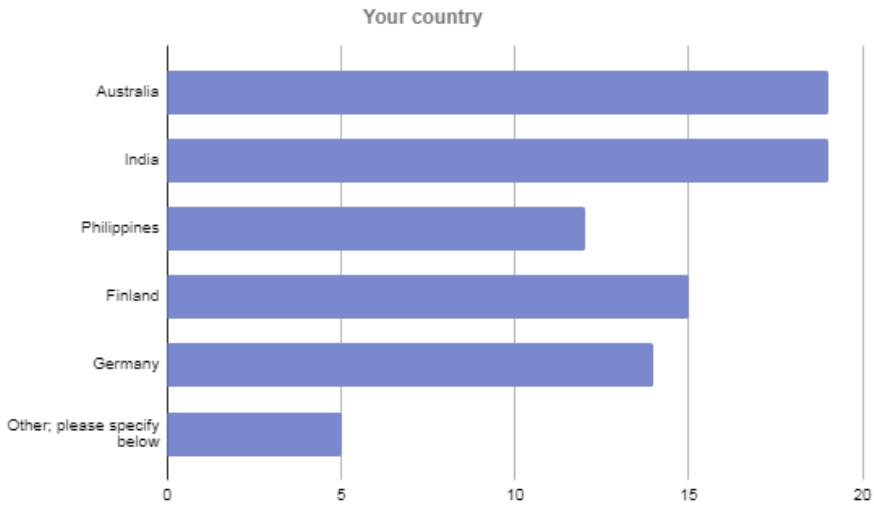

Figure 14. Test user nationalities.

The question form consisted of 20 questions and a section for general feedback (Appendix B). Most of the questions were predefined by the client company and two questions were added on request by the author of this thesis. All of the questions can be seen in the list below with the added questions being numbered 12 And 18.

1. Your country
2. Name of the frontline or the global unit if other
3. What is your primary work role?
4. What is your primary competence area?
5. How long is your work experience in your role?

6. How long did you play the game? (minutes)
7. What device did you use to play the game?
8. Did you have any browser or network related problems when playing the game or when logging in?
9. How did the game work on your device?
10. If problems occurred (questions 8 and 9), please describe
11. The process was clear to follow (1-5)
12. 360 environment makes the maintenance tasks realistic (1-5)
13. Questions and tasks were good (1-5)
14. Learning content was useful to me (1-5)
15. Difficulty level (1-3)
16. Instructions were good and informative (1-5)
17. Navigating in the game was easy (1-5)
18. Game elements (points, badges, leaderboard) motivated my learning (1-5)
19. What was your overall impression of the game? (1-5)
20. Would you recommend this game to your colleague? (Yes/No)

The first six questions are for gathering the background information of the participants. Some details regarding the trainee's unit and work role have been purposefully left out from the results. Questions 7-11 are for assessing the technical implementation and quality of the game. Rest of the questions help to evaluate the content of the game, especially questions 13-15, 18 and 19 which can be used for evaluating the game based on the reaction level of the Kirkpatrick method. Questions 13 and 14 were answered by 83 participants instead of 84 like the rest of the questions. The full set of data can be found in Appendix C, which shows all of the data in relation to each participant.

The results from question three show that 73.80% of the participants were from the intended target group. 46.43% of the participants reported that their working experience is over five years (Figure 15). 35.71% of the participants with more than five years of experience were from the target group.

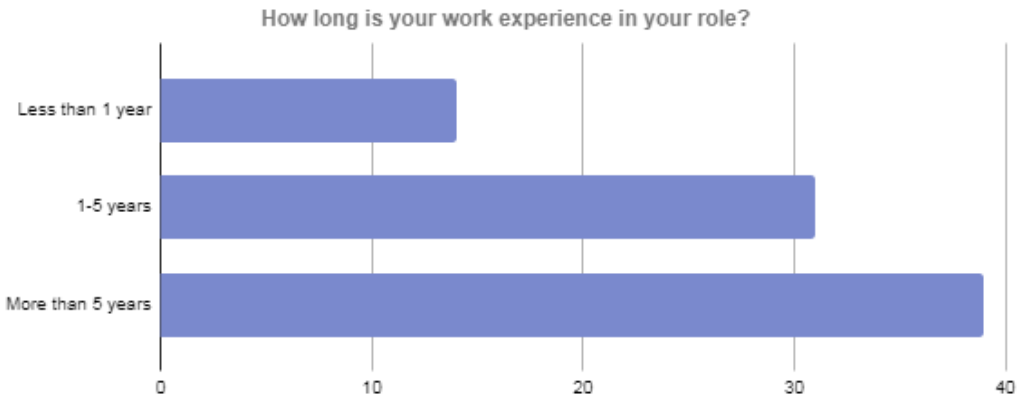

Figure 15. A chart showing the work experience of the participants.

76.19% of the participants played the game for 15-30 minutes or longer. This indicates that the participants may have been motivated enough to finish both modules (Figure 16). 82.14% used mobile phones for playing the game, which shows that the focus on mobile touch devices was the right course for development.

