EVOLUTION OF COMPUTER GAME DEVELOPER ORGANIZATIONS

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Abstract

Purpose – The study aims to identify the peculiarity of computer game organizations and their human resources. It presents a stage model including four phases covering the growth from demo group to full business. This study extends the research on how computer game organizations are formed and what it takes them to grow to financially self-sufficient. The study also broadens the understanding of the beginning phase of an organization.

Design/methodology/approach – The article utilizes the grounded theory research method with 34 interview sessions among 11 computer game organizations. The interviewed persons include chief executive officers, designers and developers.

Findings – This article presents empirical findings on what a computer game organization go

through when they evolve from demo group phase, which is not discussed in existing literature, to full business. We observed that the core team is formed over a game designer and one or more developers. The team fortifies as the organization moves onwards to next phases. At the same time its reliance on partners and outsourcing changes to need based.

Research limitations/implications – As this is a qualitative study the observations are directly applicable only in the context of observed organizations. In the other context they are merely suggestions.

Practical implications – The study presents concrete growth model that can be utilized when building a computer game organization.

Originality/value – This article illustrates the specialty of computer game organizations and their growth process. It also presents discussion of the beginning phase of organizations.

Keywords: Human capital, Entrepreneurship, Organizational structure, Computer games, Phases of growth

1. INTRODUCTION

Game development organizations can be generally characterized as specialized software development organizations (Kanode & Haddad 2009; Blow 2004). Both game development and software development share several features, such as programming work, design and testing practices, but game development includes also a bigger portion of creative work, similar to what can be found in music and movie industry (Blow 2004). Computer games are also intangible products (Rus & Lindvall 2002) that means, for example, that companies have no high starting cost but people can start a "hobby project" that can lead to serious business if considered suitable; the most important resource of a computer game organization is the intellectual capital (Vanhala & Kasurinen 2014).

The game industry has been on a growing trend for the last ten years despite economic

downturns. For example in the United States and in Finland the number of new game companies and amount of money involved in the industry has been growing. The increase in the sector also means increase in employment. To understand what sort of knowledge is useful for the industry, the needs of the games industry have been previously studied for example from the perspective of compatibility between academic programs and industry expectations (McGill 2009; Kasurinen et al. 2013). The industry is still young and research is required on various areas.

In this article we study growing computer game organizations and their means of building a growing and successful organization from the perspective of competences as we consider the current literature lack of studies of this kind. We study organizations in different phases of growth and analyze what core competences these organizations have and what types of skills and expertise they need for their growth. To achieve this objective, we interviewed 34 professional game developers in eleven game development organizations. During the data collection, we interviewed several stakeholders such as game designers, developers, project managers and upper management. Additionally, we held a separate interview round on startup companies with the company founders to gain a comprehensive view into game startups and to understand what the main problems related to their competences are. This led to the formation of two research questions: "How do computer game organizations grow from an idea to a profitable company?" and "What competencies are required in different phases of the growth process?" This article is also related to our earlier studies on game developer organizations and their development processes.

The rest of the paper is structured as follows: In Section 2, a number of related studies are introduced and assessed. In Section 3, the applied research methods are introduced and the results are presented in the Section 4. Section 5 discusses the study observations and Section 6 closes the paper with conclusions.

2. RELATED RESEARCH

In EU there are millions of companies and the majority - 93% - of them are micro enterprises providing employment for less than ten employees (Feindt et al. 2002). Similarly, the number of companies that are growing fast is also small, as 3% of the companies do most of the growing (Feindt et al. 2002; Hopkins 1997). Lin (1998) describe that successful SMEs put more value to their soft issues – people – than hard ones – technology. People, their roles and skills and growth

form combination that produces success to an organization.

2.1. Different Roles and Competencies in Software Companies

Individuals that have different roles based on their skills, experience, and personality form organizations. Organizations benefit when individuals are working with the tasks that are most suitable for them. Researchers have developed models to help organizations to put talents to an optimal use. For example, Wu (2009) identified 23 entrepreneur competencies from literature and interviews. This list includes, for example, analytical thinking, communication, expertise, flexibility and personal motivation. Furthermore the article argues that managers of larger organizations have different competencies compared to entrepreneurs of small organizations. In addition André et al. (2011) studied a larger variety than just entrepreneurs and divided competences to generic and technical ones and mapped the competences to different roles in software development. Acuna et al. (2006) had a similar result as they listed personality factors and discussed which factors are required by which roles in software development in the organizations they studied. Their data indicates that, for example, a requirement engineer needs judgment and a tester needs to have discipline capabilities. The key point in this study is to match individuals to different roles based on their capabilities.

Harris & Harris (1996) also argue that there are behaviors and attitudes that lead to success in team work. Besides that they note that employees have their given roles (e.g. tester or designer), but there are also roles that employees adopt during the work (e.g. innovator or completer). Harris & Harris (1996) discusses how teamwork can be developed through management and leadership. They argue that team strategy is the key to team success.

Thompsen (2003) reported a case study where a software startup company utilized the critical talent (CT) concept to improve their organizational performance. The CT value was calculated from skills, values and the temperament of a person added with capabilities, experiences and knowledge. With the calculation a company could improve the match of employees and work tasks and thus increase performance.

2.2. Organizational Growth

Since 1960's researchers have built dozens of stage models to present different phases in

organizational growth (Levie & Lichtenstein 2008). Levie & Lichtenstein (2008) identified 104 organization growth models developed between 1962 and 2006. Most of the models with clear stages had from three to five stages, but some growth models had even eleven. Levie & Lichtenstein (2008) argue that there is no consensus on the concept and this is also supported by Dobbs & Hamilton (2007) and Shepherd & Wiklund (2009).

McKelvie & Wiklund (2010) utilized literature review done by Shepherd & Wiklund (2009) and argued that the focus of growth research should be on growth mode instead of growth rate. McKelvie & Wiklund (2010) identified three research streams: growth as an outcome, the outcome of growth and the growth process. Besides these streams they also identified three modes of growth: organic, acquisitive and hybrid. Weinzimmer et al. (1998) found out that majority (83%) of studies considered sales and revenue as a concept of growth. However they argue that focusing only on sales is not enough; the growth is more. Gilbert et al. (2006) agrees with the findings of Weinzimmer et al. (1998) and states that the most examined resources are the financial and human capital.

Levie & Lichtenstein (2008) identified five "source nodes" from literature. These are cited as the bases of new models in other publications. These models are *evolution and revolution*, *stages of corporate development*, *morphogenesis*, *organizational life cycle* and *the product life cycle*. In evolution and revolution model the organization faces calm evolution phases and critical revolution phases. Stages of corporate development model was based on similarities of development of four larger US corporates. Morphogenesis is described as an evolutionary learning process of an organization. The organizational life cycle model is based on the idea that companies have life cycles. As a fifth model the product life cycle is also used as reference when presenting stages of organizational growth.

Agrawal et al. (2012) discusses human resource management challenges in Indian software industry. They identified six major themes of human resource -related problems that existed in case descriptions: turnover of IT professionals; HR-related problems inherent in onsite-offshore delivery model; lack of technical and interpersonal skills in both team leaders and team members; routine, boring nature of maintenance and legacy work; inadequate HR practices/systems; and poor transition from technical to managerial roles. Agrawal et al. (2012) argue how managers need to consider these issues when working with their subordinates and hiring new ones.

