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**Industry Life-Cycle Theory in the Cultural Domain:  
Dynamics of the Games Industry**



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## **Industry Life-Cycle Theory in the Cultural Domain: Dynamics of the Games Industry**

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## Abstract

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**Keywords:** Games industry, industry life-cycle, cultural industries, creative industries

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Industry life-cycle theory is interested in changes in key industry variables, including entry and exit rates, firm numbers, price, performance and concentration, and in innovative activity as the industry ages. To date, industry life-cycle studies have concentrated on traditional manufacturing industries that produce utilitarian goods. The present study investigates the dynamics of the games industry which is a prime example of a non-manufacturing and non-utilitarian industry. As prior research on the games industry is scarce, the cultural industries literature is reviewed to shed light on the conformities and deviations that can be expected to be found between the propositions of the industry life-cycle theory and the empirical analysis on the games industry. The specificities of cultural industries are discussed in terms of economic characteristics, management challenges and industry dynamics.

The empirical study comprises two analytical steps. The first one investigates the evolution of the games industry with standard industry life-cycle tools. In the second one a qualitative systems dynamics model on the micromechanisms of the game development sector is built to explain the observations made in the first step.

The key finding of the study is that the dynamics of the games industry differ from the propositions of the industry life-cycle theory in two respects. Firstly, innovative activity has not levelled off in either hardware or software. Secondly, game development has remained an unconcentrated industry. The innovative activity is explained by the constant need for novelty common to all cultural industries and it manifests in the key role that the production of original ideas has in game development firms. The low level of concentration is explained by lesser economies of scale caused by increasing management challenges and the increasing risk of bankruptcy with increase in firm size.

The study contributes (1) by applying the industry life-cycle theory to the cultural domain, (2) by combining the phenomena listed in the cultural industries literature and analysing their effect on industry dynamics, (3) by examining the evolution of the games industry in both hardware and software sectors and (4) by highlighting the micromechanisms that produce industry dynamics. The study also has implications for policy-making and management practice. These relate to different forms of public funding, education, outsourcing and the key role of original IP.



## Tiivistelmä

Peltoniemi, Mirva. 2009. *“Industry life-cycle theory in the cultural domain: Dynamics of the games industry”*. Tiedonhallinnan ja logistiikan laitos, Tampereen teknillinen yliopisto.

**Asiasanat:** Peliala, toimialan elinkaari, kulttuurialat, luovat alat

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Toimialan elinkaaren tutkimus keskittyy selvittämään toimialan iän karttuessa tapahtuvia muutoksia. Niitä seurataan keskeisissä toimialamuuttujissa, joihin kuuluvat alalle tulevien ja alalta poistuvien yritysten lukumäärät, alalla toimivien yritysten lukumäärä, tuotteen hinta, suorituskyky ja toimialan keskittyminen. Lisäksi mielenkiinnon kohteena ovat muutokset innovaatiotoiminnassa. Toistaiseksi ko. tutkimukset ovat keskittyneet valmistavaan teollisuuteen, jonka tuotteet ovat utilitaristisia. Tämä tutkimus tarkastelee pelialaa, joka on erinomainen esimerkki toimialasta, jonka tuotteilla ei ole utilitaristista tarkoitusta ja jossa fyysinen valmistus ei ole keskeisessä roolissa. Pelialan tutkimus on toistaiseksi ollut vähäistä, joten työssä on hyödynnetty kulttuurialoja koskevaa kirjallisuutta. Tämän kirjallisuuden pohjalta on arvioitu, minkälaisia yhdenmukaisuuksia ja poikkeamia on odotettavissa toimialan elinkaaren teorian ja empiirisen materiaalin välillä. Kulttuurialoja käsittelevää kirjallisuutta on käyty läpi taloustieteellisten erityispiirteiden, liikkeenjohdon haasteiden ja toimialadynamiikan osalta.

Tutkimuksen empiirinen osa koostuu kahdesta analyttisestä askeleesta. Ensimmäisessä askeleessa tarkastellaan pelialan evoluutiota toimialan elinkaaren teorian perustyökalujen avulla. Toisessa askeleessa rakennetaan laadullinen systeemimalli pelikehitysalan mikromekanismeista. Sen kautta pyritään selittämään ensimmäisessä askeleessa tehtyjä havaintoja.

Tutkimuksen päälöydös on, että pelialan dynamiikka eroaa toimialan elinkaaren teorian propositioista kahdella merkittävällä tavalla. Innovaatiotiheys on pysynyt korkeana sekä laitteistotietä ohjelmistopuolella. Toiseksi, pelikehityssektori on säilyttänyt hajautuneen rakenteensa. Innovaatiotiheys selittyy sillä, että kulttuurituotteille tyypillinen jatkuva uutuuksien tarve tuo omaleimaisuuden keskeiseksi pelikehitysyrityksen tavoitteeksi. Toimialan hajautunut rakenne puolestaan selittyy sillä, että pelikehityksessä skaalaedut ovat vähäisiä johtuen johtamisen haasteiden ja konkurssiherkkyyden kasvamisesta yrityksen kasvun mukana.

Tutkimus kontribuoi (1) soveltamalla toimialan elinkaaren teoriaa kulttuurialaan, (2) kokoamalla kulttuurialojen koskevan kirjallisuuden ilmiöt ja analysoimalla niiden vaikutusta toimialadynamiikkaan, (3) tarkastelemalla pelialan evoluutiota sekä laitteiden että ohjelmistojen osalta ja (4) nostamalla esiin mikromekanismeja, jotka tuottavat toimialatason dynamiikan. Tutkimuksella on myös implikaatioita koskien elinkeinopolitiikkaa ja yritystoimintaa. Ne liittyvät julkisen rahoituksen muotoihin, koulutukseen, alihankintaan sekä immateriaaliomaisuuden tärkeyteen rooliin.

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Tampere, April 2009

Mirva Peltoniemi



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## 1 Introduction

One of the popular theories applied to the study of industry dynamics is that of the industry life-cycle. The core of the industry life-cycle theory is the alternation between radical and incremental innovations in industry evolution. Abernathy (1978) posits that radical innovations introduce new products and tend to be performance-maximising. Incremental innovations, on the other hand, take place when products are standardised, and they have a cumulative effect on productivity and cost. The shift from radical to incremental innovations marks the maturity of an industry.

Such a shift tends to come with the emergence of the dominant design, which is a concept introduced by Abernathy (1978) and Abernathy and Utterback (1978). For them it marks the transition from made-to-order production to standardised mass-manufacturing. Murmann and Frenken (2006) state that the emergence of the dominant design changes the nature of the game. Teece (1986) describes this transformation as competition changing from design to price. Dominant design allows standardisation which enables economies of scale.

For Audretsch (1991) such changes in competition mark the shift from entrepreneurial to routinised regime. Under the entrepreneurial regime entrants have an advantage as radical innovations based on knowledge external to the industry serve as the route to success. Under the routinised regime the advantage shifts to incumbents as knowledge internal to the industry becomes more important in increasingly incremental innovative activities. There are various innovation classifications (e.g. Abernathy and Clark 1985; Tushman and Anderson 1986; Henderson and Clark 1990), but in all of them a distinction is made between innovations that reinforce the dominant design and those that introduce new candidates for dominant design.

In addition to changes in innovative behaviour, industry evolution manifests in firm numbers. Under the entrepreneurial regime entry rate is high. As the dominant design emerges and the industry shifts to the routinised regime entry rate decreases and exit rate increases sharply. This kind of a shakeout is defined by Klepper and Miller (1995) as a persistent fall in firm numbers over a lengthy period of time during which output rises. In such conditions incumbents tend to beat recent entrants as they can capitalise on economies of scale and spread R&D costs over a larger production volume (Cohen and Klepper 1996a). On the other hand, during eras of intense technological activity incumbents may suffer from technological obsolescence and innovative entrants prevail (Agarwal 1996). The stage of the industry life-cycle and the associated competitive regime determine whether it is the incumbents or the entrants that have the advantage.

Industry life-cycle studies assume that there is a relationship between market age and key industry variables (Agarwal 1998). Such variables include entries and exits, firm numbers, output, price and performance, the incidence of different types of innovations as well as concentration and inter-firm sales variability. The contexts that have been studied include mainly traditional manufacturing



industries, such as cars (e.g. Abernathy and Clark 1985), aeroplanes (Tushman and Murmann 1998), computers (e.g. Anderson and Tushman 1990), penicillin (e.g. Klepper and Simons 2005) and cement (e.g. Tushman and Anderson 1986). Findings on service industries are scarce, with the exception of pharmaceutical wholesaling (Fein 1998), encryption software (Giarratana 2004) and facsimile transmission services (Baum et al. 1995). Fein (1998) concluded that no dominant design emerged in pharmaceutical wholesaling. Instead, he conceptualised a ‘dominant business model’ that standardised channel functions within the industry. Findings on industries producing to some degree at least non-utilitarian products are limited to television sets (e.g. Klepper 2002a).

Even though wide empirical support has been found for the general model of the industry life-cycle, there are some cases in which the dominant design has not emerged or the shakeout has not taken place. Systematic approaches to such anomalies have been proposed by Klepper (1997) and Bonaccorsi and Giuri (2000). Klepper (1997) defines three kinds of cases in which shakeout does not happen: (1) design and manufacturing firms are separated from process technology firms, (2) product innovators license new products to other manufacturers and (3) demand is heterogeneous and fragmented causing small competitors to survive as no leaders covering all segments emerge. Bonaccorsi and Giuri (2000) build on this classification by merging the first two cases and elaborating on the third. They argue that shakeout does not happen if (1) the technology becomes non-appropriable and the incentive to invest in R&D weakens or (2) there are no increasing returns in the firm’s activities, such as R&D, manufacturing or marketing. In their view, demand segmentation is not sufficient to keep a shakeout from happening. Still more research is called for by Murmann and Frenken (2006), for example, to solve the puzzle of exceptions to the industry life-cycle theory.

In general, the dynamics of non-manufacturing and non-utilitarian industries have not been intensively studied from the viewpoint of industry life-cycle. Thus there is a lack of research on industries where the value is not created on the shop floor but in offices by highly educated people. For example, software industries would provide interesting research sites, but not much is known about their dynamics. This also highlights the issue of product complementarity. The life-cycle of computer manufacturing has been studied (e.g. Anderson and Tushman 1990; Filson 2002) but its impact on the life-cycle of the software industry has not been thoroughly examined. In general, there is a lack of research on the effect of complementarity of products on the life-cycle dynamics of the respective industries. Findings, such as the number of car manufacturers peaking in 1909 and that of the tyre producers peaking in 1922 (Klepper 1997), have been reported but there is still room for much empirical study on the effects of product complementarity. Bonaccorsi and Giuri (2001) have found that the evolutionary dynamics of vertically related industries affect each other. There is no reason to assume that this is not the case of industries producing complementary goods.

Cultural industries form an interesting set of industries that are non-manufacturing and non-utilitarian. In addition, they produce goods that can be enjoyed only after investments in relevant hardware have been made. Music or film recordings, for example, require the purchase of complementary durables to be of any use.

There has been a growing academic interest in cultural industries in recent years. ‘Culture industry’ is a term coined by Adorno and Horkheimer (2008, first published in 1944) in the *Dialectic of Enlightenment*. This work assumes cultural pessimism in the sense that manipulation of the masses is seen as the purpose of such industries. Research on cultural industries has since expanded to cover cultural economics, the production of culture view in sociology as well as cultural phenomena in regional studies. Cultural economics originates from Baumol and Bowen’s (1966) findings on the inability of cultural industries to reach efficiency gains comparable to those in other industries. The production of culture view, on the other hand, concentrates on the production and distribution processes of cultural goods and the ways in which such offerings are filtered before they reach the audience (e.g. Hirsch 1972a). In regional studies the importance of cultural industries is acknowledged from the viewpoint of regional development, regeneration and urban planning (Scott 2004; de Berranger and Meldrum 2000).

There is quite a good consensus that films, music, fashion and video games come under the ‘cultural industries’ term. The common denominator is that the products are non-utilitarian (Hirsch 1972a, p. 642; Lampel et al. 2000). Instead, the value of the product is aesthetic and semiotic (Power and Scott 2004), cultural, artistic and entertaining (Caves 2000, p. 1) or in “the production of social meaning” (Hesmondhalgh 2002, p. 11). According to Vogel (2001, p. xviii) the basis of the demand for such entertainment products is that they are something that people look forward to enjoying in a life that is full of responsibilities. Cultural industries are also non-manufacturing in the sense that most of the value is created through creative work as opposed to the industrialised process of manufacturing CDs or printing books.

In addition to the non-utilitarian nature of the products, there is much research on other economic characteristics specific to the cultural industries. Cultural goods typically face monopolistic competition and horizontal differentiation (e.g. Lampel et al. 2000). The market tends to divide cultural goods into hits and misses and increasing returns render hits extremely profitable (e.g. Hesmondhalgh 2002). Cultural goods have to face several gatekeepers before they reach the consumer (e.g. Hirsch 1972a). Firms within cultural industries encounter unique management challenges as ‘art for art’s sake’ logic confronts ‘art for profit’ logic and tension builds between suits and creatives (e.g. DeFillippi et al. 2007).

Even though research on cultural industry dynamics has not been particularly industrious there are some interesting findings. Firstly, there is division of labour among majors and independents (e.g. Mezias and Mezias 2000). Secondly, the phenomenon of flexible specialisation is seen either as a source of democracy in cultural production (e.g. Storper 1989) or as an efficient way to exploit the independents (e.g. Aksoy and Robins 1992). Thirdly, there is a relationship between industry concentration and product diversity (Peterson and Berger 1975; Lopes 1992). Finally, the role of stylistic innovations as opposed to technological innovations has been emphasised (Cappetta et al. 2006).

However, there has not been a very strong link between the characteristics specific to cultural goods and their markets on the one side and industry dynamics on the other. What effect do these

characteristics have on the life-cycle of cultural industries? Is there something specific in the dynamics of cultural industries that differentiates them from the general model of industry life-cycle? A similar topic of interest has been pointed out by Huygens et al. (2001) who call for research on the organisational and competitive dynamics of cultural industries and Jones (2001) who sees the need for micro-level studies on entrepreneurship and firm capability development in the cultural domain.

For the industry life-cycle theory to be validated in the context of cultural industries it needs to overcome a significant hurdle. According to Teece (1986), Nelson (1995) and Windrum and Birchenhall (1998) the dominant design theory is limited to homogeneous markets. Teece (1986) and Windrum and Birchenhall (1998) also state that the market needs to be a mass market. The market for cultural products is often a mass market but it is not homogeneous as people have diverse preferences regarding which artists to listen to, which books to read and which films to see. Moreover, most consumers' preferences tend to vary; they want different products at different times in their lives or in different situations.

Furthermore, R&D is a major component of the explanations of life-cycle events. Dominant designs should emerge in R&D intensive industries. This draws attention to one specific cultural industry, namely the games industry. Technology development is a crucial task in game development and this makes games R&D intensive products. Most of what game developers do can be classified as R&D. The games industry also offers a unique research site among the cultural industries as the creation of content takes place in firm form as opposed to writers, musicians, painters, etc. who often work as individual artists and use the respective industry only as a means for the reproduction of their creative content. Thus, does the games industry conform to the characteristics attributed to the cultural industries in general? In the literature on cultural industries the games industry is often mentioned but relatively seldom the object of actual empirical research.

Since the late 1990s there has been an increasing number of studies on the games industry from economic, business and management perspectives. These studies form roughly three research streams. The first one deals with the competition among console manufacturers and the role that network externalities and installed base have on it. Gallagher and Park (2002) found that strong complementary products (i.e. games) and installed base help to increase switching costs that increase market share, which further increases switching costs. Shankar and Bauys (2003), on the other hand, found that the network effects within the games industry are more complex and that the device with the largest installed base does not necessarily win. In the same vein Schilling (2003) found that entrants should have better technological functionality and better complementary goods to have a chance against incumbents and that the perceived or anticipated qualities are just as important as the actual ones. Venkatraman and Lee (2004) look at the console competition from the game developer's perspective and conclude that developers tend to favour consoles that are not crowded by other developers, that are dominant in the market and that are new. The emphasis in these studies is on drawing stylized facts from historical developments and theorizing thereon.

The second stream of research deals with creativity in and management of game development. Games are recognised as special kinds of creative products, which renders their development a special kind of business. Baba and Tschang (2001) found that game development entails recurring revisions of the design of the product, which means that the employees need both autonomy and a benevolent dictator to guide them. Later on Tschang found that different kinds of creativity, both individual and team-based, are required at different stages of game development (Tschang 2003), that the combination of content, design and technology makes games specifically complex products to develop (Tschang 2005) and that games are evolutionary products as they are recombinations of concepts from disparate sources (Tschang and Szczypula 2006). Grantham and Kaplinsky (2005) have tried to measure innovation management in game development and Sapsed, Grantham and DeFillippi (2007) report the usefulness of offering advice to game development entrepreneurs in the form of business clinics. Cohendet and Simon (2007) have contemplated the reconciliation of creativity and efficiency in game development. Furthermore, Autier and Picq (2005) have found that alongside growth developer firms decrease the proportion of creative workers and increase that of managers. This research stream rests mainly on interview data as well as participant observations.

The third stream concentrates on the quality, evaluation, consumer adoption and pricing of games. The main findings are that different consumers (by nationality, age or experience with games) may have different preferences (Ip and Jacobs 2006; Jacobs and Ip 2003; Lee et al. 2004), that the ease of use is important for consumer adoption (Ha, Yoon and Choi 2007; Song and Lee 2007) and that pricing has an impact on purchasing behaviour and profits (Meagher and Teo 2005; Nair 2007). This kind of research is typically quantitative and somewhat simplistic.

Based on this, the industry dynamics of console manufacturing appear to be relatively well-known as are also the internal management issues of game development firms. However, texts on competition among console manufacturers tend to concentrate on particular battles associated with the introduction of a new hardware generation or resort to a storytelling approach without extensive analysis. In addition, texts on the management issues of game developers are oriented towards project management, which leaves strategic decision-making, such as project selection, platform selection and capability development, without adequate attention. Thus, not much is known about the long-term evolution of either game hardware or software sectors or of the effect that the dynamics of device manufacturing sector and that of the game development sector have on each other.

In this state of affairs the recent paper by Tschang (2007) on the evolution of the game development industry is very important as it is the first to formulate arguments concerning the industry dynamics and life-cycle of game development. The main argument is that game development as an industry has reached maturity as the introduction of new genres has ceased. He sees game genres, such as first-person shooter, real-time strategy or music, as dominant designs of which the most recent, virtual life, was introduced in 2000. This would thus mean that game development has moved to the era of refinement innovations. However, the rise of the casual game genre in recent years and the introduction of *Wii Fit*, the potential founder of the health and fitness genre, in early 2008 are

counter to Tschang's arguments. There are also other facts that speak against the maturity of the game development sector.

Maturity of an industry should entail stagnation in output quantity. The growth of the market has been considerable; the US market has grown from 73.8 million units sold in 1996 to 267.9 million units in 2007 (ESA 2008). The growth rate of the game software industry has been more than four times that of the US economy as a whole in 2004 and 2006 (Siwek 2007). Thus there is no stagnation in market size. Another interesting feature of the game market is that the growth also has qualitative factors. The games industry has previously borne the image of a niche entertainment sector aimed at teenage boys, but to a growing extent games have become everyman's entertainment. In 2007 the average age of gamers was 35 in the US, 26% of gamers were over 50 and 40% of gamers were female (ESA 2008). Thus the consumer base is widening and diversifying, which can also have an effect on the dynamics of the industry.

In addition, the maturity of an industry should entail increasing concentration and low inter-firm variability in market shares. One of the very few data sources on game development firms is the Develop 100 ranking list published yearly by the *Develop Magazine*. It lists the top 100 development studios according to their retail revenue in the UK. Based on this listing some interesting preliminary observations can be made. First of all, the joint sales of the top 100 developers in 2006 were £1,009m accounting for no more than around 72% share of the UK market. Thus, the number of firms operating within the industry is considerable. Interestingly, the 2007 ranking has 34 new entries of which six are located in the top 30. (French et al. 2008; French and Wallbank 2007) All in all, the listings appear quite turbulent from year to year. These facts yield an impression on an industry that is not concentrated and where inter-firm variability in market shares is considerable.

Counter to these facts there is also a trend of consolidation among game developers. It has been reported that a significant portion of game developers have exited in major game development regions between 2000 and 2007. According to Games Investor Consulting (2007, p. 79) the mortality rate has been 45% for the UK, 25% for the USA and 45% for France. These percentages indicate a shakeout taking place in the game development industry. However, there is also considerable activity on the entry side observed in the Develop 100 rankings. Of the 100 studios in the list 20 in 2007 and 16 in 2006 were founded after 2000. Of these five are located in the top 30 for both years (French et al. 2008; French and Wallbank 2007). Thus there is evidence of both entries and exits taking place within the game development industry.

These preliminary observations suggest that more research is required to understand the specificities of the games industry dynamics. Research on the games industry will allow us to address limitations in the industry life-cycle and cultural industries literature mentioned earlier. Firstly, industry life-cycle studies are concentrated on traditional manufacturing industries that produce utilitarian goods. The games industry is a prime example of non-manufacturing and non-utilitarian industry. Secondly, the evolution of industries producing complementary goods has not so far been the subject of rigorous study. Game hardware and software form a setting where this issue can be

addressed. Thirdly, the connection between the phenomena specific to the cultural industries and the phenomena posited in the industry life-cycle theory has not been built in literature. This research will build such a connection in order to sketch what may be reasonably expected to be found in the empirical study on the games industry. Thus additional light will be shed on the dynamics of cultural industries in general. Finally, the industry life-cycle theory does not pay great attention to the micromechanisms that produce the life-cycle events. In the present study the micromechanisms of the game development sector will be modelled in order to explain the observed life-cycle dynamics.

