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THE ROLE OF BUSINESS MODEL IN COMPUTER GAME DEVELOPMENT ORGANIZATIONS

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Abstract

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The computer game industry has grown steadily for years, and in revenues it can be compared to the music and film industries. The game industry has been moving to digital distribution. Computer gaming and the concept of business model are discussed among industrial practitioners and the scientific community. The significance of the business model concept has increased in the scientific literature recently, although there is still a lot of discussion going on on the concept.

In this thesis, the role of the business model in the computer game industry is studied. Computer game developers, designers, project managers and organization leaders in 11 computer game companies were interviewed. The data was analyzed to identify the important elements of computer game business model, how the business model concept is perceived and how the growth of the organization affects the business model.

It was identified that the importance of human capital is crucial to the business. As games are partly a product of creative thinking also innovation and the creative process are highly valued. The same applies to technical skills when performing various activities. Marketing and customer relationships are also considered as key elements in the computer game business model. Financing and partners are important especially for startups, when the organization is dependent on external funding and third party assets. The results of this study provide organizations with improved understanding on how the organization is built and what business model elements are weighted.

Keywords: Computer games, startups, business model, organization, grounded theory, case study, survey

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I have never felt any pressure from my family when I have been wondering what kind of school I should apply to. It would have been acceptable if I had become a taxi driver or a football player. I shall express my greatest thanks. Additionally I could mention dozens of names but those of you who have speeded up or delayed my thesis already know it. You will always stay in my heart <3

Writing a PhD thesis gives one a book as a concrete result but it also gives so much more. It helps one to find himself and to observe the world through the lenses of science and skepticism. The following two quotes are there for me to remember not to take the easy way but the way that is the most beneficial – for me and for mankind.

"Croyez ceux qui cherchent la vérité, doutez de ceux qui la trouvent" – André Gide

"You must always believe you will become the best, but you must never believe you have done so." – Juan Manuel Fangio

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List of publications

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In this thesis these publications are referred to as *Publication I, Publication II, Publication III, Publication IV and Publication V*.

Contribution of the author to the publications

I. Made the research plan, gathered articles for a review, analyzed them and wrote most of the article.

II. Made the research plan, designed the interview sessions, collected the data, analyzed it and wrote most of the article.

III. Participated in analyzing the data, wrote parts related to business sides of game development in the theoretical background and the corresponding findings.

IV. Made the research plan, designed one round of interview sessions, collected the data from them, analyzed it and wrote most of the article.

V. Participated in developing the research plan, gathered half of the data, analyzed it and wrote half of the article.

Symbols and abbreviations

AHP   Analytic Hierarchy Process

B2B   Business to Business

B2C   Business to Consumer

BMC   Business Model Canvas

BMF   Business Model Framework

F2P   Free-to-Play

GDD   Game Design Document

CEO   Chief Executive Officer

HTML5   Hypertext Markup Language, version 5

IAP   In-App Purchasing

IT   Information Technology

NES   Nintendo Entertainment System

P2P   Pay-to-Play

PC   Personal Computer

TRIZ   Teoriya Resheniya Izobretatelskikh Zadatch (theory of inventive problem solving)

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1 Introduction

The computer game business has grown to significant business in revenues and surpassed the music and movie industry (Statista 2014d; Statista 2014b; Statista 2014c). From 1996 to 2013 the entertainment software industry increased its revenues from $2.6 billion to $22.41 billion in the USA alone (Entertainment Software Association 2014b; Entertainment Software Association 2015). In Finland, the revenues have increased from 40 million euros in 2004 to 250 million in 2012 (Hiltunen et al. 2013) and even 1.8 billion in 2014, although the metric is not 100% compatible (Neogames 2015). The industry has been constantly in the news headlines and the growth rate of the computer game industry was 9% in 2013 (Galarneau 2014), which illustrates the fact that the computer game markets have not yet saturated. Although the first digital games were created already in the 1950s the computer game industry was born in the 1970s when the first coin-operated gaming machines and home video game consoles were introduced (Kultima 2009; Entertainment Software Association 2012). Even though the very first games were merely technology demos made by engineers, the coin-operated machines started the game business where digital games produced revenue for the developers. During the first decade of digital gaming the game companies manufactured gaming machines that were heavy, expensive and did not have much programming. The first home video game consoles were released in the 1970s (Entertainment Software Association 2012), and since then the industry has moved from selling dedicated physical gaming devices to selling games in plastic packages and further to fully digital distribution. Digital sales surpassed physical sales in USA in 2014 (Entertainment Software Association 2015).

The change in technologies and platforms has also changed the business models. Instead of programming games, finding someone to publish and distribute them in plastic boxes the industry allows today both bigger industrial players and smaller independent, privately owned companies to build their games and release them in global virtual game stores. The appearance of hundreds of ready-to-use game engines (e.g. Unity or Construct 2) (Lewis & Jacobson 2002) has shortened the time needed to create a game. This has also led to a situation where competition is hard, as app stores have hundreds of thousands of games available.

Scientific research on computer games has increased in this millennium, but it is still recognized as a young domain when comparing to for example software engineering, not to mention welding and ship building; research is required in fundamental issues like requirements analysis and programming tools (Ampatzoglou & Stamelos 2010; Kanode & Haddad 2009). The current research is reported to lack the empirical – industry practitioners – point of view in business model research (Valtakoski & Rönkkö 2010).

Although the computer game industry, its tools and business models have experienced changes, the value games create has stayed almost the same. Serious games, such as learning and health-care games have been developed, but excluding these, the value of the game is in the fun side – they provide entertainment (Boyle et al. 2012; Kanode & Haddad 2009).

In this thesis the role of the business model in present startups and established companies is studied. The thesis consists of a series of empirical studies focusing on computer game organizations and the role of the business model in the computer game industry. The overall research question is "*What is business model, its elements and their roles in computer game development organizations?*" With this question, the role of the business model is aimed to be defined in the computer game context. The aim is to shed light on how the business model of computer game companies is formed and how it differs from the conventional software business. This is achieved with a series of qualitative studies based on data collected in computer game organizations of various sizes and ages. For validation a quantitative study is also conducted. As the study observes the computer game companies from the business model perspective, also the concept of business model needs to be clarified. There is no clear definition for the business model concept (Al-Debei & Avison 2010; Schief & Buxmann 2012), and thus, this study examines the current literature on the business model and summarizes it.

The contribution of this study is threefold: 1) the business model concept is described in the field of the computer game industry. This includes both a literature review and data gathered in the field. In addition to a systematic literature review, 40 individuals in 12 organizations were interviewed to gain knowledge from practitioners; and 2) the

elements of the business model of computer game startups are identified and discussed. This is done through analyzing interview data; and 3) the elements and their roles in the computer game business are discussed in detail and computer game startups are compared with established game companies and other IT organizations.

This thesis is divided into two parts: an introduction and an appendices including five scientific publications and theme-based questions for the interviews. The introduction consists of six chapters. Chapter 2 introduces the research background and the key concepts necessary for understanding the following chapters. Chapter 3 describes the research goal and methodology in detail. This includes the research perspective, philosophies, methods, and the overall research process. Chapter 4 summarizes the publications, which are presented in the appendix 1, with short descriptions and relations to the whole. Chapter 5 combines the results, and discussion of the theoretical and practical findings is presented. Also the limitations of the research are discussed. Chapter 6 concludes the thesis by summarizing the results and proposing future research ideas and topics.

2 Computer game industry and business models

This chapter presents the scope of the study by describing the relevant history of the topic, concepts and their definitions. Based on scientific literature, the chapter describes software industry and its characteristics; computer game industry and how it differs from conventional software industry; and what a business model is and what its relation to the computer game industry is.

2.1 Software industry

The software industry is a rather young area of industry. The mankind has built bridges and houses for thousands of years, but the first software were created in the 1940s and 50s when the wires in early computers were replaced with punch cards and programming languages. The term software engineering was first used in 1968 (Shaw 1990). The early computers were used in universities making it possible to study software engineering from the very beginning.

The size of software has grown enormously since the first pieces of software. This has led to a development of different process models like the waterfall or spiral model and agile development (Dybå & Dingsøyr 2008; Wasserman 1996). At the same time the development has moved from one place to distributed development – global software engineering (Portillo-Rodríguez et al. 2012).

The software industry has specialties that the conventional brick and mortar industry does not face. The software industry is moving from products to services, which are intangible (Chesbrough & Spohrer 2006), meaning that they can be delivered through online marketplaces, and thus, the logistic costs are basically non-existent. The cost of copying is close to zero, which means that every project solves a new problem as the already solved problems can be solved again with an existing software solution. As the industry is moving from products to services (Cusumano 2008), the revenues are generated from monthly/yearly fees instead of upfront licence fees. An example of this kind of a shift is the comparison of Microsoft Office as a stand-alone software and Office 365 with Office Online tools, which is a service run in the cloud. The first one generates profit once and the latter monthly/yearly, depending on the billing period. The software industry has changed over the years, the business has evolved and keeps evolving at a fast pace.

2.2 Computer game industry

To understand the computer game industry, it is necessary to understand first what games are. Whether one is talking about traditional or digital games, one talks about a system that has explicit rules which will lead to different outcomes every time the game is played (Crawford 1984)[1]. A game differs from a movie or a novel in storytelling, where the game has no linear story, but every story is built upon the player's actions (Vorderer et al. 2003): "a story [is] static where a game is dynamic" (Crawford 1984, p. 11). Building a computer game is hard work, and the tools, concepts, requirements and platforms have changed dramatically in the last 30 - 40 years (Blow 2004).

2.2.1 Evolution of the computer game industry and business

The commercialization of computer games started when the first home video game consoles were released in the 1970s (Entertainment Software Association 2012), and in the 1980s home computers and special gaming consoles like Nintendo Entertainment System (NES) began to conquer space from the living room. During this change, newly founded game companies started to release games on these new platforms, like Commodore 64, Amiga, PC and NES.

During the 1990s, the game industry kept growing and started to be socially accepted as a hobby – or even as an occupation. For example, Blizzard's StarCraft (released in

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1 With these specifications it can be argued whether Calvinball – a fictional game presented in Calvin and Hobbes cartoons – is really a game or not as it has rules that can be applied only once ever (excluding the rule that defines that rules can be applied only once).

1998) became popular in South Korea and tournaments were shown on TV. Game strategies were also studied to improve real life training (Lewis et al. 2011), and game network traffic was studied to improve network architectures (Claypool et al. 2003). The first games for mobile phones were launched and for example PC games could be bought in normal supermarkets instead of specific computer shops.

In the 2000s, gaming was considered as a mainstream hobby, and the game industry overtook the music industry in business turnover (Table 1). Digital distribution also saw daylight when the network bandwidth increased and mobile phones gained more performance. The introduction of Steam, AppStore and Google Play increased the digital distribution and introduced new business – and especially revenue – models.

The diffusion of mobile phones first brought out simple games (e.g. Snake by Nokia) available for every phone owner in the late 1990s. Mobile phones got color screens in the mid-2000s and could run Java-based applications. Mobile operators and third party digital markets sold small Java games that were installed through PCs. Apple introduced its App Store in 2008, and the users of iPhone could buy applications and games, and these apps would be downloaded directly to the phone and be installed there automatically. This soon exploded the mobile game markets and introduced various new successful mobile game companies like Rovio Entertainment, Supercell and King. It is now reported that both Apple's App Store and Google's Google Play have over one million apps to download (Statista 2014a).

Table 1. Global revenues of different entertainment industries

Data source	Video game industry	Music industry	Film entertainment industry
Statista (Statista 2014d; Statista 2014b; Statista 2014c)	$101.62bn (2014)	$47.4bn (2014)	$88.3bn (2014)
BigFishGames (Galarneau 2014)	$76bn (2014)	-	-
Gartner (Gartner 2013)	78.9bn (2012)	-	-
IBIS World (IBISWorld 2015; IBISWorld 2014)	-	$15bn (2014)	$92bn (2015)
IFPI (IFPI 2013)	-	$15bn (2013)	-

Computer game engines have matured in a way that the content, game logic and rendering engine are separated, allowing thus the building of different games with the same engine. The game engines have evolved to be modular and adaptive, so that they are also used as scientific research tools (Lewis & Jacobson 2002). It was reported already in 2002 that over 600 commercial game engines existed in at that time (Lewis & Jacobson 2002). Using existing components, such as a game engine, can make the development process faster (Folmer 2007), and therefore game engines like Unity have

gained popularity. Some companies are specialized in developing game engines, some making physics engines, and some creating artificial intelligence to be utilized in games (Kanode & Haddad 2009).

When computer games became socially acceptable, it also meant that the games could be played by anyone. The gaming culture was male-dominated in the beginning but gained diversity where for example in the casual gaming segment females represent a half of the players (Casual Games Association 2007) and almost two thirds of the players are adults. According to statistics, the average age of a gamer is 31 (Entertainment Software Association 2014a). These issues have created wider customer segments and thus allowed the game designers to focus on a more specific gamer segment compared to the industry of the 1980s where the gamer population consisted of young males.

