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The Digital Games Industry and its Direct and Indirect Impact on the Economy. Case study: Supercell and Finland.

Helsinki Metropolia University of Applied Sciences

Metropolia Business School

International Business and Logistics

Thesis

2.05.2017

Helsinki Metropolia University of Applied Sciences

Author(s) Title Number of Pages Date	Sebastian Santasärkkä The Digital Games Industry and its Direct and Indirect Impact on the Economy. Case study: Supercell and Finland. 36 pages + 2 appendices 2 May 2017
Degree	Bachelor of Business Administration
Degree Program	International Degree Program
Specialisation option	International Business and Logistics
Instructor(s)	Daryl Chapman, Senior Lecturer

The games industry was established in the 1970s when Atari introduced arcade video games. The mobile gaming segment was born in 2007 after Apple released the first iPhone. Even though the digital games industry is relatively new, it has established a permanent role in the entertainment industry, growing faster than the TV, music, movies, and book publishing business. The global games market was valued 99,6 billion US dollars in 2016 and it is projected to continue growing in the future, driven by technological advancements and a growth in overall gaming audiences.

Newzoo, the leading market research company covering the global games market has calculated the size of the gaming industry by summing up consumer revenues by games companies globally. However, this approach underestimates the industry's total contribution to the world economy. The purchase of video games triggers the purchase of other complementary products such as processors, content, devices, and broadband internet access. Although the sales of complementary products are an example of direct contribution to the economy, measuring the total turnover has proven to be challenging and therefore is not included in the industry's size. In addition, the games industry influences the economy indirectly since technological and service innovations developed for entertainment games are spilling over into other sectors and non-leisure applications. In the context of this thesis, spill-over is referred to as voluntary and involuntary exchange of useful technological information, new concepts, ideas, and different types of capital. The gaming industry players have strong innovation capabilities, and they act as catalysts for innovation and knowledge-based growth in various other industries, contributing to economic growth across the economy indirectly. Knowledge spillover is a driving force of economic growth, yet the industry size calculation does not capture the benefits. Therefore, it can be estimated that the industry's total contribution is much higher than what Newzoo reports.

Finland stands out in the global games market with the mobile games maker Supercell, which is valued over 10 billion dollars and many other globally known game makers, such as Rovio with their *Angry Birds.* Although Supercell is a small company employing roughly 180 people, it plays a major role in the Finnish economy.

Keywords	Gaming industry, video games, digital games, Supercell

Contents

List of Figures

1 Introduction

1.1 Preview

In just a few decades, video games have gone from a niche hobby to a mainstream entertainment, growing into a global industry of enormous proportions. Between 2009 and 2012, the games industry grew four times faster than the US economy. The size of the global games market in 2016 was 99,6 billion US dollars.

Video games have established a permanent role in the entertainment industry, influencing other media like film, television and the internet. The gaming industry has been growing faster than any other entertainment industry segment, such as TV and video, music, cinema and books. It is highly dynamic and growing due to technological advancement and digitalization. New mobile and online platforms and innovative business models have revolutionized the gaming industry.

Much of this growth is coming from growth in overall gaming audiences. Digital games of all types are enjoyed by millions of people worldwide. Digital games have now integrated into our culture as a permanent part of our daily lives.

The videogame industry contributes to the economy in many ways, not only in terms of the value of direct sales, but in innovation, technology spill-over, building the domestic infrastructure for advanced online services, stimulating complementary sectors including the broader media sector, semiconductor electronics and software. (Stewart & Misuraca, 2013)

1.2 Objectives

The aim of my study is to give an overview of the gaming industry's development and impact on the world economy. This study will provide the historical background of the games industry development and the technological advancements which supported the growth of new categories, such as mobile games, which are now becoming the most significant segment in the entire gaming business. The games industry has been one of the most rapidly growing industries in the past 10 years, contributing billions to the world economy. I will discuss the significant financial impact the industry has in the economy and society. In addition, I will investigate how the rapid innovation in the

games industry impacts other businesses. **My objective is to show the economic importance of the gaming industry, as well as the broader impact on society through positive spill-over effect gaming companies generate, most importantly by influencing new innovations and technology.**

1.3 Research Question

The aim of the research is to determine the impact video game companies have on the global economy. A series of questions serve as a guideline to understand the impact and importance of the gaming industry:

1. How and when did video games become an industry? How to define the industry?
2. What is the size of the video games industry in 2016?
3. What other effects the gaming industry has on the economy and society, other than financial gains?
4. What caused the growth of the gaming industry?

The first chapter is an introduction to the topic, the second chapter will give an extensive background of the gaming industry and its development, both internationally and more specifically in Finland. Chapter 3 will discuss the economic impact of the gaming industry. The focus is on the financial impact the gaming industry has on the world economy, breaking down the regions which have the most significant growth. In this chapter, Finland will again be analysed more in depth. Chapter 4 is dedicated to understanding the positive spill-over effects the gaming industry has on other related sectors and the society. Chapter 5 identifies the trends which led to the gaming industry's dominance in the entertainment business. Chapter 6 is a case study about Supercell, and the aim is to provide a solid example of the impact a gaming company has on the economy and society, in this case, on Finland. And last, a conclusion of findings will be discussed in Chapter 7.

1.4 Methodology

The research in this thesis is based on secondary data analysis. There is a vast amount of information available on the subject, for example online and newspaper arti-

cles, journals, books, statistics etc. To complement the findings from secondary sources, a case study will be used, as it allows the investigator to retain holistic and meaningful characteristics of real-life events. (Yin, 2003) The Finnish gaming company Supercell will be used as a case study, as it is now the highest valued mobile games developer in the world. The founders of Supercell rank among the century's top taxpayers In Finland, an example of direct impact on the economy. When the Chinese internet conglomerate Tencent bought the majority stake in Supercell in 2016, it became the most expensive acquisition of a Finnish firm in the country's history.

1.5 Terminology and definitions

Gaming industry: The videogame industry is made up of a number of building blocks – the consumer platforms, both hardware (the devices, consoles) and software (for example app stores); Content development and production, which includes publishers providing capital and intellectual property rights (IPR) management, marketing, networks of developers, animation studios and other creative teams, middleware and software tools production; Distribution, both 'digital' (online/mobile), including the servers and network technologies, and physical distribution. There is also an active end-user developer movement. (Stewart & Misuraca, 2013)

The industry elements are illustrated on figure 1:

Figure 1. Value chain of the gaming industry (Egenfeldt-Nielsen;Smith;& Tosca, 2016)

As shown on Figure 1, the industry comprises of numerous vendors. Game developers and publishers get the most attention when addressing the industry, since they are the creatives who develop the game and make the game available to a large audience.