The general research questions can be summarised as follows:

What kinds of life-cycle phases and events can be detected in the history of game hardware and software sectors?

What kinds of micromechanisms are there in the game development sector and how do they explain the observed patterns?

To pursue these interests the empirical enquiry comprises two analytical steps. The first makes a diagnosis of the dynamics of both game hardware and software sectors whereas the second analyses the micromechanisms that produce the dynamics observed. More specific research questions are drafted on the basis of literature and listed at the end of Chapter 3. The questions above, although games industry specific, also relate to the more general issues of the industry life-cycle theory. The emergence of the dominant design, or the lack thereof, is a central concern to life-cycle theorists and this study will contribute to that debate. The conceptualisation of game genres as dominant designs is not without its problems and the limits of the concept need evaluation. Whether there are dominant designs within the games industry will be discussed. There are naturally things that are not re-evaluated in the beginning of each game project and thus some domination effects shall be found.

Conformities and deviations between the industry life-cycle theory and the empirical observations on the games industry are a central interest of the present study. Klepper and Graddy (1990) and Klepper and Miller (1995) have reported 20 to 30-year periods between the entry of the first firm and the beginning of the shakeout and around 10-year shakeout periods in various industries. Day et al. (2003) argue that in the 'new economy' the shakeout will come increasingly fast. For example, in the PC hard disk drive market it took only 10 years from the entry of the first firm to the onset of the shakeout and in online business-to-business exchanges the boom and bust appears to take only five years (ibid.). The games industry emerged in the early 1970s and thus the competitive process has had over three decades to shape the industry structure. This means that the phenomena described in the industry life-cycle literature should have had enough time to appear.

Another important contribution is the examination of the effect of product complementarity on the dynamics of the respective industries. Furthermore, there is not much research on industries in the process of growth and maturation. Thus this study will add to the body of work on industry life-cycles by taking a more 'current events' view instead of the more usual purely historical view.

Finally, this study will contribute to the understanding of the micromechanisms that produce the changes in industry dynamics as the life-cycle progresses. After all, it is the firms and their strategies that create the shifts in competitive regimes. Gaining an understanding of the mental models of the entrepreneurs and managers will shed light on strategic issues such as considerations concerning entry, the perceptions of competitive situations and competitive moves undertaken including skill development, specialisation and mergers.

In studies on industry life-cycles quantitative data has a major role. Statistics on entries, exits, output quantities, market shares and prices have been analysed and life-cycle events have been determined based on such statistical trends. The games industry poses a considerable challenge in this respect. The games industry is not a part of any standard industry statistic. The lack of quantitative data on the games industry has forced most authors to confine themselves to qualitative data. Thus the problem becomes: How can the questions be answered without a comprehensive quantitative dataset?

Qualitative data has been used successfully in research on industry dynamics in numerous cases. Jenkins and Floyd (2001) studied the evolutionary forces that contribute to the emergence of dominant designs in Formula 1 racing using periodicals, autobiographies and semi-structured interviews. Jacobides (2005) relied on both qualitative and quantitative evidence, such as archival data, industry publications and manuals, interviews and direct observation, to understand vertical disintegration in mortgage banking. Jones (2001) used archival data and historical analysis on her study on the emergence of the American motion picture industry, its institutional rules and competitive dynamics. The research strategy of Huygens et al. (2001) in their study on the relationships between capabilities and competition within the music industry entails a historical study based on quantitative data from industry associations and qualitative data from secondary sources as well as a multiple-case study based on semi-structured interviews with top managers. Wikström's (2006) study on the dynamics of the music industry draws on published qualitative sources and interview data.

The general aim in these studies has been to find out "what has happened and what has brought it about" (Jacobides 2005). Some of these studies have produced a qualitative model of the observed dynamics (Jacobides 2005; Wikström 2006). Both Jones (2001) and Huygens et al. (2001) identified shifts in competitive regimes. Wikström (2006) predicted the effects that new distribution models will have on industry dynamics using the qualitative model. Jenkins and Floyd (2001) traced competitive and complementary technological paths.

In this study, too, the aim is to find out what has happened and what has brought it about. For the diagnosis to be made the indicators of industry-life cycle phases, such as the frequency of major innovations, entries, exits and consolidation, changes in price and output and variability in market shares, are to be analysed. Quantitative data will be used whenever possible to illustrate the developments within the industry. However, qualitative data will have a central role in constructing the story of industry events and in finding out about the micromechanisms.

The history of the industry is constructed drawing on secondary sources, such as monographs, periodicals, reports, research papers and websites concentrating on games industry events. These will be used to track innovations and firms. Quantitative data will be gathered as it is published by industry associations and in industry publications. An exhaustive quantitative dataset will be gathered on the entries, exits and firm sizes of the games industry in Finland to shed light on changes in the ability of the international game market to absorb new entrants and their products. Qualitative interview data will be gathered on game developers to gain knowledge of the micromechanisms that the entrepreneurs and the firms experience and bring about. The games industry in Finland serves as the sample. Such qualitative data can offer insights into the mental models of the people working within the industry and constructing its future. Based on this, a qualitative systems dynamics model of the micromechanisms of game development is built. This will offer explanations for the phenomena observed in industry history.

The key finding of the study is that the dynamics of the games industry differ from the propositions of the industry life-cycle theory in two respects. Firstly, innovative activity has not levelled off in either hardware or software. Secondly, game development has remained an unconcentrated industry. The innovative activity is explained by the constant need for novelty common to all cultural industries and it manifests in the key role that the production of original ideas has in game development firms. The low level of concentration is explained by lesser economies of scale caused by increasing management challenges and the increasing risk of bankruptcy with increase in firm size.

The study contributes (1) by applying the industry life-cycle theory to the cultural domain, (2) by combining the phenomena listed in the cultural industries literature and analysing their effect on industry dynamics, (3) by examining the evolution of the games industry in both hardware and software sectors as well as (4) by highlighting the micromechanisms that produce industry dynamics. The study also has implications for policy-making and management practice. These relate to different forms of public funding, education, outsourcing and the key role of original IP.

The remainder of the dissertation is organised as follows. In Chapter 2 the industry life-cycle literature is reviewed and some of its limitations are discussed. The interest is on changes in innovative behaviour and industry composition as well as the empirical backing of the theory. Chapter 3 concentrates on the literature on cultural industries, including the games industry. After the origins and definitions of the terms, the characteristics and phenomena specific to cultural industries are reviewed and linked with the propositions of industry life-cycle theory. Chapter 4 introduces the data and methods used in the empirical part of the study. The empirical material is analysed in Chapters 5 and 6. Firstly, the evolution and dynamics of the games industry are described and analysed using published sources and industry statistics. Secondly, the micromechanisms of the games industry are analysed based on interview data and qualitative systems modelling. Chapter 7 presents a summary and discussion of the findings.





## 2 Industry life-cycle theory

### 2.1 Basics

The core ideas of the industry life-cycle theory have been built in the work of Abernathy, Utterback and Clark (Utterback and Abernathy 1975; Abernathy 1978; Abernathy and Utterback 1978; Abernathy and Clark 1985). According to this theory the evolution of an industry follows a predictable pattern of growth and maturity. The industry life-cycle theory rests on prior work on the product life-cycle (see Dean 1950; Levitt 1965; Vernon 1966; Cox 1967), but the focus has moved from the product to the wider issue of industry evolution. Industry life-cycles have also been studied as a part of the dynamics that create long-term economic development, growth and employment (Saviotti and Pyka 2008).

In the model of industry life-cycle introduced in Utterback and Abernathy (1975) product development and process development are separated into distinct patterns. Both go through a three-state cycle. At first product development concentrates on the maximisation of the performance of the underlying technology. There is considerable uncertainty over customer needs and thus the firms change their products continuously. There are only a few firms, margins are large and firms rely on information external to the emerging industry in their product development efforts. At the second stage the firms aim at maximising sales. Some product designs begin to dominate the market as the uncertainty over customer needs and technological opportunities is reduced. At the third stage firms aim at minimising costs as competition shifts to product price. Products are standardised and firms innovate incrementally to improve efficiency and economies of scale. At the same time the production process goes through three stages. At first the production process is uncoordinated, frequently changing and inefficient. At the second stage the production system becomes efficient but rigid as automation and task specialisation are exploited. At the final stage the production system becomes fully integrated, capital-intensive, large-scale and costly to change. Utterback and Abernathy (1975) emphasise that in their model of the industry life-cycle the unit of analysis is the entire production process and not just the firm. Thus the pattern should also apply to vertically disintegrated industries.

Three years later in a monograph by Abernathy (1978) the industry life-cycle model is structured around two types of innovation, namely radical and incremental, instead of the distinction between product and process development. Incremental innovations take place in industries where products and production processes are standardised. Such innovations have a cumulative effect on productivity and cost. They can also have a large and immediate impact as they benefit industries that are high in volume. Radical innovations, on the other hand, are identified as new products that fill an emerging need and they are usually brought to the market by new firms. Radical innovations

are rather performance-maximising than cost-minimising and thus such new products compete with predecessor products based on performance and not on price. Abernathy (1978) argues that as a new industry emerges the focus is on radical innovations and as the life-cycle proceeds the industry transitions to the incremental mode of innovating. Thus the shift from radical to incremental innovation regime, or from fluid to specific state, marks the maturity of an industry. In the fluid state the industry can be highly innovative, whereas in the specific state the industry can be highly efficient. The evolution of an industry according to the life-cycle represents a trade-off between these two goals. At the same time with Abernathy's (1978) monograph these ideas were published as a managerial article by Abernathy and Utterback (1978).

Firm numbers, entries and exits became core variables in the work that followed Abernathy and Utterback's contributions. For example, Gort and Klepper's (1982) model of industry life-cycle consists of five stages defined according to differences in net entry rate. In the first stage a new product is commercially introduced and there is sharp increase in the entry rate. In the second stage the number of producers increases sharply. Thus the emerging market is served by a growing number of firms and not a stable number of growing firms. In the third stage entry and exit rates are equal. Entries become increasingly scarce whereas exits take up. In the fourth stage there is negative net entry as exits outnumber new entries. In the final stage net entry is again zero as both entries and exits become scarce and the stable industry structure anticipates market shrinkage. This pattern is verified by data from various manufacturing industries. Furthermore, the pattern of growth, shakeout and stability in firm numbers is accompanied by changes in output and price. The output of the industry grows at a decreasing percentage rate and price falls at a decreasing percentage rate. As the number of firms stabilises so do also output and price. (Klepper and Graddy 1990)

The other focal indicator of the maturing process of an industry is the emergence of the dominant design. Abernathy (1978) and Abernathy and Utterback (1978) introduced the concept of dominant design and for them it marked the move from made-to-order products to standardized mass-manufacturing. Tushman and Anderson (1986) and Anderson and Tushman (1990) have divided the industry life-cycle into four stages that include (1) discontinuity, (2) era of ferment, (3) dominant design and (4) era of incremental change. The discontinuity signifies a major breakthrough that dramatically advances an industry's price versus performance frontier and opens a new product class. During the era of ferment there is substantial variation among competing product designs. As the dominant design emerges the innovative efforts are directed towards elaborating the dominant design. This era of incremental change is then broken by the next technological discontinuity. For Utterback and Suarez (1993) a dominant design is a synthetisation of individual technological innovations introduced in prior product variants. The dominant design encourages or enforces standardisation that allows the search for economies of scale in production. It also allows efficient competition based on performance, price and scale. Prior to the emergence of the dominant design many firms enter with diverse product variants. The shift in competition following the emergence of the dominant design induces a wave of exits and industry consolidation. Furthermore, the transition to mainly process R&D, following the emergence of the dominant design, gives a scale advantage for large firms (Klepper 1996). Potential new entrants begin to face such price disadvantage that

entry into the industry is foreclosed. Thus the firm numbers, price, output and dominant design are tied to each other both temporally and causally.

Early studies on the industry life-cycle were mainly based on data on the American car manufacturing industry (Abernathy 1978; Abernathy and Utterback 1978; Abernathy and Clark 1985). The car industry has continued to be a popular research site (Klepper 1997; Mazzucato 2002) while a widening array of industries, such as the turboprop engine industry (Bonaccorsi and Giuri 2000) and the amateur camera industry (Windrum 2005), have been under study. Moreover, many studies have used data on a panel of varied industries from antibiotics to guided missiles (e.g. Gort and Klepper 1982; Agarwal 1996). Thus there is a widespread consensus and solid empirical backing for the pattern of the industry life-cycle. The dynamics of the industry life-cycle will be elaborated in the following sections.

## **2.2 Changes in innovative behaviour**

In the course of the industry life-cycle the innovative behaviour of the firms changes. Gort and Klepper (1982) state that there are changes in the character, importance and sources of innovations. Furthermore, technological change and information flows among the firms shape the structure of the industry. The changes in the innovative and competitive behaviour are captured with the concepts of dominant design and competitive regimes.

### *2.2.1 Dominant design*

The dominant design concept was pioneered by Abernathy (1978) and Abernathy and Utterback (1978). As a new industry emerges the products tend to be made to customer order or to exact specifications. There are many radically different product versions available. Once a dominant design is selected the diversity among products is decreased. The innovative behaviour of the firms transitions from the introduction of radically different products to improving the existing design. Innovations tend to be incremental and cumulative. The production volume rises and cost becomes an increasingly important competitive weapon. This stimulates process innovation and dramatic reductions in unit costs are achieved. Prior to the dominant design production is characterised by skilled labour and rather erratic than efficient work flows. The dominant design allows increasing efficiency and division of labour in production and workers become deskilled. This also makes changes in product design costly. Furthermore, the dominant design transforms the initial ill-defined and uncertain performance criteria into well-defined metrics for comparing the products. (Abernathy 1978)

As the dominant design emerges the competitive dynamics of the industry change. According to Murmann and Frenken (2006) the widespread interest in dominant designs among researchers and managers is due to the “change in the nature of the game” that their emergence entails. A dominant design is synthesized from fragmented technological innovations introduced independently in prior products which can be termed as tests of customer preferences (Suárez and Utterback 1995). For

Teece (1986) a dominant design is either one design or a narrow class of designs that shifts the competition from design to price. Volume and learning become important as scale economies are pursued in production. The product standardisation allowed by the dominant design and the subsequent rise in production scale also afford the opportunity to amortise specialised long-lived investments. Furthermore, the standardisation opens the door to followers who can benefit from the innovators' initial research and development work without bearing the risk of the uncertainty as to which design will eventually prevail. (ibid.) Tushman and Anderson (1986) term the dominant design a guidepost that ends the period of technological ferment. The dominant design gives a focus for the development efforts as its elaboration becomes the main task. Anderson and Tushman (1990) add that as the dominant design decreases variation and uncertainty the relations with suppliers, vendors and customers become more stable. This allows learning-by-doing throughout production process. In the course of the industry life-cycle the dominant design also anticipates stability in sales as sales tend to peak after the emergence of the dominant design and remain fairly stable afterwards. (ibid.)

The concept of the dominant design has subsequently been elaborated based on the idea of design hierarchy. Clark (1985) points out that changes high up in the design hierarchy are more radical and destroy existing competences, whereas changes low down in the hierarchy are refinements that strengthen and reinforce commitments to the existing dominant design. For Tushman and Murmann (1998) product designs consist of core and peripheral subsystems that are not equally important. The dominant design is built by the core subsystems whereas the peripheral ones give degrees of freedom in product design. Similarly, Christensen et al. (1998) found that the dominant design for disk drives came to be defined by certain architectural concepts that allowed much of component-level innovation. Frenken and Leydesdorff (2000), on the other hand, have found in their study on the passenger aeroplane industry that there can be different dominant designs on the firm level and on the industry level. Thus a firm can make a long-term commitment in its development efforts to design concepts that differ from the emerging dominant design committed to by most of the industry participants.

Murmann and Frenken's (2006) elaboration on the concept of dominant design rests on the hierarchical and modular nature of many products. Aeroplanes, for example, consist of a fuselage, wings, etc. whereas wings contain lights, fuel tanks, etc. Murmann and Frenken (2006) argue that processes of variation, selection and retention are taking place at various levels of the hierarchy and respectively dominant designs emerge at various levels. Furthermore, there may be a dominant design at a higher level of hierarchy without any at a lower level. Murmann and Frenken (2006) base their analysis on the idea of pleiotropy defined as the number of functions that are affected by a change in a given component. High-pleiotropy components are called core components as changes in them have great repercussions on the functioning of the system as a whole. Low-pleiotropy components are peripheral components as changes in them have much lesser effects. In modular products dominant design is defined by the high-pleiotropy elements whereas the low-pleiotropy elements can come in hundreds kinds of varieties. As variation in the high-pleiotropy components is reduced by the emergence of the dominant design the search concentrates on low-pleiotropy components and search costs and time are exponentially reduced. (ibid.) This way the dominant

design becomes an architectural guidepost that closes a wide range of technological possibilities but at the same time opens up a smaller range of technological avenues for further exploration.

The selection of a particular dominant design has been explained in various ways. The simplest explanation is perhaps that the best variant wins (Murmann and Frenken 2006). This explanation still has its complications as the definition of the best is not straightforward. According to Das and Van De Ven (2000), institutional criteria for performance define the merits of competing technologies. This way the institutional process precedes the emergence of the criteria that allow evaluation and comparison.

The second class of explanations includes economies of scale and network externalities (e.g. Henderson and Clark 1990). Economies of scale can arise in both manufacturing and R&D of a particular design whereas network externalities make a particular design increasingly attractive for buyers (e.g. Murmann and Frenken 2006; Farrell and Saloner 1986). Both of these processes can give rise to dynamic increasing returns that cause a particular design to gain market share over others. Schilling (1998) defines such a process as increasing returns to adoption. The more users a product has, the more resources are directed at making it better and cheaper. Furthermore, the network effect is not dependent solely on the number of adopters as certain users have a stronger effect on the benefits that other users gain (Suarez 2005). Such power users with strong ties play a significant role in building the network effect that can determine the dominant design. More elaborate analysis of the effect of network externalities on long-run market shares can be found in Mitchell and Skrzypacz (2006).

The third explanation of the selection process is strategic manoeuvring. Firms can use coalitions, R&D collaborations, pricing and licensing in determining the dominant design (Murmann and Frenken 2006). Furthermore, a powerful producer or user can mandate a dominant design (Anderson and Tushman 1990). A dominant design can also be forced by government regulation on the assumption that a standard is good for the public (Schilling 1998). The final explanation is that dominant designs emerge from the interaction of institutional forces, economic constraints and technological possibilities (Anderson and Tushman 1990; Tushman and Murmann 1998; Murmann and Frenken 2006). Thus it is a complex and unpredictable process.

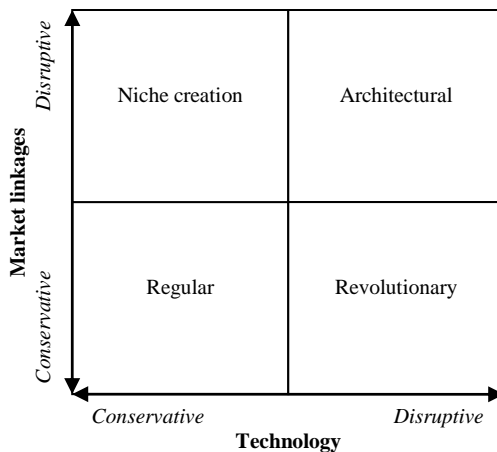
This has not discouraged management scholars from proposing actions that firms can take to affect the selection process. Management frameworks that suggest building switching costs and forming partnerships, for example, have been proposed by McGrath et al. (1992), Lee et al. (1995), Smit and Pistorius (1998) and Suárez (2004) among others. Funk (2003) emphasises that dominant designs emerge through purposeful actions. In the same vein Fai (2007) argues that firms have a surprisingly high degree of control over technological development. This view differs from Abernathy's (1978) who emphasises the conditions that are needed for rapid innovative change as opposed to those that support efficiency increases (see p. 4).

### 2.2.2 *Regimes*

The differing industry dynamics that reign at different stages of the life-cycle take the form of distinctive competitive regimes during which the sources of innovation change. Gort and Klepper (1982) argue that both information external and internal to the industry are important as sources of new technology throughout the life-cycle but their balance changes systematically over time. In the early stages of the industry life-cycle information external to the industry is valuable as new entrants with innovative product designs are competing for market dominance. As the dominant design emerges internal information becomes more valuable. As the focus is on elaborating the dominant design, past learning-by-doing gives an advantage to incumbents over entrants and creates a barrier to entry. Audretsch (1991) conceptualises this kind of development as a change in the competitive regime. In the early stages competition takes place under an entrepreneurial regime that is conducive to experimenting based on external knowledge. Later on during the routinised regime incumbents gain an edge over potential entrants based on their accumulated knowledge stock and this discourages entry to the industry. Furthermore, the incumbents often have advantages in economies of scale and investment intensity as new entrants are seldom able to secure funding to ramp up the production scale to match that of the incumbents.

The different kinds of competitive regimes are characterised by different kinds of innovations. These have been classified into architectural, revolutionary, regular or niche creation (Abernathy and Clark 1985), competence-enhancing and competence-destroying (Tushman and Anderson 1986), incremental, modular, architectural and radical (Henderson and Clark 1990) as well as deepening and widening (e.g. Breschi et al. 2000). The core idea of each of these classifications is the same. An innovation has a different impact on the industry structure and dynamics depending on whether it builds on existing common knowledge or opens up new unknown avenues. The former kinds of innovations take place in a mature industry, solidify the status quo and tend to be produced by incumbents. This corresponds to the routinised regime. The latter kinds of innovations create new industries, take place during the era of ferment and tend to be produced by new entrants. This corresponds to the entrepreneurial regime. Next we take a closer look at these classifications.