The revenue sources of the computer game industry evolved from selling physical devices to selling games in physical boxes. The next step was digital distribution where the only physical item the gamer has is the gaming device, the game itself is bought digitally online. Figure 1 illustrates this change from the conventional process of selling physical game boxes through retail stores to digital distribution. Profit distribution has also changed, as a publisher or a distributor is no longer required as the retailer takes care of the distributing process and the developer organization itself can handle the marketing. In reality, not all developers have the marketing competence leading to the utilization of a third party marketer, which can also be a publisher, such as Microsoft or Valve.
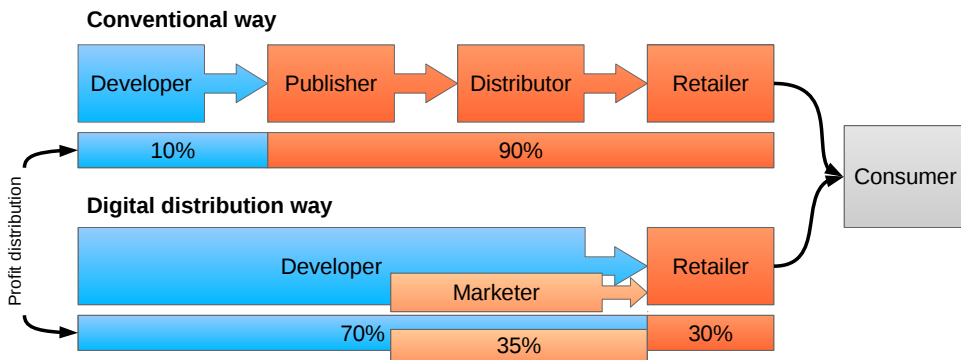

Figure 1. Business logistics and profit distribution of a game in traditional and digital distribution ways (Hiltunen et al. 2013)

2.2.2 Current status of the computer game industry and business

The increase of mobile gaming has generated new games and game companies focusing on games that require only fast gaming sessions. These games are built with third party game engines and tools that allow developers to deploy the game on several different platforms (e.g. iOS, Android) at the same time. Organizations have differentiated themselves to work with tasks like game engines and physics engines (Kanode & Haddad 2009). A music artist can make sounds and music to several games developed by different companies. Graphical assets can be bought on online markets or one can use freely licensed material or form a partnership with a third party art studio.

Kanode and Haddad (2009) describe how game development is divided into pre-production and actual production. In pre-production a game design document (GDD) is created to illustrate the game concept, and it can include the craziest ideas ever made (Alves & Roque 2007; Callele et al. 2005). This can mean for example a storyboard, a concept artwork, paper prototypes or even a game prototype, as the game making tools enable fast prototyping. The GDD is very informal and changes when the game is put in the production phase (Alves & Roque 2007; Callele et al. 2005). The computer game industry requires innovation and creativity, as the games need to be entertaining. There are various ways to improve the innovation and creative process, and companies are putting effort into generating new successful game ideas (Kultima 2009; Kultima & Alha 2010). The GDD includes these creative ideas and is used to concretize the ideas. Alves and Roque (2007) also argue that the GDD is only useful for the organization that has written it, as other stakeholders would interpret it differently. Callele et al. (2005) investigated how the transition from pre-production to the production phase can be a source of many failures. In the actual production phase the game is created, tested and put on the markets. Lee et al. (2006) define the testing and marketing phase as post-production. The testing phase of a computer game differs from conventional software testing, as usability and user experience are weighted as the most important testing tasks and the testing can also change the product in the end of the development stage (Kasurinen & Smolander 2014).

Blow (2004) argued in 2004 how game engines can cost $600 000 and developers have to think carefully whether the engine can do all the necessary tasks. Since 2004, several open source (e.g. the Phaser HTML5 game framework) and freemium game engines (e.g. Unity) have lowered the costs, and this has also been noted in research articles mentioning that the price of the tools are not considered a problem – even for startups (Kasurinen et al. 2013).

The computer game industry has grown to be one of the biggest industries globally. It has already passed the music industry in revenues, and the film industry has similar figures to the computer game industry according to the various sources presented in Table 1. The growth rate has been more than seven times the growth rate of the entire economy during 2005 - 2009 in the USA alone (Entertainment Software Association 2014b).

The business has also changed in relation to revenue models. While the pay-to-play (P2P) model was dominant for the first 30 years of game business, the free-to-play (F2P) model has gained popularity recently. Digital distribution has made it possible to innovate new revenue models instead of the old "selling game packages" model. In the P2P revenue model, the only income is received when the game (e.g. StarCraft 2) is sold, and when the game does not sell anymore the game company does not get income, although the game might require updates. Free trial versions of games are provided so that the gamers can test the game before they decide whether to buy it or not. The subscribe-based games (e.g. World Of WarCraft) change this, as besides the game, the customer needs to pay a monthly fee to get access to the virtual world. The F2P – also known as freemium – model removes the initial and monthly payments and relies only on optional payments. The basic idea is that getting the game is free and after that a part of the customers produce income by using money to buy virtual goods inside the game (Hiltunen et al. 2013). Although also shareware games were free to download and copy, the completely game was not free and no virtual goods were sold; only the complete game was the one being sold (Camper 2008). Advertising inside the games has moved from static banners and product placement to a dynamic content where the advertising seen inside the game can vary, for example, between different geo locations, marketing campaigns and languages (Entertainment Software Association 2014c). These models can also be combined so that the game is provided with advertising and one can upgrade to an ad-free version with a small amount of money. Advertising can also appear in F2P games.

The F2P model with in-app-purchasing (IAP) has gained both negative and positive publicity (Hiltunen et al. 2013). From customers' point of view, it provides free games, so one will not lose money if the quality is not as expected. On the other hand, although the game is free it might still require in-app-purchasing for the gamer to succeed in it. For example, the levels can be so hard that the gamer is required to buy virtual goods to help in the playing. The increase in the utilization of F2P has been fast (Wu et al. 2013; Casual Games Association 2013). The level of so called casual gaming, which means short gaming sessions here and there with mobile devices, has been growing hand in hand with the number of mobile devices.

2.2.3 Current status of computer game research

The computer game industry has grown, and according to a systematic review conducted by Ampatzoglou and Stamelos (2010), also scientific research on the topic has increased. In their review study, Ampatzoglou and Stamelos (2010) list more than half of the studies published in 2008 or later. Games have been studied from various perspectives. For example, they have been studied from the enjoyment point of view (Vorderer et al. 2003), where it is argued that the game has to be challenging enough but not too hard to provide the best possible enjoyment. Games have been studied from the point of view of engagement in a game (Boyle et al. 2012), the expectations from development tools have been researched (Kasurinen et al. 2013), and how gaming can be utilized outside the original context has been illustrated (e.g. gamification and serious games). Pedreira et al. (2015) have mapped the current literature on gamification, which means "incorporating game mechanics and elements, thus making that task more attractive" (Pedreira et al. 2015, p. 157), concluding that the research is in an infant state. Connolly et al. (2012) came to the same conclusion when they studied serious games, which are games that are used for example in education and health-care. These new angles to games are topics that have just now gained popularity among researchers and there is a lack of high quality journal articles about the issue (Connolly et al. 2012; Pedreira et al. 2015). Recently Melcer et al. (2015) made a bibliometric study going through over eight thousand articles and collecting keywords and publishing forum from them. Their findings illustrate 20 major research themes and how research has clusters of articles and forums of specific topic, such as technical research; journals and conferences have focused on a narrower topic than just "computer games". Melcer et al. (2015) argue to be one of the firsts to present research on computer game research community in such an extensive way. Although the study researched computer game research with wide perspective, it lacks the business side.

These arguments underline the youth of the field; although the computer game industry has existed for half a century, the research on business models and development techniques lacks behind. New special gaming concepts like serious gaming make no exception.

2.3 Specialty of the computer game business

Computer games are like software: they are intangible products, and basically every project and product is new, as existing products can be copied virtually without any costs. This means that the manufacturing costs are close to zero, whereas the design, development and marketing costs make up the price tag.

It can also be noted that when using digital distribution, also the distribution costs are virtually non-existing. As the distributing of mobile applications and games is completely digital, the business model has to be developed to suit this, and it modifies the weighting of the business model elements. Games are not tightly segmented to strict geo-locations but aimed at global markets, as the gamer population is spread all over the world.

Although game companies make market research and have discussion with players, games (excluding e.g. serious games) are sill built without complete prior knowledge of customer needs (Alves et al. 2007). This is logical in sense that games are providing surprise factor and games are basically always products, instead of projects to be used by only one stakeholder (Alves et al. 2007).

When the game business is compared to other creative fields like music, movie or book industry, similarities and dissimilarities can be found. Kanode and Haddad (2009) and Alves et al. (2007) mention that computer game engineering combine various disciplines, such as programming, art and music. Together they form entertainment. Callele et al. (2005) point out how the creative element in computer games requires extensiveness from conventional requirement engineering; the non-functional requirement "fun" is important in a computer game. Overall, computer game development is considered less strict and more artistic (Murphy-Hill et al. 2014).

On one hand, the gaming, music, book and movie industries are moving towards fully digital distribution and thus share similarities, but on the other hand the game industry is the only one that updates the product after it has been released. Products can even be released as "half-done" in some platforms or countries and thus get initial feedback, which is used to improve the later full-scale release.

Publication II points out that creating computer games is in a way opposite to conventional software development. A quotation illustrates this: "[conventional software] tries to minimize the time a user needs to spend. With games we try to maximize the time spent, and still keep it entertaining" (Chief Executive Officer [CEO], Case G, see Table 5). This quotation illustrates the specialty of the computer game business and why it is worth studying. Games are played because they give enjoyment (Boyle et al. 2012; Vorderer et al. 2003; Ampatzoglou & Stamelos 2010) – not because they improve the business or reduce the costs.

2.4 Business model

Although the concept of the business model has been mentioned in the literature since Norman's Management for Growth in 1977 (Hedman & Kalling 2003; Valtakoski &

Rönkkö 2010), the research and interest towards the concept has increased since the mid-1990s. The dot-com bubble in the beginning of this millenium brought the term to general discussion: companies were started and marketed because they were expected to develop highly profitable business models, and that led investors to invest in them (Teece 2010; Richardson 2008). Although the bubble burst, the concept of the business model stayed in the general and scientific discussion and the concept was included in scientific research (Osterwalder & Pigneur 2002; Teece 2010). Business models have been argued to be the first step in requirements engineering when developing software systems, and without a functioning business model, the innovation would not deliver and/or capture the intended value (Gordijn et al. 2000; Teece 2010). These ideas bind the business model concept to software engineering and underline the importance of understanding that building a software company is, besides building software, also building a business model.

2.4.1 Definition of the business model

The definition of the business model concept has been anything but unambiguous (Al-Debei & Avison 2010; Shafer et al. 2005; Schief & Buxmann 2012). Shafer et al. (2005) have done a review of relevant studies and found that there is at least 12 different definitions for the concept of the business model. The articles included in their study also listed 42 different elements – building blocks – of business models. Al-Debei and Avison (2010) selected 22 studies offering a scientific definition for the business model concept. Schief and Buxmann (2012) identified eight core publications discussing the business model concept in the software industry context.

Both Al-Debei and Avison (2010) and Shafer et al. (2005) argue that numerous researchers have taken too narrow a view on the definition of the business model concept and an overall – more abstract – view has not been in the focus. Shafer et al. (2005) also point out that the lack of considering all the elements of the business model led to the situation which caused the burst of the dot-com bubble. Although companies had a large customer base or an innovative revenue model the business model as a whole was not considered.

The business model literature has discussed various aspects of the concept. Timmers (1998) argues that the business model should include a description of the architecture for the product, service and information flows, potential benefits, sources of revenues and marketing strategy. This is one of the earliest definitions of the concept defining it through its elements. Hedman and Kalling (2003) add the customers and competitors to the list of elements, and do not discuss marketing as an individual element. Johnson et al. (2008) argue that the concept is formed from four main elements: customer value proposition, profit formula, key resources, and key processes. There is no mention of competitors, but for example metrics are added to the key resources. On the other

hand, Weiner and Weisbecker (2011) list competition as a part of the business model domain and do not mention metrics. This short comparison illustrates how the concept of the business model has evolved and transformed within the last 15-20 years.

Although it may seem that the research on business models is a wild field with no single thread or consensus, the situation is not so incoherent, as central elements can be found when several studies are considered as a whole. Table 2 presents 20 definitions for the business model concept defined in the literature. The list has been combined from previous studies (Al-Debei & Avison 2010; Shafer et al. 2005), modified and extended to illustrate the transformation and improved definition of the concept.