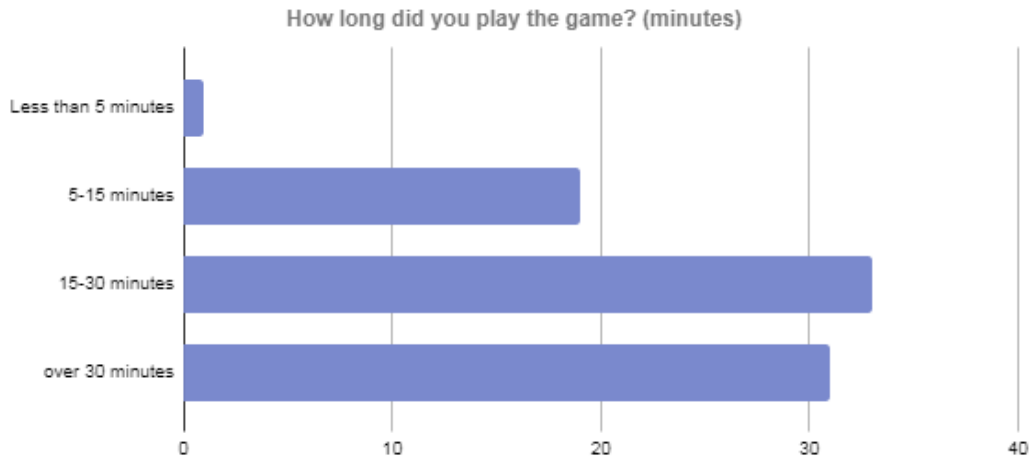

Figure 16. A graph showing the amount of time participants spent playing the game.

According to Kim (2015b), many attempts at gamification fail because of poor implementation of the system and the game design elements. The game in this particular study was tested at its pilot phase and not all features were yet fully polished and ready. Even with the minor pilot phase deficiencies, 80.95% of the participants reported that the game worked well and 14.28% reported that some problems had occurred (Figure 17). However, the results also show that some of the participants who reported that the game worked well, also reported some problems. 30.95% of the participants reported that they

had network related issues and 3.57% were completely unable to log into the game. From the high percentage of participants who reported that the game worked well, it can be assumed that the troubles with network connection were not too detrimental to the overall experience.

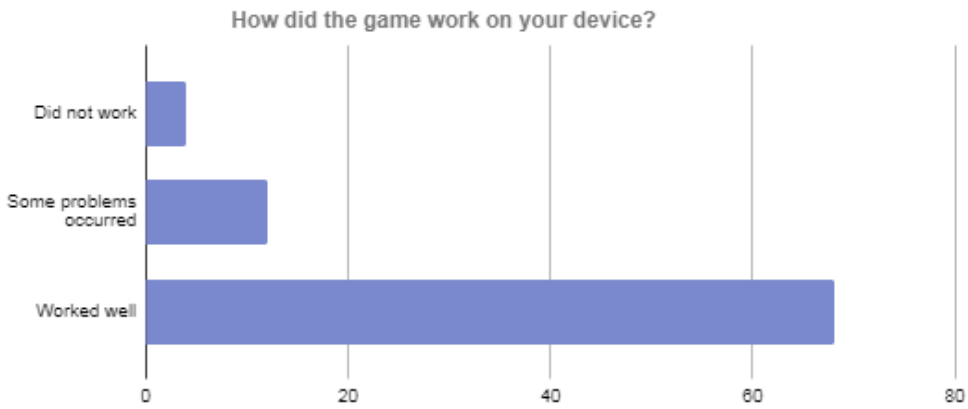

Figure 17. A chart showing the functionality of the game.

Question 10 and the general feedback section asked the participants to leave free-form feedback. 19.04% of the participants answered question 10 and 63.09% gave general feedback. 16.66% of the participants gave feedback that is explicitly positive and 11.9% gave positive feedback with additional improvement suggestions or criticism. The combined data from question 10 and general feedback also reveal problems that occurred most frequently: sluggish gameplay, unclear instructions, and confusion with tool logic.

Participants who reported sluggish gameplay also reported problems with the network connection. This indicates that the game may not be suitable for multiple concurrent players within the same network. It is also important to note that 10.83% of the participants who played the game for 15-30 minutes or longer reported performance issues with the network or the game. This could mean that the overall play time was longer because of the slow loading times. Sluggish gameplay may also refer to the capability of the device rather than the network.

Game instructions were rated with an average of ~3.6 and 10.71% of the participants mentioned problems with unclear instructions in the general feedback section. However, the free-form reports on this matter are more or less ambiguous. The language of the game was English which may have been a problem for some of the participants. The data does not make it clear how many of these responses are related to

the tool logic. Only 4.76% of the responses regarding unclear instructions are clearly not related to the tool logic. All of these responses say that the game should provide more information about the tasks. This could be fixed with a button that opens up a window that shows information related to the tasks within the current game area. A relevant page from the maintenance manual could also be added. 13.09% of the participants reported that the game did not provide enough information about the tools and the way they should be used. All of the participants who reported these issues were from the intended target group. The problem was most likely with the logic that is required when choosing a tool and interacting with the tool hotspots. The game expects the player to make the correct tool selection before interacting with a tool hotspot. However, some tasks do not require a tool in real life but in the game the *hand* tool must be chosen. This most likely made the logic very confusing when multiple different tool hotspots were present in one game area. The tool logic was later changed completely based on this feedback. A short tutorial that introduces all of the tools was also implemented. The later version does not require the player to choose a tool beforehand. Instead, the tool belt appears only when interacting with a tool hotspot that actually needs a tool. However, the later version was never tested as extensively as the pilot version and there is no data for evaluating the usefulness of the new tool logic.