Abernathy and Clark (1985) position innovations in a two-by-two matrix based on the nature of the change in technology and in market linkages (Figure 1). Such change can be either conservative or disruptive. Regular innovations are conservative in both dimensions thus serving existing customers and building on existing technology. Revolutionary innovations, on the other hand, serve existing markets but disrupt the technology and thus destroy existing competence. Niche creation innovations build on existing technological knowledge but serve a new customer base. Finally architectural innovations destroy existing technological knowledge and serve a new market. These innovations either create new industries or fundamentally reformulate existing industries.



**Figure 1.** Categorisation of innovations into four types by Abernathy and Clark (1985).

Abernathy and Clark's (1985) categorisation is based on the premise that different kinds of innovative activity is required at different stages of the life-cycle. As the life-cycle proceeds, firms transition from one type of innovative phase to another. New industries are created and old ones reformulated through architectural innovations. As the dominant design emerges the innovative activity shifts to the regular type. In addition, revolutionary innovations that change the technological basis of an industry can give rise to a dominant design that offers better performance compared to the previous one. Regular innovations may be invisible but they have a cumulative effect that is significant in terms of product cost, reliability and performance. Niche creation innovations exploit existing technologies to serve new markets. Abernathy and Clark (1985) mention changes in fashion as an example of such niche innovations that offer only temporary advantage and a sequence of products is required to retain consumer interest. The Abernathy and Clark model is cyclical. This means that the position of the dominant design initiated by an architectural or revolutionary innovation is strengthened through regular and niche creating innovations until the pressure from the opportunities created by changes in technological possibilities, customer preferences or government policy builds up and is released through revolutionary or architectural innovations.

In another paper Clark (1985) makes a distinction between movements up and down the design hierarchy. Movements down the hierarchy signify refinement or extension to higher order concepts. Existing commitments are reinforced and strengthened and thus such innovations are conservative. Movements up the hierarchy signify departure from existing approaches. Such innovations can shake the core concepts but this may also take place in lower order concepts and still have a significant impact. Furthermore, movements up the hierarchy destroy the value of established competence and investments and they need to be replaced with new skills and resources. This dichotomy is combined with the idea of existing and new customer bases. Movements down the hierarchy can open up new customer segments whereas an innovation that departs from established concepts can serve the existing market. Thus Clark's (1985) paper follows the logic of Abernathy and Clark's (1985) paper with the two dimensions. However, the idea of design hierarchies and innovations as movements up and down is more elaborately put in Clark (1985).



Tushman and Anderson (1986) categorise innovations into either competence-enhancing or competence-destroying. Competence-enhancing innovations are usually originated by incumbents as they build on existing knowledge and create barriers to entry and minimum scale requirements. Competence-destroying innovations, on the other hand, tend to be originated by new entrants as they alter the set of relevant competencies. Competence-enhancing innovations lead to consolidation whereas competence-destroying innovations create opportunities for new entrants as the incumbents tend to be held back by their traditions, sunk costs and internal politics. This dichotomy follows the logic presented in Abernathy and Clark (1985) and Clark (1985), but the focus is different. Abernathy and Clark (1985) and Clark (1985) concentrate on the changing balance of different kinds of innovations during the industry life-cycle whereas Tushman and Anderson (1986) focus on how these different kinds of innovations distribute among incumbents and entrants.

A similar incumbents versus entrants focus is also present in Henderson and Clark's (1990) two-by-two matrix (Figure 2). Technological innovations are classified by two dimensions. Innovation can either reinforce or overturn the core concepts of the product class. The innovation can also either change the linkages between core concepts and components or leave them as they were. Incremental innovations reinforce the core concepts and do not change the linkages. Modular innovations take place inside system parts as they can overturn core concepts but do not have an effect on the rest of the system. Both architectural and radical innovations change the linkages between system parts but only radical ones overturn core concepts. Thus architectural innovations mainly affect the way system parts are connected whereas radical innovations bring whole new parts as well as their connections.

		Core concepts	
		<i>Reinforced</i>	<i>Overturned</i>
Linkages between core concepts and components	<i>Unchanged</i>	Incremental	Modular
	<i>Changed</i>	Architectural	Radical

**Figure 2.** Categorisation of innovations into four types by Henderson and Clark (1990).

Henderson and Clark (1990) concentrate mainly on architectural innovations and state that they create opportunities for new entrants. This is because they are not held back by the institutionalised communication channels and filters that exist in established organisations. In such organisations the division of labour and communication between different departments is institutionalised around refining a stable architecture effectively. As this architecture changes, even without major changes in component technologies, the firm is unable to respond and develop new ways of working fast enough to survive competition with new entrants without such baggage.

In all these classifications innovations are divided into those that reinforce the existing dominant design and those that introduce new candidates for a dominant design. The latter kinds of innovations have also been called “widening” innovations in the sense that they open up new avenues for exploration whereas the former kinds are “deepening” innovations and thus reinforce previous commitments (Breschi et al. 2000). The classifications have been made on the premise that industry evolution consist of eras where most innovations tend to be of either kind and this makes the environment friendly towards either incumbents or entrants. This means that such eras alternate and the transition takes place from time to time. A good example of this is the amateur camera industry where several cycles of radical product and process innovations as well as several shakeouts have taken place (Windrum 2005).

The transition from the era of ferment to the era of incremental innovations is marked by the emergence of the dominant design whereas the transition from the era of incremental innovation to the era of ferment is marked by a radical innovation or a discontinuity. What can be termed a dominant design is more or less a judgement call as is also the case with radical innovations or discontinuities. One empirical definition for a dominant design is that by Anderson and Tushman (1990, p. 620) according to which a dominant design is a single configuration or a narrow range of configurations that accounts for over 50% of new product sales and holds an over 50% market share for at least four years. Criteria for assessing the radical quality of an innovation have been developed by Green et al. (1995) from a firm’s viewpoint and Dahlin and Behrens (2005) with a more general approach. For the latter, a radical innovation is novel, unique and has an impact on future technology. Coccia (2005), on the other hand, assesses the intensity of innovations according to the number of adopters and the welfare or utility gained through the innovation. For Tushman and Anderson (1986) a discontinuity signifies a sharp price-performance improvement. Even though there is no exact conceptual consensus there is usually a widespread empirical consensus on which innovations are radical and when a dominant design has emerged.

The transition towards the era of ferment and a new technological basis for the industry accompanies the battle between the old technology and the new one. According to Windrum and Birchenhall’s (2005) findings the replacement will take place as long as there is a positive differential between the direct utility of the new technology and the old one. This is more likely to arise when the entrants have ample time to turn their “attractive ducklings” into “swans”. According to Malerba et al. (2007) entrants experimenting with the new technology enhance the changes of replacement when they are able to exploit fringe markets that the old technology does not serve well. Such niches may be too small to attract established firms but they offer the space for entrants to experiment with the technology and a market that keeps them alive until the technology is developed to the stage that it can serve the main market. On the other hand, increasing concentration can increase the founding rates of specialist producers who serve niches without any hegemonic intentions (e.g. Swaminathan 1995).

The battle between the old and the new technology can be prolonged by regulatory regimes that prevent the emergence of a clear winner and the exit of losers as well as by the fuzziness of the performance criteria that makes it difficult to argue and understand the advantages of the new

technology (Nair and Ahlström 2003). Also, installed base and network effects can slow down or create excess momentum for the adoption of the new technology (Farrell and Saloner 1986). Furthermore, switching costs that arise from the need for the reconfiguration of customer organisations can slow down the widespread adoption of a new technology (Bresnahan and Greenstein 1996). On the other hand, alliance formation can be used to speed up the transition to new technology by creating new industry standards (Rice and Galvin 2006). Alliances and technology sourcing can also help firms to keep abreast with an emerging technological regime (Nicholls-Nixon and Woo 2003). Geels (2006) argues that technological discontinuities should be seen as transitions in socio-technical systems that take place through the co-evolution of markets, user practices, regulation, culture, infrastructure and science.

### **2.3 Changes in industry composition**

The changes in the innovative behaviour discussed in the previous section go together with changes in industry composition. Such changes include high entry rates in the early stages of the life-cycle, stagnation as the candidates for dominant design compete, shakeout after the emergence of the dominant design and a further stage of stagnation as the industry matures. In addition to these regularities much research has been targeted at determining who survives the shakeout. In certain situations early entrants have an advantage over late entrants and *vice versa*.

#### *2.3.1 Entries and exits*

Geroski (1995) has summarised known stylized facts concerning entry. First of all, entry is common. There are many new entrants to most industries in most years but only a fraction of these manage to survive for any extended period of time. Secondly, entry rates vary more between different years within an industry than between industries. Thus the stage of the industry life-cycle affects entry rates more than industry-specific characteristics. Entry and exit rates are highly positively correlated which means that net entry is a small fraction of all entry. Even successful entrants may take more than a decade to grow to a size that matches that of incumbents. Most entrants are *de novo* entrants, i.e. newly founded firms, even though firms that enter through diversification are generally more successful. Entry rates vary over time and tend to peak at the early stages of the industry life-cycle. These stylized facts concerning entry have been elaborated in many empirical studies and we will review some of them.

Santarelli and Vivarelli (2007) point out that there are many different kinds of entrants and thus they should not be treated as a homogeneous population. In addition to the Schumpeterian innovative entrepreneurs there are passive followers, over-optimist gamblers and even escapees from unemployment. Entrants also have been found to differ between different stages of the life-cycle. Market pioneers, early followers and late entrants tend to have different skill and resource profiles (Robinson et al. 1992). This indicates that at different stages of industry evolution the strategic window is open for different kinds of entrants.

Increasing entry in the early stages of the industry life-cycle goes together with sales takeoff that is dependent on quality improvements and price reductions. However, sales takeoff is not just a matter of price decline caused by the pressures of increased entry. Agarwal and Bayus (2002) argue that sales in new markets are initially low because the first versions of the product are primitive and the willingness to pay for them is low. As new firms enter, the quality of the product improves and price may also decline which makes the product more valuable for the buyers and sales takeoff follows. Thus increased entry induces sales takeoff through the quality improvements that entrants can offer and not primarily through price reductions that they cause. Agarwal and Bayus (2002) report that a takeoff in firm numbers systematically occurs prior to takeoff in sales. Furthermore, they claim that increased entry dominates price reductions in explaining takeoff times. They interpret this to support their thesis that in the early stage of the industry life-cycle demand shifts due to non-price factors.

In addition to critical quality improvements, new industries face the challenge of legitimacy. This means that entrants to new industries face the challenges of cognitive and socio-political legitimacy to a higher degree than entrants to existing industries (e.g. Aldrich and Fiol 1994). Cognitive legitimation refers to the spread of knowledge about the new venture whereas socio-political legitimation refers to the process by which the venture is deemed appropriate and right according to existing norms and laws. Such acceptance is required from the general public, key opinion leaders and government officials. Doubts may rise from other industries because of cannibalisation effects or in society in general on whether the business in question is acceptable (ibid). Thus the success of a new industry or a new technology that replaces an older one is seldom just a matter of performance, quality, price and costs.

The stylized fact of survival rates going vastly below entry rates has opened the discussion on whether there are too many entries. Santarelli and Vivarelli (2007) argue that most new firms are doomed from the start and this type of entry is not conducive to technological progress and economic growth. On the other hand, Götz (2002) points out that from the welfare perspective there can never be too much entry as even inefficient firms provide consumers with more choices. Also, firms that exit soon after entry may have accumulated enough profit by that time to cover the sunk costs caused by entry. Thus an exit is not necessarily a disaster. Furthermore, excessive entry can be seen as a vital producer of diversity that increases the chances of success for the entire industry. Goldfarb et al. (2007) argue that during the Dot Com era there was actually too little entry. This is because there was a general belief that it is good to get big fast and for this reason venture capital clustered and was directed at too few candidates. At the end, the Internet start-ups experienced a rate of survival similar to firms in other emerging industries (ibid.).

Young industries are characterised by turbulence that consists of high entry and exit rates, short firm life-spans and radical innovations. This pattern has been found to hold across industries and across time. The early car manufacturing industry in the early 1900s and the early PC industry in the late 1900s show similar high degrees of turbulence during their first 30 years (Mazzucato 2002). The turbulence, or churning, due to frequent entries and exits is also apparent in the identity of the innovators. Malerba and Orsenigo (1999) found that there is a high degree of turbulence in

innovative activities as the population of innovators changes substantially over time. *De novo* entrants and their exits usually generate higher turbulence than entrants through diversification and their exits. Most innovative entrants are occasional innovators and only some of them become persistent innovators. In the same vein, Audretsch (1995b) found that industries conform either to the “revolving door” or the “replacing forest” metaphor of industry evolution. In revolving door industries the bulk of the exiting firms are recent entrants. Thus the persistent innovators manage to survive and the occasional innovators enter and exit at a fast pace. In replacing forest industries entrants tend to replace exiting incumbents. This model thus includes only occasional innovators. The revolving door model reigns in industries with high scale economies and under routinised regime whereas the replacing forest is more applicable to industries under the entrepreneurial regime (ibid.).

The transition from the era of ferment to the era of incremental innovation, or from entrepreneurial to routinised regime, is marked by the emergence of the dominant design and followed by a shakeout. Klepper and Miller (1995) define shakeout as a lengthy period of time after the sharp increase in firm numbers during which there is a persistent fall in the number of firms while there is continued growth in output. Shakeouts have been shown to be common across various industries (e.g. Gort and Klepper 1982). Klepper and Graddy (1990) as well as Klepper and Miller (1995) have reported 20 to 30-year periods between the entry of the first firm and the beginning of the shakeout and around 10-year shakeout periods in various industries. The typical shakeout included a drop of roughly 50% in firm numbers whereas in some industries, such as cars and tyres, the numbers declined by 80%. Even though the industry life-cycle theory predicts the shakeout to take place after the dominant design has emerged and thus relatively early in industry history, shakeouts have also been detected in mature industries (Bergek et al. 2008). On the other hand, Day et al. (2003) argue that in the ‘new economy’ shakeouts will come increasingly fast. For example, in the PC hard disk drive market it took only 10 years from the entry of the first firm to the onset of the shakeout and in online business-to-business exchanges the boom and bust appears to take only five years (ibid.).

The causal explanations for shakeout can be divided into roughly two approaches. The first class assumes that mass-exit follows mass-entry and thus shakeout is caused by excessive entry. Horvath et al. (2001) argue that as most firms die young it is only natural that industry shakeouts follow periods of mass-entry. For Carree and Thurik (1999) entries take place when there are profit opportunities and exits when there is a lack of such opportunities. As the number of firms exceeds the carrying capacity of the market some of them are forced to exit. Aaker and Day (1986) argue that shakeout is the product of excessive entry relative to market size. Such excessive entry takes place because growth industries attract numerous competitors who believe in easy market share gains and profits and are eventually disappointed by the intensity of competition. Day et al. (2003) term these entrants as an “unsustainable glut of competitors” who may be naïve about entry barriers and unaware of the volume of hopefuls preparing to enter at the same time.

Klepper and Miller (1995) discredit the overshooting theory in their study of nine products that had undergone a shakeout and seven products that had not. Shakeout products included adding and

calculating machines, freezers, guided missiles, paints, radars, radio transmitters, televisions, pneumatic tyres and windshield wipers. Non-shakeout products included lasers, pens, shampoo, cryogenic tanks, tapes, transistors and zippers. The shakeout products showed a longer duration of exit than predicted by the overshooting model and the non-shakeout products showed persistence in entry and exit inconsistent with the overshooting model. Alternative explanations are thus needed.

The second class of explanations assumes that shakeout is caused by technological developments and thus excessive entry and shakeout do not have a causal link but rather they correlate. Utterback and Suárez (1993) explain shakeout based on the dominant design and the transition that it brings about in innovative activities. Firms that are unable to move towards greater product standardisation and process innovation will not succeed in competition against those who make the transition and they will eventually die. In the Jovanovic and MacDonald (1994) model shakeout is the result of a single major refinement innovation that substantially increases the optimum firm size. As many firms ramp up production to exploit such scale economies the market is overflowed and price drops. This causes many firms to exit. Klepper's (2002a) theory, on the other hand, is based on dynamic increasing returns to R&D. As large firms benefit most from R&D due to their large output they also tend to perform the most R&D. This gives the incumbents an ever increasing advantage over entrants as they tend to have grown larger and have had more time to perform R&D. The later entrants find it hard to catch up in size and as the price continues to fall the smallest firms and least able innovators exit.

As the shakeout has taken its course the industry reaches "ultimate structure" that is determined by the sequence of events traversed (Gort and Klepper 1982). Utterback and Suárez (1993) call it a point of stability where few large firms have standardised products and stable market shares. For them this is not in any way an ultimate structure but a situation that is waiting for the next technological discontinuity.

### 2.3.2 *Survival*

Early entrants are usually found in industry life-cycle studies to have higher survival rates. According to Lambkin's (1988) study pioneers tend to outperform all later entrants and order of entry is systematically related to competitive performance. In the same vein Audretsch (1991) concludes that survival rate increases with the age of the firm. In Klepper's (2002a) findings on car, tyre, television and penicillin producers early entrants categorically have higher survival rates. Furthermore, Klepper and Simons (2005) found that during the shakeouts in these industries early entrants had lower hazard rates. In Agarwal and Bayus' (2004) study the firms that enter prior to the takeoff in firm numbers (creators) have higher survival rates than firms who enter between the take-off in firm numbers and take-off in sales (anticipators). They in turn have higher survival rates than firms who enter after the sales take-off (followers). Interestingly, Agarwal and Bayus (2004) did not find any difference in the survival rates based on order of entry within the cohorts. In Agarwal's (1997) study early entrants have higher probability of survival across all stages but as the industries age and firms reach 'senility' the hazard rate increases. For later entrants senility hits earlier (Agarwal and Gort 1996).

These regularities in survival rates mean that the maturing of an industry does not necessarily create a barrier to entry but a barrier to survival (Audretsch 1995a) or a barrier to growth (Bartelsman et al. 2005). According to Audretsch (1995a) the barrier consists of scale economies and product differentiation. Bartelsman et al. (2005) have found similar churning rates across ten OECD countries. In most of them about 20% of firms enter and exit most markets every year and around 20-40% of entering firms fail within the first two years. There may be barriers to growth instead of barriers to entry.

The advantage of early entrants is explained with cumulative learning, economies of scale in production and cost spreading in R&D. According to Nelson (1995) before the dominant design emerges there is no advantage of incumbency. Afterwards cumulative learning by incumbent firms puts entrants increasingly at disadvantage. Suárez and Utterback (1995), on the other hand, argue that those firms that enter prior to the emergence of the dominant design benefit from being able to experiment with different product designs during the era of ferment. Kim and Park (2006) refer to the superior resources gained due to early entry as a birthright. In their study on the telecom shakeout reputation and brand were found to be the key ingredients of birthright. Thus, in addition to learning inside the firm, learning by consumers may give an advantage to early entrants.

Learning is related to both technology and market. The commercialisation of new products requires knowledge about the market and skills in distribution, marketing and so on. Nerkar and Roberts (2004) argue that there are complementarities among technological and product-market experience. In their study the success of pharmaceutical product introductions increased with both. According to Christensen and Rosenbloom's (1995) study on the disk drive industry incumbents led in all kinds of innovations, at component and architectural levels, competence-enhancing and competence-destroying, incremental and radical, as long as the innovations addressed previously known consumer needs. According to Rothaermel and Hill's (2005) findings on four industries, incumbents have an advantage over new entrants even with competence-destroying product innovations as long as the commercialisation of new products requires specialised market related competencies. Similarly Tripsas (1997) using data from the typesetter industry found that specialised complementary assets buffer incumbents against the effects of competence destruction. Levinthal (1991) on the other hand argues that prior success simply buffers firms against selection pressures. Surviving organisations tend to be the ones that were successful in prior periods.

Economies of scale and process technology development further exacerbate the entrants' difficulties. In addition, cost of entry increases with the investment levels required by efficient scale. (Nelson 1995) In Cefis and Marsili's (2005) study innovators had a higher survival rate than non-innovators. Process innovations especially increased the chances of survival independent of age and size. Klepper and Simons (2000a) found that larger firms tend to be at the technological frontier and for this reason they have higher survival rates. Also, among firms that were at the technological frontier the larger ones tended to have higher survival rates. Firm size had a much smaller effect on the hazard rate of a firm not at the technological frontier which suggests that the technological advance related to large firms is more important for survival than other effects of large size. In the

same vein Banbury and Mitchell (1995) found that the ability to perform incremental innovations is critical for the survival of firms.

As mentioned above, economies of scale cause the production within an industry to concentrate within a few firms, which contributes to the shakeout phenomenon. Economies of scale also create incentives for R&D as the larger the production capacity the larger the number of units over which costs can be spread. This means that as long as firms expect to benefit from R&D close to the time it is performed the firm's capacity has an effect on the incentive to undertake R&D (Cohen and Klepper 1996a). Thus larger firms have a stronger incentive to engage R&D. Cohen and Klepper (1996b) add that the cost spreading effect is particularly strong for process relative to product R&D. Investments in R&D can also be rationalised through the lowering of variable costs with the expense of rising fixed costs. This way unit cost may decrease when the market and production capacity is large enough. (Shaked and Sutton 1987) The cost spreading effect has been found also to hold for advertising (Audretsch 1991).