To summarize the growth research we can say that the topic has been studied for years and it has different perspectives, like the perspectives of a growth model, growth process and reasons for growth. Although the software industry has been studied from the growth perspective, the growth of computer game organizations has not received much attention yet. The difference between creating computer games and conventional software might not have been yet understood completely. The computer game business is still young and in our opinion there is a gap on organizational perspective and how it is beneficial to understand the special case of growth in computer game organizations.

3. RESEARCH PROCESS

We chose to use the grounded theory research method (Strauss & Corbin 1990; van Niekerk & Roode 2009; Hughes & Jones 2003). The development of software is a complex phenomenon, which has different approaches even within organizations that look similar (Kasurinen et al. 2009) and according to Hughes & Jones (2003) a qualitative research method, grounded theory, is suitable for observing and understanding organizational and social real life phenomena.

We followed the principles of a Straussian grounded theory approach presented by Strauss & Corbin (1990). The overall process of building theory from case study was planned based on guidelines described by Eisenhardt (1989). To be able to conduct a field study and interpret its results we followed the guiding principles from Klein & Myers (1999).

Eisenhardt (1989) presented eight steps in her guidelines: *getting started*, *selecting cases*, *crafting instruments and protocols*, *entering the field*, *analyzing data*, *sharping hypotheses*, *enfolding literature* and *reaching closure*. Our starting point for this research process was that we had collected data and we noted that our case organizations were talking about their human resources and organizations were different-aged, had different kind people and were fighting with different issues. These observations led to formulating the research questions and further analyzing of the data with additional interview round 5 (see Table 2), which discussed human resources and business issues thoroughly. These topics had also emerged from other interview rounds, thus we considered acceptable to utilize all the 11 cases. Table 1 presents the steps and our execution.

Table 1

Steps presented by (Eisenhardt, 1989) and our execution

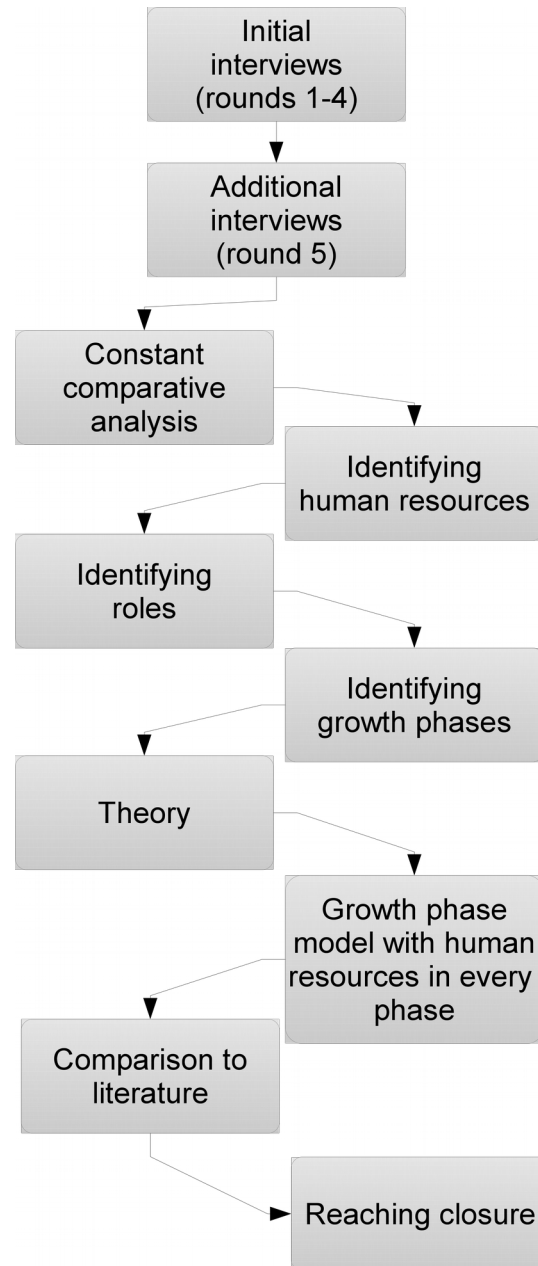| Step	Activity	Our execution
Getting started	Definition of research question Possible a priori constructs Neither theory nor hypotheses	Based on our earlier interviews we built research questions on computer game organization growth.
Selecting cases	Specified population Theoretical, not random, sampling	Selection of available computer game organizations.
Crafting instruments and protocols	Multiple data collection methods Qualitative and quantitative data combined Multiple investigators	Interviews by eight researchers from two laboratories. We used only qualitative data, although the number of released games and sales turnover can be considered as quantitative data.
Entering the field	Overlap data collection and analysis, including field notes Flexible and opportunistic data collection methods	Conducting a pilot interview and confirming that questions are sound. Conducting other interviews. If new issues rose during interviews they were discussed.
Analyzing data	Within-case analysis Cross-case pattern search using divergent techniques	Coding of interviews to discover what issues and findings are raised from the data. To note what similarities and dissimilarities are found between cases. Discussion between researchers to avoid bias. Drawing ideas into models, validating and refining them.
Shaping hypotheses	Iterative tabulation of evidence for each construct Replication, not sampling, logic across cases Search evidence for "why" behind relationships	Comparison of findings from interview round 5 to earlier interviews. Finding the thread of organizational decisions and human competencies.
Enfolding literature	Comparison with conflicting literature Comparison with similar literature	Comparison of findings to existing literature that we agree and to literature we see conflicting.
Reaching closure	Theoretical saturation when possible	We had 8 existing cases and we added 3 in the fifth interview round so in reaching closure we only concentrated on iterating theory and data. The end was reached when our theory matched all the roles and phases to existing case organizations.

The objective of the open coding in grounded theory is to classify data into categories (Strauss & Corbin 1990). After the fifth interview round we had 2249 minutes of recordings from 34 interview sessions. We used ATLAS.ti software to code our interview data. In total 230 codes and 1940 individual observations were collected in open coding phase, which produced findings presented in Table 4. These are the categories that we extracted from the data and used as a base for axial coding, which aims to find relations between larger concepts (Strauss & Corbin 1990). For example "Work: important tasks", "Business: partners" and "Missing factor: wanted talent" build an evidence that organizations have outsourced assets they cannot do in-house and the aim is to grow and gain the talent to work with them.

In the selective coding, third phase in grounded theory, core category is identified. It presents the findings as a whole and relates to all the other categories (Strauss & Corbin 1990). In this study the selective coding produced the growth model presented in Figure 2. Literature is reflected to our findings in the Discussion chapter and the conclusion is presented in Conclusion chapter. The overall process is presented in Figure 1.

Figure 1

The process used in this study to build theory from interview data. The process is based on Eisenhardt (1989), Hughes & Jones (2003) and Strauss & Corbin (1990)

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                    ┌──────────────┐
                    │   Initial    │
                    │  interviews  │
                    │ (rounds 1-4) │
                    └──────────────┘
                           │
                    ┌──────────────┐
                    │  Additional  │
                    │  interviews  │
                    │  (round 5)   │
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              │   Constant   │
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              │    roles     │──────────┐
              └──────────────┘          ▼
                     │           ┌──────────────┐
                     ▼           │  Identifying │
              ┌──────────────┐   │ growth phases│
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3.1. Data Collection

We carried out five interview rounds in our study (see Table 2) with two different company

groups. At the first four interview rounds we focused on seven organizations and their project managers, game developers, upper management and game designers. For the fifth interview round we focused on startups or recent startups, and supplemented our sample with three new organizations. During the fifth round the interviewees were company founders, owners or upper management.