Video game / digital game: Zackariasson and Wilson define video games as their own special medium. They are a unique form of entertainment based on meaningful interactions between individuals and machine. Although video games are often referred to as "just" software, this attempt to collapse the one into another neglects the broader social, cultural, technological and political-economic system within which the world of

game development is rooted. (Zackariasson & Wilson, 2013, s. 17). Hunicke, LeBlanc and Zubek have developed a formal approach to understanding games as dynamic systems. From the player's perspective, the three components of a game are:

1. *Rules*
2. *System*
3. *"Fun"*

and from the developer's perspective, their design counterparts are:

1. *Mechanics* which describe the particular components of the game, at the level of data representation and algorithms.
2. *Dynamics* which describe the run-time behaviour of the mechanics acting on player inputs and each other's outputs over time.
3. *Aesthetics* which describe the desirable emotional responses evoked in the player, when she interacts with the game system. (Hunicke;LeBlanc;& Zubek, 2004)

Smartphone: There is no standard definition for the term "smartphone", but some of the features that are distinctive to a smartphone are:

- They have an operating system which allows them to run applications. The operating systems are for example, iOS for Apple's iPhones and Android for Samsung's smartphones.
- They allow downloading applications through operating system specific app stores
- They allow access to the internet through 3G and 4G data networks
- They have a QWERTY keyboard (keys are laid out like on a computer keyboard), either as physical buttons that can be pressed or as displayed on a touch screen
- They sync with the user's personal and/or professional e-mail

Spill-over effect: There is a no strict definition for spill-over effect. By one narrow definition, it could mean an unintended information exchange:

“By technological spill-overs, we mean that (1) firms can acquire information created by others without paying for that information in a market transaction, and (2) the creators (or current owners) of the information have no effective recourse, under prevailing laws, if other firms utilize information so acquired.” (Grossman & Helpman, 1992, s. 16)

However, a much broader definition could be found:

“R&D spill-overs refer to the involuntary leakage, as well as, the voluntary exchange of useful technological information.” (Steurs, 1994, p. 2)

Richard Russell (2015) has researched spill-over effects of cultural and creative industries. He offers a definition to spill-over effect in the context of his study:

“[A spill-over effect is] The process by which activity in the arts, culture and creative industries has a subsequent broader impact on places, society or the economy through the overflow of concepts, ideas, skills, knowledge and different types of capital.”

Spill-over effect can also be explored on a micro level when examining the psychology of an individual. As an example, studies show that there is a link between in-game behaviour and work life behaviour. The positive games-to-work spill-over effect can be explained by three specific behaviours that are commonly manifested in online games: active learning, leadership and collaboration (Derks & Bakker, 2013, s. 108)

1.6 The scope of the research

This research is based on a macro-level analysis, the objective is to express how the gaming industry affects the economy and society as a whole. Thus, the findings tend to be generalized. To narrow the scope of my research and give more specific examples, I will provide a deeper analysis on the gaming industry’s impact on the Finnish economy. Moreover, a Finnish gaming studio Supercell will be used as a case study.

The games industry is developer centric. The developers can be categorized based on which platform their games run on: PC, console or mobile. Each of these segments can be analysed as a separate industry, for example mobile games industry, or as games industry as a whole, including all developer types. As already mentioned in chapter 1.5,

the industry also includes other vendors, such as the hardware developers and distributors. To keep a consistent approach, I will look at the industry on a macro-level, but also give specific examples from the mobile gaming segment, since the case study is about a mobile games developer.

1.7 Suggestions for future research

Since the scope of the thesis is macro-level and gives a general understanding of the games industry, it provides a solid foundation to narrow the research to a micro-level, to expand the understanding of a given aspect of this research. In this case, numerous paths for future research can be identified:

- Industry segment specific
- Customer/user specific
- Firm specific

The corresponding topics could be for example:

- Business models used in mobile gaming industry
- Games as an instrument of learning. Any evidence that the skills developed in playing games could be transferred to work life?
- The factors that lead to the emergence of globally successful Finnish games companies such as Rovio and Supercell

2 Gaming Industry Overview

2.1 The Development of the Industry

The first example of a video game was created by nuclear physicist Edward Condon in 1940 which was based on a mathematical game Nim. This was played by around 50 000 people for six months while it was on display. However, the first game system designed for commercial home use was released in 1967 by Ralph Baer which was called Brown Box. This was a multiplayer, multiprogram video game system which could be used for a variety of games. (Rogers, 2016)

In the early 1970s Atari and arcade gaming came into the market. Atari founded by Nolan Bushnell was the first gaming company to set a benchmark for a large-scale gaming community. In 1973 retailing at $1095, Atari began to sell their first game Pong, and arcade machines started spreading to bars, bowling alleys and shopping malls around the world. People started seeing the opportunity in the market and more than 15 companies started to develop video games. (Chikhani, 2015)

In addition to gaming consoles becoming popular in commercial centers and chain restaurants, a new possible section opened for game production when personal computers started appearing in households and technological advancements, such as Intel's invention of the microprocessor came to the market. While home computers started growing in popularity having much more powerful processors than the previous generation of consoles, consoles started getting bad press. In the late 1987 computers and consoles allowed users to connect their devices with other players. This was the first step towards the idea of deathmatch[1] and exploded in popularity when *Doom* was released in 1993. (Chikhani, 2015)

The real revolution in gaming came when LAN[2] networks and the internet was introduced to multiplayer gaming. Between 1993 and 1996, Sega, Nintendo and Atari made a number of attempts to break into online gaming by using cable providers but none of them were successful due to slow internet capabilities and problems with the cable providers. The first real advances in online gaming were made when Sega Dreamcast introduced the first internet ready console in 2000. This was a revolutionary system, but ended up being a failure due to expensive internet prices. Regardless of its failure, the technology opened doors for the next generation of consoles such as the Xbox and Playstation. (Chikhani, 2015)

The release of *Runescape* in 2001 was a game changer. *Runescape* was one of the earliest MMORPG[3] games which allowed millions of players worldwide to play, interact and compete against each other on the same platform. (Chikhani, 2015) Since the ear-

[1] Deathmatch is a mode of play in which the aim is to kill the characters controlled by other players.
[2] Local area network (LAN) is a computer network of interconnected computers within a close proximity
[3] Massive multiplayer online game (MMORP) is an online role-playing video game in which a very large number of people participate simultaneously.

ly 2000s, internet capabilities and computer technology have improved at an incredibly fast rate enabling games to develop better graphics and crush the previous generation.

The first significant mobile game launched for a mobile phone was the game *Snake*. *Snake* was released in 1997 for Nokia 6610 and is still considered the most famous mobile game of all time. Games like *Tetris* and *Snake* were the first generation of mobile games. The second generation were Wireless Application Protocol[4] (WAP) games. The two first generations of mobile games were primitive but together created a basic ecosystem that allowed developers to make games and sell them over the air to willing mobile players. (Wright, 2016)

After smartphones were introduced to the market, the gaming industry experienced yet another revolution, which totally changed the way people played games. The first iPhone was released in June 2007, while Android released its first phone in October 2008. Mobile technology has rapidly developed an explosion of mobile gaming, which has already overtaken revenue from the PC and consoles. (Newzoo, 2016)

2.2 The Industry's Market Segments

Games can be split into three major categories – PC, mobile, and console. In early 2012, Newzoo introduced the consumer-centric *Screen Segmentation* as an alternative for the traditional game segmentation.

[4] WAP is a technical standard developed in the late 1990s for accessing the Internet. The third-generation technology, 3G, has mostly replaced WAP data protocol.