The first-mover advantage is not universal. It is likely to occur when the pace of market evolution and the pace of technology evolution are both smooth (Suárez and Lanzolla 2007). Based on their study on the telecommunications equipment industry Dowling and Ruefli (1992) argue that technological innovation is a gateway to entry in a changing industry. Similarly Agarwal and Gort (1996) found that in technical products entrants often come with innovations that give them superior knowledge over incumbents. Entrants then have higher survival rates. For non-technical products learning by doing gives incumbents an edge over entrants. In addition to the difference between industries there is a difference between industry life-cycle stages. In the era of intense technological activity entrants enjoy a higher rate of survival as incumbents suffer from technological obsolescence (Agarwal 1996). Furthermore, Dowell and Swaminathan (2006) found that in the bicycle manufacturing industry earliest entrants had an advantage but only until the emergence of the dominant design. The incumbents found it hard to make the transition from their design to the dominant one as their search efforts tended to be local. Entry after the dominant design has emerged has the benefit of resolved uncertainty.

The threat of obsolescence comes from technological and organisational commitments that are hard to adjust as new opportunities emerge. Sørensen and Stuart (2000) state, based on their findings on semiconductors and biotechnology, that as organisations age they generate more innovations. The downside is that these innovations exhibit an increasing divergence between organizational competence and current environmental demands. On the other hand, Czarnitzki and Kraft (2004) offer empirical evidence that challengers invest more in R&D than the incumbents. Another story is the effect of stock market reactions on the ability of established firms to pursue novel innovative directions. Benner (2007) argues that incumbent firms are not as inertial as prior studies claim, but the institutional pressure of the stock market forces established firms to narrow their focus. Benner (2008) also found that securities analysts pay little attention to technological discontinuities and that analysts and investors tend to continue to reward incumbents for cash flows arising from focusing on existing business and technology despite the increasing certainty of technological obsolescence.



The industry life-cycle theory suggests that whether the advantage is held by incumbents or new entrants is dependent on the stage of the life-cycle. According to Audretsch (1991), the technological regime affects the ability of new firms to survive over a fairly long period but has no influence in the short run. Under the routinised regime when scale economies and cumulative learning reign small firms are at a disadvantage. As entrants tend to be small they find it hard to survive. The entrepreneurial regime on the other hand is conducive to small firm innovation and thus the survival of entrants is more common. However, industry concentration may aid entrant survival over the short term as concentrated markets tend to have higher prices. (ibid.) Agarwal et al. (2002) have found that firms that enter during the mature phase suffer from significantly higher levels of mortality than the firms that enter during the industry growth phase. However, as the mature phase begins the entrants of the previous period face a rising mortality rate. Agarwal et al. (2002) conclude that the survival advantage of the growth phase seems to be related to the knowledge conditions of the entrepreneurial regime and lesser scale and resource requirements. Sarkar et al. (2006) combined the regime and R&D intensity within an industry in their analysis on entrant survival. They found that in general the survival rate of new entrants is higher during the entrepreneurial regime, but in addition high technological intensity (measured as R&D investment as percentage of sales) is required before the survival of small entrants is aided. This confirms that small firms have an edge in innovation during the entrepreneurial regime.

Cefis and Marsili (2006) found that innovativeness conditions survival for firms of all sizes and ages but it is especially important for small and young firms. The survival rate of young, small and non-innovative firms is the lowest. Henderson's (1993) study on radical innovation in the photolithographic alignment equipment industry showed that incumbents invest more in incremental innovation which helps them to gain market share, but are less productive than entrants in producing radical innovations. Thus the incumbents also put a lot of effort into succeeding in radical innovations but their productivity in those efforts is significantly lower than that of new entrants. Once such radical innovation is introduced the first-mover advantage emerges again. In Ehrnberg and Sjöberg's (1995) classification technological discontinuities are categorised into either within old generic technology or new generic technology and either complementary or substituting. They find that the most disrupting kind of discontinuity, i.e. new generic technology and substituting, induces the greatest first-mover advantage. Furthermore, the faster the technology diffuses among customers the greater the advantage of first movers. This means that the radical innovations that are more easily produced by entrants than incumbents give the greatest first-mover advantage and thus the biggest lead.

Despite many studies on survival the factors that determine survival and non-survival are not completely known. In Willard and Cooper's (1985) study on the US colour television set industry shakeout the survivors were not determined by costs, prices or market shares. Furthermore, the survivors were following different kinds of strategies and many non-survivors were following strategies similar to those of survivors. Storey and Wynarczyk (1996) found that the talent of the entrepreneur does not explain survival and non-survival in micro firms. Christensen et al. (1998) on the other hand found that managerial choice rather than environmental factors determined survival in the disk drive industry. Firms that chose to incorporate the key elements of what became the

dominant design had double the survival rate of firms that chose otherwise. To complicate things, Tegarden et al. (1999) found that in the personal computer industry firms that originally chose the 'wrong' design were not doomed by that decision. Switching to the dominant design later on was also possible for later entrants and an increase in the chances of survival was thus attained.

In managerial writing the battle of incumbents and entrants has been a popular topic. D'Aveni (1999) guides incumbents and challengers to take up different kinds of strategies in the face of a technological disruption. The proposition is that the incumbent should resort to a dampening strategy to exhaust the challengers with their resources whereas the challenger should take up a disruptive strategy and build a more flexible and creative organisation. Hill and Rothaermel (2003) suggest that incumbents can improve their chances of survival by, for example, investing in basic research to raise awareness on emergent technologies and employing a real options perspective for evaluating technology investment decisions. According to Stoelhorst (2002) an incumbent should invest in accessing knowledge of emerging technologies, strive to understand the market and possible applications, try to take the lead and build alliances and complementary assets.

Another question of interest in the survival pattern has been that of *de novo* and *de alio* entrants. *De novo* entrants are newly founded firms that do not have much experience to help them or to tie them down. *De alio* entrants are old firms that enter an industry through diversification. They thus have experience from a related industry or just generally of doing business. A common assumption is that pre-entry experience increases survival rates. For example, radio producers who entered the television industry had a higher survival rate than *de novo* entrants (Klepper 2002a). *De alio* entrants can also leverage complementary assets to overtake incumbents. This is how Nokia, Ericsson and Samsung overtook Motorola (He et al. 2006). In the early automobile industry *de alio* entrants performed better than *de novo* entrants, but the best of all were *de novo* firms founded by individuals who had previously worked for leading automobile firms (Klepper 2002b). Furthermore, Agarwal (1997) found that *de alio* firms have lower hazard rates in earlier stages of the life-cycle but higher in the later stages. This is because they have a higher opportunity cost for staying in the market. Khessina and Carroll (2008) argue that the differences in product turn-around rate explain differential survival. *De novo* firms tend to introduce and kill products at a faster pace than *de alio* firms. This is because *de novo* firms are under more intense pressure to create a market identity. Bayus and Agarwal (2007), however, found that the advantage shifts from *de alio* entrants to *de novo* entrants in the later stages of the life-cycle. This is because later entering *de novo* firms are more likely to use the latest technology whereas *de alio* entrants settle for the industry standard.

Finally, survival has been conditioned to the size of the product portfolio and the pattern of the new product introductions. Dowell (2006) found that in general firms offering a greater number of different products have higher survival rates. Barnett and Freeman (2001) found that incremental approach to product introductions and a wide product portfolio advances survival whereas the introduction of several products at a time may be detrimental. Wezel and van Witteloostuijn (2006) on the other hand state that new product introductions increase the chances of survival only for those firms that already have a large portfolio. Firms with a small number of products risk failing with each new product. Furthermore, Dowell and Swaminathan (2000) point out that maintaining

old product lines may be beneficial while introducing new ones but the firm suffers if such overlap is retained for an extended period of time. Jones (2003) argues that the entrants versus incumbents analysis of technological discontinuities should be complemented with analysis over product line strategies. He finds that the benefits of early entry can be traded off to some extent for investments and time put into the development of the product line strategy, i.e. modularity and platform.

## **2.4 Empirical backing**

Empirical backing for the industry life-cycle theory is vast and the variables that have been used are numerous. Moreover, a surprisingly wide range of industries have served as research sites for work on the industry life-cycle theory.

### *2.4.1 Variables*

Industry life-cycle theory assumes that there is a relationship between market age and key industry variables (e.g. Agarwal 1998). Many studies elaborate on the changes in these variables that occur as the industry evolves and on the relations of the variables. The variables of most interest have been (1) entries and exits, (2) output, price and performance, (3) the occurrence of different kinds of innovation and (4) concentration and inter-firm sales variability.

Entries and exits during the history of any industry form a central database for theorizing in most industry life-cycle studies. In their review of over 20 empirical industry life-cycle studies Murmann and Frenken (2006, p. 931) find it “heartening” that so many diverse studies support the stylized fact of inverted U-curve of entry and exit. Some studies differentiate between entry rates and exit rates (e.g. Utterback and Suárez 1993; Klepper 1997; Murmann and Homburg 2001) whereas many resort to net entry rates, entry to exit ratios or firms numbers (Gort and Klepper 1982; Tushman and Anderson 1986; Jovanovic and MacDonald 1994; Filson 2001; Bonaccorsi and Giuri 2001). The difference is that net entry rate hides the degree to which existing firms have been replaced by new entrants. Probably the use of net entry instead of entry and exit rates is due to data restrictions. The unit of analysis in looking at entries and exits is usually the firm. Murmann and Homburg (2001) also identified the entries and exits of actual production plants as a valuable variable.

The entry and exit rates have been used to determine the survival rates of early and late entrants and to identify shakeouts. Such a survival by cohort approach has been used by Klepper (1997; 2002a), Agarwal and Bayus (2004) and Klepper and Simons (2005) among others. The aim of this kind of analysis is to show how the survival rate changes and how the industry closes its doors to new entrants as it matures.

Shakeouts have many empirical definitions. Willard and Cooper (1985) determine a shakeout to have taken place if at least 25% percent of the firms exit within a ten year period while the long-term sales trend remains positive. Klepper and Miller (1995) define a shakeout as a process whereby the number of producers declines after a peak by at least 30% and does not subsequently

rise to within 90% of the peak. The definition by Day et al. (2003) is stricter as it requires 80% of the firms to exit. According to Filson's (2001) definition a shakeout begins when the net exit rate exceeds 15% and afterwards exit rate remains greater than entry rate. Some studies (e.g. Klepper and Simons 2005) do not give a definition for a shakeout even though it is determined to have taken place. This is perhaps because the drops in firm numbers encountered in the data are so severe that a formal definition is deemed unnecessary.

The data on firm numbers have the obvious limitation that only legally existing firms are monitored. Entrepreneurs starting their business become a part of the industry statistics with some delay. Data from industry associations may include only the members of the association. Furthermore, studies may track only firms that have received external funding (e.g. Day et al. 2003).

The second class of variables includes output, price and performance. Industry output, or sales, has been used in many studies (e.g. Klepper 1997; Jovanovic and MacDonald 1994). Output is expected to rise fast together with firm numbers, then at a decreasing rate and to stabilise together with firm numbers. Output also has a relation with price, which tends to decrease as output rises (e.g. Gort and Klepper 1982; Agarwal and Bayus 2002). Price decline has been easy to determine in industries that produce clear product units such as cars (e.g. Klepper 1997). However, as products are developed further the value of the product to the customer increases. This has been noted by Willard and Cooper (1985) with the variable 'value' which refers to units of quality per unit of price. Anderson and Tushman (1986) also used price-performance ratio to evaluate changes in prices. Changes in the efficiency of the production process have been assessed also based on labour productivity (e.g. Klepper 1997).

The third class of data used in industry life-cycle studies concerns innovations. Innovations are often divided into product and process innovations (e.g. Klepper 1997; Klepper and Simons 2005) and their occurrence and the balance between them in the course of the life cycle is plotted. Innovations have been divided into minor and major (e.g. Gort and Klepper 1982) as well as competence-enhancing and competence-destroying (Tushman and Anderson 1986). Changes in an industry's innovative behaviour have also been tracked on the basis of annual patenting rates (Gort and Klepper 1982; Agarwal 1998; Haupt et al. 2007). However, the usage of patents as a proxy for innovations has received some criticism. According to McGahan and Silverman's (2001) findings patenting rates are not higher in emerging industries compared to mature ones. Another somewhat frequently used proxy for innovations is new product introductions (e.g. Greenstein and Wade 1998; Bonaccorsi and Giuri 2001). Concerning the innovative behaviour of the industry the interest is often on the time of the emergence of the dominant design (e.g. Utterback and Suárez 1993). Empirically, a dominant design has been defined, for example, as a single configuration or a narrow range of configurations that accounts for over 50% of new product sales and holds over 50% market share for at least four years (Anderson and Tushman 1990, p. 620). The definition of dominant design as a design that the majority of producers conform to is common.

The final commonly used group of variables consists of concentration and inter-firm market share variability. Industry concentration is usually measured with the Herfindahl index

(e.g. Abernathy 1978; Bonaccorsi and Giuri 2000). Industries tend to move from low levels towards high levels of concentration. Inter-firm market share variability is another indicator of consolidation or the absence thereof. According to Anderson and Tushman (1986) competence-enhancing innovations create order and induce the consolidation of an industry. Such orderliness is measured with inter-firm market share variability. The lower the variability the more consolidated the industry is. Mazzucato (2002) argues that the changes in market shares among firms depict the dynamic growth of the industry more accurately than absolute growth rates.

#### 2.4.2 Contexts

There are roughly three kinds of empirical settings in industry life-cycle studies. The first one includes one industry, or a few of them, and the entire history of the industry is traced. The second setting also includes one or more industries, but the focus is on a particular phase of the industry history. The third empirical setting includes the usage of data from a large panel of industries. Understandably, the studies concentrating on a small number of industries are more qualitative in nature and offer more extensive historical detail. Changes in industry variables are tied to specific states of affairs and event paths are explained. In panel data studies the focus is usually on building formal models or on classifying the industries according to the statistical dynamics that they show.

**Table 1.** Industry life-cycle studies on transportation industries.

<b>Industry</b>	<b>Study</b>
Airline	Tushman and Anderson 1986
Automobile	Mazzucato 2002
Automobile	Abernathy and Clark 1985
Automobile	Filson 2001
Automobile	Suárez and Utterback 1995
Automobile	Utterback and Suárez 1993
Automobile	Abernathy 1978
Automobile	Klepper 1997
Automobile	Klepper 2002a
Automobile	Klepper and Simons 2005
Bicycle	Dowell and Swaminathan 2000
Bicycle	Dowell and Swaminathan 2006
Car tyre	Jovanovic and MacDonald 1994
Civil aircraft	Frenken and Leydesdorff 2000
Combined gas turbine	Bergek et al. 2008
Motorcycle	Wezel and van Witteloostuijn 2006
Passenger aeroplane	Tushman and Murmann 1998
Tyre	Klepper 2002a
Tyre	Klepper and Simons 2005
Tyre	Klepper and Simons 2000b
Turboprop engine	Bonaccorsi and Giuri 2000

Tables 1-5 list different industries used in the kind of industry life-cycle studies that concentrate on a small number of industries. Early studies concentrated mainly on transportation industries (Table 1), but soon ICT industries gained similar popularity (Table 2). Consumer electronics (Table 3) and medical (Table 4) sectors have also been somewhat popular. In addition to these, individual studies on miscellaneous industries from beer brewing to synthetic dye manufacturing (Table 5) have been conducted.

**Table 2.** Industry life-cycle studies on ICT industries.

<b>Industry</b>	<b>Study</b>
Cellular phone	Funk 2003
Computer monitor	Filson 2001
Computer printer	Filson 2001
Computer	Bresnahan and Greenstein 1999
Disk drive	Christensen and Rosenbloom 1995
DRAM	Kim and Lee 2003
Info-communications	Krafft 2004
Integrated circuit	Utterback and Suárez 1993
Integrated circuit	Levitas et al. 2006
Laser printer	de Figueiredo and Kyle 2006
Mainframe computer	Greenstein and Wade 1998
Microcomputer	Lawless and Anderson 1996
Minicomputer	Anderson and Tushman 1990
Minicomputer	Tushman and Anderson 1986
Optical disk drive	Khessina and Carroll 2008
Personal computer	Mazzucato 2002
Personal computer	Filson 2001
Personal computer	Filson 2002
Personal computer	Tegarden et al. 1999
Personal computer	Henderson 1999
Personal computer	Bayus and Agarwal 2007
Photolithographic alignment	Henderson 1993
Photolithographic alignment	Henderson and Clark 1990
Picture tube	Suárez and Utterback 1995
Picture tube	Utterback and Suárez 1993
Rigid disk drive	Filson 2001
Rigid disk drive	Christensen et al. 1998
Semiconductor	Stoelhorst 2002
Supercomputer	Utterback and Suárez 1993
Telecommunications equipment	Dowling and Ruefli 1992
Telecommunications switching	Jones 2003
Transistor	Suárez and Utterback 1995
Transistor	Utterback and Suárez 1993
Typewriter	Suárez and Utterback 1995
Typewriter	Utterback and Suárez 1993

**Table 3.** Industry life-cycle studies on consumer electronics industries.

<b>Industry</b>	<b>Study</b>
Amateur camera	Windrum 2005
Calculator	Utterback and Suárez 1993
Colour television set	Willard and Cooper 1985
Electronic calculator	Suárez and Utterback 1995
Television	Suárez and Utterback 1995
Television receiver	Klepper and Simons 2000a
Television set	Utterback and Suárez 1993
Television	Klepper 2002a
Television	Klepper and Simons 2005

**Table 4.** Industry life-cycle studies on medical industries.

<b>Industry</b>	<b>Study</b>
Biopharmaceuticals	Rothaermel 2000
Pacemaker technology	Haupt et al. 2007
Pacemaker	Banbury and Mitchell 1995
Penicillin	Klepper and Simons 2005
Penicillin	Klepper 2002a

**Table 5.** Industry life-cycle studies on other industries.

<b>Industry</b>	<b>Study</b>
Beer brewing	Horvath et al. 2001
Beer brewing	Tremblay et al. 2005
Cement	Anderson and Tushman 1990
Cement	Tushman and Anderson 1986
Daily newspaper	Van Kranenburg et al. 2002
Facsimile transmission service	Baum et al. 1995
Glass	Anderson and Tushman 1990
Laser	Klepper and Thompson 2006
Newspaper	Levinthal 1991
Pharmaceutical wholesaling	Fein 1998
Synthetic dye	Murmann and Homburg 2001
Typesetter	Tripsas 1997

These give quite a comprehensive view of the kind of industries that have been studied. Most of the industries are traditional manufacturing industries. Even though many ICT industries have been studied, they include only hardware industries. No life-cycle studies have been published on software. Of the studies listed here only four are non-manufacturing industries. The study on facsimile transmission services by Baum et al. (1995) and on pharmaceutical wholesaling by Fein (1998) are clearly service industries. Daily newspaper (Van Kranenburg et al. 2002; Levinthal 1991) is also not exactly a traditional manufacturing industry. Biopharmaceuticals

(Rothaermel 2000) and beer brewing (Horvath et al. 2001; Tremblay et al. 2005) are on the borderline. The selection of industries is probably directed by the availability of data. Anderson and Tushman (1990, p. 619), for example, openly admit that they chose cement, glass and microcomputers because data were available.

The studies that concentrate on a specific phase in an industry's history are listed in Table 6. Which studies to include here is more or less a judgement call as they are not clearly branded as ILC studies. The studies included here have classic industry life-cycle papers in their reference lists.

**Table 6.** Studies on specific life-cycle stages.

<b>Industry</b>	<b>Issue</b>	<b>Study</b>
Automobile	Pre-shakeout and shakeout stage	Argyres and Bigelow 2007
Automobile	Comparison on the survival of <i>de novo</i> and <i>de alio</i> entrants	Klepper 2002b
Bicycle	Product lines of entrants	Dowell 2006
Brewing	Entry of specialists, microbrewery and brewpub segments	Swaminathan 1998
Cellular telephone service	Evolution of intra-industry variety	Noda and Collis 2001
Chemical	Technological leaders and followers	Fai 2007
Electrical/electronic	Technological leaders and followers	Fai 2007
Encryption software	Birth of the industry	Giarratana 2004
Fibre optics	Pre-adaptation	Cattani 2005
Hard disk drive	Entry into new submarkets	Chesbrough 2003
Household electrical equipment	Late entrants	Shamsie et al. 2004
Initiation systems in mines	Move from traditional to electronic systems	Smit and Pistorius 1998
Internet start-ups	Survival in the dot com era	Goldfarb et al. 2007
Local area network switch	Product location of incumbents and entrants	Fontana and Nesta 2006
Machine tool	Mature phase	Roy and McEvily 2004
Mobile telecommunications	Shakeout	Kim and Park 2006
Mobile telecommunications	Challengers won the incumbents	He et al. 2006
Pacemaker	Incremental innovations and survival	Banbury and Mitchell 1995
Pharmaceuticals	New product introductions	Nerkar and Roberts 2004
Retail banking	Innovative activity and competitive advantage	Roberts and Amit 2003
Tennis racket	Radical inventions	Dahlin and Behrens 2005
Transport	Technological leaders and followers	Fai 2007
Wineries	Entry into maturing industry, specialists	Swaminathan 1995

These studies include many of the same industries as the tables above. However, there are proportionately more studies that focus on non-manufacturing industries, such as encryption software (Giarratana 2004), Internet start-ups (Goldfarb et al. 2007) and mobile telecommunications (Kim and Park 2006; He et al. 2006).

The third kind of empirical setting is based on panel data on several industries and these studies usually use data from the *Thomas Register of American Manufacturers* (e.g. Agarwal and Gort 2002; Agarwal and Bayus 2004). Such studies usually include around 20 to 50 industries. In



Table 7 industries that have been included in panel studies are listed (Gort and Klepper 1982; Klepper and Graddy 1990; Audretsch 1991; Agarwal 1996; Agarwal and Gort 1996; Agarwal 1998; Agarwal and Audretsch 2001; Agarwal and Bayus 2002; Agarwal et al. 2002; Agarwal and Bayus 2004; Sarkar et al. 2006). These studies have shown that the aging patterns predicted by the industry life-cycle theory hold for a wide variety of industries. Even through the product range here is vast the products are all from traditional manufacturing sectors.