The overall sample of the interview rounds consisted of eleven game development organizations selected from our research partners and supplemented with additional volunteering organizations to achieve a heterogeneous group of different maturity levels, target audiences, development platforms and organizational histories. The organizations always made the choice who would represent their viewpoint and the interviewer had no power but to ask the person who would know the studied issues best. The interviewed organization had the final word on who would be provided as an interviewee. Overall, 34 interview sessions were held between the spring of 2012 and summer of 2013 by eight researchers from two research laboratories.

The first round interviewees were project managers. Our initial concept was to interview management to gain understanding on how game developer organizations operate, and compare game industry against our earlier observations made in general software industry.

The second round interviewees were developers, programmers or testers to assess the infrastructure needed for game development. The objective was to understand the technical development process involved in the game development.

The third interview round focused on the business and marketing aspects, with the interviewees being company owners or upper management. This round established understanding on the aspects beyond the scope of development process, to understand why game developer organizations were operating as observed.

The fourth interview round focused on creative aspects by interviewing game designers and art directors. This interview round focused on identifying the aspects which are characteristic to the game industry, but usually have less emphasis or do not exist in traditional software development.

The fifth interview round was conducted with the startup and recent startups to assess their business models, business strategies, customer relations, key talents and marketing strategies to understand how game developer organizations are established. During the fifth interview round, our interviewees were company founders, current owners or upper

management. For this interview round we organized interviews with four additional case organizations as two organizations (Case A and Case C) were not representative of the target group and some other organizations (Cases B, E and F) were not available for an interview. Additionally, since we wanted to fine tune our data collection instruments between interview rounds to collect data on new observations, we conducted the interviews one round at a time. Because of scheduling issues, we were unable to interview one developer during the round 2. Similarly, because of non-disclosure requirements with an external partner, one case organization could only participate in upper management interviews and later as a recent startup on the fifth interview round.

The interview round themes are summarized in Table 2, and the organizations and their participation to the different interviews in Table 3. The interview questionnaires are available online at the project home pages, at address www2.it.lut.fi/projects/SOCES/library.

Table 2

Interview rounds and themes

Interview	Interviewee	Description	Main themes of the interviews
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.
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.
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.
Semi-structured interview with 7 organizations	Lead designer or art designer	The interviewee was a game designer or managerial level person with the ability to affect the product design and selection of the implement features.	Development process, design and innovation, testing, quality
Semi-structured interview with 6 organizations	Founder, owner or upper management	The interviewee was responsible for decision making in marketing and financial aspects and has 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 when organization participated interviews for the first time.)

*Interview themes discussed during later rounds with other representatives of the organization

The interviews lasted about an hour and were sound-recorded for later analysis. The interviews were held face-to-face, at the location the interviewee had selected. All interviews besides one at round 2 were conducted with the first language of the interviewee to ease their

tension and allow more free-form discussions during the interview. Since for most interviewees the first language was Finnish, the quotes in this paper had to be translated for publication by the authors.

To reduce stress and allow some form of preparation, should the interviewee consider it necessary, questions were given to the interviewees before interview session. Additionally, on some occasions the organization had selected two interviewees instead of one, or there were present more than one researcher. If there were several researchers, one was the lead interviewer and other one took notes.

Table 3

Description of the interviewed organizations

	Release platforms	Organization age	Production team size	Maturity. amount of released games	Rounds participated				
					1	2	3	4	5
Case A	PC, game consoles	More than 5 years	Large	Established, more than 10 released products	X	X	X	X	
Case B	Mobile platforms	Less than 2 years	Small	Recent startup, less than 5 released products	X	X	X	X	NA
Case C	Game consoles, PC	More than 2 years	Large	Established, less than 10 released products.	X	X	X	X	
Case D	Mobile platforms, PC	More than 2 years	Medium	Recent startup, less than 5 released products.	X	X	X	X	X
Case E	Mobile platforms	Less than 2 years	Small	Recent startup, less than 5 released products	X	X	X	X	NA
Case F	PC	Less than 2 years	Medium	Recent startup, less than 5 released products	X	X	X	X	NA
Case G	Browser games	Less than 2 years	Small	Recent startup, less than 5 released products.	X	NA	X	X	X
Case H	Mobile platforms, PC	Less than 2 years	Small	Recent startup, less than 5 released products.			X		X
Case I	Mobile platforms	Startup	Small	Startup, developing first product.					X
Case J	Mobile platforms	Startup	Small	Startup, developing first product					X
Case K	Mobile platforms, browser games	Startup	Small	Startup, developing first product					X

X = Participated on the interview round, NA = Organization not available for an interview, Production team sizes are: small < 10, medium 10 - 50 and large > 50 person.

4. RESULTS

Based on our analysis several characteristics rose from the data and are presented in Table 4 from the interviews. The analysis was done by one researcher and then validated and extended by

others. The eleven interviewed organizations had several distinguishing features in their human resources, team composition and preferred abilities of employees.

The Reason for starting category shows why organizations were initially founded. To make games was a dream basically for every founder, but also other reasons were listed. For example, layoffs in other software industries were one of the starting points for setting up an actual game company. In two cases, after being made redundant, persons started to create games. On few cases it was also mentioned that working under someone's command from 9 to 5 was not for founders, but more artistic field of business sounded better.

The category *Organizational background* indicates the background the core team had. *Media* indicates that the organizations were founded on another media organization, such as an advertising agency, a publisher or a film company. *Academia* indicates that the core team had backgrounds as teachers, researchers or students of an academic level institute. *Software Industry* indicates that the core team was from some software development organization, which did not primarily produce computer games. The background *Games* was used in the second generation organizations, indicating that all of the core personnel came from other game organizations. In some organizations two backgrounds were identified in cases where there were clear differences between some of the core team members.

The category *Startup core team roles* indicates the competences the organization had when people started their first game development project. In most cases all of the members in the startup team did a bit of everything, but in this category only their "main roles" are listed. The role *Designer* indicates that the person is mainly responsible for game design, creating the mechanics and overall feel of the game product. *Artist* indicates that the person is responsible for art work, S*ound artists* the person who designs and creates the sound effects and music for the products. *Developer* indicates that the person is proficient programmer, working with the development infrastructure the organization uses. Finally, *Business* indicates that the person was responsible for managing the marketing, business and finance aspects of the team startup.

The category *Most important abilities* characterize what the organization considers to be the most important abilities in employee to have. Besides technical skills and social skills, also things like able to work in groups and communication skills were brought up several times. Besides actual skills or traits also motivational aspects were brought up, three case organizations also considered the overall dedication to making games to be the most important ability.

The category *Outsourced activities* illustrates tasks that organizations are not doing by themselves. Virtually all the organizations outsource something although the biggest ones have resources to do all the things in-house. Most outsourced parts are game engine and sounds. Few organizations had built their own game engine, but most of them utilized 3rd party engine with or without own extensions. In smaller organizations there are no resources to hire full-time sound artists but the service could be bought from 3rd party artists. Some graphical outsourcing is also done, but it is mainly considered as one of the key assets of organizations and is done in-house.