Table 2. Definitions and elements of the business model in different studies (combined from Al-Debei and Avison 2010 and Shafer et al. 2005)

Study	Definition	Elements
(Timmers 1998)	"Business model is an architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues." (p. 4)	An architecture for the product, service and information flows, potential benefits, sources of revenues + marketing strategy
(Linder & Cantrell 2000)	"An operating business model is the organization's core logic for creating value. The business model of a profit-oriented enterprise explains how it makes money. Since organizations compete for customers and resources, a good business model highlights the distinctive activities and approaches that enable the firm to succeed – to attract customers, employees, and investors, and to deliver products and services profitably." (p. 2)	Pricing model, revenue model, channel model, commerce process model, internet-enabled commerce relationship, organizational form, value proposition
(Gordijn et al. 2000)	"Who is offering what to whom and expects what in return." (p. 41)	Business actors, offering, activities, relations between these elements
(Alt & Zimmermann 2001)	"Business models determine participation of partners, channel conflicts, and revenues etc." (p. 2)	Mission, structure, processes, revenues, legal issues, technology
(Van der Vorst et al.	"It is essential to focus on the value proposition of the initiative; that is, the	Value proposition, roles, processes, functionalities,

2002)	underlying purpose for which the participants in the b-web are working together to create competitive advantage. " (p. 125)	applications, characteristics
(Dubosson-Torbay et al. 2002)	"A business model is nothing else than the architecture of a firm and its network of partners for creating, marketing and delivering value and relationship capital to one or several segments of customers in order to generate profitable and sustainable revenue streams." (p. 7)	Product innovation, customer relationship, infrastructure management, financial aspects
(Magretta 2002)	"Business modeling is the managerial equivalent of the scientific method – you start with a hypothesis, which you then test in action and revise when necessary." (p. 5)	Customer, value, revenue logic, delivery process, pricing
(Chesbrough & Rosenbloom 2002)	"How you make money." (p. 533)	Value position, market segment, value chain, cost structure, profit potential, value network, competitive strategy
(Camponovo & Pigneur 2003)	"A business model provides a description of the roles and relationships of a company, its customer, partners and suppliers, as well as the flows of goods, information and money between these parties and the main benefits for those involved, in particular, but not exclusively the customer." (p. 4)	Utilizes elements from Dubosson-Torbay et al. (2002).
(Hedman & Kalling 2003)	"The model integrates firm-internal aspects that transform factors to resources, through activities, in a structure, to products and offerings, to market. The logic is that in order to be able to manage industrial forces and serve the product market, businesses need activities, resources and input from the factor market (capital and labour) and the supply of raw material. " (p. 53)	Customers, competitors, offering, activities and organization, resources, supply factor and production input, longitudinal process
(Rajala et al. 2003)	"We combine product development, marketing, sales, revenue logic, services and implementation into a cohesive framework describing the generic elements of business models in the software industry." (p. 1614)	Product strategy, revenue logic, distribution model, service and implementation model
(Andersson et al. 2006)	"A business model is created in order to make clear who the actors are in a business case and	Actor; resource, feature, right; event, transfer, conversion;

		processes, interfaces, exchange, transaction and transformation; commitment, claim, contract and agreement; value activity; value proposition
(Kallio et al. 2006)	"The means by which a firm is able to create value by coordinating the flow of information, goods and services among the various industry participants it comes in contact with including customers, partners within the value chain, competitors and the government." (pp. 282-283)	Product development, sales and marketing, servicing and implementation, value creation, customer base, Government technology, relationship between operators and suppliers
(Chesbrough 2007)	"A business model performs two important functions: value creation and value capture. First, it defines a series of activities, from procuring raw materials to satisfying the final consumer, which will yield a new product or service in such a way that there is net value created throughout the various activities. … Second, a business model captures value from a portion of those activities for the firm developing and operating it." (p. 12)	Value proposition, target market, value chain, revenue mechanism(s), value network or ecosystem, competitive strategy
(Janssen et al. 2008)	"A business model reflects the core business of an organization and is useful to describe (and even prescribe), the organization from the perspective of its main mission, and the products and services that it provides to its customers. … A business model can [also] be viewed as a collection of organizational roles, the system functionalities, detailed description of a mechanism, and relationships among parties."(pp. 204-205)	Mission, logic, description of products and services, channels, position of organizational network and relationship with other agencies, description of future evolvement
(Johnson et al. 2008)	"A business model, from our point of view, consists of four interlocking elements (customer value proposition, profit formula, key resources, key processes) that, taken together, create and deliver value." (p. 60)	Customer value proposition, profit formula, key resources, key processes
(Osterwalder 2010)	"A business model describes the rationale of how an organization creates, delivers, and captures value." (p. 14)	Customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key

		partnerships, cost structure
(Weiner & Weisbecker 2011)	"A business model is an abstract description of a company's business logic and provides an aerial view on several elements of a business, like value proposition, target customers, revenues stream and processes." (p. 21)	Value approach, market interface, products & services, value creation & capabilities, financial domain
(Zott et al. 2011)	"[A] business model [is] … a new unit of analysis, as a system-level concept, centered on activities, and focusing on value." (p. 1037)	Value proposition, revenue model, network of relationships
(Schief & Buxmann 2012)	"Business models describe the strategic direction of a firm and have significant impact on the success of innovations." (p. 3328)	Main categories: strategy, revenue, upstream, downstream, usage

Table 2 illustrates how the definition of the business model has changed and the focus has moved from one part to another over the years. All the studies also mention elements, components or similar concepts as the building blocks of a business model. The most often listed elements are value proposition -related (12 hits), revenue (9 hits), key resources / processes (9 hits), and customers (6 hits). Based on these ideas, the definition for the business model concept in this thesis is the following: *business model defines who is offering what to whom, with what resources the offering is produced and what is expected in return*.

Based on the definitions by for example Chesbrough and Rosenbloom (2002), Osterwalder (2010) and Weiner and Weisbecker (2011), the definition of the business model can be drawn as the framework presented in Figure 2. The business model presents the value an organization generates for its customers. The customers provide income or some other value back to the organization. The organization uses this income to hire or buy resources to build products that generate value for the customers.
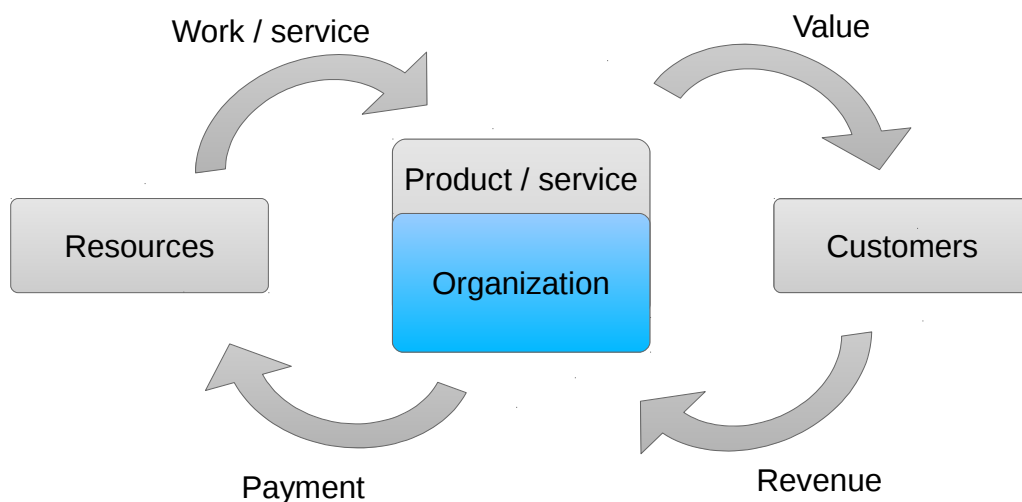
Figure 2: Simplified framework to define business model concept (based on Chesbrough & Rosenbloom 2002; Osterwalder 2010; Weiner & Weisbecker 2011)

It should be noted that there has been discussion on whether or not the concept of the business model actually exists. On one hand, there is research that argues that the business model is not a remarkable concept (Porter 2001) or how software business should be seen in the light of a research discipline (Käkölä 2002; Rönkkö et al. 2010), and on the other hand some studies – mainly recent ones – have recognized the concept (Al-Debei & Avison 2010; Magretta 2002; Osterwalder et al. 2005). In this light the study of business models is a study of a concept of which existence the scientific community still argues about.

2.4.2   Placing the business model concept in the business research context

Al-Debei and Avison (2010) position the concept of the business model between business strategy and business processes. They argue that the business model concept intersects with the other two concepts but is still an individual concept. Business strategy is high-level organizational decision making that, according to Zott et al. (2011), emphasizes the role of customers less than the business model. Business processes include more concrete activities done in the organization (Gordijn et al. 2000). Gordijn et al. (2000) define the business model as answering the questions of who, what and with whom, and the business process model as answering the more concrete question of how. The business model is positioned between business strategy and business process, where some parts, like value proposition, exist near business strategy and some, like key activities, are positioned in the business processes end (Al-

Debei & Avison 2010; Morris et al. 2005). The concept of the business model includes customers but their role varies between individual elements.

Sainio & Marjakoski (2009) focus on the revenue logic and argue that it is one element of the business model. They position both the revenue logic and the revenue model inside the business model and argue that the logic is strategic and the model operational. Weiner and Weisbecker (2011) define the business model as an abstraction of the business logic. This definition differs from that of Amit & Zott (2001), who argue the revenue and business model to be two distinct concepts. This illustrates the development of the business model concept, as the same researchers argued ten years later that the revenue model is a part of the business model (Zott et al. 2011). Knowledge about the concept has increased during the years although consensus has not yet been achieved. Yip (2004) states that the term business strategy has been used for over 40 years describing both business strategy and business model issues, and argues that the concepts should be separated.

The business plan is also related to the business model, and the terms are sometimes used interrelated. Morris et al. (2005) argue that the business model has elements from the business plan, but the plan is wider than the business model. A business plan is used when entrepreneurs seek funding from banks, venture capital funding or business angels (Mason & Stark 2004). Mason and Stark (2004) state that different funders require a different kind of business plan. When presenting their business plans entrepreneurs need to be able to sell their business ideas (Chen et al. 2009; Foo et al. 2005). This also questions the difference between a business plan and a business idea. It seems that when presenting business they are used interrelated, but when the business is presented on paper it is question of a business plan (Chen et al. 2009; Foo et al. 2005).

Alvesson (1999) has defined the business concept in a similar way than the business model was defined ten years later. According to him, the business concept includes elements like marketing, analytical internal organization and overall image. In addition, Osterwalder et al. (2005) state that the business model shows how the elements of the business concept fit together. In this light the business concept can be positioned in the same way as the business model, and it can be argued that they discus the same phenomenon, at least to some extent.

Business cases are also recognized as related to the business model concept (van Putten & Schief 2012). It is discussed that when the business cases of a company do not follow the business model of the company, it may be time to change the model (van Putten & Schief 2012). In this study business cases represent an abstraction of company's operations, whereas the business model is described as an implementation of a strategy. The business cases should illustrate the business model, and if that is not the case, the model should be revised.

The business logic includes formal or informal statements – business rules – of how the business is done (Wang & Wang 2006). According to Sneed (2001), the business logic can be in the source code or in the head of a programmer. This means that the positioning is the near business process concept. Sneed (2001) illustrates this with a case where the business logic is retrieved from the source code.

The business model has also similarities to the concept of value chain developed by Porter (1998). Porter (2001, p. 12) argues that "[t]he definition of business model is murky at best". His arguments emphasize strategy and competitive advantage. Chesbrough (2007) states that the best business models tie other organizations to the same value chain. As the definition of the business model has changed and it has become more complete, Chesbrough (2007) positions the value chain as one element of the business model. Morris et al. (2005) also argue that the concept business model builds upon ideas of business strategy, and most directly the value chain concept. Peppard and Rylander (2006) state that a value chain could be updated to value networks where different value systems exist between each entity in the network.

Based on analysis presented, Figure 3 illustrates the abstract positioning of various business model -related concepts. As can be noted, these definitions are overlapping and conflicting with each other.
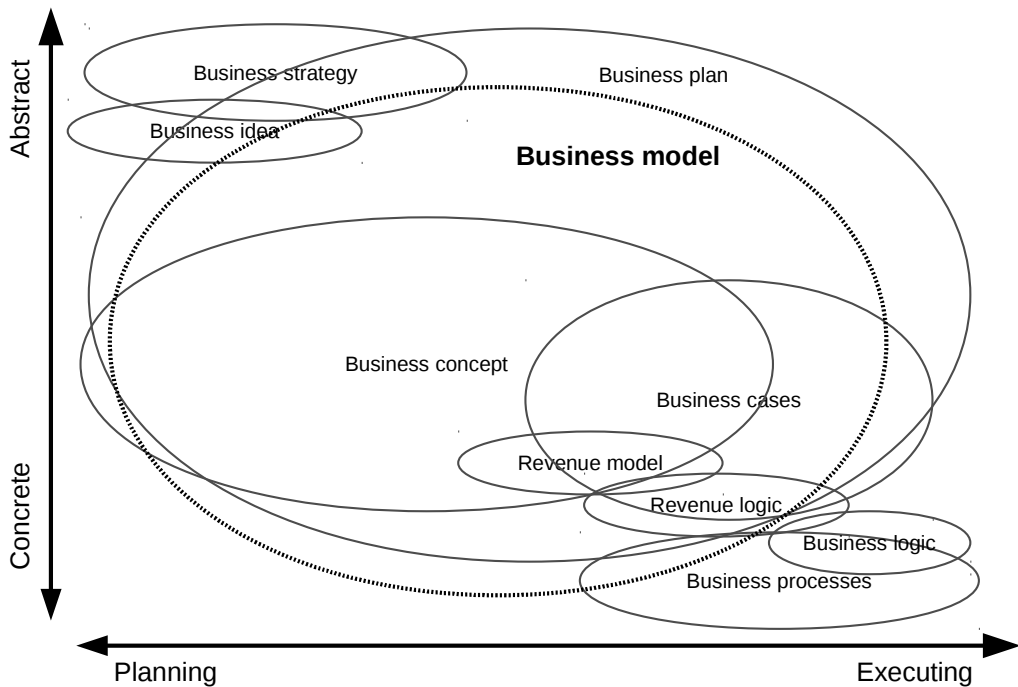
Figure 3: The relationship of different terms related to the concept of business model

As the business model concept has not been defined unambiguously, also its positioning has challenges. As argued, the concept of the business model has been positioned between the business strategy and business processes (Al-Debei & Avison 2010). Besides this "vertical" differentiation, the business model can also be considered working on the "horizontal" level where it helps to narrow the gap between planning and executing, as the business model comes soon after the business idea. It has been stated that the business model is the first step of requirement engineering (Gordijn et al. 2000), and thus it is positioned before the actual development. Business model can be considered as similar concept to the business plan, although business model seems not to be so broad as a concept, nor does it elaborate the topic so widely. Even though the business model is presented as a broad concept in the Figure 3, the reason behind this is mainly the novelty and ambiguousness of the concept. For example, the concept of business strategy has been studied for decades and its positioning is not as blurry as business model's.