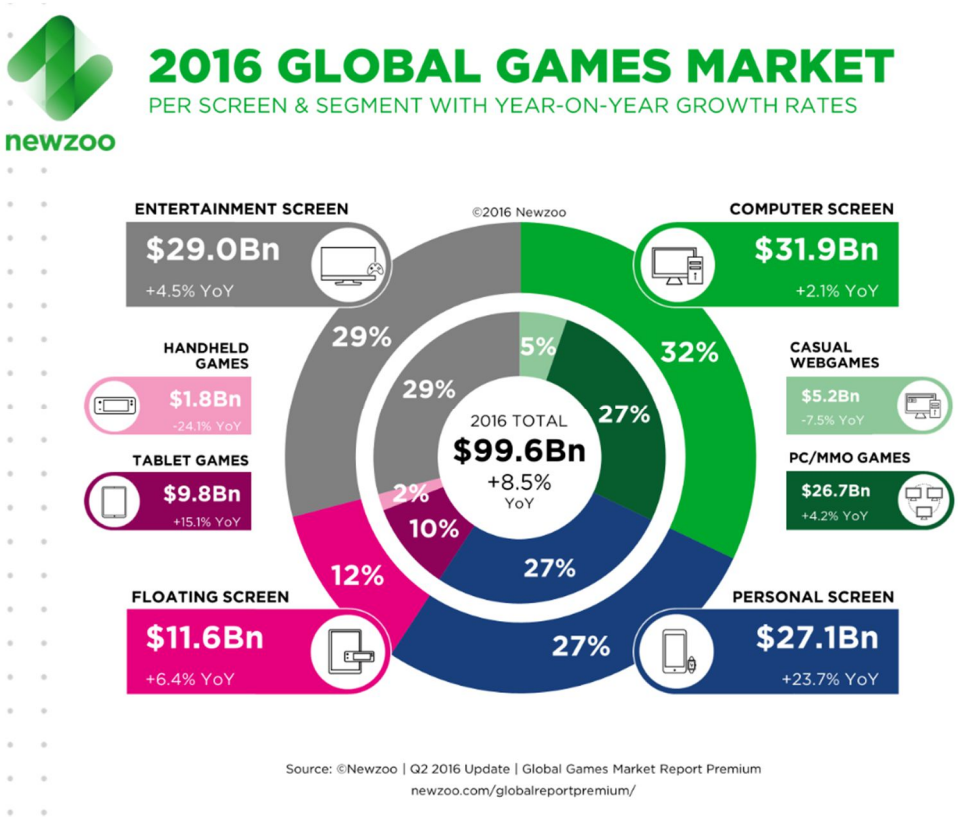

Figure 2. 2016 global games market by segment

The Screen Segmentation model distinguishes four types of screens: the Computer, Entertainment, Personal and Floating Screen. This new model groups tablets with handheld consoles rather than with smartphone, which was traditionally done in the mobile gaming market segment. According to the NDP Group Connected Intelligence report, 52% of all US households with internet connection have at least one TV connected to the internet. (NDP Group, 2016) The term Entertainment Screen is justified as more apps enter the TV space and the use of this screen continues to grow. As seen on figure 2, computer screen is the most lucrative on a global scale, followed closely by the entertainment screen. Newzoo predicts that the personal screen (smartphones) will take the global lead by 2018. (Newzoo, 2016)

2.3 The Economics of the Gaming Industry

The digital games business is one of the most profitable businesses of the entertainment industry. Games can generate unbelievable turnovers in a matter of days. For example, Rockstar games came out with *Grand Theft Auto 5* in 2013 and made around $1 billion during the first three days. (Crecente, 2013) In comparison, the fastest film in

history to earn $1 billion is The Avengers, it took 19 days. The budget for the superhero movie was estimated $220 million, while the game development cost $260 million. (Kain, 2013)

The casual[5] gaming industry enjoys extremely high profit margins compared to console games. The profit margins for hit games can be around 90%, compared to the average margins of about 40% for the average successful console game. (Maher, 2009) This can be explained by lower production costs of casual games, they are often made by a single programmer or small teams. Console games developers are typically much larger companies with higher labour costs. Compared to mobile game developers, consoles are packaged and shipped as actual physical goods, not as virtual goods. In addition, console developers pay licencing fees to copyright holders of the characters in the game, and they have high marketing costs, because they use traditional marketing channels. In recent years, the most popular mobile game developers have also started to invest heavily in marketing. Supercell, the Finnish developer, and King, the maker of *Candy Crush Saga*, both spent over $400 million in marketing in 2014. Although both increased revenues, marketing costs are starting to outstrip profits. (Lovell, 2015)

Due to the industry's immense revenue potential competition is extremely tough. There are on average 10 000 games submitted to iTunes App Store each month.(Statista, 2016) Ten of the most played games account for half of the whole industry's revenue, while the top three games account for a third of the whole revenue. (Pietarila, 2015)

[5] A casual game is targeted at or used by mass audience of casual gamers. Casual games have simple rules and lack of commitment required compared to more complex hardcore games. The term is used widely across different types of gameplay and genres. Most typically used to refer to mobile games.

Top Games by All-Time Worldwide Revenue

iOS App Store

Rank	Game	Company	Release Date
1	Clash of Clans	Supercell	Jun. 2012
2	Candy Crush Saga	King	Nov. 2012
3	Puzzle & Dragons	GungHo Online	Feb. 2012
4	Game of War – Fire Age	Machine Zone	Jul. 2013
5	Monster Strike	Mixi	Sept. 2013
6	Hay Day	Supercell	Jun. 2012
7	Boom Beach	Supercell	Mar. 2014
8	Slotomania	Caesars Entertainment	Nov. 2011
9	Big Fish Casino	Churchill Downs	Aug. 2012
10	The Simpsons™: Tapped Out	Electronic Arts	Feb. 2012

Figure 3. Top games by all-time worldwide revenue

Mobile data firm App Annie has released new research detailing the most downloaded and top grossing titles on the iOS App Store between July 2010 and July 2015. As seen on Figure 3, *Clash of Clans* tops all-time worldwide revenue list. Supercell's other two games, *Hay Day and Boom Beach*, are also in the top ten. The Finnish studio is the only company to have more than one game in the all-time top grossing chart. (Chapple, 2015)

With technology developing and consumer habits and preferences changing, maintaining a competitive edge over others is extremely hard. The unstable market leads to successful and unsuccessful periods. When technology advances in one area, consumers are pulled away from others areas of the industry. When *Pokemon Go* was released in July 2016 it became an instant global and cultural phenomenon. The game brought a new technology, augmented reality[6], to mass audience and broke five new world records (Swatman, 2016):

[6] Augmented reality (AR) is a technology enriching the real world with digital information and media, such as 3D models and videos, overlaying in real-time the camera view of a smartphone, tablet, PC or connected glasses. (Augment.com, 2017)

1. Most revenue grossed by a mobile game in its first month
2. Most downloaded mobile game in its first month
3. Most international charts topped simultaneously for a mobile game in its first month (downloads)
4. Most international charts topped simultaneously for a mobile game in its first month (revenue)
5. Fastest time to gross $100 million by a mobile game

The virtual economies of mobile games are massive. In 2002, the economist Edward Castronova from Indiana University published a paper in which he calculated the value of *EverQuest*[7] goods sold through internet auctions, and through the statistical findings he described the virtual world economy as if it was the real economy. Castronova found, remarkably, that the game's per capita GDP made the virtual country of Norrath (the place where the game takes place) the 77th largest economy in the world, ranking it between Russia and Bulgaria. Astonishingly, the game's currency was more valuable than the real-world Japanese yen or Italian lira. (Castronova, 2002) Nowadays, game developers have made it illegal to sell or trade game accounts, but there are black markets for buying and selling gaming related virtual assets online.

The most popular and top grossing mobile games are the so called free-to-play or freemium games. The innovative business model has become an industry standard, and while the name suggests it being free, thus not associated with high earnings, it brings in billions in revenue. Supercell's biggest hits, *Clash of Clans and Clash Royale*, are an example of successful use of the freemium model in which the users can down-load the game for free but have the option to purchase the premium virtual currency of the game (for example gems, gold), with real money.