Even with these problems the participants found the overall process to be clear to follow with an average rating of ~3.9. The 360 degree game environments were rated to be realistic with an average of ~3.8. Usefulness of the learning content was rated with an average of ~3.7 and 83.33% of the participants reported that the difficulty of the game was suitable (Figure 18). Questions and tasks were rated with an average of ~3.8. 73.68% of the participants who gave a rating of 3 or lower were participants with more than five years of experience.

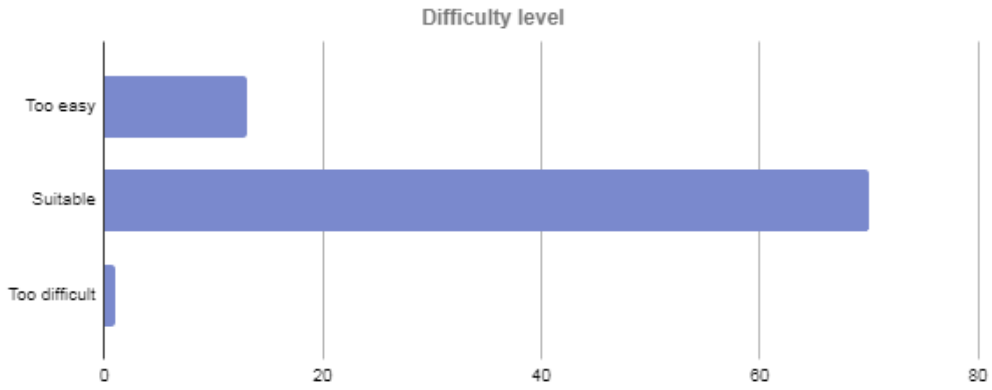

Figure 18. A graph showing the difficulty level of the game.

According to observations at the testing sites, some participants did not really care about accumulating points from tasks and questions. These observations can't be fully proven based on the data but 3.57% of the participants reported that there should be more consequences for wrong actions. This may indicate that these participants were either not motivated by mastery or points and leaderboards were not clearly presented and emphasized. However, game design elements like points, badges, and leaderboards were rated to be motivating with an average of ~3.8. This may indicate that the visual presentation and feedback produced by badges and points was more influential than the actual value of them. It may also indicate that achiever type players were motivated by these game design elements. This finding correlates with the description of informational rewards [Deci et al., 1999], hinting that the feedback of getting points and badges fulfilled the players' need for competence.

Overall impressions of the game were positive. 58.33% of the participants gave the game an overall score of 4 out of 5 with the average score of ~3.9. 94.04% answered that they would recommend the game to their colleagues. All 5.95% of the participants who answered that they would not recommend the game to their colleagues had network or browser difficulties.

7. CONCLUSION

Gamification is an increasingly popular trend and it is understandable that companies want to make their training programs more appealing. The McDonald's Till Training Game is a great example of a well-made and highly successful gamified training solution. It simulates the usage of a touch screen based till computer and offers a great way for employees to learn without the fear of failing.

The game presented in this thesis also simulates real working environments but is limited in terms of simulating the actual work tasks. The game reduces work tasks to hotspots that the player must simply tap instead of interact with the game world in a more realistic manner. This may result in the game becoming boring and repetitive after some time. The game delivers its educational content through feedback messages, tool choices and question forms. The linear progression of the work tasks in the game also trains the player to follow correct procedures.

The game is based on gamified panoramic environments that may seem like a new and exciting technology which may result in a novelty effect. Even though the pilot version of the game was rather well received, it is important to note that some of the positive comments might be due to a novelty effect as suggested by Hamari et al. [2014]. However, it is impossible to determine how much the feedback was affected by it. It should also be noted that not all of the test participants were from the intended target group. This could mean that the educational value of the game was evaluated very differently by these participants.

The testing environments were open spaces where the participants could chat amongst themselves as they played the game. An observation was made that social interaction with peers during gameplay encouraged discussion and enhanced engagement and fun. This suggests that the game may work best in a synchronous learning environment where the players can interact and learn from each other. However, the results show that multiple players playing in the same network may cause problems. It should also be noted that the testing sessions included other e-Learning solutions as well. Testing multiple e-Learning solutions within the same session may have affected the results of the questionnaire in some way.

The client company uses the Kirkpatrick [2006] method for evaluating the effectiveness of their e-Learning solutions. The final evaluation of the game can be

conducted only after the game has been in use for some time and the four levels of the Kirkpatrick method can be measured. The reaction level can be measured based on the data from questions 13-15, 18, and 19. The other three levels of the Kirkpatrick method cannot be evaluated based on the data. The data shows that the initial reactions towards this type of training were mostly positive. However, positive reactions alone do not ensure learning. Evaluation of the learning level would have been possible if the questionnaire had contained questions about learned knowledge and skills acquired by playing the game. The usefulness of the content was rated ~3.7 which could mean that some of the participants may have learned something new. Even though it is impossible to fully evaluate the game for now, it should be noted that by organizing a big scale testing event, the client company may have already affected future evaluations. The testing sessions most likely created a more positive atmosphere towards the upcoming e-Learning solutions. This may become apparent especially on the reaction and behavior levels as the testing sessions have encouraged employees to use the new e-Learning solutions. Based on the results of the questionnaire and open feedback it is safe to assume that the test environment was not too controlled and that the participants were not under any kind of pressure.