Although there are boundaries for how to position the business model concept, the boundaries are not clear. The crossing points of the different concepts are still foggy and overlapping exists. In this thesis, business model is positioned as a concept that

on one hand fills the gap between the business strategy and business process, and on the other hand helps both the planning and executing phases, depending on the business model element under consideration.

2.4.3 The importance of business models

Whether or not companies realize it, they have a business model (Teece 2010). The business model can be extracted from all the executed businesses even if it is not documented or discussed knowingly. Magretta (2002) considers the business model as managerial equivalent to the scientific method. In this process, the business model is started from a hypothesis, which is then tested and revised when necessary. In this view, the weight of the business model concept is great, as the scientific method has proven to be successful in improving mankind. In addition, Favaro and Pfleeger (2011) argue that innovation management and business analysis have replaced conventional activities like requirement engineering. They also argue that business models play an important role in changing the standards of software industry, entitling their article "Software as a Business".

Chesbrough (2007) argues that the cost of an innovation has increased, and it is not enough to base innovations on research and development but also the business model element should be included in innovation. This means in the current state of economic development that an innovation may not be enough to generate revenue. It requires a functioning business model to support the innovation. Chesbrough (2007) builds a six-type business model framework (BMF) where the Type 1 organizations have no process to manage their business model and Type 6 business models are adaptive and tie other organizations to the same value chain. With this framework companies can verify where their business models stand compared to the whole potential and define steps that would lead to improvements. Shafer et al. (2005, p. 207) also argue that "[b]usiness models provide a powerful way for executives to analyze and communicate their strategic choices". The business model is considered a way to analyze, build and improve the business the company is doing; in essence the software industry is business.

2.5 Definition of a startup

In their systematic mapping study of software startups, Paternoster et al. (2014) point out that the majority of the studies have been published in this millennium. It seems that both the business model literature and startup literature have gained popularity after the change of the millennium. A startup has been defined as a company that is in its early stages and is moving from the idea and prototype phase to embark operations and secure financing (Sutton 2000; Paternoster et al. 2014). According to

Sutton (2000), a startup is not a synonym to a small or an established company, but Crowne (2002) defines the startup phase as the period between the initial plan and the first release. It has been said that startups are particularly innovative (Paternoster et al. 2014), they have limited resources and can be under the influence of several sources as the organization is still forming and storming (Sutton 2000).

Paternoster et al. (2014) claim that their study provides the first systematic exploration of software startup research. They also argue that there is a lack of research on primary studies in software development in the context of startups. The startup business is fluctuating and just over half of them survive the first year of existence (Peña 2002; Paternoster et al. 2014). Startups have been studied for example from the perspective of intellectual capital (Peña 2002), personal factors of the business founders (Frank et al. 2007), and survival (Åstebro & Bernhardt 2003).

As a summary, startups can be defined as young companies without operating history rather than established ones with experience, and rather small than large. They apply rather ad-hoc methods than systematic processes and utilize rather new emerging technologies than old and proven ones.

2.6 Computer games and business models

As mentioned earlier computer games have been studied for years, but the research could be broader. The increase of gaming – especially mobile gaming – has also increased the research on the topic lately. Although computer game companies build products with creative design and innovative game mechanism, in the end the industry is still doing business.

The growing computer game industry gives the business model research an angle that has not yet been studied thoroughly. The research is beneficial for both the computer game industry and the scientific community. Knowledge on the topic has increased, which subsequently provides improved models and metrics for examining the computer game business. The industry has faced quick changes in business models and research on the topic would benefit the newcomers in the industry as they could get on the right track from the beginning.

3 Research goal and methodology

In this chapter, the research goal is introduced and the research methodologies applied in the study are explained. This chapter also discusses the reasoning and selection of the research approaches, and describes the data collection process.

3.1 The research problem

The main research goal is to investigate the business model elements and their roles in computer game organizations. This goal is divided into six sub-questions (Table 3) where the steps include the definition of the business model concept, description of the elements it consists of, analysis of the organizational growth and comparison of the computer game startups to established organizations.

The first and second sub-questions address the problem of how the concept of business model is defined in the literature (1 in Table 3) and how industrial practitioners define the concept (2 in Table 3). To understand the role of the business model concept fully both views need to be considered.

The third sub-question focuses on the elements through which computer game startups define their business model. The fourth question continues this by describing that the computer game business has its own particularities. These two (3 and 4 in Table 3) sub-questions bring out the particularities that have not been studied previously.

The fifth sub-question concentrates solely on the growth process of a computer game organization. Although business model research has not discussed growth widely it is considered relevant, as business models are studied in both very small and young organizations and older and larger ones.

The sixth and final sub-question focuses on how the business model varies between computer game development organizations and other information technology (IT) -related organizations.

The first three sub-questions provide answers on how the business model is defined, and the last three sub-question addresses the topic extensively on organizations of different sizes and ages.

Table 3: The research sub-questions and the publications they are addressed in

	Sub-question	I	II	III	IV	V
1	How is the concept of the business model used and defined in the literature?	x				
2	How is the concept of the business model used and defined in the computer game development industry?		x			
3	With what elements do computer game development startups define their business models?		x			
4	What are the particularities of the computer game business?		x	x	x	
5	What issues exist in the growth management of computer game development organizations?				x	
6	What is the role of the business model in computer game development, and other, organizations of different sizes and ages?					x

Although the computer game industry has expanded to include health-care games and games used in teaching, this thesis concentrates on traditional games that are played for fun. The aim of the games is to provide an entertaining experience, not heal one's muscles or teach how to calculate differential equations. Even though these so-called serious games are important, they are out of the scope of this study.

3.2 Research perspective

Numerous different research approaches and methods exist in the scientific domain (Järvinen 2004; Wilson 2004; Easterbrook et al. 2008; Orlikowski & Baroudi 1991). In (Järvinen 2004)classification, the research approaches are divided into mathematical approaches and approaches that study the reality. The latter is then divided further into research stressing the utility of innovations that can be studied by evaluating and building approaches. The second sub-approach to studying reality is studying what the reality is. This is then divided into analytical and empirical approaches. The empirical approach can then be divided into theory-testing and theory-creating approaches. The taxonomy is presented in Figure 4.

The classification of research approaches is useful for understanding how different problems and research tasks require different approaches. Formal problems can be solved with formal – mathematical – techniques. The world we are living in is rarely formal but informal in many ways, and thus methods studying the reality are more suitable when studying real-life phenomena.
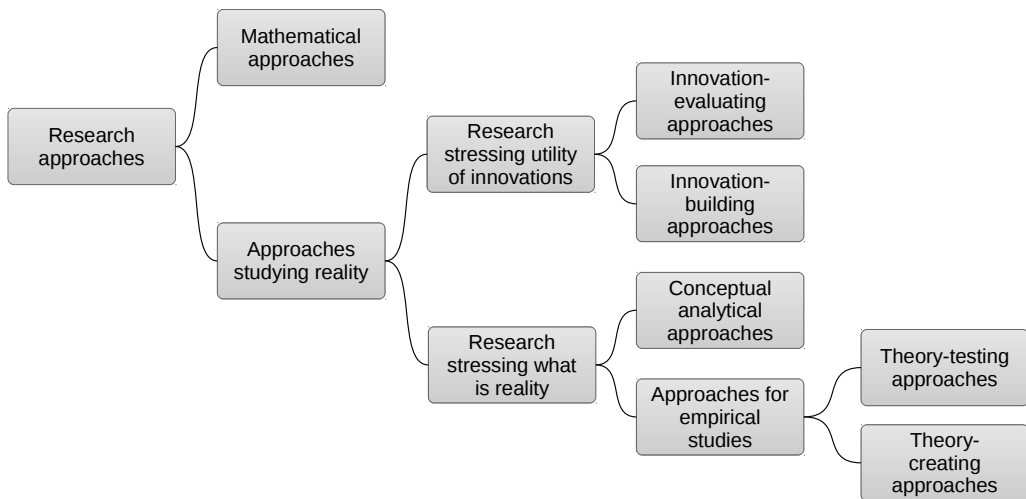
Figure 4: Taxonomy of research methods (Järvinen 2004)

Considering (Järvinen 2004) classification, this thesis falls under the type of research stressing what the reality is, as the aim is to study a concept that has lacked scientific research. The classification of this thesis goes to the deepest level presented by (Järvinen 2004), to the theory-creating approaches, as the aim is to find new theories and models through empirical studies. As there is also discussion on how suitable business model canvas is when working with computer game business models, a theory-testing approach also exists.

Wilson (2004) claims that all research methods are based on observation. He divides these observations into direct and indirect ones, which are then divided into imposed and emergent sub-categories where the difference is in the data collection – whether it will be handled statistically or not. Figure 5 illustrates this division.

Similar to research methods, also observation can be done in multiple ways. Direct observation requires the researcher to spend time with the work place / community / tribe and observe the phenomenon under study. This requires time and can generate a huge amount of data (e.g video recordings or notes). Indirect observation is faster to conduct widely as it can consist of for example surveys or interviews.
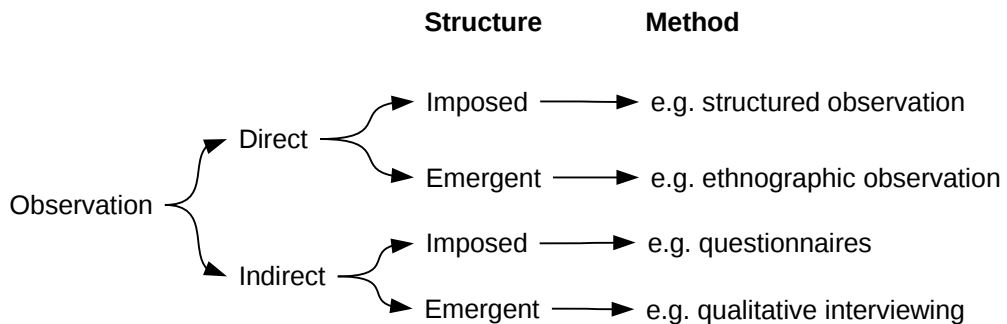
Figure 5: Observation categories (Wilson 2004)

As this thesis consists of case studies and Straussian grounded theory research, it is positioned as indirect and emergent.

3.3 Research philosophy

As this study is qualitative, it is suitable for describing underlying philosophical epistemologies. Chua (1986) has presented three epistemologies: positivist, interpretive and critical. This classification has also been used by Orlikowski and Baroudi (1991) and Myers and Avison (2002). Easterbrook et al. (2008) have added pragmatism to these philosophical views.

Positivist research is generally based on the assumption that the reality is objectively given and it can be observed and measured without the observer affecting the observed phenomenon (Myers & Avison 2002; Orlikowski & Baroudi 1991; Easterbrook et al. 2008). Positivist studies aim at testing theories and increasing the understanding of phenomena (Myers & Avison 2002). The problem with positivist is reductionism, as the phenomenon is studied in isolation from its context (Easterbrook

et al. 2008). Easterbrook et al. (2008) suggest that the researcher should think thoroughly whether laboratory experiments produce correct results or the study should reflect a real-life environment.

Interpretive – also called constructivist (Easterbrook et al. 2008) – research abandons the assumption that organizations are static and accepts the assumption that the relationship between people, organizations and technology are constantly changing (Klein & Myers 1999). Interpretivists do not emphasize theory verification but understanding how different people and actions make sense (Easterbrook et al. 2008; Myers & Avison 2002). Interpretive research also separates itself from positivism by only interpreting reality, not discovering it (Orlikowski & Baroudi 1991).

Critical research seeks to challenge the existing perceptions (Easterbrook et al. 2008), brings critique to the status quo, and aims at removing contradictions from organizations and society (Orlikowski & Baroudi 1991). Critical theorist experience research as a political act because knowledge – gained through research – improves different society groups and fortifies the existing ones (Easterbrook et al. 2008; Myers & Avison 2002).

Pragmatic research goes with the engineering approach, as it applies whatever methods are suitable to gain practical knowledge rather than abstract knowledge (Easterbrook et al. 2008). Pragmatists emphasize consensus on the researched issues to overcome the problem of relative truths, as people have different views on what is useful for them (Easterbrook et al. 2008).