2.4 The Entertainment Industry

The major sectors in the entertainment industry are: gambling, TV, books, video games, movies and music. The top 6 sectors had a combined global value of 833,5 billion in 2014.

[7] EverQuest is a popular MMORPG fantasy themed game, it was first released in 1999.

#	Sector	Global Value
1	Casinos and online gambling	$285 billion
2	TV subscriptions and licencing	$250 billion
3	Book publishing and distribution	$103 billion
4	Video game market	$91.5 billion
5	Movie production and distribution	$89 billion
6	Music production and distribution	$15 billion

Figure 4. The biggest entertainment industries in the world

As seen on Figure 4, the video games industry is the fourth biggest entertainment market in the world, surpassing the movie industry, which is in decline since 2012, when it was estimated to be worth 126,8 billion. (BusinessTech, 2015) The video games industry is growing at a fast rate. The global games market reached 99,6 billion in 2016, up 8,5% since 2015. (Newzoo, 2016)

2.5 The Finnish Gaming Industry

The introduction of personal computers in the 1980s enabled the games industry also in Finland to start its development. Creating games used to be expensive and games were highly dependent on software and hardware. Quickly after computers started appearing in households gaming enthusiasts started creating their own games as a hobby. In 1986 Finland released its first game to the international markets. Even though the growth in the 80s was slow and insignificant to the economy, this was a major milestone in the Finnish gaming industry.

By the end of 1990s a professional gaming industry was born in Finland. There was a dozen of game studios and the industry employed about 200 people. During this time, the mobile games market was underdeveloped, so most of the games were developed for PC or consoles. Nokia paved the way for the mobile games industry with new mobile phones and with a gaming platform N-Gage which came out in 2003. (NeoGames, 2015)
It was the late 2000's when the industry reached new heights, as the first touch screen mobile phones with advanced technology became widely used.

The success story of Rovio Entertainment's *Angry Birds* started in 2009 which is to date the most well-known game in the world. The game has been downloaded more than a billion times, which makes it also the most downloaded game of all time. Rovio's

success inspired many to start their own gaming companies in Finland. In 2012 Fingersoft introduced *Hill Climb Racing* which has been downloaded from the iOS app store and Play store over 100 million times. This same year *Hay Day* and *Clash of Clans* from Supercell came out to the market and were the most downloaded game for Android and iOS for a long time.

By the end of 2014, Finland had 260 fully operational game studios. 91 companies out of 260 said that iOS is their primary platform for games development, followed by 78 companies who focus primarily on Android and 49 who develop primarily for the PC. (NeoGames, 2015) The digital distribution model and advancements in development tools have made the barriers to entry much smaller. The mobile platform enabled more people to start companies as game developers than any other platform.

3 Gaming Industry's Economic Impact

In 2016, the global games market reached $99,6 billion. As shown on Figure 5, Asia Pacific takes up the largest share of the world's games market accounting for 47% of the whole games market. North America is the second largest region with estimated revenues of $25,4 billion in 2016 which is mainly driven by the mobile game segment. Western Europe's revenue estimates at $17,3 billion and Eastern Europe at $3 billion. Latin America generated $4,1 billion with a year over year growth of 20,1%. Africa and the Middle East generated $3,2 billion but had the highest year over year growth which was 26,2%.

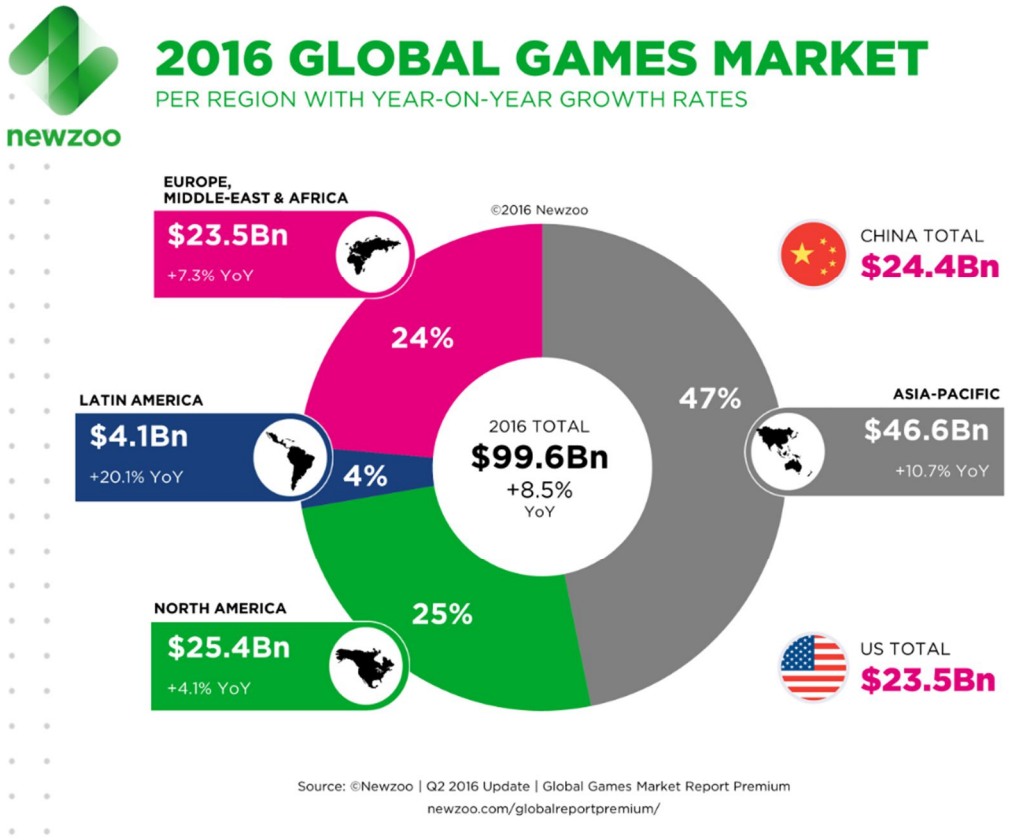

Figure 5. 2016 global games market by region

China alone accounts for one quarter of all global game revenues valued at $24,4 billion ahead of the US market size of $23,5 billion. China is forecasted to remain the largest games market growing to $28,9 billion by 2019. The global market is expected to reach $118,6 billion with mobile games at $52,5 billion by 2019. (Newzoo, 2016)

According to Newzoo's 2016 report the top 4 publicly listed games companies by revenue are Tencent, Sony, Activision Blizzard, and Microsoft. The combined revenue of these companies exceeded $30 billion in 2016. (Newzoo, 2016) These companies are from the regions which are dominating the industry: China, the United States and Japan.

3.1 Gaming Industry's Impact on The Finnish Economy

Finland stands out as the top country for information and communications technology (ICT), according to the European Commission. (European Commission, 2017) The main reason to explain Finland's ICT excellence is the legacy of Nokia. Ironically, Supercell found its success thanks to rise of Android and iOS, the platforms which brought down Nokia. Despite the downfall of Nokia as a company, its legacy lives in the vibrant start-up scene in Finland. Supercell can arguably claim to be Nokia's successor as Finland's leading consumer company. (Milne, 2016)

In recent years, the gaming industry in Finland has become quite a significant part of the Finnish economy. During the past five years Supercell and Rovio have increased growth from a 100-million-euro industry to more than two billion. Finland's economy continues to struggle, but despite the uncertainty the gaming scene is flourishing. (Mitzner, 2016) There is a large number of start-ups and young companies in Finland's games industry. The Finnish gaming industry had 290 registered companies employing 2700 workers in 2016. (MTV uutiset, 2016) According to Neogames, Finland is the third largest game developer in Europe based on revenue and 95% of all revenue comes outside of Finland.