The first research question of this thesis is about the effectiveness of gamified training in general. Evaluation of the game presented in this thesis remains incomplete and therefore its effectiveness cannot be fully proven yet. However, the feedback was mostly positive and the participants showed interest towards the game. This could mean that producing the game has in fact been a feasible strategy. The effectiveness of the game will ultimately be decided by how it is included into the set of existing training routines. The act of playing a game should always be voluntary, meaning that making the game a compulsory part of traditional training may result in decreased motivation towards the game [Carse, 1986]. Previous gamified training systems like the McDonald's Till Training Game has proven to be very effective. Evaluating it with the Kirkpatrick method shows that all of the four levels have produced positive outcomes. Trainees have reacted very well to the training and learned to serve customers more efficiently. Positive changes in job behavior have led to increased profits for the company. The till training game is a great example of effective gamification. The research conducted by Hamari et al. [2014] also reported favorable results regarding gamified education.

As for the second research question, the results show that the technical implementation of the game was good enough for most of the players to experience the

learning material within the game. Some participants had experienced various technical difficulties during the testing but the overall quality of the game was sufficient. The client company considered the pilot version of the game to be a success and therefore decided to continue its development.

References

[Al-Asfour, 2012] Al-Asfour, A. (2012). Online Teaching: Navigating Its Advantages, Disadvantages and Best Practices. *Tribal College Journal of American Indian Higher Education*, 23(3).

[Badgeville, 2017] Badgeville, world leading gamification service. https://badgeville.com/

[Bartle, 1996] Bartle R. (1996). Hearts, clubs, diamonds, spades: players who suit MUDs. In Schwartz, A. (Eds), *Journal of Virtual Environments*, https://www.hayseed.net/MOO/JOVE/bartle.html

[Buckley & Doyle, 2016] Buckley, P., & Doyle, E. (2016). *Gamification and student motivation, Interactive Learning Environments*.

[Brull & Finlayson, 2016] Brull, S., & Finlayson, S. (2016). Importance of gamification in increasing learning. *The Journal of Continuing Education in Nursing*, *47*(8), p. 372-375.

[Carr, 2014] Carr, D. (2014). *Kaplan expands gamification of online courses.* https://www.informationweek.com/software/kaplan-expands-gamification-of-online-courses/d/d-id/1110550?page_number=1

[Carse, 1986] Carse, J. (1986). *Finite and Infinite Games: A Vision of Life as Play and Possibility*. Free Press.

[Deci, Koestner & Ryan, 1999] Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. In Albarracín, D. (Eds.), *Psychological Bulletin*, 125, p. 627-668.

[Deterding et al., 2011] Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). *From game design elements to gamefulness: defining gamification*.

[Dicheva et al., 2015] Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in Education: A Systematic Mapping Study. In Chen, N-S., & Sampson, D. (Eds.), *Journal of Educational Technology & Society*, 18, p. 75–88. Retrieved from http://www.jstor.org/stable/jeductechsoci.18.3.75

[Dragona, 2015] Dragona, D. (2015). Counter-Gamification: Emerging Tactics and Practices Against the Rule of Numbers. In Fuchs, M., Fizek, S., Ruffino, P., & Schrape, N. (Eds.), *Rethinking gamification*, p. 227-251. meson press.

[Duolingo, 2017] Duolingo, Learn a language for free. Forever. https://www.duolingo.com/

[Solis, 2015] Solis, A. (2015). *Gamified Design Review: A In-depth Analysis Of Duolingo.*

[Fuchs et al., 2015] Fuchs, M., Fizek, S., Ruffino, P., & Schrape, N. (2015). *Rethinking*

gamification. meson press.

[Ferri, 2015] Ferri, G. (2015). To Play Against: Describing Competition in Gamification. In Fuchs, M., Fizek, S., Ruffino, P., & Schrape, N. (Eds.), *Rethinking gamification* p. 201-227. meson press.

[Guiney, 2015] Guiney, P. (2015). *e-Learning in the workplace: an annotated bibliography*. Tertiary Sector Performance Analysis, Tertiary, International and System Performance, Ministry of Education.

[Hamari et al., 2014] Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?—a literature review of empirical studies on gamification. In *System Sciences (HICSS), 2014 47th Hawaii International Conference,* p. 3025-3034. IEEE.

[Hanus & Fox, 2015] Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. In Heller, R. S., Nussbaum, M., Tsai, C-C. (Eds.), *Computers & Education,* 80, p. 152-161.

[Harlen et al., 2003] Harlen, W., & Deakin Crick, R. (2003). Testing and motivation for learning. In Hopfenbeck, T. N. (Eds.), *Assessment in Education: Principles, Policy & Practice*, 10, p. 169-207.

[Hevner et al., 2004] Hevner A., March S., Park J., & Ram S. (2004). Design science in information systems research. In *MIS quarterly*, 28(1), p. 75–105.

[Houlfort et al., 2002] Houlfort, N., Koestner, R., Joussemet, M., Nantel-Vivier, A., & Lekes, N. (2002). The impact of performance-contingent rewards on perceived autonomy and competence. In Richter, M. (Eds.), *Motivation and Emotion,* 26, p. 279-295.

[Hunicke et al., 2004] Hunicke, R., LeBlanc, M., & Zubek, R. (2004, July). MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI*, 4(1), p. 1-5. AAAI Press.

[Ryan & Deci, 2000] Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. In Alexander, P. (Eds.), *Contemporary Educational Psychology*, 25, p. 54-67.

[Huizinga, 1955] Huizinga, J. (1955). *Homo Ludens: A Study of the Play-Element in Culture*. The Beacon Press.

[Kahn, 1990] Kahn, W. A. (1990). Psychological Conditions Of Personal Engagement And Disengagement At Work. In *Academy of Management Journal*, 33(4), p. 692–724.