Wilson (2004) argues that researchers have prior knowledge -based ideas to structure research, Myers and Avison (2002) continue by arguing that researches have assumptions about what forms valid research and what are suitable research methods. These ideas are also supported by Seale (1999). According to these views, positivist philosophy is hard to reach. Easterbrook et al. (2008) present that positivist research trusts in controlled experiments and uses also surveys and case studies, whereas interpretive research weights ethnographies and uses case studies, as well as surveys. Critical research relies on case studies, however Easterbrook et al. (2008) argue that action research would fit the critical research philosophy best. As pragmatic research is less dogmatic compared to other epistemologies, it utilizes mixed methods.

This thesis falls mainly into the category of interpretive study, as the research has been carried out by analyzing data concerning real-life phenomena and natural environments, instead of laboratory experiments. It also utilizes the pragmatic view in the sense that from the beginning the aim was to focus on the industry view instead of an abstract academic one. It was not possible to use the positivist research angle as there were no clear theories to utilize as a starting hypothesis, which is required in positivist research (Myers & Avison 2002). The study also utilizes the multimethod

paradigm, supported by pragmatism, as different methods were suitable for the different phases of the study.

3.4 Research methods

In this section the research methods used in the study are introduced and described. In the end of this section the use of multi-method research is justified.

3.4.1 Systematic mapping study

Systematic mapping study was used to identify the research gap. As Petersen et al. (2008) explain, systematic mapping study produces a map that can be for example a table, a diagram or a chart. Kitchenham and Charters (2007) describe systematic mapping study similar to a systematic literature review, but it does not necessarily require a read-through of articles.

The systematic mapping process suggested by Petersen et al. (2008) is utilized in this study. The process is presented in Figure 6. It includes steps starting from the definition of research questions and search of keywords. After the searches have been conducted from selected databases, journals and/or conference articles that do not meet the criteria are filtered out. The articles are then classified and a systematic map is built of the extracted data.

Definition of research question	Conduct search	Screening of papers	Keywording using abstracts	Data extraction and mapping process
Review scope	All papers	Relevant papers	Classification scheme	Systematic map
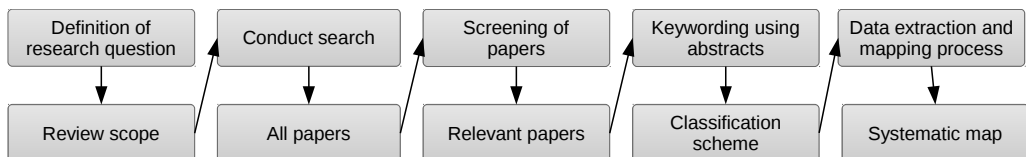
Figure 6: The systematic mapping process (Petersen et al., 2008)

3.4.2 Multiple case study

Case study is a common research method in information system research (Myers & Avison 2002). Easterbrook et al. (2008) divide case studies into exploratory and confirmatory ones. Gable (1994) and Eisenhardt (1989) categorize the purposes of description, exploration, prescription, theory testing, and theory building. According to Gable (1994), the strengths of a case study include research in a natural environment, the researcher's ability to understand the nature and the complexity of the process, and the fact that information can be gained rapidly. Qualitative data, for example interviews and observations, are used while seeking understanding of the

problem investigated (Gable 1994; Easterbrook et al. 2008). Case studies can also be divided into single case and multiple case studies (Eisenhardt 1989). In this thesis, case study method is utilized in the exploratory sense for theory building from multiple cases.

Various frameworks have been developed for conducting a case study (e.g. Eisenhardt 1989; Gable 1994; Meyer 2001). Eisenhardt (1989) describes an eight-step process of how to build a theory from the case study. The process includes defining of research questions, selecting the cases, crafting instruments and protocols, entering the field, analyzing the data, shaping a hypothesis, enfolding the literature, and reaching closure. Gable (1994) illustrates a more extensive framework, which takes care of multiple case studies and also adds survey-conducting to the same framework. Easterbrook et al. (2008) argue that case studies are open to interpretation and researcher bias, and thus it is recommended to use an explicit framework.

3.4.3 Analytic hierarchy process

The analytic hierarchy process (AHP) provides a way to ease the decision making and makes it formal and systematic (Vaidya & Kumar 2006). AHP is not limited to any specific task but it has been used in various areas, such as selection, evaluation, benefit-cost, priority, development, resource allocation, decision making, and forecasting (Vaidya & Kumar 2006; Alidi 1996; Babic & Plazibat 1998; Sarker et al. 2009). AHP does not limit the number of criteria or attributes either (Chen & Wang 2010), but makes it possible to compare N candidates with M attributes. As the number of calculations increases when the number of candidates and/or attributes increases, there exist dedicated software and spreadsheets to handle the data. With small amounts of data, the matrix calculations can be done by hand.

According to Chen and Wang (2010) and Vaidya and Kumar (2006), the process is described as follows, as the AHP includes several steps. First the goal is set. For example, it is possible to rank presidential candidates or places for vacation. In the second step, criteria for the candidates are set. The criteria can have the same weight, but they can have various weights, and these weights can also be decided with the AHP. The third step is to compare every candidate against each other with every criterion and decide which one is more important. If the candidates are equal, value 1 is set. If candidate A is more important, values 3, 5, 7 and 9 are used. If B is more important, values 1/3, 1/5, 1/7 and 1/9 are used. The bigger – or smaller – the value is, the more important one is over the other. Even numbers can also be used if the gap between odd numbers is considered too harsh. This generates matrices from which eigenvalues are calculated. The calculated eigenvalues are the ones used in the decision making. The bigger the value, the more important is the criterion.

The actual decision making is done on the basis of the final eigenvector. This can be used in for example prioritization or selection. In conclusion, the AHP provides key numbers gained from systematic comparison and mathematical calculations to be used in the decision making.

3.4.4 Grounded theory

The use of the grounded theory has increased in information system research after its introduction in sociology in the 1960s (Hughes & Jones 2003; Locke 2001). The grounded theory seeks to develop theory that emerges from data collected on a phenomenon through systematic analysis (Myers & Avison 2002; Strauss & Corbin 1990). The grounded theory can be used in two ways. The Straussian discipline focuses more on systematic categorization and analysis, whereas Glaserian approach focuses on passive observation (Strauss & Corbin 1990; Glaser 2002). In this thesis, the Straussian discipline is utilized, and the Glaserian method is not discussed. The Strauss-Corbin approach was considered suitable as some of the research data was already collected and thus more effort could be put on the analysis.

The coding process includes open, axial and selective coding, which are the key steps in grounded theory research (Strauss & Corbin 1990; Locke 2001). The role of open coding is reading through all the data and identifying all the key points that for example an interviewee talks about. This is done by coding words, sentences and paragraphs with terms presenting the issue at hand. The codes are then categorized to larger groups to include main categories and sub-categories. In axial, coding connections between categories and sub-categories are analyzed and built. The important part is to note what the categories and sub-categories are and how they are linked to each other. Axial coding is done after open coding but it can also take place at the same time as open coding (Strauss & Corbin 1990). Although both these phases use the term "coding" it has to be noted that the actual task is different between the first two steps. The last step is selective coding, where the core category is identified and defined. The core category can be a category that has been identified already in axial coding, but it can also be a more abstract category that presents the "central phenomenon around which all the other categories are integrated" (Strauss & Corbin 1990, p. 116). According to Locke (2001), the final step is to write the theory and publish it. With grounded theory, it has to be remembered that "the aim is not to discover *the* theory, but *a* theory" (Heath & Cowley 2004, p. 149), meaning that in the beginning the researcher has little knowledge on the topic, and the data can lead to numerous directions.

3.4.5 Multi-method research

This study relies on multiple methods, as not only one research method was recognized as suitable to handle different phases of the study. Multi-method research has been carried out for years, but according to Mingers (2003), only one of five studies utilize more than one method. The mixed method is a special case of multi-method research, where both qualitative and quantitative methods are used (Esteves & Pastor 2004). Frameworks exist (e.g. Teddlie & Tassahakori 2006) that are considered suitable when the research includes mixed methods. This study utilizes various qualitative methods, thus implementing the multimethod paradigm.

3.5 Research process

The research process was divided into four phases (Fig. 7). In Phase I, a systematic mapping study was conducted to review the scientific literature and to gain knowledge of how the computer game business and business models had been studied so far. Based on the current status of business model research and the gaps in it, Phase II could be formed.

A research gap was identified while reviewing the existing research in Phase I, and in Phase II it was studied how the business model of a computer game startup is constructed. Before Phase II started, prior research in a research project was also studied. This included testing standards, requirement engineering and overall game development techniques. In this stage the project had not considered the business side and the research gap found in Phase I was adapted to the computer game environment. Phase II resulted in the identification of business model elements that required a closer look in Phase III.

In Phase III, computer game organizations were studied deeper and their innovation and growth processes were described. A study of the innovation process was considered relevant, as the computer game industry is considered to differ from the conventional software industry. A similar issue is the growth process, as it requires for example talented persons from various fields such as programming, graphical designing and marketing.

Phase IV concluded the research with a study where the previous findings of the computer game industry were compared to different areas of the software business, mainly telecommunication organizations.
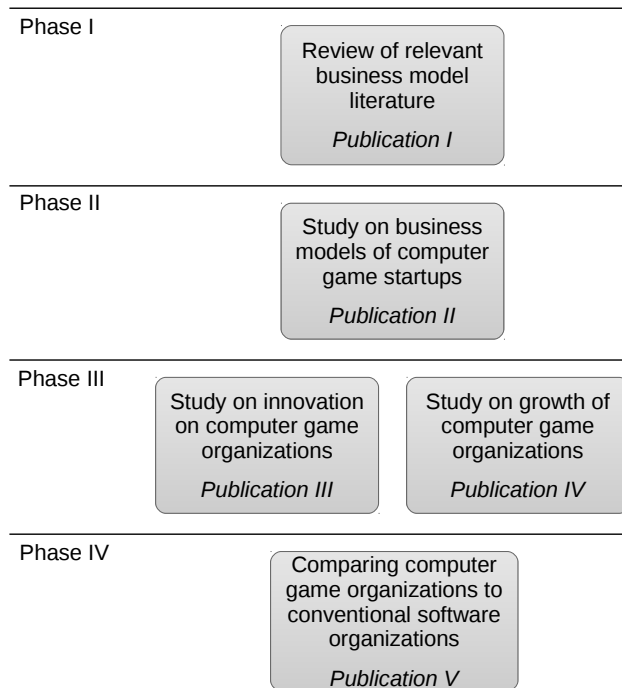
Figure 7: Research process and phases

3.5.1 Data collection

The data related to the computer game business was collected through a series of semi-structured interviews, described in Table 4. Rounds one through four were held in cooperation with other thesis workers, and rounds five and six were focused only on this thesis. The first interview rounds focus on software engineering apects and give background to the game business from the engineering point of view. The later interview rounds focus increasingly on the business sides, including topics such as financing and business modeling. In total, 12 organizations participated in the study, and 40 individual interview sessions were held between the years 2012 and 2014. These interview sessions generated 38 hours and 17 minutes of data, which was transcribed and analyzed. Seven individuals in two departments conducted the interviews, and interview questions were validated by these persons in two research organizations.

Table 4: Data collection rounds and themes

Round	Data collection method	Interviewee / survey respondent	Description	Main themes of the interviews
1	Semi-structured interview with 7 organizations	Team leader or project manager	The interviewee was responsible for the management of the development of one product, or one phase of development for all products.	Development process, test process, quality, outsourcing, development tools, organizational aspects.
2	Semi-structured interview with 6 (+1*) organizations	Developers, lead programmers or testers	The interviewee was responsible for the development tasks, preferably also with the responsibilities of software testing activities.	Development process, test process, development tools, development methods, quality.
3	Semi-structured interview with 8 organizations	Upper management or owners	The interviewee was from the upper management, or a business owner with an active role in the organization.	Organization, quality, marketing, innovation and design process, development process.
4	Semi-structured interview with 7 organizations	Lead designer or art designer	The interviewee was a game designer, or a managerial level person with the ability to affect the product design and selection of the implemented features.	Development process, design and innovation, testing, quality.
5	Semi-structured interview with 7 organizations	Founder, owner or upper management	The interviewee was responsible for decision making in marketing and financial aspects and had power to influence the long-term strategies.	Customers, partners, business models, marketing, human resources, organization. (Design, development and test processes for new organizations were also asked about when the organization participated in the interview for the first

				time.)
6	Semi-structured interview with 5 organizations	Upper management and/or project manager	The interviewee was responsible for the management of game designs and had knowledge on the customer relationship of the company.	How customers participate in the game development process and how they can build an identity inside the game.

* The interview themes were discussed during later rounds with other representatives of the organization

Some of the organizations ceased to exist during the research period and were thus unavailable for rounds five and six. Also, as round five focused on startups, it was not relevant to interview large organizations that had existed for years. The interviews were held face to face in a location preferred by the interviewee. Two interviews in round six were executed over the phone, as that was considered the best way to reach the interviewees working in other cities than the interviewer, and because of scheduling problems, traveling was not an option at the time. Table 5 describes the interviewed case organizations, their main figures and how they participated in the interview rounds.

The aim at selecting case organizations was to get in contact with different aged and sized companies. Due to traveling cost issues it was possible to select only Finnish companies. Similarly when interviewing individuals inside the organization different roles were targeted to gain wide level of understanding on what the company does and how the organization is formed.