In the *Ways to grow* category none of our case organizations reported any company acquisitions done, but all of them had grown in organic fashion or were still in infant state where no growth had happened. In one case some acquisitions were done in form of recruiting key persons from other companies and this could be seen as a bit like of hybrid mode for growth based on McKelvie & Wiklund (2010) division.

The category *Preferred qualities of a new employee* indicates which qualities are considered most important for a new potential employee given that they are "adequately experienced" to qualify for the position. In some case organizations (A, C and F) the communication skills were further emphasized. Extraordinary high experience or talent was sought in cases B, E, H, I, J and K, of which in cases H, J and K (to a lesser degree also Case E) the person would be filling the skill gap in the core team. Two cases (D and G) promoted the importance of person being intelligent and capable of working independently, without constant or near constant supervision.

Table 4

Case Organization Characteristics

	Reason for starting game organization	Organization background	Startup core team roles	Most important abilities	Outsourced activities	Ways to grow	Preferred qualities of a new employee
Case A	Personal interests to change business domain	Media	"Small team"; at least 1 developer, 1 designer.	Technical skills, communication skills.	Parts of sound work, Secondary 3D objects, game engine	Organic	Communication skills, ability to learn while doing.
Case B	Continuation to education	Academia	1 designer, 2 developers, 2 artists, 1 sound artist, 1 business.	Social skills, Technical skills, understands overall picture.	None	Organic	Experience, understanding of personal talents.
Case C	Need to redefine branding.	Games	Team composed from experienced game developers.	Dedication, group working skills, communication.	Parts of sound work, Secondary 3D objects, game engine	Organic	Communication skills, ability to learn while doing.
Case D	Personal dream	Media	1 designer, 1 developer.	Dedication, Art talent, programming.	All sound work, game engine	Organic	Independent worker
Case E	Personal interests to change business domain	Software Ind./ Games	2 artists, 1 developer.	Creative, group working skills.	All sound work, game engine	Hybrid	Experience.
Case F	Personal dream	Academia	1 developer, 1 designer, 1 manager, 1 artist	Dedication, social skills, technical skills.	Parts of sound work, game engine	Organic	Team working skills, outspoken.
Case G	Layoffs, personal dream	Software Ind.	1 business, 1 designer, 1 developer, 1 artist.	Communication skills, multiple technical talents.	All sound work, secondary art	No growth	Intelligent, trustworthy.
Case H	To be your own	Academia	3 developers	Marketing	Some graphics	No	Artistic talent

				skills, Technical skills.		growth	
	boss						
Case I	Common interest in and dream of doing own games	Media/ Games	2 developers, 1 artist.	Technical skills, Art talent.	Game engine	No growth	Experience
Case J	To be your own boss	Academia / Software Ind.	1 business, 3 developers, 1 artist.	Artistic talent, dedication.	All sound work, game engine	No growth	Able to create production quality content
Case K	Layoffs, personal dream	Academia	1 artist, 3 developers	Technical skills, artistic skills.	Game engine	No growth	Good business sense, experience on management.

4.1. The Roles in the Computer Game Organization

We identified four strong roles (developer, graphic artist, designer, business) that were mentioned in most of the cases. These four roles were essential in the startup organizations. A number of other roles (e.g. sound artists, quality assurance (QA)/ tester, marketer) existed also in some organizations or they were acquired later, after the initial startup phase was over. The four strong roles are "critical" roles, which are needed in the organization to be able to do commercial game development. As the core competence of a computer game startup is to create a game it requires roles of developers to do programming, graphic artists to generate graphics, designers to decide the game logic and business persons to take care of business operations. In reality, in most startups the founders do everything, but for each person there usually is some areas in which they are more talented than in others.

The developers are people with programming skills and experience on the technical development work required to construct a game product, whereas graphic artists are skilled and able to produce consistent, commercial grade graphics and animation for the game. The designers are people who have ideas and insight into the industry, and can create and design products that are appealing for their target audiences, beyond their own preferences. The business people are skilled in acquiring funding or securing business deals and contracts. The people in the business role usually were also skilled managers and decision makers, steering the development work towards professional practices.

For the minor roles, sound artists design and compose music and/ or produce high quality sound effects. QA/ testers do quality assurance and testing work and marketers to handle marketing campaigns and acquiring visibility for the company products.

4.2. Organizational Evolution in Computer Game Organizations

In this study we identified four phases that computer game organizations go through before the organization can be called a functional business unit that produces revenue through its products. In the following, we will describe how these phases were identified and what they are composed of.

Table 5 describes the criteria for different phases, lists the crises specific to each phase and gives an example from the case organizations in this study that are in the phase. The phase model emerged in the analyzing round when we divided the case organizations to logical groups. We noted that three organizations were on so early stages of business that we could not call them as startups but as *demo groups*. For example, they had not registered themselves as legal entity. Two of the organizations were categorized as *full businesses*, meaning that the organization had existed in the business for several years and its catalogue included more than five released products and most of these products had been financially successful. After these classifications we had still six organizations left. Some of them were working on a recently released game and did not yet have a business model and clientele that would give them enough revenue. The rest of the remaining organizations had already released more than one game and were gaining revenue. Thus we divided these organizations to two classes, *business startups* and *recent startups* to include organizations that were either starting their business or that were already advanced in the business.

Table 5

The characteristics and crises of computer game organization on different phases of organizational growth

	Characteristics	Crisis	Example Case Organizations
Phase I *Demo group*	There are people (artists and developers) interested in game development and they have an idea for a game (a designer). No significant investment is involved in this phase, but people are merely making "a dream come true" with own savings, bank loan, or other external funding.	Talent	I J K
Phase II *Business startup*	The company is able to release its product and is getting its first customers. The release process requires a publishing partner or own business knowledge (a business person). Funding is mainly coming as in Phase I, but also venture capitalists can be involved.	Business	E F G H
Phase III *Recent startup*	The organization is fully operational and games are producing revenue. New games are funded with revenue from the existing ones. There is a possibility to start another development team.	Independence	B D
Phase IV *Full business*	The company is big enough to do self-publishing with in-house resources (a sound artist, tester, marketer) when wanted. Outsourcing is done if it is cost efficient. Several teams are working with different products. Games produce revenue to cover all the cost and gives also profit.	Organization related	A C

By moving from one phase to next new skills are required and employees have new roles when the organization grows. For example, when a demo group moves to Phase II its employees, especially the CEO, need more business knowledge. These issues are described in the following phase descriptions.

4.2.1. Phase I

We found out that a typical "demo group" computer game organization is a collection of programming experience, game designing skills and artistic talent. The minimal core team of an organization consisted of one or two developers that can create the game. This included mainly programming, but also proof-of-concept level graphics. If the team has no own skills of generating graphics and/ or 3D-models, they can outsource the problem, but as it costs money, which startups rarely have, it seems that the team prefers to invite persons with artistic skills to join them as a partner.

"We have a talented graphical designer and we want to tie him to our organization and thus we try to sign him as a partner", CEO, Case K.

"We can do basically everything by ourselves, but we have trainees to help with the graphics. In the future marketing issues require thinking", CEO, Case I.

On several occasion interviewees mentioned that the team consists only of those that are crucial to the success of the game development project. Therefore if the team is too large in the beginning, there might be a need for scaling it down. This happened to Case K, in which the initial team had nine persons involved, but when the game development got serious, the team was scaled down to three persons. These three were the crucial persons that were needed for the development.