[Kirkpatrick & Kirkpatrick, 2006] Kirkpatrick, D., & Kirkpatrick, J. (2006). *Evaluating Training Programs: The Four Levels*. Berrett-Koehler Publishers.

[Kim, 2015a] Kim, B. (2015). Gamification in Education and Libraries. *Library Technology Reports, 51*(2), p. 20-28.

[Kim, 2015b] Kim, B. (2015). Designing Gamification in the Right Way. In Griffey, J. (Eds.), *Library Technology Reports,* 51(2), p. 29-35.

[Koivisto & Hamari, 2014] Koivisto, J., & Hamari, J. (2014). Demographic differences in perceived benefits from gamification. In Guitton M. (Eds.), *Computers in Human Behavior,* 35, p. 179-188.

[Laskaris, 2015] Laskaris, J. (2015). *eLearning in the Workplace.* https://www.talentlms.com/blog/elearning-in-the-workplace/

[Lifesaver, 2017] Lifesaver. https://www.unit9.com/project/lifesaver-cpr/

[Marczewski, 2015] Marczewski, A. (2015). User Types. In *Even Ninja Monkeys Like to Play: Gamification, Game Thinking and Motivational Design,* 1, p. 65-80. CreateSpace Independent Publishing Platform.

[Kineo, 2014] Kineo (2014). McDonald's Till Training Game Case Study. http://www.kineo.com/case-studies/mcdonalds-till-training-game

[Michael & Chen, 2005] Michael, D. & Chen, S. (2005). *Serious Games: Games That Educate, Train, and Inform*. Course Technology, Cengage Learning.

[Nichols, 2008] Nichols, M. (2008). E-Learning in context. *E-Primer Series*, 1.

[Nicholson, 2015] Nicholson, S. (2015). Exploring the Endgame of Gamification. In Fuchs, M., Fizek, S., Ruffino, P., & Schrape, N. (Eds.), *Rethinking gamification*, p. 289-305. meson press.

[Overton & Hills, 2009] Overton, L., & Hills, H. (2009). E-Learning maturity in the workplace: the benefits and practices. In Overton, L. (Eds.), *Impact: journal of applied research in workplace e-Learning*. http://www.towardsmaturity.org/elements/uploads/Towards_Maturity_Benchmark_research_from_Impact_Dec_09.pdf

[Pasterfield, 2014] Pasterfield, K. (2014). *How Gamification Is Used In Elearning.* https://elearningindustry.com/how-gamification-is-used-in-elearning

[Ross et al., 2010] Ross, S., Morrison, G., & Lowther, D. (2010). Educational technology research past and present: balancing rigor and relevance to impact learning. In Fahme, D., Simsek, A. (Eds.), *Contemporary Educational Technology*, 1(1), p. 17-35.

[Ruffino, 2014] Ruffino, P. (2015). From Engagement to Life, or: How to Do Things with Gamification? In Fuchs, M., Fizek, S., Ruffino, P., & Schrape, N. (Eds.), *Rethinking gamification,* p.47-71. meson press.

[Sailer et al., 2017] Sailer, M., Hense, J., Mayr, S., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. In Guitton, M. (Eds.), *Computers in*

Human Behavior, 69, p. 371-380.

[Salen & Zimmerman, 2004] Salen, K. & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge (Mass.): MIT Press.

[Shepherd, 2012] Shepherd, C. (2012). So What is eLearning? In Hubbard, R. (Eds.), *The Really Useful elearning Instruction Manual: Your toolkit for putting elearning into practice,* p. 1-16. John Wiley & Sons.

[Suits, 2005] Suits, B. (2005). *The grasshopper: Games, life and utopia.* Peterborough: Broadview Press.

[Zameer, 2010] Zameer, A. (2010). *Virtual Education System (Current Myth & Future Reality in Pakistan).*

Appendices

Appendix A. – Results of the questionnaire

	Your country	
Australia	19	22.61%
India	19	22.61%
Philippines	12	14.28%
Finland	15	17.85%
Germany	14	16.66%
Other; please specify below	5	5.95%
	How long is your work experience in your role?	
Less than 1 year	14	16.66%
1-5 years	31	36.90%
More than 5 years	39	46.42%
	How long did you play the game? (minutes)	
Less than 5 minutes	1	1.19%
5-15 minutes	19	22.61%
15-30 minutes	33	39.28%
over 30 minutes	31	36.90%
	What device did you use to play the game?	
Mobile phone	58	69.04%
Tablet	11	13.09%
Computer	15	17.85%
	Did you have any browser or network related problems when playing the game or when logging in?	
Yes	26	30.95%
No	58	69.04%
	How did the game work on your device?	
Did not work	4	4.76%
Some problems occurred	12	14.28%
Worked well	68	80.95%

	1	2	3	4	5	Total	Average
process was clear to follow	1	2	20	**45**	16	84	3.869047619
360 environment makes the maintenance tasks realistic	2	5	16	**45**	16	84	3.80952381
Questions and tasks were good	2	8	10	**47**	16	83	3.807228916
Learning content was useful to me	3	5	23	**32**	20	83	3.734939759
Total	8	20	69	**169**	68	334	3.805185026

	Difficulty level	
Too easy	13	15.47%
Suitable	70	83.33%
Too difficult	1	1.19%

	1	2	3	4	5	Total	Average
Instructions were good and informative	3	7	23	**37**	14	84	3.619047619
Navigating in the game was easy	3	2	20	**39**	20	84	3.845238095
Game elements (points, badges, leaderboard) motivated my learning	2	3	20	**41**	18	84	3.833333333
Total	8	12	63	**117**	52	252	3.765873016