The turnover of the Finnish game industry has grown at a massive rate in the last 10 years, from 40 million euros to 2,4 billion euros. In 2012 the industry size was €250 million, in 2013 €900 million and €1.8 billion in 2014. (Neogames, 2014) The two million euros milestone was reached a year later, in 2015 the industry turnover was 2,4 billion euros. Finland's game industry grew more rapidly than the rest of the global games business in 2015, Finland reported a 33% growth compared to 9% global growth. (Visionist, 2016)

The Finnish Funding Agency for Technology and Innovation Tekes plays an integral role in the industry's growth. Over the last decade, Tekes has funded over 100 game companies with about 70 million euros. Global success stories Supercell and Rovio are but two of the companies to have received a Tekes boost. (GoodNewsFromFinland, 2015)

4 Gaming Industry Spill-over Effects

The gaming industry's direct contribution to the GDP underestimates the total economic contribution it creates. When measuring the size of the gaming industry, only direct

sales of games to consumers[8] are taken into account, however, it is clear that the gaming industry has a much bigger impact on national output. The purchase of video games results in the purchase of other complementary products, which can be divided into four categories: processors, content, devices, and broadband internet access. The entertainment software not only triggers complementary sales, but also triggers the development of these complementary products faster than they would otherwise occur. For example, because of video games, computer processing would have not developed as fast as it has. (Sidak, 2007)

In addition to sales of complementary products, there are two other factors that provide indirect economic value, yet are not included in the industry turnover calculations. First, the entertainment software industry invests significantly in specialized human capital. The industry also invests a large percentage of its sales to research and development (R&D) in order to generate more innovative games for the next generation of players. These investments in human capital and R&D creates benefit for other sectors of the economy as well. Second, video games can be used in some cases for a different purpose in a different industry, sometimes intentionally and other by accident. (Sidak, 2007) For example, language learning app Duolingo and the learning platform Kahoot! bring gamification[9] to education. These two factors can be considered technological spill-overs, although they are not captured in the GDP numbers.

Knowledge and technology spillover across industries can also be understood in the context of labor flows. For example, the ESSnet Culture report finds that creative professionals such as designers, advertisers, software developers, but also professionals in film and television industries may be employed outside the creative industries, bringing with them new techniques, ideas, and ways of working. Or, they may start spin-off companies in a different sector. This means creative industries may be significantly more involved in the innovation system of national and regional economies than has previously been recognized. (BÍNA, et al., 2012)

[8] Newzoo's market size calculation includes consumer revenues generated by companies in the global games industry. Excluding: C2C second-hand trade, VAT or sales taxes, hardware sales, B2B services,,online gambling and betting (Newzoo, 2017)

[9] Gamification is the application of game elements and digital game design techniques to non-game problems, such as business and social impact challenges. (Coursera, 2017)

An expert report compiled on behalf of the German Federal Ministry of Economics and technology identifies 5 core messages to indicate in which way cultural and creative industries[10] add value in the economy and society (Prognos & Fraunhofer, 2012):

1. Cultural and creative industries are innovative and pioneering in their use of new kinds of methods and forms of working.

Cultural and creative industries are very innovative because their products and services have short lifetimes. Mobile games have very short lifetimes compared to more traditional games where a hardware investment has occurred prior to purchasing a game. Mobile games have flooded the app markets, most of them are free-to-play, so users can easily try out and then abandon games. Mobile games developers must keep this in mind as they create new games. Games developers need to create new ways of working to foster innovation and readiness to implement change. Supercell, for example has organized work in small teams of about 5 members, who operate independently. These new forms of working are becoming models to other industries and sectors, which also seek to become more innovative.

2. Enterprises from cultural and creative industries make great use of non-technical innovations and are thus broadening the innovation system characterised by technical advances.

Innovation in the cultural and creative industries can be understood more broadly than only technical aspects when including new kinds of social practices such as consuming, working and organizing. Innovations are happening less as the result of further development in the field of technology and more due to using products in new ways or in a different application context. For example, many new innovations are a result of combining already existing technologies and processes across different sectors. Until recently, it was not common knowledge that social and organizational innovations have positive effects on economic development, just as technological innovations.

[10] The cultural and creative industry actors include: performing artists and artists, musicians, journalists, media as well as marketing and advertising companies, designers and the makers of games and software.

3. Cultural and creative industries drive innovations in other sectors and contribute to improving the competitiveness of the economy as a whole due to their strong orientation towards innovations.

Creative enterprises contribute new ideas and concepts for new products by recognizing and communicating specific needs of consumers. For example, customer wishes can be identified with the help of design thinking process rather than with other traditional problem solving approaches. Cultural and creative enterprises are valued for their different view of business issues and their approach of developing specific business models and products from new trends. Creative ways of thinking make a change of perspective possible for enterprises in other sectors too.

4. Cultural and creative industries make the innovations of other sectors applicable and marketable by creating new user experiences and emotionalising products and services.

Cooperative innovation processes between companies from cultural and creative industries and other sectors lead to better products and services. Appealing to customers emotionally plays an important role in marketing products and services. In addition, creative industries can develop new business models (e.g. pay-per-download, premium customers etc.) and new sales channels for digital products and services, which are designed to be interactive to create new user experiences.

5. In order to increase the exploitation of previously untapped innovation potentials, cultural and creative industries need to become more visible to enterprises from other sectors.

The cultural and creative industry players are primarily micro and small enterprises, it is therefore very difficult for them to become visible and well known partners to enterprises in other segments.

The gaming industry players have strong innovation potentials themselves, but they also act as a catalyst for innovation and knowledge-based growth in many other industries. Spill-over effects cluster around economic outcomes – with a noticeable lack around education, social outcomes and cultural outcomes. (Russell, 2015) A particular

form of spill-over occurs when the economy, as a whole, benefits more from an innovation than is appropriated as profits. A difference, then, occurs between the private rate of return and the social rate of return. (Tidd, 2006, s. 100)

Gaming is an impressive 99,6 billion dollar industry, but it only includes direct sales of games to consumers and does include sales of complementary products triggered by the demand for games. Because it is so difficult to measure benefits associated with the spill-over of innovation from gaming companies, it is not included in the calculations. Knowledge spillover is a driving force of economic growth, but measuring it has proven to be a challenge. Therefore, it can be estimated that the industry's total contribution is much higher than what Newzoo reports.

5 Trends

To understand how the gaming industry has grown into the massive industry it is today, we have to understand the trends that have enabled its success. In the past, gaming was limited to board games and console video games, but through the growing popularity of PCs and electronic devices, the industry has been able to go through massive changes which has led to the development and commercialization of video games.