**Table 7.** Industries included in panel studies.

<b>Industries</b>		
Antibiotics	Fluorescent lamp	Photocopy machine
Adding and calculating machinery	Freezer	Piezoelectric crystal
Artificial Christmas tree	Freon compressor	Polariscope
Automobile	Garbage disposer	Radar antenna assembly
Ballpoint pen	Gas turbine	Radiant heating baseboard
Baseboard radiant heating	Guided missile	Radiation meter
Betaray gauge	Gyroscope	Radio transmitter
Car tyre	Heat pump	Recording tape
Cathode ray tube	Home microwave oven	Rocket engine
Cellular telephone	Home VCR	Saccharin
Clothes dryer	Jet engine	Sewing machine
Clothes washer	Laser	Shampoo
Combination lock	Magnetic recording tape	Streptomycin
Compact disc player	Microcomputer	Styrene
Computer printer	Microfilm reader	Telemeter
Computer	Monitor	Television
Contact lens	Nuclear reactor	Transistor
Cryogenic tank	Nylon	Turbojet engine
Dase	Optical disc drive	Vacuum cleaner
DDT	Outboard motor	Video cassette recorder
Dishwasher	Oxygen tent	Windscreen wiper
Electric blanket	Paint	Zipper
Electric shaver	Penicillin	
Electrocardiograph	Phonograph record	

Of the studies on non-manufacturing industries the study by Fein (1998) on pharmaceutical wholesaling is the only one that argues that the life-cycle dynamics of non-manufacturing industries differ from those of manufacturing industries. Newspapers are treated like any manufacturing industry by Van Kranenburg et al. (2002) and Levinthal (1991). The same applies to Internet start-ups (Goldfarb et al. 2007) and mobile telecommunications (Kim and Park 2006; He et al. 2006). Beer brewing (Horvath et al. 2001; Tremblay et al. 2005) is also seen as just another manufacturing industry even though consumer taste differences and branding are acknowledged through the emergence of specialist microbrewers. The study on facsimile transmission services by Baum et al. (1995) concentrates on positive network externalities and does not highlight the difference between manufacturing and non-manufacturing industries.

Biopharmaceuticals (Rothaermel 2000), on the other hand, are labelled high-tech, which serves as the explanation for innovations tending to take place in partnerships. The absence of economies of scale is mentioned as a special feature of the encryption software industry (Giarratana 2004).

As specificity for a non-manufacturing industry Fein (1998) concludes that no dominant design emerged in pharmaceutical wholesaling. Instead, he conceptualised a “dominant business model” that standardised channel functions within such a service industry. However, the business model was not selected from among alternative business models but evolved gradually through the one-by-one adoption of new procedures, such as automation in warehouses and generation of data about anticipated customer ordering patterns. Furthermore, Fein (1998) found that increasing returns to size operate similarly to manufacturing industries, but firms tend to exit through mergers and acquisitions instead of closing down the firm or the department completely. This is due to the geographic nature of the wholesaling industry. Growing national wholesalers were willing to buy regional players to extend their coverage to new areas.

In summary, industry life-cycle theory is based on research on mainly manufacturing industries. The empirical backing is vast, as a very large number of industries have been studied. Studies on non-manufacturing industries are scarce and some treat non-manufacturing industries as similar to manufacturing industries whereas others argue that there are fundamental differences in their life-cycle dynamics. Many high-tech industries have been studied, but they are generally treated just as any other manufacturing industries. On the other hand, the acceleration of the aging patterns predicted by the industry life-cycle theory is proposed by some due to the transition to high tech (e.g. Day et al. 2003).

## **2.5 Limitations**

The industry life-cycle theory is not universal and the characteristics of the market, the product and the industry structure can limit its applicability. In addition, the micromechanisms that produce the life-cycle as well as the effects that the dynamics of interconnected industries have on each other are identified here as issues that need further studying.

### *2.5.1 Applicability of and exceptions to the theory*

The applicability of the industry life-cycle model has its limits. Abernathy (1978, pp. 83-84) already contemplated the factors that may make the theory unsuitable for some industries. According to him, the theory applies to productive units where a complex production process ends with products whose characteristics may be varied. This rules out heavily standardised products, such as nylon, copper and sulphuric acid, as the idea of radical innovation is practically impossible due to the definition of the product. Abernathy (1978) states that the model is not limited to industrial products but may extend to services as long as they are sufficiently standardised. An example of such a standardised service is telephone systems. Further, the model is applicable to any service that is based on well-defined procedures and delivery technologies, such as health care. On the other hand,

the industry life-cycle model is not applicable to industries where development is very rapid. For example, chemical products and other continuous flow processes tend to have advanced, elaborate and large-scale processes virtually from the initial product introduction. These do not leave much room for radical and incremental product innovations. Furthermore, the applicability of the model is limited in industries where the available process technology defines the mode of operation and may have made the product feasible in the first place. Examples of such products include simple metal and plastic products. In summary, Abernathy (1978) rules out industries where the products or processes are too simple, but no industry is deemed too complex.

Teece (1986), on the other hand, limits the industry life-cycle model to apply to mass markets where consumer tastes are relatively homogeneous. Thus the model is not applicable in small niche markets where the absence of scale economies and cumulative learning does not penalise firms for having multiple designs. Similarly, Windrum (2005) states that the model is applicable only to markets where there is a homogeneous set of consumers. Likewise for Nelson (1995) the industry life-cycle model is applicable only to industries where customers have similar demands. As examples of industries with a high degree of variety in demand he mentions chemical products, pharmaceuticals and computers. In addition, he argues that the model best applies to industries where the product is a 'system' which rules out very simple products. Malerba and Orsenigo (1996) list several limitations. First, the industry life-cycle model best fits consumer durables, such as automobiles and televisions. Second, the model applies to industries defined by a single product. Broader definition of industries or systemic products limit the applicability. Third, the model does not apply to capital-intensive industries like plastics or petrochemicals, where innovations tend to be only of the process kind. The model also does not apply to customized investment products like machine tools, where innovation is mainly of the product kind. Fourth, the model does not apply to industries where major discontinuities come regularly at a fast pace, as in the semiconductor industry. Finally, Malerba and Orsenigo (1996) point out that the pre-existing conditions vary greatly among industries. For example, the automatic tellers first introduced by major banks have very different background compared to the cars first introduced by entrepreneurs.

Cases that deviate from the general industry life-cycle theory have attracted some research interest and several explanations for the inexistence of dominant design or shakeout in an industry history have been developed. For example, Anderson and Tushman (1990) suggest that when technological discontinuities take place every few years the selection mechanism does not have enough time to work out a dominant design. Phillips et al. (1994) found that there was no shakeout in the manufacturing of business jets. This was explained by the variability of preferences of the buyers. Furthermore, shakeout may not occur if new uses for the product are discovered continuously and improved products open up new markets which offer opportunities for entrants (Klepper and Thompson 2006). Jin et al. (2004) also argue that effective spillovers can keep shakeouts from happening. In general, industry growth helps new firms to survive (Audretsch 1991).

More systematic approaches to the deviations from the industry life-cycle model have been proposed by Klepper (1997) and Bonaccorsi and Giuri (2000). Klepper (1997) defines three kinds of cases in which the shakeout does not take place. In the first one, specialist firms emerge to serve

the manufacturers of the final products. These specialists develop new process technology, new production equipment and supply key inputs for the manufacturing process. An example of this is the evolution of the petrochemicals industry. In the second type of deviation, the division of labour takes a different kind of turn. The product innovators concentrate on developing the product and license manufacturing to others. Examples of this include medical diagnostic imaging products. The third group of deviant cases is characterised by specialisation in customer segments. When demand is heterogeneous small competitors survive as no leader covering all segments emerges.

Bonaccorsi and Giuri (2000) build on this classification by merging the first two cases and elaborating on the third. They classify the violations of the industry life-cycle model into violations of appropriability and violations of increasing returns. In the former class either product or process technology becomes non-appropriable and the incentive to invest in R&D weakens. This happens as product and process R&D and manufacturing are performed by different firms and no one is able to achieve monopolistic appropriation. In the latter class no increasing returns are found in the firm's activities, such as manufacturing, marketing or R&D. This threatens the basis of cumulative advantage of incumbents. For example, the lack of increasing returns in advertising may appear due to persistent heterogeneity in customers' preferences. In their view, mere demand segmentation is not sufficient to stop a shakeout from happening but the explanations should take comprehensive account of the cost structures in R&D, manufacturing and marketing. Bonaccorsi and Giuri (2000) classify their findings on the life-cycle of the turboprop engine industry into the second class. This industry shows a high level of concentration and a continuous presence of a dominant leader but there is no shakeout visible in the industry history. This is explained by the continuous existence of generalist and specialist firms which is made profitable, on the one hand, by the lack of economies of scope in marketing as the market is fragmented and the submarkets are independent and, on the other hand, the lack of economies of scale in R&D and manufacturing due to the nature of the turboprop technology. Thus the generalist strategy does not have an advantage over the specialist strategy.

Windrum and Birchenhall (1998) argue that the emergence of the dominant design may well be a special case and just one of a number of possible market outcomes. In many industries the patterns of innovation have been far richer and several distinct market niches have appeared. They claim that instead of focusing on the artefact dimension of the technology one needs to investigate the learning and knowledge dimensions which ultimately determine whether a dominant design or some other market outcome emerges. Srinivasan et al. (2006) also argue that a dominant design may never emerge in some industries. This is due to certain characteristics of the products. First, weak appropriability is associated with a greater probability and earlier emergence of a dominant design. Thus in industries where there is strong appropriability a dominant design is less likely to emerge. Second, the more firms there are in a value net the sooner the dominant design emerges. Third, in radical product categories dominant designs are less likely and slower to appear. The first two characteristics run counter to the two deviant classes summarised by Bonaccorsi and Giuri (2000).

In the study on the aircraft, helicopter, motorcycle and microcomputer industries by Frenken et al. (1999) the emergence of a dominant design is found to be conditioned by the range of

services a technology offers. Helicopters and microcomputers offer a narrow range of services and product variety tends to decrease. This causes the industry to concentrate around one dominant design. Aircraft and motorcycles, on the other hand, offer a wide range of services which allows the creation of many niches. This allows many dominant designs to emerge as each is dominant in respective niche. The emergence of specialist niches has also been identified in beer brewing. Even though it is a model example of an industry with scale economies in manufacturing and advertising, there are over 1400 microbreweries, brewpubs, and larger specialty brewers in the USA (Tremblay et al. 2005). This is due to consumer demand for variety, which makes the production of local traditional products as well as craft-style products worthwhile. For this reason the beer brewing sector has remained a dynamic, competitive market.

Other deviations from the industry life-cycle studies have been reported by Filson (2001), Windrum (2005), Krafft (2004) and Murmann and Homburg (2001). According to Filson's (2001) study, the pattern of quality innovation early and cost innovation later on in the life-cycle does not hold for high-tech industries. On the contrary, the microelectronics industry showed cost innovation first and quality innovation later. Filson (2001) argues that opportunities for innovation evolve systematically in different ways in modern high-tech industries. Windrum's (2005) study on the amateur camera industry also calls into question the order of product and process innovations. This industry is a particularly messy example as it has experienced several rounds of radical product and process innovations. Krafft's (2004) study on the other hand reports a local non-shakeout pattern in the info-communications industry which was caused by specific local knowledge dynamics. The interaction and complementarity that developed among companies, research institutes and dedicated policies contributed to attracting new entries and to limit exits over time. Similarly, Murmann and Homburg (2001) found that in the synthetic dye industry France was the only country to experience a shakeout and this was because of their patent laws and the decision to grant an important patent to one particular producer. Other countries did not experience shakeouts in the research period of 1857-1914. Thus, the patterns detected at the global level may differ from those at the local level.

Many industry life-cycle studies conclude with a call for studies on counterexamples. Anderson and Tushman (1990) suggest the conditions under which dominant designs do not emerge as a topic for further study. Suárez and Utterback (1995) state that contemporary industries and counterexamples should be studied to isolate factors or characteristics of an industry with the help of which the model could be developed to a higher degree of validity. Filson (2001) states that richer environments with heterogeneous choices, network effects and brand effects deserve further study. Also Filson's (2001) proposition of the opportunities for innovation evolving systematically differently for modern high-tech industries compared to previous ones should be elaborated. For Klepper (2005) the ultimate question is why certain industries are susceptible to being dominated for long periods by the same firms, for Murmann and Frenken (2006) whether the emergence of a dominant design is a cause or a consequence of industry evolution.

### 2.5.2 *Micromechanisms*

Research findings are limited concerning the micromechanisms that produce the industry life-cycle pattern. However, some research has been conducted on population learning and on how industries form communities. First of all, Wade et al. (1999) identify two kinds of population level learning. Vicarious learning takes place when multiple organisations learn by observing the experiences of similar others and incorporate practices and procedures that are perceived successful. It may be informal, through social connections, or formal, through joint ventures. Collective learning emerges in the interactions of many organisations. In these interactions industry associations are formed, collective identity constructed and industry-wide strategies towards government regulation drafted. Wade et al. (1999) state that in the early stages of a new industry interactions are rather cooperative than competitive. This is when collective learning takes place as firms cooperate to build the legitimacy of the industry. As the industry matures learning shifts to the vicarious kind. During the shakeout many people from exiting firms are employed by the survivor firms. Knowledge is transferred and facilitates further learning. Windrum and Birchenhall (1998) have found that intra-population learning is driven by emulation which comes close to the concept of vicarious learning. Similarly, Khanna (1995) conceptualises the technological advancement of an industry as racing behaviour where technologically proximate firms try to keep up with or get ahead of each other.

Williams and Mitchell (2004) argue that whether a firm decides to enter an industry and participate in population-level learning is dependent on its information infrastructure, which consists of business units and links between them that allow information sharing. The elements of the information infrastructure both enable and constrain the firm's actions. They conclude that the more units that scan a given market the more likely it is that the firm will enter. On the other hand, the more units there are oriented away from that market the more the information on it is filtered. Links between these units generally aid in sharing complementary knowledge and encourage entry. This sort of conceptualisation may fit with *de alio* entrants but not with *de novo* entrants as the latter seldom constitute of several business units.

According to Wade (1995) whether firms join industries depends on organisational support and the emergence of technological bandwagons. Organisational support refers to all the organisations that have a stake in a given technology or design. This includes competitors, complementors and government actions. Wide organisational support increases the probability of consumer adoption. The concept of organisational support thus comes close to legitimacy. Technological bandwagons are affected by small differences in initial sales. Thus the ability of the technological community to attract additional members early on is crucial for the growth and survival of the industry. Each new member increases the likelihood of industry survival and legitimacy. However, increasing entry also increases competition and for this reason nascent industries benefit from differentiated and complementary members who can offer the organisational support without an increase in competition. The support that affects the evolution of an industry also includes the national setting. This, however, is not just a matter of favourable policies that enable certain kinds of firms to succeed. Lamberg and Laurila (2005) found that in the Finnish paper industry firms developed their organisational forms in a direction that allowed them to benefit from their societal setting.

The community view on industry evolution has been adopted by Mezas and Kuperman (2000) in their study on the birth of the film industry in Hollywood. They argue that successful entrepreneurship is dependent on the social system of a larger collective of organisations engaging in activities similar to those of the entrepreneur. In addition, there is interdependence of outcomes among complementary populations of organisations, such as the population of filmmakers and the population of cinemas. Mezas and Kuperman (2000) argue that individual entrepreneurs may be more successful if they recognise some of the ways in which they depend on the actions of other entrepreneurs in the community. Entrepreneurship in one part of the community often creates opportunities for entrepreneurial activity in other parts. Thus the birth of an industry exhibits community dynamics that are important for the takeoff of the industry life-cycle.

Munir and Jones (2004) argue that the focus on technology in industry life-cycle research is simplistic. Instead, they adopt actor network theory to explain how dominant designs are constructed. There are various social processes that influence the conceptualization of radically new technologies and lead to their acceptance. Munir and Jones (2004) state that how people make sense of a nascent technology is a critical aspect of technology evolution and yet it has received very little research attention. The co-evolution of technology, the demand for it and institutions that allow consumers to make sense of the new technology requires research.

Some authors have recognised the micromechanisms as an important study area in furthering the industry life-cycle literature. Khanna (1995) sees research on strategic interactions between firms, i.e. observing, learning, keeping up and getting ahead, as complementary to life-cycle models. Tushman and Rosenkopf (1992) point out that relationships with suppliers, professional associations, universities, customers and suppliers of complementary products have an impact on the evolution of technologies. Wade (1995) calls for research on a broad set of community linkages and concludes that research at the community level of analysis can increase our understanding of the industry life-cycle.

### *2.5.3 Inter-industry effects*

In addition to the micromechanisms that produce the industry life-cycle the inter-industry effects on it have been left without much research attention. Pistorius and Utterback (1997), however, have elaborated on the various interactions that different technologies may have. They propose the effect that one technology has on another's growth rate as a classification criterion. This gives three different kinds of interactions, namely pure competition, symbiosis and predator-prey. Competition between technologies usually takes place as mature technologies face substitution by new ones. Symbiotic technologies have positive reciprocal effects on one another's growth rate. Pistorius and Utterback (1997) mention computer hardware and software as an example of such a relationship as sales in one aid sales in the other. Finally, a predator-prey relationship may arise when an emerging technology enters a niche market that is not served by a mature technology. The emerging technology will benefit from the presence of the mature one while the emerging technology may slowly be stealing market share from the mature technology. They argue that the interaction between technologies should be viewed in a broader sense than mere competition.

The effect that vertically related industries have on each other's evolution has been studied to some extent. Bonaccorsi and Giuri (2001) have studied the dynamics of the jet and turboprop aircraft and engine industries and conclude that the evolution of a downstream industry affects the evolution of an upstream industry. The vertical exchange relations transmit the firm and product numbers, entries, exits and concentration upstream. These relations may be either partitioned or hierarchical with different transmission effects. The partitioned network structure identified in the turbo-prop technology directly transmits the changes of downstream to upstream industries, whereas the hierarchical network identified in the jet technology filters the effects. In the course of industry evolution the networks evolve and act as constraints to the evolution of industries. Furthermore, the emergence of a dominant design has an effect on supplying industries. Murmann and Frenken (2006) point out that standardisation at higher system level may force exits of firms but at the same time it may open entry at a lower subsystem level. Thus the emergence of a dominant design is followed by a shakeout at the system level while new avenues are opened for component level innovations from supplying industries.

Malerba et al. (2008) consider the effects that the market structures of vertically related industries may have on each other. They state that a fragmented system industry tends to specialise when it is confronted with a monopolistic component industry. On the other hand, a monopolistic system industry tends to become vertically integrated with component manufacturers when confronted by a fragmented upstream industry. The vertical integration and disintegration of firms is caused by differential development of capabilities among firms in uncertain technological and market environments. More specifically, Cacciatori and Jacobides (2005) argue that vertically disintegrated industries have a narrower scope of product possibilities compared to integrated industries. As each firm is specialised the degrees of freedom are considerably fewer than when the industry is occupied by generalists. Thus vertical reintegration can be triggered by changes in the environmental demands for the industry. Cacciatori and Jacobides (2005) report such developments in the British construction industry. Wolter and Veloso (2008) examine the incentives for disintegration and integration brought about by the four different kinds of innovations classified by Henderson and Clark (1990). Incremental innovation is not likely to induce changes in this respect whereas modular and radical innovations create incentives for both. Architectural innovation, on the other hand, encourages integration. Furthermore, Argyres and Bigelow (2007) argue that different stages of the industry life-cycle shape the vertical integration of an industry in different ways. During the fluid state there are fewer pressures for resource alignment. As the dominant design emerges efficiency becomes a key success factor and transaction cost economizing is an important component in that. Thus make or buy decisions are made with different kinds of criteria during the fluid state and shakeout stage and that shapes the boundaries of industries.

There is practically no research on the effects that the dynamics of complementary products industries have on each other. In a sense upstream and downstream industries are complementary but the situation is different from those settings where the customer buys complementary end products from different producers. For example, the life-cycle of computer manufacturing has been studied (e.g. Filson 2002) but its impact on the life-cycle of the software industry has not been examined. Findings, such as that the number of car manufacturers peaked in 1909, and the number



of tyre producers peaked in 1922 (Klepper 1997), have indeed been made, but there is still room for much empirical study on the effects of product complementarity. What effect does the emergence of a dominant design in a product class have on its complements? Is a shakeout in an industry followed by shakeouts in complementary industries? Is a radical innovation in an industry followed by radical innovations in complementary industries? Questions like these could be answered with research on the life-cycle dynamics of complementary industries.

The present study attempts to understand the dynamics of the games industry. Whether the evolution of this particular industry follows the propositions of the industry life-cycle theory will be investigated. The games industry represents a wider set of industries labelled as cultural industries. While the industry life-cycle theory describes what is general in industry evolution, the cultural industries literature can tell us about the specificities faced within such industries. Hence reviewing the cultural industries literature will shed light on the kinds of conformities and deviations that are reasonable to expect to be found between the propositions of the industry life-cycle theory and the empirical analysis on the games industry.

### **3 Cultural industries**

As previously mentioned, the present study is motivated by an interest in the dynamics of the games industry. Literature on the games industry has so far been scarce and for this reason we will have recourse to the literature on cultural industries to give insight into the economic characteristics, management issues and industry dynamics specific to such industries.