	1	2	3	4	5	Total	Average
My overall impression	1	1	17	**49**	16	84	3.928571429

	Would you recommend this game to your colleague?	
Yes	79	94.04%
No	5	5.95%

If problems occurred (questions 8 and 9), please describe:
when the connection lost, i am can't directly continue it's blank display need to restart
Sometimes the disply goes blank, it is required to start again 1st. If it is starts from last topic its easy to do fast completion.
Slow in network and instructions are not clear
Mobile phone getting Stricker often. Usually we don't us helmet for maintenance work
Tools selection doubt
Slow and stalled. Waited and sorted itself
Slow to load page had a black screen
Internet connection problem lead to a few errors when I tried to log back into the game i.e. Modules not loading, no option in the VR view etc...
slow to load and change
Difficult to write username + password because display buttons open over text boxes
Went back to the start once
cannot login, tried to change password a number of times, but nothing happened
Sometimes its hanging problems
Graphic not good it's too hang.
Samsung s5 jäi jumiin vähän väliä (Samsung S5 got stuck regularly)
S5 Chrome Samsung could not log in

Appendix B. – General feedback

General feedback
goes to mobile apps
Everything's good, i lime this game
3D viewing in this game good, but understanding the exact meaning of symble and position is difficult. Many times the spanner symble appears is bit confusing.
Instructions are not clear..
Tools name must be listed . MAP panel name must be motioned on the picture.
Good, but before start of the program if it's explain little more deeper about the function keys, thought it good be better.
Tool selection having confusion
It is very interesting. Hope front line maintenance technician will enjoy it.
1. Required Name of tool in the selection box 2. MAP Panel need to change as bigger one. 3. Rope dressing not done properly during that second module visuals and points missing. 4.
Photos not clear to understand the subject.
Only problem i found was with the questions if multiple answers were required and i only selected one answer it did not tell me i was not complete it just said correct and it was only after i could not proceed any further that i started to try and select multiple answers Mayby it should say 50% complete to indicate your status on a question when you require multiple answers selected
It would be good to include a customer request to be checked during the visit. Use a hidden hotspot at the end of the exercise to test follow up.
Easy to follow no problems with course.
It needs the consquences of doing thing wrong. Also some info for what your aactually checking.
More information on what is required at each check point is required
The tasks to perform need to be more informative. i.e clicking the spanner on the door and being to told you have successfully checked door gaps does not teach any useful information. Instead of a spanner it would be better to have the banner say "check door gaps" and then ask what are acceptable gaps. This goes for all inspection points. This will teach what functions to check (door gaps) and also what the acceptable tolerances are. From a safety point of view more detailed consequences of actions i.e removing a hoist rope could be catastrophic. These risks and hazards need to highlighted. The platform has awesome potential and should be persued as a great training tool.
The game is currently not well structured, I think that additional information should be provided during the modules. In particular, most of the tasks are too generic, where I didn't quite understand why certain procedures were being carried out... I think that a better idea would be to allow the user to choose what to check, where certain safety checks should also be in place. There is a lack of information relating to the hazards which may be encountered during the maintenance visit. Overall, I think there is potential for this training program to be effective, however it does need to be optimized.

More instructions regarding next step needed. For example when a tool is required the words "select tool" are needed. Some module items dont match KEA. Some terminology is too vague.
ON SCREEN iNSTRUCTIONS ARE VERY DIFFICULT TO UNDERSTAND INITIALLY AND NOT RELATABLE TO MAINTENANCE PROCEDURES
directions were a bit ambiguous and points were lost due to not having clear direction initially especially with tool selection process. Also some answers were not in line with local requirements i.e. floor level, close force, etc.
training in general was good point system and functionality is pretty good user friendly on tablet instructions unclear when needed to use a tool and when not to multiple choice questions not specified Overall good experience its a good change and more interactive
minimal differences used in the field compared to simulator. maybe need a scroll over option for task so you know what you are about to perform so you can select the correct tool or after one use of the tool, should go back to default of gloves/visual inspection.
Better if text is finish
Gaming aspect was nice. The content to be fine tuned.
Olisi mielenkiintoista testata kaikki moduulit. (*It would be interesting to be able to test all of the modules*)
Very interesting. Will this be available in Finnish.
Needs too be more clear with tools needed and after initial moduels could use some more advenced moduels
Very good for new players. They should make the game more punishing in a way in which if you miss a step and continue then you have to restart/see consequences example: no stop button. Game should be more relevant to Australian standards. Great game.
Very basic for my level of the experience. Some processes i don't agree are correct. Might be useful for a new employee
Game didn't explain if or why our choices for a possible fault where wrong, it just stated that the fault isn't in the area which doesn't help the learning. Also some elements seemed too be placed in weird and hard to find categories, such as car only having cigar switches and battery located in shaft category even though it I located on car
There must be a game also for minispace.
Though it would take you time to find the problem it is part of the game to make it difficult but only in finding for experienced tech. they find it difficult for they are really finding faults on each picture even though there is not really a problem.
This game is very usefull to all technicians and supervisors as well in development of technical skills. The game was good,enjoyable and meaningfull.
Educational, motivational and fun.