"We started as nine person cooperative, but after we found the three key persons, we were ready to start the actual joint stock company", CEO, Case K.

The disadvantage of the smallest possible team is that the teams are so small that when one person leaves, it might make the company to disintegrate. A CEO in Case K put it: "If we would lose one of our designers... we would probably halt the project temporarily." This quote underlines the issue that a Phase I organization cannot afford to hire additional resources nor can it afford to lose a key resource.

When using 3rd party game engines the testing process of games is different from traditional software testing as the core system - game engine - is delivered as a product, and the low level technical testing is done by the developers of the engine. The testing that still needs to be done by the game developer includes usually usability and user experience testing, which at this level is often done by giving the game to social connections of the developers - friends,

family - for quick play testing. Although this kind of testing is not systematic, it gives the developers feedback whether the game is usable and if the experience is entertaining.

"The first step is to press the play button in Unity... but a developer can be blind to his own work, so the next step is to compile it to a test device and give it to someone who has no money involved in the project", CEO, Case J.

The growth in the Phase I includes learning new things, tools and ways to build games, as well as building the initial formation of the organization. It is much of a surviving among other game companies. The Phase I has the crisis of talent. As our cases show the core people are very important and without them the projects would fail. The developer team requires graphics and sound assets, and if the team cannot find the required talent from their own ranks or outside, the game development cannot continue and the team breaks ups. If the team finds the talents required to finish the first game, it moves on to Phase II, where it can concentrate on the next step - publishing the product.

Case I is in Phase I. It has an existing game prototype, which it develops further and tries to find a way to publish it. Case I has not yet needed any office as it operates in an academic environment and gets all the facilities that way. As Case I is still categorized as demo group in Phase I, the group does not have capital to buy assets, so it uses trainees to work for them. These issues illustrate Phase I, during which the product is in development and the publishing and business ideas are still in an infant state. Cases J and K are in the similar situation as they are developing game prototypes further and trying to accomplish all the needed sounds, music and graphics.

4.2.2. Phase II

After the smallest possible core team is formed and the game starts to take shape the publishing process becomes important. The publishing might be implemented by an external a publisher, which is then responsible for publishing and marketing. The game can also be published in-house. The latter means that people in the organization have marketing skills and ways to get visibility in the computer game market. This can also be done by hiring a marketing person or learn-by-doing. During the interviews on our cases marketing was seen as important, but there were different views on how to do it.

"We have been going with the idea that we are unknown - invisible - and we don't have

marketing know-how. The first games are exported to different countries via a publisher that then gives us the coverage", CEO, Case G.

"We see marketing important as we are now finishing our product and want to get our customers to know us and want our product", CEO, Case H.

We observed similar conceptions about the role of a publisher. Some saw publisher the easiest way to get visibility to their products and some had strong idea of going without one more middle man taking its share from the revenue stream.

"We are discussing with publisher candidates as we do not have the know-how to get visibility to our games in App Store. It is a black box for us", CEO, Case G.

"We think that it is a good thing to invest in publisher's marketing know-how", CEO, Case E

As game development transforms to game business in Phase II it also means that the group of developers need to register the company as a legal entity, and our cases also show that they benefit from a physical office that they can use for their game development. Although teams have become more formal as they have, for example, documented CEO and post address for authorities, they still have people doing "everything" and usually no professional CEO has been hired.

"In our strategy we would require a real CEO instead of me. I am not a specialist in this area. I could then go back to coding", CEO, Case G.

The growth in the Phase II is mainly finding the business partners and correct people to do jobs related to publishing and overall business issues. The crisis of phase II is business. Although a company could develop a game it also needs to be published and produce income for the company. This includes problems of finding the best channels for publishing, marketing the product and gaining revenue through a working revenue model. For example, the first game of Case G did not produce enough revenue. Therefore the company decided to put effort for the second game. Luckily they had enough financial capital to go on with the second game. If the organization cannot build a profitable revenue model it runs out of money and probably exits the market. When the crisis of business is solved the organization moves to Phase III.

Case G illustrates a Phase II organization. The members of the team had their game ideas, which they were able to publish with the help of a publisher. They also started to work in a home office, but when the business started to generate income they moved to a real office setting. They

have outsourced some of their graphics production to another country as it is cost-effective for them. Cases E, F and H managed also to publish games and gained revenue and therefore they are in a similar situation as Case G.

4.2.3. Phase III

In the third phase several products have been released and organization has established its position in the business. In this phase a dedicated person can be hired to run the organization and employees get actual salary paid from the revenue from their products. This phase may also include an expansion of the business, for example, by starting an additional development team. This means hiring more developers and designers.

"We are still small, but we do not want to recruit more individuals now but to establish additional team", CEO, Case D.

In Phase III a company has also a steady base of customers - gamers. This leads to investments to customer relationships and customer segmentation. Gamers have their opinions, improvement ideas and other feedback. Customers need to be taken care of as they are the source for revenue.

"Facebook is actually a quite good bidirectional channel to get new ideas, feedback and to answer gamers questions", CEO, Case D

In the Phase III organization has grown in turnover and in number of employees and it can stay in Phase III for years - as long as it is financially sustainable, but the crisis of independence may arise. The company has managed to release a game or two, but the organization may be too dependent on its partners and lose its independence on the game design process. The publisher, a funding source or a third party graphics, sounds or marketing provider may cause pressures and constraints. The crisis can be overcome by improved independence. The company may aim at having resources to do almost everything in-house, although it can still use outsourcing. If the company cannot solve the crisis it might end up severing the cooperation with its critical partners, making its existence in the market difficult or impossible. If the crisis is solved, the company may move to Phase IV.

Case D is a good example of an organization that has reached the Phase III. The organization is fully functional with a CEO and an own office. Case D can do the most of its tasks in-house, but it is dependent on the publisher. It is able to fund its projects with revenue

coming from existing games, and it aims at creating another development team to grow its business.

4.2.4. Phase IV

In the fourth phase, the business has expanded and, for example, testing is done by specialists, game production includes pre and post productions besides the actual production and several games are being developed simultaneously. The reliance of 3rd party partners has decreased. The fourth phase also includes hiring people that would be only part timers in the previous phases. In the fourth phase operation from day to day can be done with the persons that are on the payroll. This does not mean that outsourced workforce could not be used if there would be a sudden need for that or it would be cost-effective, but that organization has skilled people to do everything in-house and have, for example, their own artist to compose music and edit sound effects to their games. This means that the business has increased enough to warrant a separate sound engineer or musician as a full time employee.

"We have our dedicated head of marketing... We are moving to self-publishing where we need to do all the marketing by ourselves", Producer, Case A.

In Phase IV the number of people involved in the production can vary from tens to hundreds and, as several different games can be done simultaneously, the size of teams can be scaled up and down when needed. The management has knowledge and experience in this kind of production that is controlled instead of mostly ad-hoc development in the Phases I and II.

As the number of people has increased and in Phase IV employees work on monthly salary rewarding systems have also been introduced to motivate people, for example, to keep to the schedule.

"Bonuses can be based on reviews and selling figures or they can be based on keeping to the schedules in milestones", CEO, Case C.

Although our data does not indicate well the crises in the fourth phase, we can speculate that the crisis of fun could emerge as the company keeps growing and bureaucracy gains ground. In that kind of scenario talented developers might leave the company and start their own, thus returning to Phase I or that the organization may face financial downturn and is forced to dismantle themselves partially or completely.