Game development has been identified by many authors as one of the creative industries, but somewhat fewer place it under the cultural industries concept. At the same time the terms cultural industries and creative industries are used interchangeably by many authors (see Bilton and Leary 2002, p. 49; Towse 2003b, p. 170; Peterson and Anand 2004, p. 311; Thompson et al. 2007, p. 626). However, the origins and original purposes of the two conceptualisations are quite different.

Research on the economics and management of the film and music industries has been active since the 1970s. The art and antiquities market has also been an active research site for decades. While the music industry has been studied mainly by sociologists, the film industry and the art market have been studied by economists. Later on the fashion industry and the games industry, on the side of the film and music industries, have received some attention from management scholars. Book and magazine publishing, opera, theatre, symphony orchestras, advertising agencies and television and radio broadcasting have also been studied from the economic and management perspective, although to a lesser degree.

In this study the game development industry is seen as one of the cultural or creative industries. The purpose of this chapter is to review the literature on such industries and to construct a coherent basis for the analysis of the industry life-cycle of the games industry. In order to achieve this, the literature has been sorted into a matrix (Appendix 1). The columns correspond to different industries whereas the rows correspond to different research streams.

In this chapter each of the research streams is introduced and the main arguments and findings are presented. The review is as exhaustive as is purposeful for the task at hand. The main emphasis is on economic characteristics, management issues and industry dynamics of cultural and creative industries. These research streams contribute the most to the study of the industry life-cycle of the creative or cultural industries in general and the games industry in particular.

#### **3.1 Origins and definitions**

The origins of the academic interest in the cultural industries and the creative industries are very different. Cultural industries have been studied since the 1940s, albeit the research approach has been more critical than analytical. Later on the study of the cultural industries matured into the

fields of cultural economics and the production of culture perspective in sociology. The basis for both of these fields is that cultural goods differ from other goods due to their low utilitarian value and high aesthetic and sign value. The interest in the creative industries, on the other hand, has emerged in the policy circles and has more of an advocacy flavour. Creative industries are defined as those that rest on individual creativity, skill and talent in their production process and their economic contribution has been a central interest.

### 3.1.1 *Cultural industries defined*

Behind the term ‘cultural industries’ is the assumption that culture is a distinct sphere of human life. Throsby (2001, pp. 3-4) gives a thorough review of the meanings of the term ‘culture’. The original meaning of culture is related to the tillage of the soil and later on, culture has referred to the cultivation of the mind and the intellect. Since the early nineteenth century the meaning of culture has shifted from individual to community characteristics. Thus, culture can signify the intellectual and spiritual development of a civilisation as a whole or describe the entire way of life of a people or of a society. Culture can also have a more functional meaning and refer to “certain activities and their products that have to do with the intellectual, moral and artistic aspects of human life”. (ibid.) These definitions of culture have a positive feel to them but the same does not go for the ideas behind the emergence of the cultural industries concept.

The term ‘culture industry’ was first introduced by Adorno and Horkheimer (2008, first published in 1944) in their *Dialectic of Enlightenment*. In addition to introducing the commercial production of culture as a topic worth studying, the text laid the groundwork for critical theory in social philosophy. Adorno and Horkheimer thus saw the culture industry as a system designed to manipulate the masses. For them, films, radio and magazines operated a monopoly that produced uniformity, manipulation and rubbish that no one was able to escape (pp. 120-167). Similar threats have been discussed by UNESCO (1982, p. 9-10) where emphasis is put on cultural imperialism. They take the view that the dissemination of cultural products from a few industrialised countries throughout the world is an issue of economic, political and cultural power exercised on the masses in order to gain economic profits or social and political control. A good example of this rhetoric is Przeclawski (1982, p. 68) who warns us of the threat of the imperialism of the mass media and the neo-colonialism through low quality entertainment programmes.

There is also empirical work that concurs with Adorno and Horkheimer. For example, from the European viewpoint de Grazia (1989) discusses the relationship of mass culture and sovereignty in the case of American films brought to Europe between 1920 and 1960. From the Asian viewpoint, Jin (2007) finds that even though Korean popular culture, such as films, TV series and music, has become dominant in the East and South East Asia the power of American cultural imperialism is still strong. Thus, the concern is with the “diffusion of dominant culture” (Throsby 2001, p. 156-7) and dominant means American. On the other hand, Burnett (1996, p. 10) states that it is no longer fruitful to talk about American cultural imperialism as the European and Japanese companies have proven to be at least as imperialistic as the American ones.

Opposed to the cultural pessimism argument of imperialism and the manipulation of masses is the cultural optimism argument according to which cultural industries give people what they want (see Hesmondhalgh 2002, p. 79). In line with cultural optimism Cowen (2000, p. 1) argues that “the capitalist market economy is a vital but underappreciated institutional framework for supporting a plurality of coexisting artistic visions, providing a steady stream of new and satisfying creations, helping consumers and artists refine their tastes, and paying homage to the eclipsed past by capturing, reproducing, and disseminating it.” Thus the market is seen as a vehicle for various cultural visions to reach their audiences. DiMaggio (1977, p. 437) summarises these two views as “the public will lap up whatever is offered” and “what the public wants, the public will get”. He finds that both of these views ignore the role of profit-making firms that produce popular culture items like books, films, records and television programmes, and the constraints of the marketplace that the firms need to face. Market structures and organisational environments of specific industries are stronger determinants of the degree of massification of culture than the masses or their masters (DiMaggio 1977, p. 488). According to this view the products of cultural industries are not simply determined by demand or by the powerful, but by the degree of concentration within particular industries and by the decision-making procedures in the firms. Much of the research reviewed in this chapter rests on this assumption. The cultural pessimism view has also been attacked with the inherent characteristics of cultural products. Gottdiener (1985), Blythe (2001) and Aoyama (2007) all argue that consumers take active and creative roles as users of mass-culture and interpret cultural commodities as they please.

In addition to the optimism-pessimism polarity and its middle ground, writing on cultural industries can be classified into four distinct views (Jeffcutt et al. 2000). The Marxist view corresponds closely to the pessimism argument and sees cultural industries as an evil capitalist scheme to organise leisure time in the same way as mass production has organised working life. The economic view sees cultural industries as just another branch of industry and commerce. This includes both the cultural optimism of capitalist markets as well as the industry structure and economic constraints view. The socio-political view sees culture as something that governments should invest in to gain both financial and social returns. Finally, the romantic view holds that culture is an “inoculation against industrialism” and thus cultural industries is a contradiction in terms. These views will be referred to later in the chapter.

The economic view of cultural industries has been adopted in cultural economics, or the economics of the arts, which has become a distinctive and legitimate sub-field of economics. Many writers (e.g. Blaug 2001; Throsby 2001; Towse 2003a) see the origin of cultural economics in Baumol and Bowen’s (1966) seminal text on the inability of the cultural industries to reach efficiency gains similar to other industries and the inevitable increase in the prices of cultural offerings. This idea is generally known as Baumol’s cost disease and is still under active debate. Many efficiency improvements, such as technological advances including paper production, printing and Internet in distributing the written word as well as recording and radio in reaching larger audiences for musical acts, have been argued to increase efficiency and help the cultural industries to escape the cost disease (e.g. Cowen 2000, p. 21; Throsby 2001, p. 119). The cost disease has, however, become only one stream of the diverse field of cultural economics.

It is characteristic of cultural economics that there is no single dominant paradigm. Blaug (2001) classifies cultural economics research into nine different themes:

1. Taste formation
2. Demand and supply
3. Industrial organisation
4. The art market
5. Economic history of the arts
6. Artist's labour markets
7. Baumol's cost disease
8. Public subsidies for the arts

These themes are all interconnected. For example, Baumol's cost disease, industrial organisation and public subsidies all have an effect on the labour market. The field of cultural economics may be diverse and colourful, but two remarks on the whole can be made. Firstly, there has been an overtly active interest on the working of the fine art market (e.g. Chanel 1995; Frey and Eichenberger 1995; Gerardvaret 1995; Higgs and Worthington 2005). This is because paintings and other collectibles present an extreme case of non-homogeneous commodity, have the characteristics of financial instruments and data is available from auctions (see Throsby 2001, p. 123). Furthermore, cultural economists have directed their attention to highbrow culture such as performing arts at the expense of lowbrow culture offered by pop music and television (Hesmondhalgh 2002, p. 28). Secondly, cultural economists are working mainly with equilibrium models (Tepper 2002). "They are interested in applying standard neoclassical models to questions about how prices are determined and the extent to which markets for cultural goods are efficient." (p. 161) Thus the interest is seldom in how markets and the organisation of industries change. This limits the applicability of cultural economics to the research task at hand. The concepts and ideas of cultural economics need some development to be useful here.

In the field of sociology cultural industries have been handled under the 'production of culture' rubric. Burnett (1996, pp. 67-68) lists six issues that the production of culture model concentrates on:

1. Technology
2. Law
3. Market
4. Industry structure
5. Organisational structure
6. Occupational careers

These issues are very much overlapping with the themes of cultural economics. However, the two approaches differ due to their parent disciplines. Cultural economics concentrates on equilibrium models and welfare gains or losses, whereas the production of culture perspective concentrates on production processes and the route of the cultural offering from the artist to the consumer. Hirsch

(1972b) emphasises the division of cultural organisations into producers and distributors. The former include book publishers, theatre companies, record producers and magazines whereas the latter include television, films, radio and newspapers. Peterson and Anand (2004, p. 311) define the focus of the production of culture perspective to be on “how the symbolic elements of culture are shaped by the systems within which they are created, distributed, evaluated, taught, and preserved.” Such studies include, for example, Denisoff (1975) and Negus (1992) on music and Storper (1989), Aksoy and Robins (1992) as well as Lampel and Shamsie (2003) on film. A more specific interest of the production of culture perspective is the relationship between industry concentration and product diversity (Burnett 1996, p. 69). Such studies have been undertaken mostly concerning the music industry (e.g. Peterson and Berger 1975; Lopes 1992). This stream of research is important for the study of industry dynamics and will be returned to later.

### 3.1.2 *What makes industries cultural?*

In definitions of cultural products the key characteristic and what distinguishes them from other products is their non-utilitarian nature. For Hirsch (1972a, p. 639) cultural products serve an aesthetic rather than a clearly utilitarian purpose. For Scott (1999, p. 807) they have symbolic as opposed to utilitarian value. Lampel et al. (2000, p. 264) find that the non-utilitarian nature of cultural goods makes their comparison hard because products are generally compared on the basis of the utility that provides the standards of quality. As the utility of cultural products is virtually non-existent their objective comparison becomes impossible. Furthermore, Breton (1982, p. 41) points out that the demand for cultural products is very different from that for commodities such as food, clothing, transportation, heating and lighting. Cultural products are not demanded continuously or repetitively over decades. This is because each cultural product includes a unique set of ideas (Hirsch 1972a) and thus different cultural products are demanded at different times and by different people. The non-utilitarian nature of cultural products also makes their demand subject to the effects of Engels’ Law, which states that as disposable income expands the demand for luxury or non-essential products rises at a disproportionately higher rate compared to other kinds of products. (Power and Scott 2004, pp. 3-4) Desperately poor people cannot afford any cultural products, whereas wealthy people can dedicate a large percentage of their means to such purchases.

For Markusen et al. (2008, p. 27) cultural industries produce “social meaning in the form of texts and symbols”. For Throsby (2001, p. 29) cultural products have aesthetic, spiritual, social, historical, symbolic and authenticity value. Power (2002, p. 105) lists cultural products to be bought based on aesthetic, semiotic, sensory or experiential reasons instead of utilitarian ones. DeFillippi et al. (2007, p. 512) state that the aesthetic and symbolic attributes of cultural goods contribute to their sign value whereas utilitarian products are assessed based on their use value. The sign value incorporates the communication of social (Power 2002, p. 105) and symbolic meaning (Throsby 2001, p. 4). According to Scott (1999, p. 807) cultural products cater to consumer demand on social display and self-affirmation in addition to the aesthetic demand for ornamentation or simply amusement. In addition, cultural products carry subjective meanings, i.e. the value of the product is dependent on the consumers’ perceptions, which further complicates their comparison (Bilton and Leary 2002, p. 50; Scott 2004, p. 462). From the perspective of society, cultural

industries influence our lifestyles, values and attitudes (Lampel et al. 2000, p. 263). They give form to social life in words, sounds and images (Burnett 1996, p. 34). Conversely, cultural products are expressive of the ways of life of a society in general (ibid.). Thus cultural products reflect society and society is influenced by cultural products.

Mora (2006, p. 335) directs attention to one more attribute of cultural industries. She states that innovation has a special function within the cultural industries. Within the manufacturing industries innovations contribute to success whereas within the cultural industries the main goal is to produce innovations in the form of new products. The consumers' desire for novelty and change must be fulfilled. This feature of cultural industries is, however, only characteristic of the operations that actively produce symbolic content and not so much on the operations that distribute and market it (Bilton and Leary 2002, p. 50). The requirement for novelty in everyday work is far more severe on film sets than it is in cinemas or video rental shops.

On the other hand, the distribution part of cultural industries should not be neglected as it forms the framework in which cultural work takes place. This is a central idea in the aforementioned production of culture perspective. It is also important because the cultural industries' conceptualisation rests on the assumption of mass-reproduction, i.e. industrialisation, of cultural works. Thus the interest is not solely in how such works are created but also on how they are manufactured, distributed, marketed and retailed. According to Towse (2003b, p. 170) the essential feature of cultural industries is industrial-scale production of cultural content. While many authors state this in a neutral tone the tradition of critical theory emerges in some definitions. For UNESCO (1982, p. 21) cultural industries are defined by large scale reproduction of cultural goods or services based on "economic considerations rather than any concern for cultural development".

Many cultural industries do rely on volume and big hits. Jeffcutt and Pratt (2002, p. 228) label cultural industries as chart businesses. Cultural industries are "businesses that live or die by the volume and success of their output being valued as 'best' in the market place for a limited period". Jeffcutt and Pratt (2002, p. 228) use computer games as an example and according to them the time in which a computer game 'charts' and needs to recoup its investment is less than four weeks. After that time unsuccessful products are removed from the shelves and replaced by other products.

The distinctive characteristics of cultural industries, i.e. non-utilitarian nature, aesthetic and symbolic value and subjective meanings, are not dedicated solely to cultural goods. For Hirsch (1972a, p. 642) utilitarian and cultural products are located on a continuum. For Breton (1982, p. 42) as well as for Bilton and Leary (2002, p. 50) the difference between the two is rather in degree than in kind. Scott (2004, p. 462) describes a continuum with films and music at the cultural extreme, iron ore and wheat at the utilitarian extreme and office buildings, cars and kitchen utensils somewhere in the middle. Bilton and Leary (2002, p. 50) state that the value of films, plays and music depends almost entirely on their symbolic meaning and are at the cultural extreme of the continuum whereas Nike trainers have both symbolic fashion value as well as functional footwear value and are located somewhere in the middle. In the same vein Djelic and Ainamo (2005) argue

that the mobile telephone industry operates according to fashion logics with frequently changing product models.

### 3.1.3 *Creative industries defined*

The origin of the creative industries concept is very different from that of the cultural industries. Creative industries have found their way into academic discussion through policy circles. The first well-publicised instance of the use of the term is from 1997 in the UK as the incoming Blair administration founded the Creative Industries Task Force. In their 1998 Creative Industries Mapping Document creative industries were defined as “activities which have their origin in individual creativity, skill and talent and which have the potential for wealth and job creation through the generation and exploitation of intellectual property” (DCMS 1998). The sectors defined creative included advertising, art and antiques, architecture, crafts, design, designer fashion, film, interactive leisure software, music, performing arts, publishing, software, television and radio. In 2005 DCMS launched the Creative Economy Programme to support the development of the creative industries (The Work Foundation 2007). According to Cunningham (2003), creative industries policies have been undertaken, in addition to the UK, in various countries in Asia, such as Korea, Hong Kong, Singapore and Taiwan, also in New Zealand and Australia as well as in the USA. Cunningham (2003) points out that Europe has not been very active in this respect. The recent creative industries reports by the European Commission (2008) and the United Nations (2008) indicate that this is no longer the case.

In the UK the importance of policies favourable to creative industries has been justified with employment figures (Table 8). The problem with these employment figures is that they have been compiled for policy purposes that thus all employees, whether having a creative job or not, are included. The performing arts do not employ 60,000 ballerinas, actors and opera singers, but that figure also includes administrators, janitors, etc. Similarly, the publishing sector employs far fewer writers and editors than the employment of 450,000 people would indicate, as this number includes all inputs from paper manufacturing to magazine and book distribution. The employment figures for 2004 based on The Work Foundation (2007) report are also shown in Table 8. Some of the sectors have been combined, but more importantly, the growth in employment in many of these sectors seems hard to believe.

What, then, is the difference between cultural industries and creative industries? Why has the cultural industries concept not been adopted instead of the creative industries concept? In the 2007 Work Foundation report commissioned by DCMS the creative industries typology was drawn as nested fields. The creative industries are seen as a wider term including the cultural industries. Firstly, the *core creative fields* were defined with the label “commercial outputs possess a high degree of expressive value and invoke copyright protection”. This was included in *cultural industries* where “activities involve mass reproduction of expressive outputs” and “outputs are based on copyright”. Furthermore, the outer circle of *creative industries and activities* are characterised by “the use of expressive value [being] essential to the performance of these sectors”. (The Work Foundation 2007, p. 4) There is some sort of consensus over the ‘creative industries



include the cultural industries' approach as it has also been used by European Commission (2008) and United Nations (2008). This is quite a practical solution as it gives flexibility to the discussion, although at the price of lesser conceptual clarity.

**Table 8.** Employment by the creative industries in the UK according to DCMS (1998) and The Work Foundation (2007).

<b>Sector</b>	<b>Employment in 1998</b>	<b>Employment in 2004</b>
Advertising	96 000	200 000
Art and antiques	26 300	25 000
Architecture	30 000	100 000
Crafts	25 000	110 000
Design	20 000	120 000
Designer fashion	11 000	
Film	33 000	60 000
Music	90 000	230 000
Performing arts	60 000	
Publishing	450 000	270 000
Interactive leisure software	27 000	590 000
Software	272 000	
Television and radio	63 000	110 000
<b>Total</b>	<b>1 203 300</b>	<b>1 815 000</b>

It appears that the cultural industries definitions are based on product characteristics and the nature of demand whereas the creative industries definitions are based the characteristics of the production process. Thus, creative industries are defined through the use of individual creativity, skill and talent and the generation and exploitation of intellectual property (DCMS 1998). Such a definition of creative industries is somewhat vague as it applies quite accurately to the R&D functions of many industries. Engineers designing ships as well as scientists working on new medicines rely on their individual creativity, skill and talent and file patents to protect the generated intellectual property. The definitions of cultural and creative industries have also differentiated between the cultural products of pure sign value and the creative products with a mixture of sign and functional value (The Work Foundation 2007, p. 20). This dichotomy, however, is simplistic as many undisputedly cultural products can have functional value as well. A Disney film, for example, is a symbolic product but for the parent it offers 90 minutes of peace and quiet.

In addition to the differences in their definitions, the policy agendas attached to creative and cultural industries are very different. Creative industries are seen as growth industries that can contribute to the national economy and help nations in international competition. The traditional cultural industry policies, dating back before the interest in creative industries, aim at subsidising cultural institutions with artistic merit and at the preservation of local cultures. Girard (1982, p. 24) describes the rationale of cultural policies as democratisation of institutions that have been traditionally preserved for an elite. Towse (2003a, p. 21) adds that such subsidies are aimed at raising the quality of cultural offerings and persuading people to improve their taste for high culture. The assumption behind such goals is that there are benefits associated with cultural productions that are victims of

market failure (Throsby 2001, p. 140). Baumol (2003, p. 21) points out that such policies run the risk of reversed Robin Hood as tax money is used to subsidise elite pastimes, such as theatre and opera. This discussion is very different from the creative industry policy aims. Indeed, the rhetoric of economic growth and high-wage jobs attached to creative industries is very different from the rhetoric of educating the common man on high culture attached to the cultural industries.

The economic contribution of the creative industries has been assessed in many papers and reports. The numbers vary, but there is quite a wide consensus on the growth of the employment and income generated by the creative industries. It is always noted that the growth of creative industries is faster than that of other industries. This has been concluded concerning Europe in general (European Commission 2008, p. 1), the UK (DCMS 2008, p. 6) and Sweden (Power 2002<sup>1</sup>). The growth of the creative industries has also been noted in Finland, even though the strong heterogeneity among the growth rates of different creative industries is also emphasised (Lindström 2005, p. 20). In the USA the number of jobs has not increased between 1990 and 2006, but at the same time the total wages generated by the creative industries have doubled (Dolfman et al. 2007). Furthermore, United Nations (2008) believes that trade in creative industries is important to the economies of developing countries and that the growth of creative industries in both developed and developing countries is a positive sum game.

In 2001 the European Commission attempted to measure employment in cultural industries in Europe and ran into difficulties with unsuitable statistics. They analysed the numbers from the viewpoint of cultural industries and cultural occupations. The conclusion was that in the EU-15 countries 3.1% of the workforce was employed in the cultural industries and 1.3% worked in cultural occupations. Cultural occupations were found to a large extent also outside the cultural industries. (European Commission 2001)

The creative industries concept has received criticism that can be divided into two distinct arguments. Firstly, the creative industries statistics and growth figures are accused of being crafted for advocacy purposes (Taylor 2006) and to gain political leverage (Tepper 2002, p. 164). Blythe (2001, p. 145) states that the bracketing of high and commercial art together in the creative industries classification creates promotional opportunities as the cultural importance of commercial arts is increased as is also the economic importance of high art. Indeed, the revenue and growth figures that can be reported on the advertising or interactive and leisure software industries are very different from those of crafts or performing arts (ibid.).<sup>2</sup> Cunningham (2003) also reports the incoherence of the creative industries classification as it mixes inputs and outputs. Secondly, the employment offered by the creative industries has been criticised. Oakley (2006) argues that creative industries rather exacerbate than address patterns of economic inequality. It is typical for creative industries that income is unevenly distributed among creative workers, that working

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<sup>1</sup> Power (2000) uses the term cultural industries, but the inclusion of sectors like software and furniture brings his classification closer to the creative industries classifications.