Nic app
Für neue Servicetechniker ist eine sehr gute Vorbereitung auf die Wartung (*For new service technicians is a very good preparation for the maintenance*)
Bei den Aufgaben die gleich als richtig erscheinen, ware eine beschreibung was genau geprüft wird, gut Sehr gutes Spiel um zu lernen (*"For the tasks that seem right, a description of what is being tested is good Very good game to learn maintenance"*)
was not able to load, cant decide if I may recommend the game
nicht gleich klar, was zu machen ist, z.B Werkzeugauswahl (*not exactly clear what to do, eg tool selection*)
Good
Werkzeugauswahl vor dem Schritt ist nicht eindeutig kleinere Verbesserung in Wartungsschritten ,z.B. Sichtprüfung Motor, (*"Tool selection before the step is not unique* *minor improvement in maintenance steps, e.g. Visual inspection engine, "*)
Ideal für neue Mitarbeiter (*Ideal for new employees*)
Absolut ideal für neue Monteure, (*Absolutely ideal for new fitters*,)
Vary good
It's good game but some problems occur during playing
Game is giid but site too hang and graphics bad
Good
Hanschuh symbol sollte immer Verwendung finden, und die weiteren Tools zusätzlich ausgewählt werden (*Hanschuh symbol should always be used, and the other tools are additionally selected*)
Für Einsteiger ideal, generell das Prinzip spielerisch zu lernen ist gut (*Ideal for beginners, generally learning the principle playfully is good*)
The game is good and very usefull to all technicians and employee as well
game ok
While choosing a wrench should game force to choose the right tool after pressing the wrench. Icons give too much tips to entering the game.
Ideal für neue Mitarbeiter als begleitendes Lernspiel in einem Training. (*Ideal for new employees as an accompanying learning game in a training*.)

Appendix C. – All answers per user

Your country	Name of the frontline or the global unit if other (above)	How long is your work experience in your role?	Difficulty level	How long did you play the game? (minutes)	What device did you use to play the game?	Did you have any browser or network related problems when playing the game or when logging in?	How did the game work on your device?	If problems occurred (questions 8 and 9), please describe:	How well do you agree with the following statements?: MBM-2 process was clear to follow	How well do you agree with the following statements?: 360 environment makes the maintenance tasks realistic	How well do you agree with the following statements?: Questions and tasks were good	How well do you agree with the following statements?: Learning content was useful to me	How well do you agree with the following statements?: Instructions were good and informative	How well do you agree with the following statements?: Navigating in the game was easy	How well do you agree with the following statements?:Game elements (points, badges, leaderboard) motivated my learning	What was your overall impression of the game?:My overall impression	Would you recommend this game to your colleague?
6	PT Kone Indo Elev	2	2	2	1	1	2	when the connection lost, i ar	4	4	4	4	4	4	4	4	1
6	Indonesia	2	2	3	1	2	3		4	5	4	4	4	5	4	4	1
6		2	2	3	1	2	3		4	4	4	4	4	4	4	4	1
6	Kone indoelevator	2	2	3	1	1	3		4	4	4	4	4	4	4	4	1
6		2	2	3	1	1	3		4	4	4	4	4	4	4	4	1
2		3	1	4	1	2	3		5	5	5	5	5	5	5	5	1
2		3	2	4	1	1	2	Sometimes the disply goes bl	4	4	3	4	3	5	4	4	1
2		3	2	2	1	2	3		3	4	4	4	4	4	3	4	1
2		3	2	2	1	2	2	Slow in network and instruct	3	4	4	4	3	3	3	3	1
2	KEI	3	2	4	1	2	3		4	4	4	4	3	3	4	4	1
2		1	3	2	1	1	1		5	4	4	4	3	3	3	4	1
2		3	2	3	1	1	2	Mobile phone getting Stricker often. Usually we don't us helmet for maintenance work	4	4	4	4	3	4	4	4	1
2	KEI	1	1	4	1	2	2	Tools selection doubt	5	5	4	5	4	5	4	4	1
2		3	1	4	1	2	3		5	5	5	5	5	5	5	5	1
2	Ramasamy	3	2	4	1	2	3		4	4	4	4	3	4	4	4	1
2	KEI	3	2	4	1	1	3		3	3	3	3	3	3	3	3	1
2		3	2	3	1	2	3		3	3	2	3	3	4	4	3	1
1		3	2	4	3	2	3		4	4	4	4	2	3	5	4	1
1	KEA	3	2	2	3	2	3		4	2	4	3	4	3	2	4	1
1		3	2	3	3	2	3		4	4	4	4	4	4	4	4	1
1		2	2	3	2	2	3		3	5	5	5	5	5	3	5	1
1		3	1	4	2	1	2	Slow and stalled. Waited and	4	2	2	2	4	4	4	3	1
1		3	2	2	3	2	2	Slow to load page had a blacl	4	3	3	2	2	4	3	3	1
1	KEA	3	1	3	3	2	3		4	4	1	2	3	5	5	4	1
1		2	2	3	3	1	2	Internet connection problem	4	5	3	3	3	4	3	4	1
1	SEB	3	2	3	3	1	3		3	2	2	3	2	3	3	3	1
1	SEB	3	2	4	3	1	3		4	3			3	4	4	4	1
1	SEB	3	2	4	3	2	3		2	3	2	3	1	1	4	3	1
1	SEB	3	2	4	3	1	2	slow to load and change	3	3	4	3	2	3	3	3	1
1		1	2	4	2	2	3		3	3	4	3	2	4	5	4	1
1		2	2	3	3	2	3		4	4	4	4	4	4	3	3	1