Digitalization is the biggest driver of growth in the gaming industry. Prior to the mobile gaming explosion, games were mostly played on consoles and PC. A dramatic change happened in 2007 with the first smartphone was released. Together with the first smart phones, platform specific app stores emerged, making it simple and easy for consumers to access games and the same time more developers could independently produce and release games, because there was no need to focus on hardware development. Three of the most popular mobile platforms are iOS, Android and Windows Phone, each of them have their own app stores. The total number of iOS apps on Apple's App Store has grown from 500 to 1,5 million between 2008 and 2015. The total number of Apps for Android Google Play store was 1,8 million in 2015. Games category is the most popular among the two dominating app stores, 23% of the total number of apps were games on the iOS market and 21% for Android market. (Dogtiev, 2016)

Today, mobile broadband has become widely available and increasingly affordable. As Shown on figure 6, mobile broadband penetration has been on the rise since 2007,

most subscribers are from developed countries. (The Broadband Commission for Digital Development, 2015)

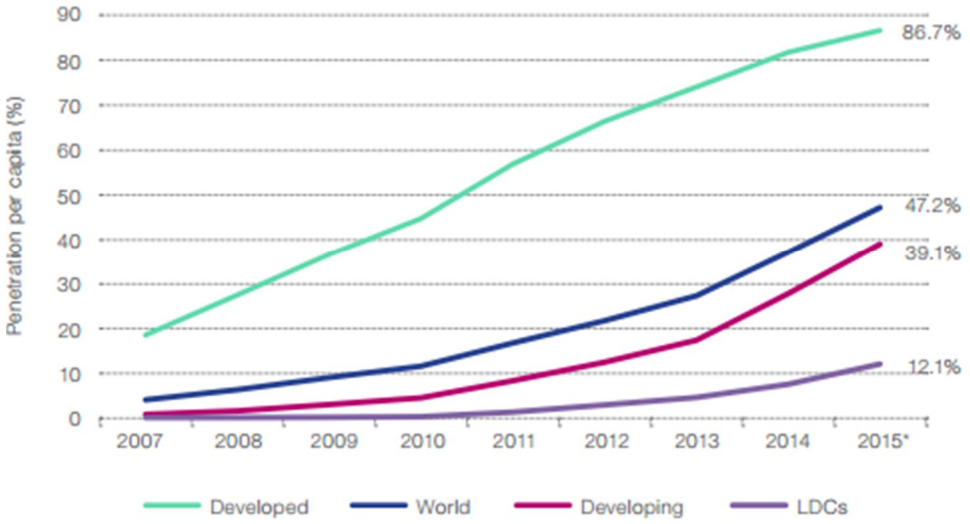

Figure 6. Mobile broadband penetration by region

Despite billions of people accessing the internet via smart phones, there are many people in the developing world who do not enjoy such freedom. In addition, several countries attempt to control and restrict content available on the web, for example China is known for implementing internet censorship. The 193 member states of the United Nations (UN) agreed in 2015 new set of Sustainable Development Goals, one of the agreements was “Everyone should have access to the Internet”. (A4AI, 2016) The UN Human Rights council passed a non-binding resolution in 2016 condemning countries that intentionally disrupt citizens’ internet access, giving a clear signal that internet access is a human right. (Vincent, 2016)

The development of widely accessible broadband connection goes hand in hand with the increasing availability and affordability of smartphones. According to the world’s leading information technology research company Gartner, smartphone sales represented 78% of total mobile phones sales in the first quarter on 2016, up 3,9% over the same period in 2015. This trend is driven by low-cost smartphones sales in emerging markets. (Gartner, 2016)

There have been many technological disruptions, which made mobile the primary platform through which people interact with others virtually, it is used for consuming media and entertainment and enables instant access to information on the internet. Mobile

has become the tool which bridges the real and virtual worlds. There have been incremental improvements to smartphones hardware over the last decade, from better batteries to clear colorful screens. Eventually the smartphone market shifted from hardware to software, operating systems created a whole new app economy.

As illustrated on Figure 7, smartphones have replaced many devices that used a single purpose in the past, for example, a watch, still and video camera, photo album, GPS device and map, alarm clock, calculator, newspapers and magazines, notepad, voice recorder, flashlight, dictionaries, music player, portable gaming devices and many more.

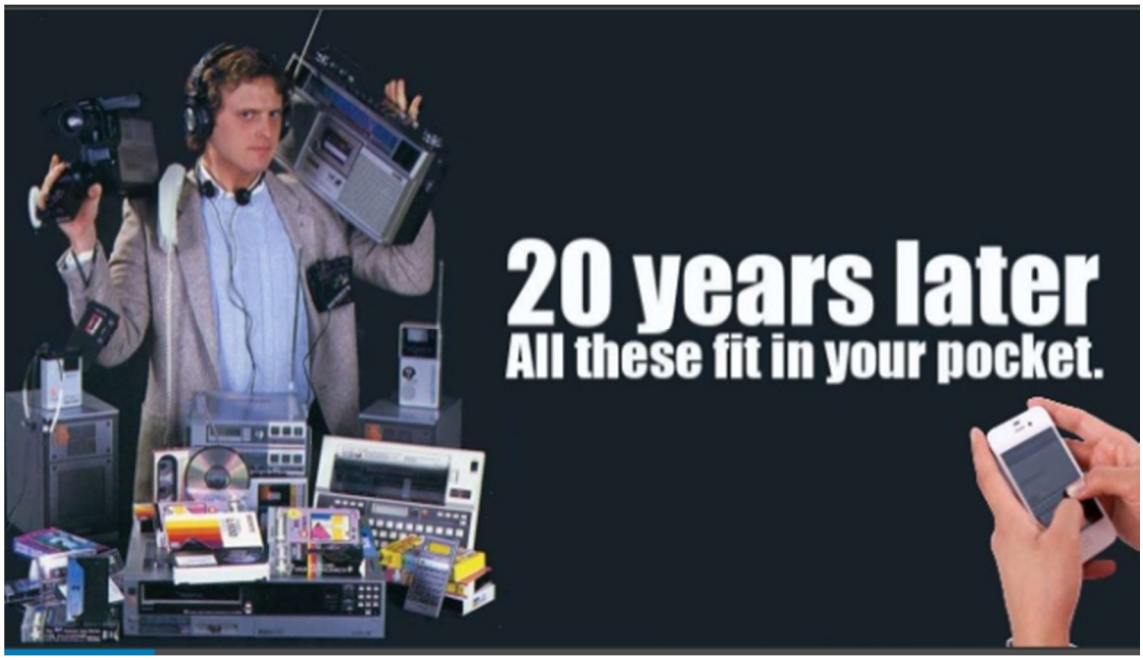

Figure 7. Items smartphone has replaced (Nievera, 2016)

Peter Diamandis has provided a chart (see Figure 8) to show how people with smartphones can access products and services, which would have cost thousands a few decades ago. (Diamandis, 2016)

>$900,000 worth of applications in a smart phone today

Application	$ (2011)	Original Device Name	Year*	MSRP	2011's $
1. Video conferencing	*free*	Compression Labs VC	1982	$250,000	$586,904
2. GPS	*free*	TI NAVASTAR	1982	$119,900	$279,366
3. Digital voice recorder	*free*	SONY PCM	1978	$2,500	$8,687
4. Digital watch	*free*	Seiko 35SQ Astron	1969	$1,250	$7,716
5. 5 Mpixel camera	*free*	Canon RC-701	1986	$3,000	$6,201
6. Medical library	*free*	e.g. CONSULTANT	1987	Up to $2,000	$3,988
7. Video player	*free*	Toshiba V-8000	1981	$1,245	$3,103
8. Video camera	*free*	RCA CC010	1981	$1,050	$2,617
9. Music player	*free*	Sony CDP-101 CD player	1982	$900	$2,113
10. Encyclopedia	*free*	Compton's CD Encyclopedia	1989	$750	$1,370
11. Videogame console	*free*	Atari 2600	1977	$199	$744
Total	**free**				**$902,065**

*Year of Launch

Figure 8. Free tools on a smartphone

Furthermore, smartphones are at the heart of biggest technology innovations of the future – experts at the annual Mobile World Congress in Barcelona in 2016 came to this conclusion. The event is one of the most important in terms on indicating where technology is headed.