<sup>2</sup> Interestingly, Blythe (2001, p. 145) labels advertising and interactive and leisure software as commercial arts that have been teamed with cultural industries, whereas traditional cultural industries, such as films and music, are seen as non-commercial arts.

opportunities are communicated through exclusive networks and that ethnic minorities are underrepresented.

From the viewpoint of the research task at hand, the creative industries concept has one clear benefit over the cultural industries concept; there is no disagreement on whether the games industry is included or not. The games industry has been included since the first DCMS (1998) report. Thus, the debate on the cultural content of games is not relevant in the creative industries framework. For the sake of conceptual clarity the industries of interest here are defined through the high degree of non-utilitarian and a generally low but varying degree of utilitarian value of their products. This characteristic has an effect on the supply of and demand for them, the manner of innovation and competition and thus on their industry dynamics.

#### *3.1.4 Which sectors belong to cultural or creative industries?*

In the literature on the cultural and creative industries there are countless lists of the particular sectors that are included under the terms. This has been especially problematic for statistical work, as the inclusion or exclusion of any sector has repercussions on the comparability of the figures. Furthermore, statistics have been drawn based on either industry or occupation. These two options yield very different results on the weight of cultural or creative activities in the economy. (Markusen et al. 2008, pp. 24-25)

Here the aim is to review some of the definitions, to gain an understanding of which sectors are generally included under the terms cultural and creative industries and to look into how often the games industry is included under either one of these classifications. A general look into the various definitions is presented in Table 9. Concerning the cultural industries, there is quite a widespread consensus regarding the inclusion of film and music, books and press, TV and radio as well as performing and fine arts. In the older classifications video games are not included, but in the 2000s either video games, new media or software have often been included. In the creative industries definitions, advertising, architecture and design have usually been added on top of the cultural industries. Video games are more often included than in the cultural industries classifications, but this may be due simply to the newness of these classifications. The creative industries classifications have been created mostly during the 2000s during which the cultural industries classifications have also included video games, new media and/or software.

In general, there are more cultural industries classifications available than there are creative industries classifications. Furthermore, the cultural industries classifications exhibit greater divergence. There are many sectors, such as furniture, amusement parks and pro sports, that have been included by only one or two authors. The creative industries classifications are more consistent which may be partly due to their lesser number. In addition, the creative industries classifications are often published by policy organisations, whereas the cultural industries classifications are more often by academic researchers. Next we take a look at some of the definitions in greater detail.



In Table 9 the classifications are listed in chronological order. Hirsch's (1972a) paper is one of the first on the production of culture perspective. He sees film, theatre, books and music as cultural products in addition to the more unorthodox art prints and professional football games. As he is mainly interested in the organisation of the industries and the various stages that products need to pass through to reach the final mass audience, his classification logically omits sectors like fine arts and architecture as they are not targeted at a mass market of consumers. Radio and TV, on the other hand, are seen as channels to the audience and not as cultural sectors *per se*. Furthermore, the age of this classification explains the omission of video games. However, in a later paper Hirsch (2000) does not include video games, either. Lampel et al. (2000, p. 263) have also excluded video games from their list of cultural goods that includes film, television, music, theatre and visual arts. Girard's (1982, p. 34) classification also rests on the requirement of mass-reproduction. Indeed, he includes, for example, art reproductions but not fine arts *per se*. Breton (1982, p. 41) is the only author discussed here who does not include films as cultural products. This is perhaps not a purposeful omission as he includes television programmes.

Scott (1999, p. 807) includes crafts, fashion, media, jewellery, perfume, film, recorded music and tourist services under cultural industries as they "cater to consumer demands for amusement, ornamentation, self-affirmation, social display and so on". Scott (2004, p. 462) also divides cultural industries into those that offer entertainment, edification and information and those that manufacture products that enable individuality, self-affirmation and social display. The former includes motion pictures, recorded music, print media and museums, whereas the latter includes fashion and jewellery. These classifications seem somewhat frivolous compared to Cowen's (2000, p. 5), according to which cultural products are those that "move us and expand our awareness of the world and of ourselves". This classification includes painting, music, film, architecture, photography, theatre, literature and dance. For him "culture stands above the concept of entertainment". Cowen sees many sectors to have an in-between status. He states that fashion and cuisine, for example, bring beauty and drama to our lives but are not cultural industries in his classification. Neither Scott (1999; 2004) nor Cowen (2000) includes video games even though their classifications are quite recent.

There are some classifications that follow the logic of core art fields and surrounding cultural fields. Throsby (2001, p. 5) classifies music, literature, poetry, dance, drama and visual art into core arts and "film-making, story-telling, festivals, journalism, publishing, television, radio and some aspects of design" into cultural industries. Later on in the monograph Throsby (2001, pp. 112-113) adds crafts, video art, performance art, computer and multimedia art to the core arts category. Furthermore, he finds organised sports (p. 5), advertising, tourism and architecture to have some degree of cultural content and thus are borderline.

The borderline is drawn somewhat differently in the studies reviewed here. Hesmondhalgh (2002, pp. 11-12) includes television, radio, film, newspaper, magazine and book publishing, music recording and publishing industries, advertising, performing arts and video and computer games in cultural industries. He excludes fashion on the basis that clothing is more about functionality than

symbolic values, which is debatable. Markusen et al. (2008, p. 39) argue that there is no logical basis for excluding sports, gambling, religion or education from cultural industries.

As the writers have continued to cast ever widening nets to catch all of the cultural industries, the classifications have become very similar to the creative industries classifications. Many classifications are also labelled with both definers, i.e. cultural and creative. Towse (2003b, p. 171) classifies “advertising, architecture, the art market, crafts, design, fashion, film, the music industry, performing arts, publishing, software, toys and games, television and radio, and video” as a collection of industries that can be noted with any of the synonymous labels cultural, creative or copyright. DeFillippi et al. (2007, p. 513), on the other hand, gather one of the most extensive classifications of cultural industries in their introduction to the special issue of the *Journal of Organizational Behavior* on the cultural industries. In addition to the traditional art, theatre, publishing, music and film sectors they include video games, photography, crafts, design, clothing, furniture, jewellery, architecture, advertising, software and new media. This classification thus comes closer to the creative industries classifications as heritage is excluded while sectors like software and furniture are included. The same goes for Power (2002) who includes a wide array of activities under cultural industries. These are advertising, architecture, broadcast media, design, fashion-clothing, film, fine arts, furniture, crafts, jewellery, libraries, museums, heritage, music, photography, print media, software and new media. Video games are not specifically included, but perhaps lie behind software in the statistics that he uses.

In addition to the synonymy of cultural and creative industries, the approach of nested fields is used. The *Economy of Culture in Europe* report by the European Commission (2008) starts with the classification of cultural industries as a subset of the creative industries. For them, in a similar fashion to Throsby (2001), visual arts, performing arts and heritage form the ‘core arts field’. These are seen as non-industrial sectors as the products are not mass-produced. The cultural industries include film and video, television and radio, video games, music and books and press. These are industrial activities that aim at the mass-reproduction of copyrighted material. The cultural industries are a subset of creative industries that use culture as an input for the production of either cultural or non-cultural products. The European Commission defines design, architecture and advertising as such non-cultural industries that use cultural inputs. (European Commission 2008, p. 3)

A similar nested approach is followed by the Work Foundation (2007, p. 19), whose report commissioned by the DCMS classifies “film, television, publishing, music, the performing arts and video games” as cultural industries that they see as a distinguishable subset of the creative industries. They find that the difference between the cultural and creative industries is that while cultural products have only cultural value, the creative products have both cultural and utilitarian value. Thus, creative products have to pass both the aesthetic as well as the workability, functionality or wearability tests. They include architecture, design, fashion, computer services and advertising in the creative industries.

The United Nations (2008, p. 202) has solved the problem of the cultural and creative industries terminology by simply referring to 'creative and cultural industries' without making a distinction between the two in their Creative Economy report. They include the following sectors under that title: cultural heritage, visual and performing arts, audiovisual industries, publishing and printed media, new media, design and creative services, including advertising and architecture. It is not made explicit whether video games are seen as one of the audiovisual industries.

The statistics paper by Dolfman et al. (2007) casts a wide net in the classification of creative industries as they also include agents and managers and fine art schools. Interestingly, they exclude books as well as video games.

In Finnish publications the cultural or creative industries have been examined in order to ascertain their economic contribution. Karttunen's (2001) study on cultural employment in Finland uses both occupational and industry-based classifications. As she works with statistics, the classifications have had to be drawn based on what the available data allow. The list of cultural occupations includes art, design and crafts, editing and journalistic work, photography, cinematography and technical work in radio and television, graphics, advertising, cultural administration, information and guidance as well as library, archive and museum work (p. 16). This list differs from others reviewed in this chapter as it excludes performing artists, musicians, film actors and architects, but at the same time includes public sector cultural administrators. The industry-based classification includes architectural and industrial design and art, arts facilities, art and antique shops and second-hand bookshops, libraries, archives and museums, production and distribution of books, production and distribution of newspapers and periodicals, advertising, photography, radio and television, production and distribution of motion pictures and videos, production and distribution of music and sound recordings as well as amusement parks, games and other entertainment and recreation. (p. 20) Again, performing artists are excluded, but musicians and film actors are included as far as they go under the production of music recordings or the production of motion pictures classes. The list, however, is quite extensive as it goes on to include even second-hand bookshops and 'other entertainment and recreation'.

Lindström's (2005) publication about the economic contribution of the creative industries in Finland first follows the DCMS classifications, but as no suitable data is available she resorts to a cultural industries classification that is very similar to the industry-based classification used by Karttunen (2001). Video games are not included in either one of the Finnish classifications. Alanen (2004) has replicated the DCMS creative industries classification with Finnish data and concludes that the economic contribution of such industries is significantly smaller in Finland than in the UK.

In addition to the particular industries to include or exclude, the definitions of cultural and creative industries vary in the degree to which activities beyond the creation of the cultural works is included. Markusen et al. (2008, p. 39) point out that there is no consensus over to what extent forward and backward linkages, such as distribution, retailing and suppliers of equipment, should be included under cultural industries. The production of culture perspective quite naturally includes all the stages from creative work to promotion, distribution and retail as the interest is in how the

products pass through such a system. A similar all-embracing approach is often used in policy publications as the goal is to show to the widest possible extent the number of jobs or the revenue that these sectors generate. For example, the European Commission (2008, p. 70) includes both the production of cultural works as well as their distribution under their definition of cultural activities. The terminology is somewhat imprecise as, for example, 'events' listed under distribution activities can mean many things.

The wide array of sectors classified under the cultural or creative industries has, despite the common feature of non-utilitarian aesthetic and symbolic value, many differences. For the purposes of the research task at hand it is not vital to determine which industries go under the labels and which do not. However, it is important to decide on the sectors that offer research sites sufficiently similar to the games industry to be helpful in building a framework for the study at hand. Video games are entertainment products offered to a mass audience of consumers. They are generally not seen as high art deserving of subsidies. Taking these features into account, useful counterparts to the games industry are *film, music, fashion, TV and radio as well as books and press industries*. All these sectors offer everyday entertainment with high symbolic value for consumers who have varying tastes. Thus it is reasonable to assume that they are similar enough to the games industry for research on them to be useful in understanding the dynamics of the games industry. After all, the games industry has so far not been a very popular research site, whereas the film and music industries especially have been under industrious study since the 1970s.

However, a preliminary remark on the similarity of the games industry to these other industries must be made. In addition to the cultural or creative content, games entail technology as an important part of their creation (Tschang 2005; Autier and Picq 2005). Clearly, the production of films and music depends on technological developments, but in game production technology development is at the core of the creative process and performed by the people who are in charge of the creative content as well. Thus the games industry comprises a unique combination of business, artistic and technologically oriented professions. This feature specific to the games industry will be kept in mind as the framework is built.

### **3.2 Economic characteristics**

According to Towse (2003b pp. 172-173) the economic characteristics of cultural and creative industries include increasing returns, hits and misses and gatekeepers. Increasing returns are effected by the cost structure of the cultural goods that requires heavy investment for the first copy and negligible cost of further copies. Hits and misses refer to the differential ability of goods to attract buyers. Most goods are miserable failures, whereas a minority ends up as highly profitable hits. Finally, it is typical for the cultural and creative industries that the creative output is dependent on many kinds of gatekeepers, such as publishers, retailers and critics, for reaching the consumers. In addition to these three characteristics, others prevalent in the literature are monopolistic competition, horizontal differentiation, the nature of cultural goods as experience goods and the



spatial clustering of cultural and creative production in urban areas. All of these characteristics are discussed in this sub-chapter.

In prior research these economic characteristics have been discussed at the general level relating to all cultural industries or specifically in the context of films, music recordings, books and fashion. Concerning the games somewhat elementary studies on pricing, quality and consumer adoption have been undertaken (Jacobs and Ip 2003; Lee et al. 2004; Meagher and Theo 2005; Ip and Jacobs 2006; Ha et al. 2007; Song and Lee 2007) but so far the economic characteristics of the game products have not been discussed. The closest candidate to that direction is Nair's (2007) study on the pricing of console games where the effect of "skimming" or price-cutting on profit is explored taking into account the forward-looking behaviour of consumers.

### *3.2.1 Monopolistic competition and horizontal differentiation*

Monopolistic competition and horizontal differentiation as characteristics of cultural and creative goods are interlinked and thus discussed here together. Monopolistic competition occurs when there is a considerable degree of non-price competition. In such a situation consumers perceive subtle differences between the products which make them poor substitutes for each other. For this reason, the producers are able to have a degree of control over price. Horizontal differentiation, on the other hand, refers to the nature of the non-price differences that consumers perceive between the goods. Vertical differentiation would mean that some products are clearly better than others in objective terms. For example, durability, speed or small size can be such qualities that differentiate goods in vertical and objective terms. Horizontally differentiated goods, however, are not better or worse by any objective quality measure. Different consumers simply prefer different kinds of films, music and video games without being able to argue their merits in objective terms.

Power and Scott (2004, p. 6) describe monopolistic competition as a situation where there are many producers in a particular product class, but each firm's output has unique attributes, such as design and brand. Furthermore, they point out that such unique attributes can be imitated by other firms only in the form of inferior reproductions or with a considerable time-lag. In the context of the cultural and creative industries product class can be used either at the higher level to refer to music recordings, films, novels or video games or at the lower level to refer to heavy music, country music or rap music.

Horizontal differentiation among cultural or creative goods stems, according to Lampel et al. (2000, p. 264), from immeasurable ideas of quality. They state that the producers of utilitarian products usually develop a consensus on specific and measurable standards of quality. In the cultural industries there are only abstract ideals of quality, such as originality, which can mean very different things to consumers. Thompson et al. (2007, p. 627) contrast utilitarian and cultural goods as valued respectively for their usefulness and for their meaning. The meaning can be interpreted by the consumer himself, as is the case with novels and music, or by others, which is the case with fashion. They conclude that within the cultural industries the goal is not efficient production but the creation and maintenance of an organisation that can produce and sell meaning.

Based on a study on the fashion industry Santagata (2004, p. 75) argues that the cultural and creative goods are among the most specialised of all goods and therefore the price system is unable to supply relevant information about the market. In the fashion industry this means that a fashion designer can become successful only if he manages to create a new pole in the complex process of differentiation. The structure of the field is constantly modified by new designers and even more so by the arrival of a new designer generation. There is no single principle of cultural justification for the success of the designers. (ibid., p. 84) Success is dependent on the structure of the field and on how well a designer is able to gain a unique position in it.

Hjorth-Andersen (2003, p. 401) discusses horizontal differentiation among books. He states that, for example, thrillers compete with many other thrillers thus forming a product class. The competition between any two thrillers is stronger than between a thriller and a detective novel. Some product classes, however, are closer and some farther from each other. It would be reasonable to assume that there is more competition between thrillers and detective novels than between thrillers and romance novels. The competition, whether within or between the product-classes, is in any case based on horizontal differentiation. According to Hjorth-Andersen (2003, p. 406) it makes no sense to say that this work of fiction is objectively better than another work. Horizontal differentiation means that a given consumer likes a particular book better.

Aksoy and Robins (1992, p. 13) find that films do not compete on audiences based on production cost or price. Cost rationalisations are meaningful as a way to decrease the investment levels for film production. But this is not a competitive strategy directed towards the final markets.

The concepts of monopolistic competition and horizontal differentiation emphasise the role of non-price attributes of the goods, but this should not be interpreted as cost and price not having any meaning in the competition among the cultural and creative industries. Throsby (2001, p. 116) finds that the luxury nature of cultural goods adds to price elasticity. In general, people are more willing to go to the cinema the cheaper the tickets are. If tickets are very expensive the consumers can make do without. However, monopolistic competition means that a highly popular film can charge a premium price and people will still go to see it. Horizontal differentiation, on the other hand, means that there are no objective measures to justify which film is worth a premium price. Furthermore, Throsby (2001, p. 116) claims that demand is more price elastic for the popular cultural products than for the high arts. Unique art pieces are thus more 'priceless' than the more commodity-like music recordings or cinema tickets.

The industry life-cycle theory assumes that as an industry matures the performance criteria for the product transition from vague ideas to well-defined metrics. This appears not to be the case in the creative and cultural industries as the criteria for comparing the products remains fuzzy independent of market age.

### 3.2.2 *Hits, misses and increasing returns*

Most of the cultural and creative industries operate under increasing returns. The production of a film, music recording or video game can be extremely expensive, but further copies can be made at

a negligible cost. The more copies are made and sold the less production cost needs to be allocated to each one and the more profit each sold copy makes. This is not unique to cultural goods as many products requiring heavy R&D investments follow this logic. However, it is unique to cultural industries that increasing returns are linked with extreme variance in sales figures, i.e. goods are either hits or misses. Together this means that many goods fail to recoup initial investment and incur losses while some goods become best-selling hits that are extremely profitable and cover the losses incurred in misses.

Hesmondhalgh (2002, p. 19) describes this situation with high ratio of fixed costs to variable costs in the cultural industries. As the break-even point concerning a particular good is achieved, the profit from the sale of each extra unit can be considerable. This will then compensate for the losses caused by the large number misses. According to Hesmondhalgh (2002, p. 19), the large number of misses is inevitable because of the volatility and unpredictability of demand. Caves (2003, p. 74) discusses this phenomenon as the problem of sunk costs. He states that the unpredictability of demand, i.e. the nobody knows feature<sup>3</sup>, would not matter could the inputs be salvaged and reused. As this is not the case, the sunk costs associated with several losses need to be compensated by each hit. Power and Scott (2004, p. 5) point out that each firm within the cultural and creative industries is able to do a limited number of products over a given time as each requires substantial inputs of capital and labour. This limits the volume of the portfolio and increases the risks for the firms.

Increasing returns have been discussed in the context of different cultural industries. Denisoff (1975, P. 203) already pointed out the negligible cost of producing the music disks compared to the retail price. Moreover, additional movie-goers leave no less of the film for others to see (De Vany 2004, p. 208). Cultural goods in general are rarely destroyed in use and the consumption by one person does not decrease the possibility of consumption by others (Hesmondhalgh 2002, p. 19). However, reaching the break-even point requires considerable sales as the retailers, wholesalers, shipping agents and promotion people all need their share (Denisoff 1975). According to Burnett (1996, p. 40), virtually the entire cost of the record is incurred in making the original master tape. According to his research, manufacturing and packaging a CD costs about one dollar, distribution also one dollar, royalties to the artist and songwriter are between one and two dollars, retailers take about five dollars and the major music companies make the big profit (Burnett 1996, p. 2). This division, however, does not take into account the vast number of misses whose costs also need to be covered by the music companies. In addition to high fixed and low variable cost, increasing returns follow from the reduction of cost per unit when large quantities are handled. Burke (2003, p. 323) states that there are economies of scale in CD manufacturing and their distribution. A larger patch comes cheaper per unit to manufacture and it is cheaper per unit to send more products in the same shipment. Furthermore, the number of artists promoted by a music company has economies of scale. The company can get discounts when buying advertising time in bulk and it can give exclusive access to a successful artist to a particular media outlet in exchange for exposure of the record label's lesser known artists. (Burke 2003, p. 323) Large record labels

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<sup>3</sup> "Nobody knows anything" is a catch-phrase within the film industry describing the unpredictability of the consumers' response to any film. It originates from screenwriter William Goldman (1983).

thus have the advantage of a larger portfolio of artists to cover each others' losses and economies of scale in manufacturing, distribution and promotion.

Concerning video games, Aoyama and Izushi (2003, p. 432) find that software publishers can expect revenues at negligible marginal costs after a certain threshold. As this threshold consists mainly of up-front labour costs, flops easily turn into major financial disasters. On the other hand, mega-hits bring in profit that can be a very high percentage of the initial investment. Aoyama and Izushi (2003, p. 432) refer to Japanese sources according to which 14% of game titles generate 70% of game sales. The hits are also exploited by turning them into series of several game titles that generate further revenue.