Case A illustrates the Phase IV. It has a large office at a business park, and it is self-

publishing smaller games on several platforms in addition to working on large projects with external publishers. The organization has the needed skills in-house, but outsourcing is used to manage development costs and schedules. Despite of having only a limited number of employees, it regularly releases products that have several hundred contributors when all outsourced activities are counted. The organization has professional management and a board of directors; it does marketing work for products and separately for the company itself and, for example, is able to maintain a presence in international trade shows without an external assistance. These things illustrate the finding that a Phase IV organization is able to implement long projects with a large number of workers. The development can be scaled up and down when necessary.

Figure 2 presents the needs in different phases. The organization has needs that can be fulfilled in-house (e.g. programming) but also needs (e.g. sounds) that required assistance from partners, like a publisher. The reliance on partners decreases as organization grows.

Figure 2

Phases of growth of computer game organization with personnel needs and needs from partners/ outsourced issues. Dashed line indicates crisis in the end of every phase
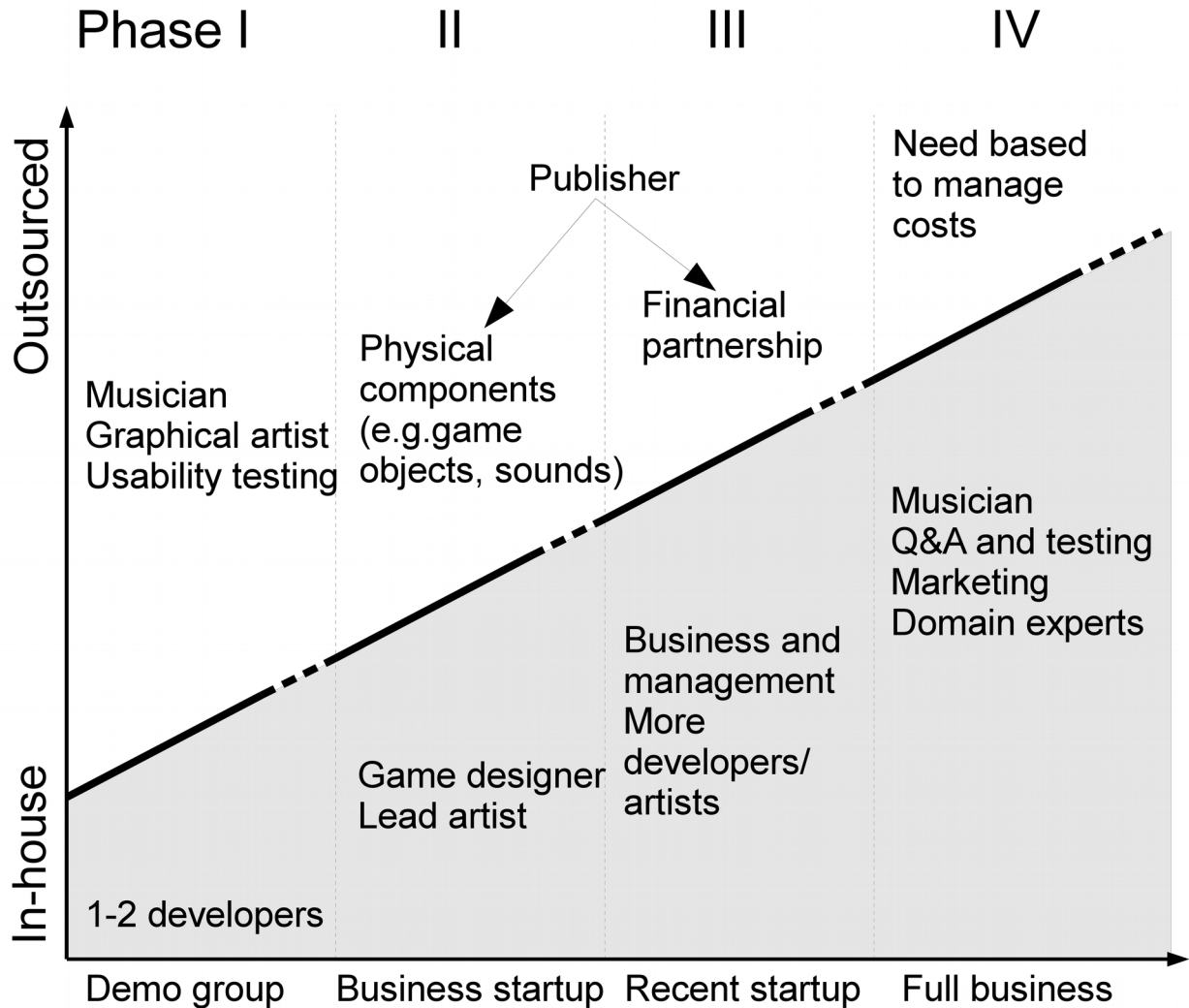
5. DISCUSSION

Based on McKelvie & Wiklund (2010) research streams division this study discusses the growth process and and also the outcome of growth as the growth produces problems – crises. The growth as an outcome is no discussed in this article.

5.1. Comparison of Our Findings to Literature

According to Levie & Lichtenstein (2008), Greiner (1972) organizational growth model is the

most cited in their literature review. Greiner (1972) presented the model of organization growth (see Fig. 3). In the model all five evolution stages end in a revolutionary stage. The evolution stages introduce new ways to improve the organization. After some time the organization ends up in crisis which needs to be resolved. The solution varies in different stages and after it has been implemented the next stage of evolution starts. It can take years to go through all the stages and not all organizations even reach all the stages.