Here are the four trends from the Mobile World Congress (Sinton, 2016):

1. Virtual reality

Virtual Reality (VR) was one of the most popular topics at the conference. Mark Zuckerberg, the founder of one of the world's most valuable companies, Facebook, claimed VR will be the future for the company.

Figure 9. Mark Zuckerberg at Mobile World Congress 2016

As seen on Figure 9, the conference audience were experiencing VR from headsets using their mobile phones as screens. The VR technology is an immersive and realistic simulation of a three-dimensional 360-degree environment.

2. 360-degree video

360-degree video provides a similar immersive experience without requiring a special headset, only a smartphone is needed. Because of this, 360-degree videos might be even a bigger trend than VR, at least in the short term, since it's a lower cost option to an immersive video experience.

3. 5G mobile broadband

5G is the next generation high-speed network that is promised to make internet connection much faster, allowing more connections to sensors from other devices. It is not clear though, when 5G fully arrives.

4. Internet of things (IoT)

IoT means sensors will be in all kinds of devices, such as fridges, TVs, buildings, street lights and much more. These sensors interact with the smartphone, which will be the central controller for the connected devices. This means that the heating system will

turn on when you start heading home, the traffic lights can adjust to the flow of traffic and the fridge orders milk when you start running low.

These trends are influencing the games industry as well. The apps marketplaces are flooded with games using VR, AR and 360 video technology. As already discussed in Chapter 2.3, *Pokemon Go* is one example of successful use of AR in gaming. The application of IoT in gaming is a fairly new idea, but might become more relevant in the future, once the 5G network becomes available. It is likely that mobile platforms will continue to dominate in the games industry as more innovations emerge in the mobile segment.

The gaming industry has been growing massively, much of the growth is coming from growth in overall gaming audiences. Digital games, which were previously limited to consoles or the PC, have become widely accessible on smartphones and tablets, reaching well over a billion of people worldwide. While children have been traditionally viewed as the core audience for video games, there are evidence of a much wider demographic among gamers. In United States, the average game player age is 35 years old.

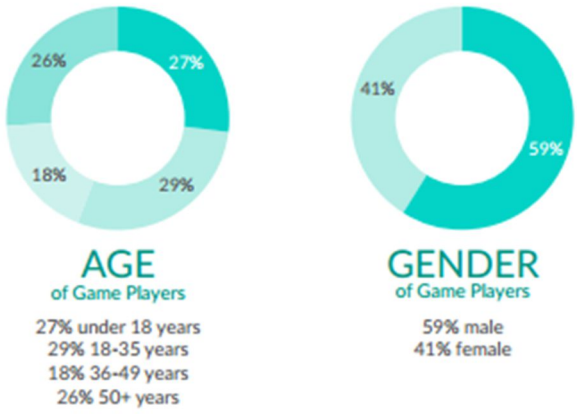

Figure 10. Gamer demographics

As seen on Figure 10, only 27% of gamers were under 18 years old. According to statistics from Entertainment Software Association (ESA), gaming in a mainstream activity enjoyed by both men and women, in 2016, men represented 59% of the gaming demographic. (Entertainment Software Association, 2016)

Children get their hands on tablets and smartphones already from a very young age. Parents who grew up playing games are passing the passion and knowledge to their kids. According to the ESA report, 62% of parents whose children are gamers play video games together with the child at least weekly. As shown on Figure 11, there are many reasons why parents play games with their kids.

Figure 11. Top 5 reasons parents play games with their kids

In today's world, users can access all forms of media and entertainment through their mobile devices. Consumer preferences are changing, people prefer online content when it comes to consuming media, such as online news, ebooks and videos, which are most commonly viewed on social media sites. This trend is also evident when it comes to games, the mobile games segment is expected to continue growing at a massive rate in the near future.

6 Supercell Case Study

Supercell is a Finnish mobile games developer that was founded in 2010 by Mikko Kodisoja and Ilkka Paananen, who is the CEO of the company. Supercell has brought four successful games to the market: *Clash of Clans, Clash Royale, Hay Day*, and *Boom Beach*. The Chinese internet giant Tencent bought majority stake in Supercell in 2016, valuing the Finnish games maker at $10,2 billion. The deal remains to be the most expensive acquisition of a Finnish firm in the country's history, but also the biggest deal in gaming industry's mergers and acquisitions ever. Supercell also became Europe's first ever "decacorn"[11], that's a technology company worth $10 billion.

In just 7 years Supercell has become one of the fastest growing gaming companies in the world. The biggest revenues come from their games *Clash of Clans and Clash*

[11] "Unicorn" is a term used to describe a tech startup wort over $1 billion. Bloomberg Business came up with the term "decacorn" when more companies started breaking into the $10 billion valuation ranks.

Royale, which has become a worldwide success since launching in 2012. The company had about 180 employees and a revenue of $2,3 billion in 2016 (Cowley, 2017), making it the most profitable mobile games developer in the world. Supercell's closest rival is the maker of *Candy Crush Saga* King Digital Entertainment, the company was acquired in 2016 by Activision Blizzard for $5,9 billion. When King filed for an IPO at the New York Stock Exchange in 2014, it priced shares at valuation of $7 billion. In 2015 King had revenue of $2 billion and 1600 employees. (PRNewswire, 2016) In comparison, Supercell achieved revenue of $2,3 billion with only 180 employees during 2015. The revenue per employee for Supercell was 12,8 million and for King 1,3 million. Supercell has released only 4 games to the market, King has developed over 200 titles.

Supercell founders and top executives have ranked as top taxpayers in Finland for years. Kodisoja and Paananen were the top taxpayers in 2013, paying 54,4 million euros and 54,1 million euros respectively, they both broke the Finnish record for one year tax payment. (Xinhuanet, 2014) The capital gains collected from Kodisoja, Paananen and other Supercell founders have paid so much tax between them that it increased the Finnish capital gains by around a fifth (20%). (Pearson, 2016)

Supercell paid a record corporate tax to Helsinki city, where they have their headquarters, 65 million euros in 2015. The previous record was held by Nokia, which paid 34 million euros to the capital city of Finland in 2007. However, Supercell does not scale up to Nokia when comparing the corporate tax paid on the country level. In 2007 Nokia paid 1,25 billion euros' corporate tax to Finland, ten times more than what Supercell paid in 2015. (Laitinen, 2016)

The CEO Ilkka Paanenen has said that he is a proud tax payer, and appreciates the help he has received from the society and government, for example, they have received funding from Tekes in their early days, and he wants to give back to the society. (Xinhuanet, 2014) There is a lot of evidence of Supercell giving back. In addition to being honest tax payers, they have been active in building the Finnish startup ecosystem by sponsoring the startup conference Slush. The employees of Supercell have made a big donation to the local children's hospital and Paananen and Kodisoja have established a social impact foundation called the We Foundation (Me-säätiö in Finnish).