Case	Release platforms	Organization age*	Production team size	Maturity, number of released games	Rounds participated					
					1	2	3	4	5	6
A	PC, game consoles	More than 5 years	Large	Established, more than 10 released products	X	X	X	X	NR	X
B	Mobile platforms	Less than 2 years	Small	Recent startup, less than 5 released products	X	X	X	X	N/A	
C	Game consoles, PC	More than 2 years	Large	Established, less than 10 released products	X	X	X	X	NR	
D	Mobile platforms, PC	More than 2 years	Medium	Recent startup, less than 5 released products	X	X	X	X	X	X
E	Mobile platforms	Less than 2 years	Small	Recent startup, less than 5 released products	X	X	X	X	N/A	
F	PC	Less than 2 years	Medium	Recent startup, less than 5 released products	X	X	X	X	N/A	
G	Browser games, mobile platforms	Less than 2 years	Small	Recent startup, less than 5 released products	X	N/A	X	X	X	X
H	Mobile platforms, PC	Less than 2 years	Small	Recent startup, less than 5 released products	N/A	N/A	X	N/A	X	X
I	Mobile platforms	Less than 1 year	Small	Startup, developing its first product					X	N/A
J	Mobile platforms	Less than 1 year	Small	Startup, developing its first product					X	X
K	Mobile platforms, browser games	Less than 1 year	Small	Startup, developing its first product					X	N/A
L	Browser	Less than 2 years	Small	Startup, less than 15 projects done (no games)					X	NR

X = Participated in the interview round, N/A = Organization not available for an interview, NR = Organization was not relevant for the interview round, empty = organization was not reached due to various reasons (e.g. organization ceased to exist or it had not been founded yet), * Organization age at the time of fifth interview round in the spring 2013 (except Case L, 2014). Small = < 8 person, Medium = 8 – 20 and Large = >20.

Case A is a computer game company formed over 5 years ago and it has created several titles that have gained world wide popularity on different platforms, such as PlayStation, PC and mobile. The company can use over one hundred people during the creation of a new title although it has only 20 to 30 persons it is payroll.

Case B was founded by students and the first game project was a graduating project, which led to a first real game. The company has released games on PC and mobile platforms.

Case C is a company founded by the owners of the Case A company to create a new brand under which to test different genres and experiment on the new concepts. Case C has its own development team, management and resources, although they share the premises with the Case A.

Case D is a young company that has got its foothold in the business. They have created a working game type and brand over the title series. Although they have little less that ten person working on game development they have managed to build a process where they produce one polished and highly successful title per year.

Case E was a small company that focused on mobile games. They ceased to exist during the research project.

Case F was founded by a programming teacher to fulfill his own dream. The game development team was formed from students. The company ceased to exist.

Case G decided to develop their games with HTML5 technologies and straight from the beginning they produced multiplayer games where the catch has been to play against real persons. The core team is very small but the academic background and award winning game designer have given their games an easy-to-play reputation in their segment.

Case H started as a normal computer game startup but later decided to produce serious games for health-care domain. Their games help injured people to heal faster and give regular feedback to health-care district.

Case I started by students developing their first mobile game during the last year in university. The company persons had several years of experience in gaming and also in working with other game companies.

Case J created its first game demo on a local game jam event and it was considered so fun that they ended up developing it further to actual mobile game. The organization is small and is formed around a lead designer and a skillful graphical artist.

Case K was also formed around graduating students. The core team consisted of the most talented and hard-working students from a bigger group. The company did not take off and ceased to exist.

Case L was interviewed for Publication V and although it does not work within computer game industry it has been a successful startup and has also worked with Case H in health-care projects. The bulk of the company personnel are university students, or recent graduates.

3.5.2 Data analysis

Handling the interview data in a qualitative study can be hard for a researcher or even a researcher group. As this thesis included 38 hours and 17 minutes of interview data, which was transcribed to text for analysis, it was decided to analyze the data with the qualitative analysis tool Atlas.ti (Atlas.ti 2015), which provides ways to analyze and code the data in text files.

Phase I included a systematic mapping study where articles were read and an illustrative "map" was built over the findings from existing studies. No special analysis tool was used, and bare spreadsheets were considered sufficient for the task.

In Phase II the fifth round interview data was analyzed with Atlas.ti and coded. Although the study itself was a case study, the coding provided a systematic view of the data. Besides coding, the analytic hierarchy process (AHP) was used to rank the findings.

In Phase III, the data gathered from interviews was used. All the interviews were coded with Atlas.ti and the grounded theory was utilized.

Phase IV compared the data from the fifth interview round to similar data gathered in another study conducted by Saarikallio and Tyrväinen (2014). In both cases the data was coded and analyzed.

3.6 Summary

Chapter 3 described the research problem, methods and process used in this thesis. Table 6 summarizes the phases of this study.

Table 6: Summary of the study phases and their methods

Phase	Data collection method	Data analysis method	Research sub-question	Publication
I	Systematic literature review	Systematic mapping	How is the concept of business model used and defined in the literature?	Publication I
II	Semi-structured interviews	Multiple case study and analytic hierarchy process	How is the concept of business model used and defined in the computer game industry? With what elements do computer game startups define their business models? What are the particularities of the computer game business?	Publication II
III	Semi-structured interviews	Grounded theory analysis	What issues exist in the growth management of a computer game organization?	Publications III, IV
IV	Use of existing semi-structured interviews from two studies	Multiple case study	What is the role of the business model in computer game development, and other, organizations of different sizes and ages?	Publication V

4 Overview of the publications

This chapter presents an overview of the publications included in this thesis. The actual publications are enclosed as an appendix 1 and contain the results in full detail. This chapter discusses the findings of the publications and their relation to the whole.

4.1 The status of software business model research – Publication I

4.1.1 Research objectives and results

In this publication, a systematic mapping study on software/game business models is presented. The aim was to go through all the relevant research that has been carried out on the topic. The interest was on the industry side, not the academic point of view, but of the 32 accepted articles only 18 were industry data -driven. The findings included a note on how the research has been carried in this millennium. Figure 8 illustrates the division of articles in years 1996-2013.
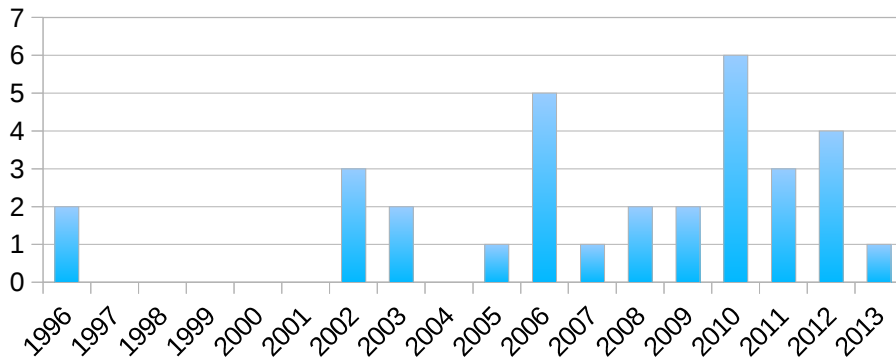
Figure 8: Number of accepted papers per year

The articles were categorized by their type and topic. The type axis included three terms: industry data -driven article, theoretical article validated within an industry / data gathered indirectly from industry, and a theoretical article. The topic axis had six terms: business model in software development, success factors and features of software companies, expanding business, tools and concepts to model business, pricing and cost structure, and scientific discussion. Several articles discussed cloud computing and the open source phenomenon but also other topics were discussed.

The overall view was that the studies were of a high level, and no articles describing the utilization of the business model deeply were found. It was also found out that the business model had not been defined unambiguously but various definitions existed, mixing the business model concept with terms like business logic, revenue model and business strategy.

4.1.2 Relation to the whole

The result of the Publication I showed how the concept of the business model required deeper research. Even the concept needed to be defined more thoroughly and the lack of studies done within the software and game industry revealed a research gap. This encouraged us to begin the research project on the computer game business, which eventually led to this thesis.

4.2 Key elements in the computer game startup business model – Publication II

4.2.1 Research objectives and results

Publication I revealed a gap in how software business models are studied from the practitioners' point of view. The starting point of this publication was to gather data on how computer game startups experience their business model.

The very first interview with the CEO of the first case company illustrated the problem with the business model concept: the practitioners' view was not in line with the academic definition. For the interviewed game organizations, the term business model meant a revenue model and/or a business plan. In deeper discussion more elements were identified and their relations started to be formed. In the end, nine elements were listed to form the business model of a computer game company. Table 7 presents these elements and their weight, generated by the analytic hierarchy process.

Table 7: Ranking of business model elements based on the analytical hierarchy process

Rank	Element	Weight
1	Human capital	0.314
2	Marketing	0.142
3	Financing	0.118
4	Key partners	0.113
5	Customer relationship	0.109
6	Key resources	0.059
7	Key activities	0.057
8	Innovation process	0.053
9	Customer segment	0.035

The study showed how human capital dominates as the most important element. This is not surprising as the computer game business has little if any logistic needs, and nor are the material costs high. Marketing was recognized as being important, but it divided opinions as, for example, one organization had outsourced it to the publisher and for them the key partners were the second most important element. As this study focused on startups, the financing part included using personal savings, getting grants

and other financial support to run the first year or two. Bank loans and venture capitalists were also mentioned. The aim was to start to gain revenue from products after they had survived the first years. The free-to-play model was the dominating revenue model but pay-to-play was also used. Licensing and outsourcing the work to someone else were also listed as revenue sources. The key partners included the publisher, asset acquisition and other organizations in the same field. Customer feedback usually changes the product, and the organizations had put an effort to listening and serving the customers as well as they could. The customer segment, on the other hand was not considered as an important element, as the digital distribution of games had simplified the customer segmentation process, and all organizations aimed at global markets. As the computer game field is creative the key activities include, besides coding, testing and modeling, also innovating new game concepts and drawing fancy graphics to support the overall feeling of the game.

To put the findings in one sentence, a quote from the study can be used: "the only thing that matters is the human capital" (CEO, Case G). This illustrates the view of startups on what is important for them to carry on their business.

4.2.2   Relation to the whole

This publication introduced the business model elements that computer game companies utilize in their business. It was found out that the business models in computer gaming have differences in comparison to, for example, the business model canvas. To the whole, this gave the base view on the important elements in the computer game business; the stepping stone for this thesis.

4.3   The role of business and innovation in computer game organizations – Publication III

4.3.1   Research objectives and results

This publication focused on design and innovation in the computer game business. As the computer game industry has a lot of similarities to the movie and music industries the innovative design is also an important element in the overall business. The innovation process was also noted as one of the business model elements in Publication II. This study set out to research how game studios design their products and how they innovate and make business.

First of all, it was found that "game design is driven by economic factors", meaning that although the designers want to make a game they love, they still consider profit over innovation. This culminated in the way that startups developing their first

product were even more focused on making a financially successful product than the most innovative one. After the company has gained a foothold in the business it can work on more creative games. This behavior was also confirmed in this study.

The game design itself was formed around ideas found in existing games, success stories and culture like movies. It was found that most game designs are based on concepts created by individuals rather than teams. After the design is accepted, a prototype is produced and the concept is tested. The overall design process was considered ad-hoc and no formal methods were found.

4.3.2 Relation to the whole

This publication shed light on how game design takes place in computer game organizations and how the business side is present from the beginning. To the whole this adds the information that business and design are related concepts, and computer game organizations aim at being financially successful instead of publicly well known.

4.4 Formation and growth of computer game organizations – Publication IV

4.4.1 Research objectives and results

Publication IV focuses on researching how a computer game organization is formed and what kind of people it includes. The collected data represented organizations in the very beginning of their life-cycle on one hand, and on the other hand organizations in a stage where they had already published globally distributed games on several platforms varying from PlayStation and PC to mobile phones and tablets. The study identified a phase model of computer game organizations presented in Figure 9.
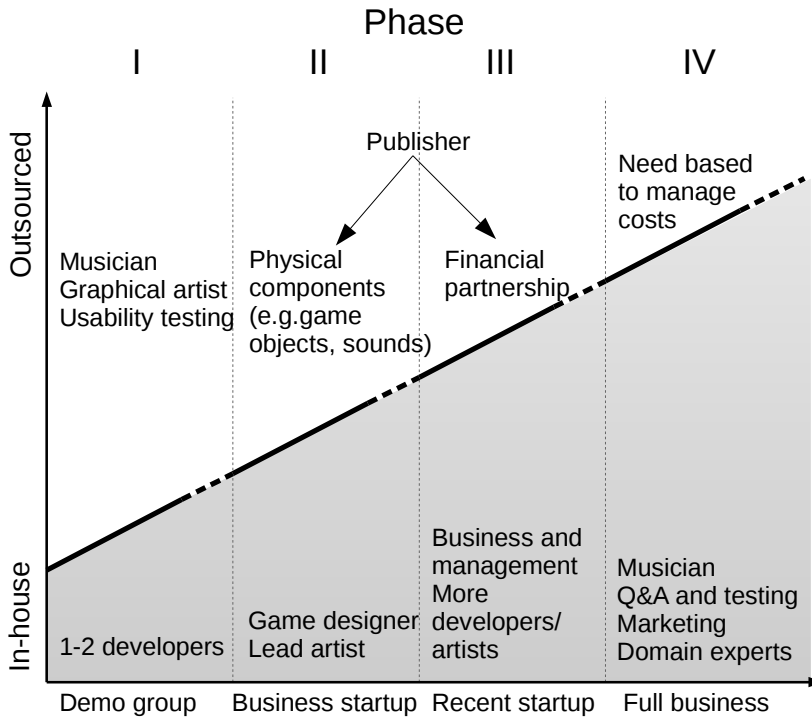
Figure 9: Phases of organizational growth in the computer game industry

Outsourcing plays a role in developing games, and in the study, a minority of the organizations had a dedicated musician or even skills to do music and sound effects. This was the most commonly outsourced work. An organization is generally formed around a small core team including 1-2 developers. To be able to start business, the organization needs to be fortified with a game designer who creates a balanced game logic, as well as a lead artist who creates the graphical look of the game.