4		3	2	3	1	1	3	Difficult to write username +	3	4	4	3	3	4	4	4	1
4	FINLAND	3	1	2	1	2	3		2	1	2	1	1	1	1	4	1
4		3	2	2	1	2	3		3	3	4	3	3	3	5	3	1
4	KEF	3	2	2	1	2	3		4	4	5	5	4	5	4	5	1
4		3	2	3	1	2	3		4	4	3	2	3	3	4	4	1
4		2	2	2	2	2	3		4	4	4	4	4	3	4	5	1
1		3	2	3	2	2	3		4	4	5	4	4	4	5	4	1
1		2	2	4	2	**1**	**3**		4	3	3	3	3	2	**2**	**4**	**2**
1		2	1	4	2	2	3		5	5	4	5	4	5	5	4	1
1		3	2	4	2	**1**	**2**	Went back to the start once	4	4	2	1	3	3	**3**	**3**	**2**
1		2	2	4	1	2	3		3	2	2	2	2	2	3	3	1
3		1	2	3	1	2	3		4	4	4	4	4	4	4	4	1
3	KPI	2	2	3	3	2	3		5	5	5	5	5	5	5	5	1
3	APA	1	2	2	1	2	3		4	4	4	4	4	4	4	5	1
3		1	2	2	1	2	3		5	5	5	5	5	5	5	5	1
3		1	2	3	1	1	3		5	4	4	5	4	4	4	5	1
3	KPI	2	2	3	3	2	3		5	5	5	5	5	5	5	5	1
3		2	2	2	1	1	3		5	5	5	5	5	5	5	5	1
5		1	2	3	2	2	3		5	5	5	5	5	5	5	5	1
5		1	2	3	2	2	3		4	4	4	5	5	5	5	4	1
3		3	2	4	3	2	3		4	4	4	4	5	5	5	4	1
2		2	2	2	1	2	3		4	4	4	4	4	4	4	4	1
5		3	2	3	1	2	3		4	4	3	4	3	4	4	4	1
3		1	2	1	1	**1**	**1**	cannot login, tried to change	1	1	1	1	1	1	**1**	**1**	**2**
5		2	2	3	1	1	3		3	4	4	4	3	3	3	4	1
3		1	2	2	1	2	3		5	5	5	5	5	5	5	4	1
2	ASLAM SHER KH	1	1	3	1	2	3		5	4	5	5	4	4	4	4	1
5		2	2	3	1	2	3		4	4	4	3	4	4	3	4	1
5		3	2	3	1	2	3		3	4	3	3	4	3	4	4	1
5		3	1	4	2	2	3		4	4	4	4	5	4	4	5	1
2	Lalit kumar	2	2	2	1	1	3		5	5	4	5	5	5	4	5	1
2	Sukhwinder singh	2	2	4	1	1	2	Sometimes its hanging problems	3	3	4	3	3	4	3	3	1
2	Amit verma	2	1	3	1	**1**	**2**	Graphic not good it's too	4	3	3	4	4	4	**2**	**2**	**2**
2	Sheeshram gurjar	2	2	4	1	2	3		5	4	5	5	4	3	4	4	1
5		2	2	4	1	1	3		4	4	4	4	4	4	4	4	1
5		2	2	4	1	2	3		4	4	4	3	4	4	4	4	1
5		2	2	4	1	2	3		4	4	4	4	4	4	4	4	1
3		1	2	2	3	2	3		4	3	4	4	4	4	3	4	1
3	SEB Department	1	2	3	1	2	3		5	5	5	5	5	5	5	5	1
2		2	1	2	1	**1**	**3**		4	3	**5**	5	3	5	**3**	**3**	**2**
4		3	2	4	1	2	3		3	4	4	3	3	4	4	4	1
4		3	2	3	1	2	3		3	3	4	3	3	3	3	4	1

4				2	1	3	1	2	3		3	4	2	3	2	4	4	3	1		
4				3	2	4	1	2	3		4	4	5	4	4	4	4	5	1		
4				2	2	4	1	2	3		3	4	4	5	3	4	5	4	1		
4				3	2	4	1	2	3		3	3	3	3	4	3	3	3	1		
4				3	1	3	1	2	3		4	2	4	3	4	3	3	3	1		
4				3	2	4	1	1	1	Samsung s5 jäi jumiin vähän	3	3	4	3	4	3	4	4	1		
4	F			3	2	4	1	1	1	S5 Chrome Samsung could n	4	4	4	4	4	4	4	4	1		
5				2	2	4	1	2	3		4	4	4	3	4	3	4	4	1		
5				2	2	3	1	2	3		4	5	4	4	4	4	4	4	1		
5				2	2	3	1	2	3		4	4	4	4	4	4	4	4	1		
5				3	2	2	1	2	3		4	4	4	3	4	4	4	4	1		
1 = Australia				1 = Less than 1 y	1 = Too e	1 = Less than	1 = Mobile phc	1 = Yes	1 = Did not work		1 = 1				1 = 1			1 = 1	1 = Yes		
2 = India				2 = 1-5 years	2 = Suitat	2 = 5-15 min	2 = Tablet	2 = No	2 = Some problems occurred		2 = 2				2 = 2			2 = 2	2 = No		
3 = Philippines				3 = More than 5 y	3 = Too d	3 = 15-30 mir	3 = Computer		3 = Worked well		3 = 3				3 = 3			3 = 3			
4 = Finland						4 = over 30 minutes					4 = 4				4 = 4			4 = 4			
5 = Germany											5 = 5				5 = 5			5 = 5			
6 = Other; please specify below																					