Figure 3

The phases in the growth of an organization (Greiner, 1972). The solid line indicates the evolution (growth) phase and a pulse illustrates a revolution (crisis) phase
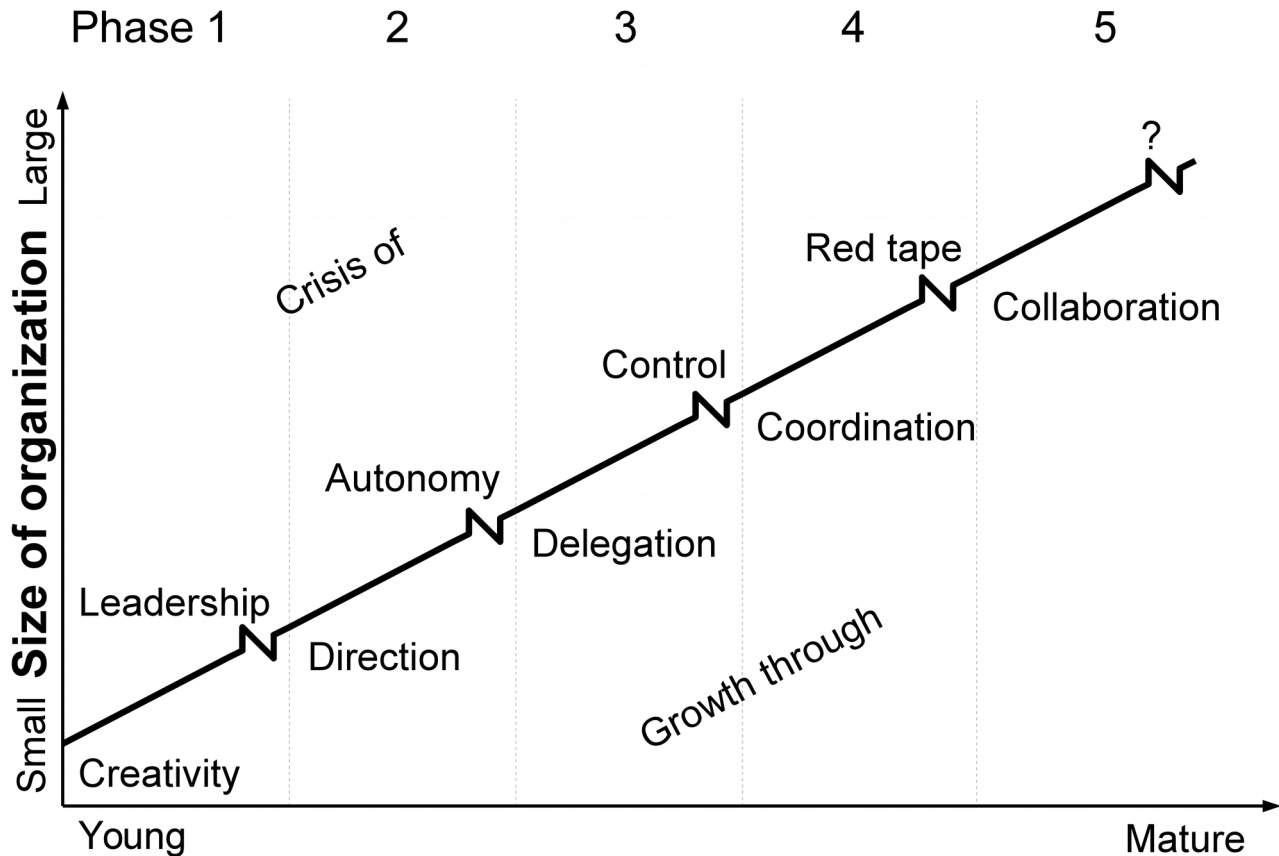
Lippitt & Schmidt (1967) have built a similar model as Greiner (1972), but they used a life cycle model for organizations and the model is based on personality development theories. Their model consists of three stages: birth, youth and maturity. All these three stages are then divided into two sub stages, which have their own critical concerns, key issues and consequences if concern is not met. One can argue that the model is similar to the one developed by Greiner (1972) as it covers the growth of an organization and discusses the issues that are problematic when an organization is growing and finding its place. Lippitt & Schmidt (1967) also describe skills required to overcome crises. We see this important as different skills in organizations play

a role in the success.

Churchill & Lewis (1983) argue that the models similar to the one presented by Greiner (1972) are not suitable for small businesses as a) they assume that a company must grow, b) they do "not capture early stages in a company's origin and growth" (Churchill & Lewis 1983, p.31), and c) the models use annual sales and the number of employees as the size of the company, whereas, for example, value adding and production technology is not taken into account.

The model presented by Churchill & Lewis (1983) concentrates on starting a small business and it identifies five stages: existence, survival, success, take-off, and resource maturity. The first two stages are presented as disengage phases and after that the organization moves to growth. This is different from the other two models that focus on the growing stage. When starting a small business there are other areas to cover besides the growth in the early stages of a business. Churchill & Lewis (1983) use four key company factors, financial, personal, system, and business resources to determine success.
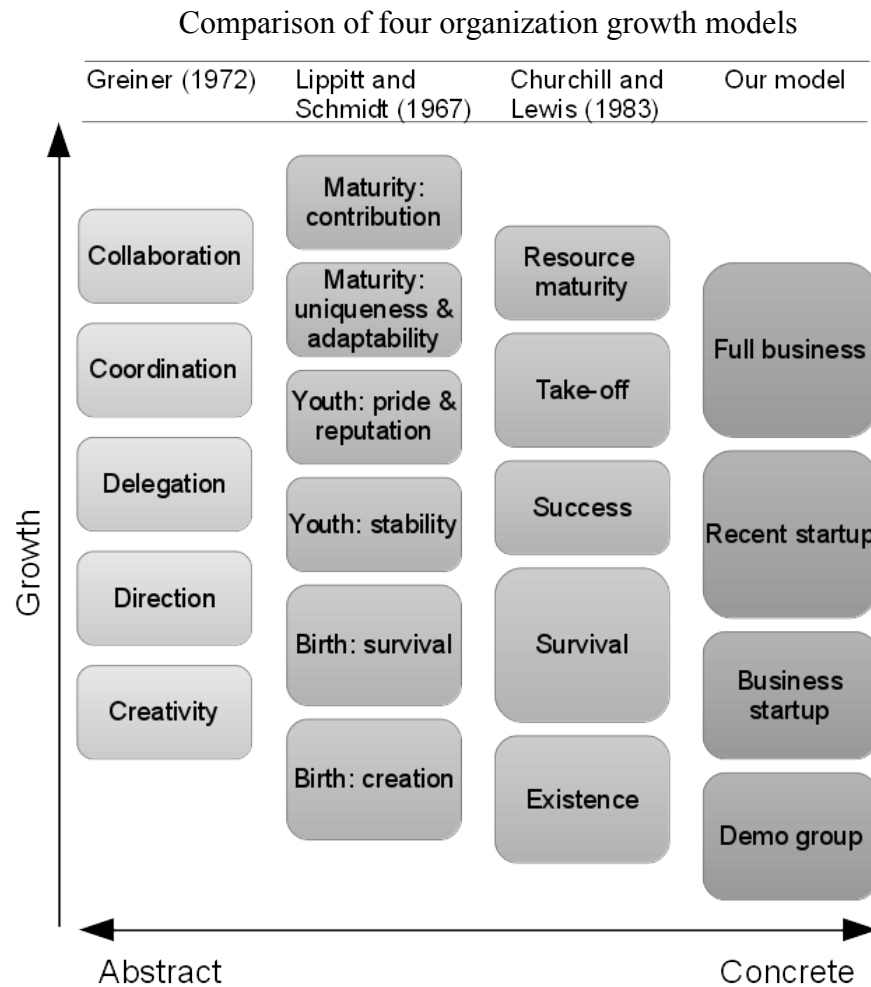
Greiner (1972) model discusses companies that are further on their growth. Therefore we argue that it is not a good model when discussing computer game startups. We found the model presented by Churchill & Lewis (1983) to be the most similar to our findings. Churchill & Lewis (1983) argue that growth can start after the organization has survived its early stages and in our study we found similar issues as some of our cases were just in the very beginning of their life cycle, some had survived and gained success and some had failed to build successful business and exited the business. The models of Churchill & Lewis (1983) and Lippitt & Schmidt (1967) identify the problematic nature of startups compared to organizations that have already been in the business for few years. We identified the crisis of talent as the first problem the demo groups seem to face and this is not in line with the model of Greiner (1972), who argue the first crisis to be leadership. To be able to have a leader, the organizations in this study first needed talented workers.

Although Churchill & Lewis (1983) argue that not all organizations want to grow, our data indicates that computer game organizations even in the Phase III want to grow and move to Phase IV even if they could succeed well in Phase III. The growth in Phase IV is not seen as very important, once all the needed skills are available. In our case organizations, growth at phase IV was not deliberately avoided, meaning that, for example, skilled applicants were hired although no drive to get more employees was observed and new game projects and platforms were

introduced.