When the first game is ready and it is time to publish it, the organization moves to the second phase where they are really in the business and real revenue and cost streams start to flow. Although the first game may not generate an extensive revenue stream, it still positions the company brand in the industry field. Marketing was considered important in Publication II, and in Phase II marketing is often done by the publisher or the platform owner. The organization itself may not have any experience in marketing and it can be learned in-house or the whole concept can be outsourced to the publisher. In this phase a partnership is also formed with for example an art studio, which can produce game graphics and other graphical arts in case in-house competence is not available.

In Phase III the turnover has increased and the products generate revenue to be used in funding the sequel products. Another developer team can be started. The organization is not led by the developers but by a full-time CEO leading the business. The CEO can be hired from outside or he or she might have grown from the in-house workforce. Partnership is still done with stakeholders like the publisher, art studio and third party musician.

In the fourth and final phase, the organization is self-sufficient and large enough to have for example a musician or sound effect engineer in its payroll. Similarly, marketing can be done in-house and domain experts can handle for example the latest game console generation equipment. Outsourcing is used when it is considered cost efficient.

4.4.2   Relation to the whole

This publication looked into the human resources of a computer game organization and identified four phases of growth with different needs for employees. To the whole, this study emphasizes the importance of human resources in the computer game business – especially in the starting phases. It also gives insight into how a computer game organization can be led to grow and what kind of mindsets are required in steps to the next phase.

4.5 Differences between startups and established organizations – Publication V

4.5.1   Research objectives and results

In Publication V, the differences between established and startup software organizations are discussed. Also the size and business type are different. The objective was to study how these issues reflect the emphasis on the business model elements.

Existing data was utilized in Publication V. The computer game startup data presented in Publication II was analyzed with data from seven additional organizations. As the data in both studies was compatible with the business model canvas framework (BMC) (Osterwalder 2010), it was decided to use it as the framework to help in the analysis. The usability of the BMC itself was also discussed.

Key Partners	Key Activities	Value Proposition	Customer Relationship	Customer Segment
Startups identified other **organizations as partners** while established medium sized organization recognized **other division as partners**.	B2B organization used **personal communication** to reach customers. Established ones **measured productivity** and had analytical way of building business while computer game organizations focused on **innovation and artistic way** of doing things and built **brand and IPR** from the beginning	Game startups chose a **general industry value proposition**: to provide entertaining experience and aim to maximize time spent with the product. B2B vendor aim to minimize time required by **automating processes**.	B2B is often offering dedicated **personal assistance**. Games try to go for **self service**, community building, and collect anonymous user data.	While B2B Telco vendor considers segmentation as important, B2C game vendor sees the **segmentation as a cost**.
	Key Resources		Channels	
	Established organizations identified people as **role-based** whereas in game organization people were **generalists**. In medium sized organization the level of management was increased while startups used only **coffee table management**.		B2C game organizations used **existing** reseller channels, not building their own.	

Cost Structure	Revenue Streams
Established and medium sized organization had **larger organizational structure**, which produced costs.	Most of the startups were trying to get **external funding** whereas B2B Telco organizations revenue was earned with **maintenance**.

Figure 10: Findings of Publication V presented in a business model canvas. The most important elements are highlighted with a different color

Figure 10 presents the findings in a business model canvas. The key activities and key resources were considered as the two most important ones. This was mainly due to the importance of human capital in software industry. The established larger organizations recognized people as role-based workers, whereas smaller startups had only generalists, and the overall working process was rather ad-hoc compared to the more systematic processes and measurements done in the larger and older organizations. This was also reflected in the cost structure, as a bigger organization requires more management.

The business-to-business (B2B) organizations considered segmentation important and wanted to get good customer references. Computer game business-to-consumer (B2C) organizations considered segmentation as a cost when they needed to do translations to their products. Also getting references was different, as they were game reviews and feedback by gamers in app stores. This showed the value of the game, thus playing the role in B2C organizations. Similarly, B2B organizations offered personal assistance to their customers, whereas computer game companies provided self service via community building (e.g. discussion forums or Facebook groups).

The value propositions were different, as the aim of the game is to offer an entertaining experience, and the game companies want to maximize the time the customer spends with the product. The non-gaming companies wanted to do the opposite: automate the processes to save the customers' time.

When comparing the key partners in these different organization types, the biggest finding was the fact that startups were in close contact with other similar

organizations and even considered some of them as partners. In established bigger organizations, other divisions were considered as partners.

Startups relied heavily on external funding and were only just building their revenue models, which utilized the most common practices existing in the industry, such as free-to-play revenue model. The other organizations considered maintenance to be their source of revenue.

Publication V also discusses the validity of BMC. The BMC framework has been designed to be abstract enough to suit basically every business area. When studying the software industry, the framework does not weight the human resource enough, which in this thesis is identified to be the key element in the software business. Similarly, in the gaming startups, a partner giving financial support is positioned in the revenue stream slot, but as it can also provide marketing help, it is positioned in key partner slot as well.

It can be argued that although BMC provides a good starting point for analyzing and building business models when the building or analyzing process goes deeper, it is necessary to do some adjustments to the elements presented in the framework.

4.5.2 Relation to the whole

Publication V compared the computer game business to the conventional software business with the business model canvas framework. The relation to the whole is two-fold. Firstly, differences between the game business and conventional software industry were identified. Secondly, the role of business model frameworks was discussed, as the BMC and other frameworks cannot satisfy the needs when an industry is observed thoroughly.

5 Discussion

This chapter presents the results of the individual studies as a summary and discusses their theoretical and practical implications. After that, the limitations of the study are presented and the contribution of the thesis evaluated. In the beginning, the research question *"What is business model, its elements and their roles in computer game development organizations?"* was set, and this chapter presents answers to this question.

5.1 Theoretical contribution and implications

5.1.1 Business model concept

As the concept of the business model in the computer game industry had not been studied extensively (Publication I), this thesis shed light on how the academic view and industrial perspective are not in line with each other. As the business model concept itself has been under broad discussion and rapid evolution it is clear that the academic and practitioners' views are different.

The business model concept is often defined through the elements it includes, and this thesis showed how this is problematic when the general elements are hard to find. The popular business model canvas (Osterwalder 2010) framework was not found completely suitable for presenting the business models of computer game startups. This leads to the question of how abstract the business model framework should be to be universal – if it should be even presented as such.

To present the business model through its elements seems to have challenges when comparing the business models of different industries where different elements have greatly varying weights. Even the elements can vary, as argued in Publication II where human capital was raised as the dominant element, but it was not separated out in other studies.

A similar issue is raised when comparing the logistics of the brick and mortar business to fully digitally distributed mobile games. Both of these can be put under for example the element channel, but the meaning of the element is quite different, as the first scenario can include physical logistics problems of a sub-contractor in another continent and the second one only the selection of virtual app stores made by the developer company or a partner, such as the publisher. The physical logistics problem can also exist in the computer game industry when games are provided in plastic boxes, but for example mobile games are fully digitally distributed.

In section 2.4.1, the abstract concept of the business model was defined on basis of the literature. The model is suitable for the computer game business as well, but it does not take account of the special needs of intangible products and digital distribution. A figure of the computer game -focused business model concept is presented in section 5.3.

5.1.2   Growth process

The growth of organizations has been studied for years, but the computer game industry has not been in the focus of the research. The main finding in Publication IV was the identification of four phases (demo group, business startup, recent startup, and full business) that computer game organizations go through when they grow. Although some phase, or stage, models have been developed during the years (cf. Greiner 1972; Churchill & Lewis 1983), the one presented in Publication IV recognized the very beginning of the organization as the first phase. In the demo group phase the organization does not exist as a legal entity but only as a group of people with the same interests and goals. As creating computer games does not require special hardware or manufacturing space, large investments are not required in the beginning.

The first phase in the industry field producing intangible products is different in the software engineering world compared to the brick and mortar business where initial capital is required to start a business. In a way this emphasizes the importance of creativity over physical material in the computer game industry. The limiting factor for growth is not material (e.g. machines) but merely human capital and/or financing.

5.2 Practical contribution and implications

When this study was started, one of the aims was to be – besides theoretically – also practically useful to the computer game industry. Thus the study collected data directly from industry practitioners to get findings beneficial to the industry itself.

5.2.1 Aspects of the computer game business

All the case organizations recognized that they were doing business, not only games that were fun. Different reasons, such as a personal dream, layoffs, the idea of being one's own boss and continuation to education had driven people to form an organization. Some said that games were the only thing they were interested in, some had dreamed about making games for years, and some wanted to do something instead of being unemployed. Although the organizations varied in size and years in business, they were all building business models around their products. The balance between the importance of revenue and fun fluctuated, but the aim for all was the same: to establish a revenue-generating business in the field and gain success.

In Publication III, evidence was found that the longer the organization had been in the field, the more it could focus on games that represented the dreams of the designers. The startups were concentrated more on creating games that could provide them revenue in any way. This led to important finding presented in Publication II where it is argued that startups get most of their financing from other streams than revenue from the actual product. Grants, venture capitalists and loans from banks were mentioned besides using personnel's own savings. The startups were wrestling with financing issues at the same time when they were creating their firsts products and learning to use the tools and platforms.

The organizations that were in Phase I or II (presented in Publication IV) had no dedicated CEO, but one of the developers acted as one. A dedicated CEO was a wanted member for startups, as the startup CEOs considered it challenging to both lead the company and do development at the same time.

The organizations were fighting with the problem of building revenue models that could generate income but would not decrease the interest of the gamers. This was seen even more important when utilizing the free-to-play model. The dilemma is building a game that is both fun and at the same time attracts gamers to make in-app-purchases. To be able to build financially sustainable business this problem needs to be resolved.

5.2.2 Innovation process

As presented in Publication III, the innovation process is more an ad-hoc-based than a systematic process, as also confirmed by Callele et al. (2005). This is good to note when moving from other industry fields to the game industry. It is relevant to discuss whether gaming or other artistic fields are a place for a systematic innovation process or not. Other industry fields have already utilized systematic innovation creating. For example Samsung introduced Teoriya Resheniya Izobretatelskikh Zadatch (TRIZ), a tool to help in problem solving and inventing, in 1998, and have reported to have benefited from its use (Kim et al. 2005). No evidence of this kind of systematic thinking was found in this study. Rather, it was reported that ideas for games come in dreams or while playing other games.

It can be argued that the designing of games has something to learn from the non-artistic industry. Research on innovating game ideas and design games with methods like TRIZ or lateral thinking (de Bono 1995) could provide interesting results. The software industry is young overall, and the game industry is even younger. As the industry has been growing fast during the last decade, it may adopt more formal processes over time. Although it was out of the scope of this study, it would be interesting to study the systematicness of innovation process in computer game organizations of different ages.

5.2.3 Growing organization and crises

Besides the theoretical contribution of the first phase of a computer game organization, Publication IV also gave practical insight into the growth of a computer game organization (Table 8). The role of outsourcing was identified as significant in all the phases except for Phase IV, where it was only need-based to manage costs (see Figure 9 in section 4.4.1).

Right partners were considered important when the startups were building and releasing their first products. Being able to get high quality graphics and sound effects from day one will ease the growing pains of a startup. Game developers may not be experts in marketing or the overall business side, and thus partners being able to do this are considered important.

Table 8: Phases of a computer game organization as presented in Publication IV

	Characteristics	Crisis
Phase I *Demo group*	People with programming skills decide to create a game over an idea. No money is involved yet but merely "a dream is coming true".	The first crisis emerging is the need for talent. If the required talent for creating graphics, sound effects and game design is not found, the organization breaks up.
Phase II *Business startup*	The company exists as a legal entity and the first product is released. Funding is mainly external. Possible partnerships are formed to help releasing and marketing.	In Phase II the crisis of business is met. The best channels for publishing and marketing are needed and a revenue model generating profit is required.
Phase III *Recent startup*	The organization is ready to expand its business and can start with another development team. The games produce revenue which is used to fund the next games.	The dream to make their own games and fulfill their creativity is under risk if the organization is too dependent on third party component providers and partners. Thus the crisis is independence.
Phase IV *Full business*	The organization has grown big enough to engage all the necessary workforce. Outsourcing is done when it is cost-efficient. The organization works on several different titles.	The data did not cover a crisis in Phase IV, but it is speculated that when the organization grows to having hundreds of workers, organization-related issues may become problematic.

Growth does not take place without crises (Table 8). It requires talent to be able to release a game at all, and if the talent and skills are not found, the dream will not last long. The crises are not limited only to human resource issues, they also include other elements of the business model. When the game is finished, it should start to generate revenue. As digital distribution and the free-to-play model have changed the revenue streams, the revenue model has become a more important part of game design. If the revenue model does not start to generate enough income, the organization phases a crisis and exits the market.