Slush is Europe's leading startup event, which took off in 2008 in Helsinki as a student-driven non-profit movement. It grew out of Aalto University and Startup Sauna, a non-profit startup accelerator program, with the goal to change attitudes toward entrepreneurship and help founders meet with potential investors. In 2008, it brought together 400 people mostly from Finland. Since then, the Helsinki event has become a global phenomenon, in 2016 there was already 17 500 attendees from all over the world. The concept of Slush has spread globally – in 2015 Slush was organized in Tokyo and Beijing for the first time and in 2016 in Shanghai and Singapore. All the Slush events are organized by volunteers, Slush remains a non-profit organization. Supercell's success has boosted Finland's reputation as an important start-up centre. The gaming industry has become a serious business for the economy and the local start-up ecosystem. Supercell has been supporting Slush events by sponsoring their afterparty in 2014 and a more formal partnership between them was established in 2015. Aalto University alumnus Ilkka Paananen is a regular speaker at Slush, he also spoke at the first event in 2008. During a panel discussion in the 2015 event, Ilkka Paananen spoke about the future of entrepreneurship and made a bold statement, he thinks that the next Google will be born in Helsinki, he estimates it will happen in 20-30 years. During the same discussion, a venture capitalist from Index Ventures, Neil Rimer said that Finland has become the new Silicon Valley for gaming companies. (Ehrnrooth, 2015)

In 2013, employees of Supercell donated 3,4 million euros for the construction of a new children's hospital in Helsinki. The donation is the largest single donation raised by the association advocating the construction project. (HelsinkiTimes, 2013)

After the donation to the children's hospital, the founding duo, Kodisoja and Paananen, decided to start social impact foundation with the objective to diminish social inequality and exclusion of children, youth and families in Finland. The core purpose of the We Foundation which was registered in 2015 is to increase equality in the Finnish society. The CEO Ulla Nord says the foundation is operated in the spirit of a start-up, they have big ambitions and want to do things differently (see Appendix 1 for list of objectives). The foundation is established for a period of 15 years and the aim is to invest minimum 38 million euros during the time. One of the first projects the foundation invested in aims to improve the refugee and immigrant youth's participation in education and employment. (Bhose, 2016)

We Foundation and Sitra[12] have launched the first Social Impact Bond (SIB) in Finland and the Nordic countries. A Social Impact Bond (SIB) is a form of impact investing where investors finance and carry the risk of an intervention to improve social outcomes. The public sector's commissioner pays only for the results (the SIB model is explained in Appendix 2). We Foundation has invested 250 000 euros to the bond which helps the public sector through private finance. The proceeds of the bond will be invested in occupational well-being programs provided to public sector employers in Finland over a three-year period. The impact of this SIB is measured in the number of sick leave days. Sick leaves have a high cost on Finland's economy, approximately 7 billion euros every year. The goal is a reduction of 2.1 sick leave days per employee per year. If the goal is met, public sector participants will realise significant savings, part of which will be returned via the SIB to the investors. (Sitra, 2015)

7 Conclusion

The games industry was established in the 1970s when Atari introduced arcade video games. The mobile gaming segment was born in 2007 after Apple released the first iPhone. Even though the games industry is relatively new, it has established a permanent role in the entertainment industry, growing faster than the TV, music, movies, and book publishing business. The global games market was valued 99,6 billion US dollars in 2016 and it's projected to continue growing in the future, driven by technological advancements and a growth in overall gaming audiences. Digital games are enjoyed by a wide population of both males and females, in all age groups. The average game player in United States in 35 years old.

The gaming industry contributed close to a $100 billion in 2016 to the world economy. Its growth rate in the recent years has been impressive. The United States gaming industry grew four times faster than the entire US economy between 2009 and 2012. Newzoo, the leading market research company covering the global games market has calculated the size of the gaming industry by summing up consumer revenues by games companies globally. However, this approach underestimates the industry's total contribution to the world economy. The purchase of video games triggers the purchase of other complementary products such as processors, content, devices, and broadband

[12] Sitra is the Finnish Innovation Fund. It is an independent public foundation which operates directly under the supervision of the Finnish Parliament.

internet access. Although the sales of complementary products are an example of direct contribution to the economy, measuring the total turnover has proven to be challenging and therefore is not included in the industry size.

In addition, the games industry influences the economy indirectly since technological and service innovations developed for entertainment games are spilling over into other sectors and non-leisure applications. In the context of this thesis, spill-over is referred to as voluntary and involuntary exchange of useful technological information, new concepts, ideas, and different types of capital. For example, computer processing would not have developed as fast as it has without video games. As the software improved, the hardware had to catch up to run the increasingly more sophisticated programs. Vendors in the gaming industry value chain invest heavily in R&D and specialized human capital. The innovation created by games companies have a broader impact on the economy and the society through positive spill-over effect. The gaming industry players have strong innovation capabilities, and they act as catalysts for innovation and knowledge-based growth in various other industries, contributing to economic growth across the economy indirectly. Knowledge spillover is a driving force of economic growth, yet the industry size calculation does not capture the benefits. Therefore, it can be estimated that the industry's total contribution is much higher than what Newzoo reports.

Digitalization is the driving force behind the growth of the gaming industry. Digital games, which were previously limited to consoles or the PC, have become widely accessible on smartphones and tablets, reaching well over a billion of people worldwide. Smartphones and access to mobile broadband has becomes widely available, and the trend is likely to continue, it is likely that the mobile games segment will be growing at a faster rate than other game segments.

Finland stands out in the global games market with the mobile games maker Supercell, which is valued over 10 billion dollars and many other globally known games makers, such as Rovio with their *Angry Birds*. Although Supercell is a small company employing roughly 180 people, it plays a major role in the Finnish economy. Supercell's founders are top taxpayers in Finland and the corporate tax paid to the capital city of Helsinki has broken a record with 65 million euros in 2015. In addition to being honest tax payers, Supercell and their employees have been actively involved in social matters. One example of social activism is the establishment of We Foundation, a social impact

foundation which seeks to increase equality in the Finnish society. We Foundation has been involved with the launch of the first Social Impact Bond in the Nordics.

Finland is known world-wide as the home of Nokia, the major player in the mobile telephone industry. Despite the downfall of Nokia as a company, its legacy lives in the vibrant start-up scene in Finland. Supercell can be looked at as Nokia's successor as Finland's leading consumer company. In just 7 years Supercell has become one of the fastest growing gaming companies in the world. This is a great achievement in a market dominated by non-European companies. The Finnish games industry reached a 2 billion euro milestone in 2015 with about 290 registered games studios and 2700 employees.

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We Foundation Objectives

The ideal venture for us to support meets the following criteria:

- **We aim to be the best in the world.** Whatever the project's objectives, it must have a worldwide perspective and high standards. We strive for excellence in everything we do.
- **Broad influence and scalability.** Each project we support must aim to have a maximum effect and reach as many lives as possible. In order to attain the best results, each successful venture ought to be implemented in other corresponding fields as well.
- **Clear and measurable objectives.** We expect each project to have clear and measurable objectives.
- **Experiments and risks.** New ideas are very welcome. We are happy to get involved in high-risk ventures, where the goal is to achieve an entirely new solution to an existing problem, for example through new technology or a novel approach. We are not afraid to fail, since only through error can we develop something new!
- **Working together.** The impact is maximized when working together with many different agents for a common goal. We are not trying to reinvent the wheel and therefore, it is crucial that municipalities are one of the key agents involved in the majority of our projects.

Impact Investing: SIB model