Figure 4 presents a comparison between the three discussed growth models and the one presented in this article. The models discuss the growth of organization on different levels. Greiner (1972) model is the most abstract one and we do not see that it discusses the problems that newly started organizations face in the very beginning. Lippitt & Schmidt (1967) model discusses, for example, issue of contributing back to society, which we saw also more abstract and which did not exist in other models. Churchill & Lewis (1983) model is the most similar to our model as it, for example, starts from almost as early stage as our model and is the most concrete of these three discussed. Our model is more specific to the computer game industry and it takes account of the phase where organization does not exist as a legal entity but as a demo group (see Fig. 4). This is an issue that has not been found in the existing literature and we consider it to be noteworthy issue when talking about industry that is producing intangible products with starting cost near zero.

Figure 4

Comparison of four organization growth models

Greiner (1972)	Lippitt and Schmidt (1967)	Churchill and Lewis (1983)	Our model
Collaboration	Maturity: contribution	Resource maturity	Full business
Coordination	Maturity: uniqueness & adaptability	Take-off	
Delegation	Youth: pride & reputation	Success	Recent startup
Direction	Youth: stability	Survival	Business startup
Creativity	Birth: survival	Existence	Demo group
	Birth: creation		

Growth (vertical axis)

Abstract ← → *Concrete*

The literature discusses different roles and their matching in talents among employees in software industry. We identified seven roles among computer game organizations: developers, graphic artists, designers, business, sound artists, QA/ testers and marketers. In addition our cases listed communication skills, the ability to learn while doing, experience, understanding of personal talents, independence in work, team working skills, outspoken, intelligent, trustworthy, artistic talent, the ability to create production quality content, good business sense and management skills as skills the cases would prefer from new employees. It seems that these roles are a mixture of software development, business operation and movie making and the required skills are also mixture of all these areas. Wu (2009) lists 23 entrepreneur competencies in her study and we found those competencies also reflecting our findings that is in line with the idea that in a startup business everyone in the company is doing everything, including entrepreneurship. Tohidi (2011) mentions passion and interest for both job and workplace that

our also exist in our study as dedication was mentioned by several interviewees.

When comparing our results with the findings of Agrawal et al. (2012) we argue that computer game organizations have not yet faced all of these challenges. Although there is turnover in game designers and developers it was not reported to be a problem. This could be challenging especially among startups, but they reported to be satisfied with their human resources. The similar case is with the onsite-offshore issue that seems not to consider computer game organizations. Even though they have partnerships with companies located in other countries no problems were identified in this kind of model. The issue with skillful workers is present in the demo group and startup phases. For example, marketing skills are required and if they are not found in the core group the skilled person needs to be recruited or the outsourced to publisher or other partner. Agrawal et al. (2012) maintenance work to be boring and thus a negative feature for workers. Although games also include maintenance work it is in minor role and people working in the industry see the whol industry nothing but boring:

"I can work with passion and get maximal payoff from it. It is kinda good", CEO, Case J.

Agrawal et al. (2012) listed also inadequate HR practices as a source for problems. Within case organizations presented in this study the whole HR side is very informal and, for example, communication is handled over coffee table. The transition from technical to managerial role can be problematic also in the computer game industry but as the organization is informal it was not mentioned as a problem in any interview session.

Although these issues were not found in our data it does not mean that the industry would not meet these challenges in the future. As the industry is still young and, for example, mobile gaming is less that twenty years old concept the whole industry is going to face different crises.

5.2. The Inclusive Mindset of a Computer Game Startup

The CEO of Case J said that the person they want would be "a digital renaissance man". They wanted a person that has skills not only in programming or graphical designing, but also in other areas that are required in the very beginning of a startup company. This mindset would include marketing, customer psychology, getting funding, composing music, drawing commercial quality graphics, developing 3D-models and programming.

As these Leonardo da Vincis of digital era are very rare and imaginary, the reality behind these requirements is that startups cannot afford to have a specialist, for example, in

programming. In startups the core team needs to do also jobs outside their expertise or comfort zone.

"In our organization we are all capable of doing each other's jobs. I think in a startup environment it is important to have multi talents", CEO, Case G.

As people need to be able to do various activities, some qualities - personality and social skills - are valued over others in these organizations. As the work is hectic and tasks can vary from programming to marketing, the personalities really need to fit socially in the team. Social skills are needed inside the team, but also outside when meeting customers or partners or otherwise representing the company.

5.3. Limitations of This Study

The application of grounded theory and qualitative analysis imposes some restrictions on the applicability of the results and generate threats to the study validity. The different types of threats are classified and explained for example by Robson (2002). Its classification identifies three different types of main threats, such as observational bias, researcher bias and reactivity. The first and the most dangerous threat to qualitative study is the researcher bias; a threat that the researchers only want to enforce their own opinions and see only conclusions that reinforce their own ideas. In this study, the researcher bias was minimized by conducting the data collection in cooperation between eight researcher from two laboratories, conducting the data analysis with four researchers working in cooperation and finally, reporting the results which were agreed in group discussions. The two laboratories did their own studies and the interaction during the data collection was minimal. After data was collected it was provided to be utilized by both laboratories. Thus the analysis of data by the persons from another laboratory did not include the others' prejudice - if there were any. The data collection instruments were also designed by three or four researchers depending on the instrument, and peer reviewed for sanity and bias by other researchers of the laboratory. Similarly, the interviewee bias was limited by selecting a number of organizations, which represented different sizes, release platforms and maturities of organizations, and interviewing several different stakeholders in the companies. Even if all of the companies are located in Finland, they still aim at international markets, and represent different types of game companies, although there may be some underlying common peculiarities imposed by the local authorities, business culture or education. As computer gaming markets are

global these 11 organization are considered to be representative group.

In addition of the possibility of a bias, qualitative studies have limitations in the applicability of the results. As described by Whittemore et al. (2001) in qualitative studies and grounded theory the objective of the research team is to describe a narrative, chain-of-evidence, to establish that they know that their observations represent the activities of observed organizations. However, these observations are always directly applicable only in the context of the observed organizations. If the results are taken outside the scope of the study, then the results should be applied as recommendations or suggestions.

6. CONCLUSION

In this study we identified four phases (demo group, business startup, recent startup and full business) computer game organizations go through when they evolve from demo group to full business. We observed eleven organizations where the newest ones had less than handful of people and were still on early stages of game development and the oldest ones had extensive catalog of games and had more than one hundred workers involved in the production.

We noticed that the core team is formed over a game designer and one or more developers. This team is then fortified with artistic and business skills when the organization moves onwards to next phases. At the same time the reliance on partners and outsourcing changes from getting components to the game to financial partnership and help in marketing.

The current scientific literature lacks research on computer game organizations as the whole industry is young and rapidly growing. The existing literature presents numerous phase and stage models for organizational growth and we see that our phase model has similarities with the existing ones, but it is more concrete and focused on the computer game industry. Our extension to the current knowledge is the addition of the phase where an organization is not yet legal entity but a "demo group", which is characteristic to computer game startups. The existing stage models have not discussed this "demo group" phase, which is recognized as fundamental part of the growth process computer game organizations.

Our findings are applicable in the computer game context. The next step is to extend this research with a quantitative study to validate the findings with a larger number of organizations. We are also aiming to compare the development phases of computer game organizations to conventional software organizations.

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