Game development is recognized as an artistic field where individuals can satisfy their creativeness. If the business is too dependent on partners, there is a risk that game ideas will not come from the developers and designers. This kind of partnership may break the core team, which can lead to the breakdown of the whole organization.

The growth of a computer game organization is different from the growth of a conventional software organization, as it includes creative issues. The role of the revenue model is also bigger, especially in mobile gaming compared to the

conventional software industry. The change from software to service is also changing this.

5.3 Key elements of the business model of a computer game organization

To present the findings in a simple format, a figure illustrating the business model of a computer game company has been drawn. The main findings of this thesis are presented in Figure 11. An abstract business model definition was drawn in Section 2.4.1, but it did not take the specialty of the computer game industry into account. In Figure 11, the left side presents the resources that make it possible to create a game. As the key partners were seen important in the beginning, but later on their role decreased, they are presented with a dotted line. The key partners can help both in funding and in actual work, such as marketing or creating sound effects.

As human capital was identified as basically the most important element in the computer game business model, it is related to the key activities – especially to the innovation and creative process, which is important in creative industry. The key activities are also related to the customers, as customer relationships were considered important in the game business.
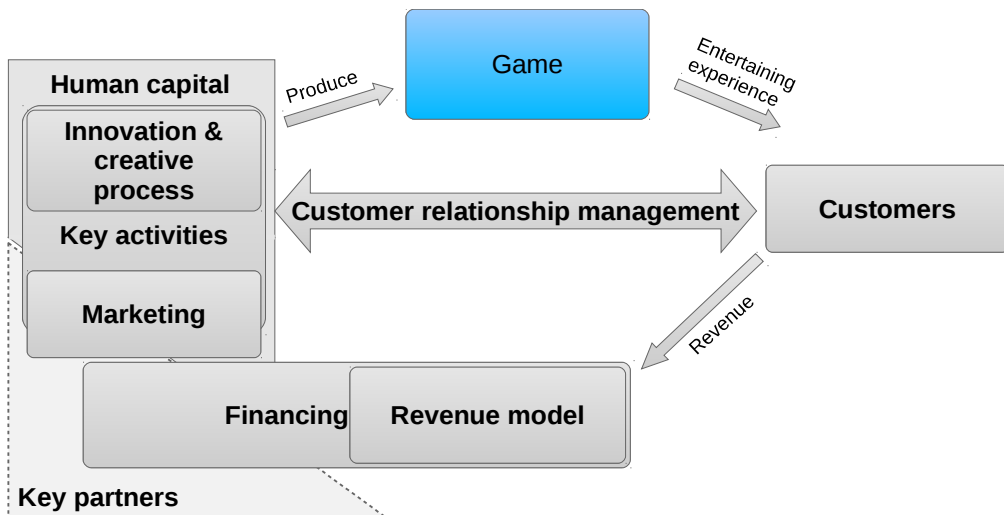

Figure 11: The recognized elements (in bold) and their relationships (not in bold) in the computer game business; game itself is highlighted in blue as it is the product

The role of the financing element is twofold. On one hand in the beginning the computer game company puts effort into getting external funding to be able to release the first games and create a name in the business. On the other hand, it also includes the revenue model part, meaning the development of a revenue model that will generate income from the games. The role of external funding decreases as the revenue generated from the games increases when the company grows and gets a foothold in the business.

This thesis has concentrated on games as products that offer an entertaining experience as a value proposition. This underlines the autonomy of the computer game organization. Instead of ordered projects, the organizations design their own dreams as products.

The customers' role is also considered important for various reasons. When using the free-to-play model the customers – gamers – are divided into two parts: the paying ones and the ones who provide the mass to support the game when it is a multiplayer one. If the game does not utilize the F2P model, the gamers can pay directly or via in-game-advertising contracts. The gamers also provide ideas, feedback, bug reports and viral marketing via social media.

5.4 Limitations of the research

No scientific study can be carried out without threats to validity and limitations of some kind (Kitchenham et al. 2002; Norris 1997), and this work is no exception. Although all studies have limitations, it does not mean that it is impossible to be prepared for them. Qualitative research has been described to have some weaknesses, including inability to manipulate independent variables, risk of misinterpretation, lack of capability to randomize, lack of controllability, lack of deductibility, lack of repeatability, and lack of generalizability (Gable 1994; Easterbrook et al. 2008). Several guidelines have been created to help empirical research (e.g. Kitchenham et al. 2002; Maxwell 1992). Maxwell (1992) has identified five types of validity threats that are related to qualitative research – descriptive validity, interpretive validity, theoretical validity, generalizability and evaluative validity. Maxwell (1992) does not argue that these would be perfect categories, but as his categories were based on the work of many other researchers it was considered suitable to use them to validate this thesis.

Descriptive validity

By descriptive validity Maxwell (1992) means that for example case descriptions are accurate in the sense that researchers report on things that exist, and not make findings up. As data collection in this study is made from series of interviews, one has

to remember that this method is not without its problems (Parry 2003; Hammersley 2003). Although interviews can have more than one interviewer, it is often situation where only two persons exists and they both have their own aims. Hammersley (2003) argues that interviewees have more potential to be affected by bias and error than researchers as they have not been for example trained observers and they have their own problems and concerns in addition to the interview. In the end Parry (2003) mentions how the aim of a qualitative study is not to represent population statistically but to understand the phenomenon under research.

In this thesis this issue was tackled by having multiple persons participate in the interview sessions on several occasions, and thus the descriptions could be – and were – validated by other researchers. The same happened when the interviews were transcribed as they were read through by other researchers not present in the interview sessions. Also several persons from companies were interviewed to gain broader picture on how the organization is formed and functioning. In the end the data is still generated from qualitative interviews and its shortcomings should not be dismissed.

Interpretive validity

Maxwell (1992) defines interpretive validity by asking what the findings mean for the studied instances. The interpretations need to illustrate findings and meanings that actually exist.

The research should have no researcher bias, but as researchers have always some ideas derived from prior knowledge (Wilson 2004; Kitchenham et al. 2002; Maxwell 1992) this is not commonly reached and other methods are required to produce valid research. As this thesis consists of five individual scientific research articles produced with co-authors, the research bias has been decreased with in-house and anonymous peer-review. In addition, Kitchenham et al. (2002) mention a problem of "fishing for results", meaning over-analyzing the data as long as the desired results are found. This problem exists in both quantitative and qualitative studies where data is analyzed. In this thesis, the problem of interpretive validity was tackled mainly by using several researchers to verify the findings. During the data collection phase, in total seven researchers participated in the collection process, and three in the writing process thus reducing the possibility of "fishing for results". Also the analytic hierarchy process was utilized, and as it abstracts the decision making from qualitative data to quantitative numbers (Chen & Wang 2010; Vaidya & Kumar 2006), it can be considered as a tool to improve group decision making and the comparability of data.

Theoretical validity

According to Maxwell (1992), theoretical validity goes beyond the concrete description discussed in the two previous categories and addresses the theoretical constructions that the researcher creates in the study. Maxwell (1992) argues that besides description and interpretation, the study also provides an explanation and theoretical validity that means validity as a theory of the phenomenon.

In this thesis, theories were first drawn from qualitative data and the findings gained through the grounded theory and case study methods. These theories were built and discussed with several researchers and then compared to other industry areas in Publication V.

Also, to be able to provide a good theory, the case organizations were selected to represent various areas of the computer game industry in gaming platforms, organization sizes and maturity levels. This enhanced the theoretical validity of the results and also their generalizability.

Generalizability

Generalizability means how broadly the findings and theory can be extended (Maxwell 1992). Maxwell (1992) argues that the generalization of qualitative research is harder than the generalizability of quantitative research, as qualitative studies are not usually designed to allow systematic generalization. Lee and Baskerville (2003) have created a generalizability framework to categorize generalizability to four different scenarios where generalization can start from empirical or theoretical statements and can lead to empirical or theoretical statements.

When considering the generalizability framework (Lee & Baskerville 2003), it can be argued that this thesis has mainly generalized from data to description and from description to theory. The first one is used in case studies and the latter is the base idea of the grounded theory. It can also be argued that when using the existing theoretical findings, such as the business model concept, this thesis could also have discussed the issues from theory to description and from concepts to theory presented by Lee and Baskerville (2003). Still, this played a minor role, as the biggest results were generated from empirical findings.

As this thesis was carried out as a qualitative research, it might not be generalizable to a wide extent. The findings in this thesis concerned the game industry creating entertaining games and are relevant in that context. If applied and extended to other areas, the findings should be taken merely as guidelines or recommendations.

All the case organizations are Finnish and were able to use financial support from different Finnish funding agencies and other similar sources. This may not be possible

in every country, as each society has different systems of supporting entrepreneurship. Although all the case organizations are of Finnish origin, they have partnerships with companies in different locations around the world. Also, as Finnish domestic markets are minor, companies tend to head to global markets and produce games that do not cover the Finnish marked segment only (Hiltunen et al. 2013). It is still noteworthy to underline that all the cases are Finnish and it might set some bias to the study. The research would benefit from several replicated studies in other countries considering for example financial support factors.

Although the case organizations were producing games on almost every platform the mobile games were the most common ones. This might also raise some bias issues. Business models vary between different platforms and thus the mobile gaming segment is somewhat overrepresented. Although the use F2P model has also increased in other segments than mobile gaming, it would be beneficial to have larger sampling including organization, which are not working with mobile game titles.

Evaluative validity

The last item in Maxwell's (1992) list is evaluative validity, but according to Maxwell, qualitative researchers do not put effort into evaluating things in their studies. The discussion on whether or not the findings presented in this thesis are meaningful is based on self and group evaluation and evaluation by the scientific community. It is hardly reasonable to study "nonsense" and get it published. The findings presented in this thesis are based on real-life phenomena and produce both descriptions and theories to be utilized by industry practitioners and scientists. The reported findings do not take a stand on how things should be but merely report on how things are.

6 Conclusions

This thesis utilized empirical research to study the role of the business model in the computer game industry. This chapter summarizes the contributions and outlines aims for future research.

6.1 Contributions and summary

The study was limited to organizations providing entertaining computer gaming, and serious gaming, such as health-care and learning games, were excluded. The thesis was divided into four phases. The first phase consisted of a literature review to find out the level of existing research. The second phase gathered information on business model elements in computer game startups. In the third phase, topics like innovation and the growth of the organization were studied further. In the fourth phase, the previous findings were compared to data collected from another IT research project.

As this study can be considered one of first – if not the very first – considering business models in computer game development organizations, it provides new knowledge on how computer game organizations and their businesses work. It introduced several topics that can be studied further. The research provided findings for the scientific community and practical knowledge for industrial parties. The following list summarizes the findings (the three most important findings are in bold):

- Research over the business model concept has been ambiguous and there is no one unambiguous definition for the term.

- From the software engineering – especially computer game development – perspective, business model research has been limited at best.

- **For computer game industry practitioners the business model concept means a business plan and/or revenue model, whereas the scientific interpretation is wider.**

- Computer game startups valued human capital over everything else. Also marketing, financing, key partners and customer relationship were considered important. Key resources, key activities, the innovation process and the customer segment were identified as other elements of the business model, but their importance was considered less significant.

  - The actual game development includes programming, testing, building graphics and sounds, and designing game logics.

  - **Games should provide an entertaining experience and the idea is to maximize the time a gamer spends with the game.**

- The computer game company is usually founded by 1-3 persons who can do programming, design a game logic and story, and draw graphics. Sound effects and music are outsourced to partners. Publishing can be done in-house or a partnership can be formed with a publisher, who can also do marketing.

- **When computer game organizations grow they face different phases and crises until they are self-supporting. Four phases were identified: demo group, business startup, recent startup, and full business. The demo group phase where the organization is not yet a legal entity seems to have been dismissed in the scientific literature.**

- Computer game organizations argue that external influence cannot dictate their game design, although they value external funding.

- Designing games is an ad-hoc process with fast prototyping. The organization uses individuals to design games and group consensus.

In summary, the computer game industry is a mixture of the software industry (e.g programming and testing) and entertainment industry (e.g. fancy graphics and sounds and a spellbinding story). It also turns around the value proposition of the conventional software industry as the aim is not to minimize the time spent with the software but to maximize it. These issues reflect the differences in the business models as well. The software industry is moving towards fully digital distribution, and for example mobile gaming has already done that. This is different from the brick and

mortar industry, which requires physical logistics. The free-to-play model has changed the way how gaming generates revenue, as only a small part of the gamers pay. The challenge is to build profitable game logics and a revenue model. The level of growth the industry is witnessing will provide interesting opportunities for research for years to come.

6.2 Future research objectives

As noted in Section 5.4, this research has presented initial and original findings for business model research in the computer game industry. As the qualitative data was gathered only among Finnish companies and computer gaming is a global phenomenon it would be interesting to compare the data to similar data collected for example in Southern Europe or even in South America or Asia. It would also be interesting to see how the location and society issues affect the computer game business. Especially funding schemes might be different in different countries.

Computer game companies cannot live without their customers – gamers – and this thesis has just scratched the surface of that topic. The customer relationships and the role of the gamers in the development of games would require more research. Especially how gamers are handled and how they can build their digital identity in the game world would provide an interesting topic for research.

The research over the topic would benefit greatly from a large survey study including respondents from several continents to verify the results of this study.

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Appendix I: Publications