In television programmes increasing returns operate as the programmes can be shown repeatedly without additional costs. Furthermore, a programme can be translated into other languages at a modest incremental cost and exported to wider markets. (Maule 2003, p. 458) In book publishing developments in printing technology have lowered the cost of production and thus steepened increasing returns. However, this has caused the number of published titles to increase because of the lower break-even point. As the total number of books sold has not increased much, the lower printing costs have led to lower sales per title which has led to increased book prices. (Hjorth-Andersen 2003, p. 405)

While increasing returns is not unique to cultural industries the extreme variance in sales figures is. Caves (2003) has described cultural industries as winner-takes-all markets. Pratt (2008, p. 100) states that this may be the exceptional quality that sets cultural industries apart from other industries in analytical terms. De Vany's (2004, p. 207, 258) research on films emphasises that a minority of films dominates the average of sales as there is infinite variability in sales figures and nothing is typical.

Jeffcutt and Pratt (2002, p. 228) have labelled cultural industries as chart businesses: "businesses that live or die by the volume and success of their output being valued as 'best' in the market place for a limited period". For Wolf (1999, p. 84) the goal of entertainment industries is to momentarily capture the fleeting, fickle attention of consumers. On the basis of data on novel sales, Beck (2007) concludes that sales of creative goods peak shortly after release and decline quickly. However, word of mouth and Christmas sales may produce a later hump in the sales curve. As a new product enters the market it has a very limited time-span to recoup its investment and to become a hit.

As some goods become hits and many goods become misses the problem is that it is impossible to know which good will end up in which category. In his study on the music industry Denisoff (1975) calls this situation the vinyl crap game. According to him in 1970 only 242 of the 5,685 singles published made it onto the Billboard Hot 100 (p. 201). For Hesmondhalgh (2002, pp. 19-20) producing cultural goods is about throwing mud on the wall and seeing what sticks. Caves (2003, p. 74) labels this as the nobody knows feature. According to him the producer of a creative good faces a fundamental uncertainty about customer preferences, but still needs to make

several decisions and commit sunk costs before customer reactions can be seen. Furthermore, utilising what has worked in the past is usually not a profitable solution.

The hits and misses feature of the cultural and creative industries has been studied empirically mostly in music and film. Research on music is mainly qualitative, whereas research on movies is mainly quantitative with formal modelling approaches. It has been estimated that in the record industry one in eight (Negus 1992, p. 40) or two out of ten (Burnett 1996, p. 24) artists or recordings manage to bring in enough revenue to cover costs and make money for the artists and the company. The rest end up as misses whose costs need to be covered by the successful records and artists. For this reason the record companies are constantly looking for “the next big thing” and identifying and constructing audiences for them. Despite all their best efforts this process produces more failures than successes. (Negus 1992, p. 152) According to Burnett (1996, p. 91) the break-even point for a major record company is around 250,000 copies. Because of the evolution of technology such as multitrack digital recording, the cost of making a technologically satisfactory recording has risen considerably. (p. 92) This means that the break-even point is by no means diminishing.

Burke’s (2003, p. 328) research on the music industry shows that it is not just a limited number of goods, i.e. records, that dominates the market, but there is a small minority of artists who dominate the market at any one time despite the ongoing turbulence. The dominant artists enjoy this advantage partly because of their greater talent, but the advantage is disproportionate to the actual talent differences. Because of the consumers’ limited search time minor differences in talent and media exposure make the market skewed.

The recording industry is known for its strict contract terms for new artists and these are the result of the hits and misses structure of sales. A typical contract has advance and royalty components. Advance covers studio costs and some cash payments for the artists. The artist’s royalty from records sold is first used to cover the advance and the rest, if any, is artists’ income. Artists commit to come up with an agreed amount of recorded material, i.e. albums, during the 5-7 year contract. During the contract the company has the option every 12 months to release or retain the artist. The royalty rate for a new artist is in the range of 10 and 14 percent. (Negus 1992, p. 42) The trick is that when an artist becomes successful he can be retained by the record company with the original new artist terms. This may seem unfair, but as Caves (2003, p. 79) points out, the record company needs to reap the profits from those few successes to cover the high ratio of recordings that lose money in order to break even in the long run.

The situation for the film industry is slightly different as films are not built around an individual artist the way the music recordings are. Obviously certain film actors carry weight similar to music stars but a film always includes a wider cast of stars, including producers, script writers and directors in addition to the actors. Thus, films do not offer continuity in hits to the same extent as music recordings by the same artist do. Most of the research conducted on the film industry from the hits and misses perspective has been done by De Vany and associates.

De Vany (2004, p. 2) describes the film industry as “completely and utterly non-Gaussian because it is a business of the extraordinary”. There are no typical films, each one is an exception. He states that the film business is dominated by a handful of extraordinary films and artists and this handful accounts for nearly all the industry’s impact and revenue (p. 3). In other words, film sales have infinite variability (p. 258). In light of his studies on the film industry De Vany (2004, p. 6) concludes that outcomes of film sales cannot be predicted and for this reason management should not get in the way of the creative process that is at the very heart of the film business. De Vany (2004, p. 9) finds that film sales bifurcate at four weeks to divide films into hits and misses. Prior to this it is impossible to know the result of this chaotic process. The statistics can be predicted but not specific outcomes (p. 259). De Vany also points out that past is a poor indicator of future. “No one but a fool would forecast a movie’s expected revenue from an average of similar movies from the past.” (p. 261) In the music industry successful artists can be expected also to sell well in the future. De Vany and Walls (1999) found that in films star power does not determine hits and neither does marketing expenditure. Films with stars are less risky at the first look, but De Vany and Walls (2004) found that this is overcome by the “curse of the superstar”. The cost sunk in the superstar’s reward raises the overall investment and break-even point for the film to the extent that a film with a superstar is more likely to make a loss than films with no stars and their expenses.

Firms in the cultural and creative industries have developed strategies to cope with the inevitable ratio of hits and misses. Hirsch (1972a) already documented overproduction and differential promotion as such coping mechanisms. He states that it is more efficient to produce more failures to each success than to produce only few items and do market research on a massive scale concerning them. According to him the annual releases in books, records and low-budget films far exceed the consumer capacity for them and thus the majority of them is expected to fail. This approach is also facilitated by the royalty-based contracts with the artists that decrease the losses incurred with each miss. Differential promotion means that only a small portion of a company’s releases are marketed on a large scale and most releases get minimal promotion and are expected to fail (Hirsch 1972a, p. 653). These “long shots” constitute a pool from which replacements may be drawn if some of the heavily promoted items fail to create sales momentum.

Such coping strategies may seem unfair to the artists and the inevitability of the high ratio of misses has been questioned. Thompson et al. (2007, p. 630) state that the naturalisation of the market failure and the focus on it keeps managers from developing their skills in creativity management. Another question is whether such coping strategies enable the production of goods with artistic merit. Holbrook and Addis (2008) found that artistic merit measured in Oscars and other awards and commercial appeal measured in sales are conceptually distinct and empirically uncorrelated aspects of success. Thus heavy promotion is not usually targeted at films with artistic merit. On the bright side, such artistic Oscar films have been determined as good enough long shots to be made in the first place. Furthermore, firms within the cultural and creative industries have been known to take self-assumed responsibility in subsidising artistic or experimental works with revenue from popular ones (Heiskanen 1982, pp. 204-205).

There is no consensus over the role of the stars in determining hits and misses. For example, concerning films De Vany and Walls (1999) have found that star power does not determine hits whereas Holbrook and Addis (2008) link expensive stars to commercial success. Ravid (1999) also found that on average films with stars bring in more revenue. Breton (1982, p. 46) states that the star system exists to stabilise volatile demand as the demand for the works of stars is easier to forecast. The logic behind the star system is that people prefer fewer high quality services over more of the same service at mediocre level (Schulze 2003, p. 431). What follows is that the best can serve a very large part of the market even though the quality difference from the second best may be small.

In addition to the star system, sequels to successful films and genre films have been introduced to sustain consumer loyalty (Aksoy and Robins 1992, p. 14). Applications of these are also used in music recordings, books and video games. According to Hesmondhalgh (2002, p. 21) stars, genres and serials are formatting methods common to all cultural industries. On the other hand, Ravid (1999) found that any big budget investment correlates with an increase in revenues to a larger extent than the film being a sequel.

The role of genres is two-fold. Goods representing existing genres offer familiarity to the consumers and are introduced to sustain consumer interest. On the other hand, the creation of a new genre through a new kind of good can prove to be profitable in case existing consumer preferences are tapped or tastes are shaped by such new offerings (Lampel et al. 2000, p. 266). Baba and Tschang (2001) claim that the creation of a new genre is an effective yet expensive way to enter the video game market. They base this on the assumption that consumers do not know what they want and thus genre innovations originate from the producers.

The industry life-cycle theory assumes economies of scale to arise as the dominant design is agreed on and stable large-scale production commences. Economies of scale operate over the design and production process as costs are spread over a growing number of units sold. In the production of cultural and creative goods economies of scale operate slightly differently. In general, cultural products, such as films, music recordings and games, are expensive to create but cheap to reproduce. The physical manufacturing process is mature in the sense that the product is bulk and costs are negligible. The creative design process has a cost spreading effect similar to that proposed in the industry life-cycle literature. However, for creative industries the creative design process forms the actual production process in the sense that it is where the value is created. Whether such a “manufacturing process” has economies of scale or scope is debatable. On the one hand, controlling a larger portfolio decreases the firm’s exposure to risk. On the other hand, it is known that a creative process may rather be hindered than helped by increasing the number of people (Brooks 1974). Whether it is more efficient to develop several games at a time in the same firm or a small number of games in each firm is not known. Furthermore, the extent to which game developers become more efficient through cumulative learning is perhaps not equal to the assumptions of the industry life-cycle theory. There is no certainty that what has sold in the past will sell in the future.

### 3.2.3 *Gatekeepers*

Gatekeepers are a common theme in the literature on cultural and creative industries. It can be approached from the viewpoint of the struggling artist who is unable to get a recording contract or to get his script approved by a film company or it can be viewed from the perspective of the major entertainment corporations who have to spend vast amounts of resources to sort through the demos and scripts unsure of finding anything good enough. Furthermore, the consumers face an avalanche of choices offered by the cultural and creative industries and are happy to let journalists, radio DJs and critics screen these on their behalf. Hirsch (1972b) states that while cultural producers create new forms, ideas, patterns and products the cultural distributors select from these “to present standardized and watered-down versions to the mass public”. Such pre-selectors can also be called cultural intermediaries rather than mechanical gatekeepers (Negus 1992, p. 46). Mol and Wijnberg (2007, p. 701) point out that the cultural industries seem exceptionally suitable for studying the relationship and interaction between the selectors and the selected as the role of the selectors is more visible than in many other industries. The gatekeepers referred to in the cultural and creative industries literature include the firms that creative artists make contracts with (recording labels, publishing houses, film studios, etc.), marketing decisions made by such firms, media coverage, retailers and critics.

The first hurdle for an artist is to be discovered by a recording label, publishing house, film studio or other such establishment. The challenge is to compete with countless other aspirants. Decisions by these firms can block or facilitate the access of the artist to his audience as the scale of the capital investment required to link creators and consumers effectively is large. (Hirsch 1972a, pp. 640-643) High hopes have been placed on the Internet as a channel for autonomous creativity that would not need to pass corporate scrutiny, but it remains unclear whether Internet can offer more than an alternative route to corporate consciousness (Thompson et al. 2007, p. 636).

Hirsch (1972a, p. 650) refers to the search for new talent as the use of “contact men”. These intelligence agents constantly monitor developments within their input and output boundaries to locate new manuscripts, singers and so on for production and marketing. The actual process of talent location has been little studied with the exception of Elsbach and Kramer’s (2003) paper on Hollywood pitch meetings. They found that the screenwriter’s creativity is assessed by identifying the characteristics and prototypes of a creative individual and based on the potential for creative collaboration. The writer has to come across as an expert and not as a disciple.

Once the contract has been signed the project still goes through many stages in which the firm decides on whether to continue or kill the project. Thompson et al. (2007, p. 632) note that in the film business such stages include buying the film rights, hiring the screenplay writers, revising the script, hiring a producer, identifying locations, hiring crew and assembling the cast. In each stage the project is continued only if further investment is considered justified by those holding the purse-strings. The stages are not as numerous in the music business, but still many of the key value-adding activities have been accomplished before the final call from senior management on whether



to release the record and whether to allocate a promotion budget for it. For artists this means that they can never be sure whether their work will actually end up in the shop shelves and, if it does, whether it will be marketed. (ibid.)

Differential marketing that already emerged in the discussion of hits and misses is the second main gate that a creative work needs to pass. Hesmondhalgh (2002, p. 72) states that marketing can ensure widespread dissemination of creative work, but such work can also sink without a trace if managers prioritise other projects. According to Lampel and Shamsie (2000, p. 238) the decisions on which goods to promote heavily are based on which goods show sufficient sales momentum. The problem with this is that such sales momentum is unlikely to occur without investments in promotion (ibid.). A further problem with marketing investment is that it increases the break-even point. The more is spent on marketing, the more sales are required to recoup the investments. Despite this conundrum marketing is seen as a necessity within the cultural and creative industries as the time period over which sales can be expected is relatively short and producers cannot wait for sales to gradually pick up. (Lampel and Shamsie 2000, p. 234)

Media coverage can be seen as a part of marketing, but it forms a separate gate, especially for music. This is because the effect of radio and music channels in persuading people to buy music recordings is considerable (Denisoff 1986; Lopes 1992). Media coverage also includes news stories, talk show appearances, reviews, critiques and so on (Hirsch 1972a, pp. 642-643). Much research interest has been targeted at the role of radio as the gatekeeper for music recording and the payola practices associated with it (e.g. Denisoff 1975; Burnett 1996; Mol and Wijnberg 2007). The output of the music recording industry is the input of the radio broadcasting industry and thus radio stations have been the most important gatekeepers for music (Burnett 1996, p. 81). The logic of payola is that to get the consumers into the shops, the record has to be played on radio first. This has made record company managers eager to pay radio DJs to get airtime for their products. This led to the payola scandal in the late 1950s, after which the radio stations were banned by law in the USA from playing records in exchange for money (Denisoff 1975). Whether this practice has since ceased is debatable. Mol and Wijnberg (2007) state that payola is an important component of competition and payola practices affect the behaviour of both the selectors and the selected.

In addition to the radio DJs, Denisoff (1975) refers to retailers and rack jobbers as gatekeepers in the music business. They decide which products get into the shop and how they are placed. More recently, in a study on the difficulties of Swedish music breaking into the United States, Power and Hallencreutz (2007) found that the main entry barriers are the need for promotion through radio, the distribution channels and retail outlets being dominated by a set of oligopolistic firms and the strategy of record companies of concentrating on a few superstars and big hits.

The final gate to the consumer is critical reviews on the product. The main concerns with critiques are how much of an effect they actually have on sales and whether the critics are biased. According to Denisoff (1975) reviews in music magazines do not carry much weight, whereas media coverage and critical acclaim were found to be key determinants of demand in theatre (Dempster 2006). Concerning critical reviews, Lampel and Shamsie (2000) argue that the magnitude of the influence

of film critics is proportional to the information asymmetry confronting consumers prior to purchase. Films in general are hard to evaluate prior to their consumption. If the film has weak signalling properties (small budget and no stars, exotic locations or special effects) it is accorded limited distribution and marketing in the hopes that critical acclaim can be leveraged to improve sales. Films with strong signalling properties are distributed and promoted widely and the film company does not need to worry about the critics. Similar conclusions have been reached by Gemser et al. (2007), who found that film reviews affect art-house movie going, but only predict mainstream movie going. Criticism can also exert influence by classifying the film, regardless of the actual review being positive or negative. Zuckerman and Kim's (2003) study on the film market shows that the classification of a film as independent damages its box office revenues considerably. The small number of opening screens and critical reviews defining the film as an independent lower its sales. However, a large number of reviews can help a limited release film to reach the audience. The analysis shows that critics validate a film's identity as either major or independent. Being reviewed by critics that specialise in major releases increases the film's power to attract audience.

Whether reviews are biased or not is hard to determine as the merits of the good cannot be objectively measured. For example, Ginsburgh and Weyers (1999) found that film awards, such as those from The Cannes Film Festival and the US Academy, do not correlate with film reviews, box office or the frequency with which a film is shown on TV. Even though critics have limited influence on sales, their ethics are often questioned. According to Denisoff (1975) reviewers are corrupted by record company freebies. Hsu (2006a) found that film critics allocate disproportionately greater critical attention to arenas they are familiar with and have experience in. This makes film critics partial to certain film categories. Ravid et al. (2006) found that film reviews by a number of critics are significantly affected by the distributor's identity. They also found that audiences do not seem to mind such bias as they appear to listen to the biased critics more, and more reputable critics may be more biased. Bias, however, is not solely a moral flaw of the critics; firms within the cultural and creative industries also target considerable marketing efforts towards the critics and anticipate critical response in their production decisions (Hirsch 1972a, p. 655; Lampel and Shamsie 2000).

Cultural and creative industries tend to be vertically disintegrated. This gives rise to the plurality of gatekeepers. Each gatekeeper enforces its own performance criteria on the goods and either selects or rejects them. As the performance criteria for cultural goods is fuzzy independent of market age, the plurality of gatekeepers and thus of performance criteria further complicates the process through which some goods reach the consumer market successfully and others remain at the fringes. To what extent the criteria applied by different actors overlap is an interesting question. Perfect overlap makes the gatekeepers obsolete, whereas extremely poor overlap makes the process impossible to pass through. In any case the fuzziness of the performance criteria and several actors imposing their own criteria makes the selection process complex. This complicates the emergence of dominant technologies or characteristics.

### 3.2.4 *Experience goods and taste formation*

The next economic characteristic of cultural and creative goods discussed here is their nature as experience goods. This means that prior to consumption it is difficult to know whether the consumer likes a particular product. For example, you cannot know whether a book is good before you have read it (Hjorth-Andersen 2003, p. 406). Moreover, the more time a person spends in the consumption of a particular class of cultural products the more interest she will have in such products in the future. Thus, taste is formed through cumulative consumption.

It is important for cultural and creative goods to be distinct and different to arouse consumer interest. For this reason past success is a poor indicator of present quality and consumers have to make decisions to purchase based on limited current information. Furthermore, goods enter and exit the market relatively quickly, especially in the motion picture industry, and thus such decisions must be made in a limited time frame. (Lampel and Shamsie 2000, p. 235) Cinemas have a limited number of screens just as music, book and video game shops have limited shelf space.

The limited information that people have on cultural and creative products prior to consumption is to a large extent communicated by other consumers that already have experience with the product. De Vany (2004, p. 7) calls this “a dynamic cascade of information” through which audiences transmit their discoveries to others. De Vany and Walls (1996) conclude that demand for a film develops dynamically over time as the members of the audience sequentially discover what they like and reveal this to others. The firms cope with this by having a flexible distribution system that allows adaptation to push a film that seems to be gaining momentum through an information cascade (ibid.).

As a further complication, many researchers (Blaug 2001; Cowen 1989; Schulze 2003; Throsby 2001) hold the view that taste evolves through consumption and thus taste for a particular kind of music, for example, is acquired rather than pre-existent. Taste formation is a theme that has raised some controversy as some researchers also argue that tastes are stable and identical among consumers. The most prominent of the latter are Stigler and Becker (1977), who have argued that all individuals have identical tastes and differences in behaviour can be explained by observable differences in the constraints individuals face and by no unobservable taste differences. According to them all changes in behaviour can be explained by changes in prices and incomes. In response to this Cowen (1989) argues that the assumption of constant and identical tastes and merely different constraints just moves the problem one step. Whether tastes or constraints are conceptualised to differ among individuals is not analytically important. Blaug (2001, p. 125) also argues that because the products of cultural industries are typically experience goods a taste for them needs to be acquired and thus the assumption of stable and identical tastes is implausible. Schulze (2003, p. 433) adds that the accumulation of consumption capital means that the marginal utility from art consumption rises over time. Throsby (2001, p. 24, 115) describes a taste for cultural goods as time-dependent and cumulative and also dependent on education. Taste may also depend on socio-economic standing as Favaro and Frateschi (2007) found that the consumption choices between classical and popular music correlate with socio-economic factors. Furthermore,

Negus (1992, p. 68) points out that music styles that have traditionally been classified as a part of rebellious youth culture are nowadays consumed by affluent middle-aged people who acquired such a taste in their youth.

The cumulative tastes of the consumers and the distinctiveness of the product from others as a key selling point result in two opposing pressures on the producers of cultural goods (Lampel et al. 2000, p. 266). On the one hand, consumers need familiarity to understand what they are offered. This comes in the form of product classes or genres. However, consumers also need there to be novelty in a cultural offering for it to be enjoyable. According to Lampel et al. (2000, pp. 264-265) firms within the cultural industries expend considerable resources on balancing between the two goals but still often find it extremely difficult to offer the right kind of combination.

Taste formation through consumption influences the performance criteria according to which some goods are preferred over others. In addition to the criteria being fuzzy, they change. Furthermore, as cultural goods are experience goods, it cannot be known prior to consumption whether the product fulfils the criteria even if such criteria were perfectly known.

### 3.2.5 *Spatial clustering in urban areas*

The final economic characteristic of cultural and creative industries discussed in this chapter is their spatial clustering in urban areas. Research on this phenomenon has taken roughly two views. The first one sees such clustering as a natural feature of these industries as they benefit from co-location or from location in large urban areas. The second stream concentrates on how cultural activities and firms can help in revitalising cities and what kinds of policies would help in achieving this.

Power and Scott (2004, p. 4) claim that firms in cultural industries face the kind of competitive and organisational pressures that encourage them to agglomerate in dense clusters even though their products are distributed globally. The producers form networks and are dependent on local labour markets, which makes their location important (Scott 1999, p. 807). For example, Los Angeles has five times and New York six times the density of the national average in creative jobs (Dolfman et al. 2007). Power (2002, p. 115) also found that the cultural industries in Sweden are concentrated in the largest urban areas.

Scott studied the agglomeration of cultural industries in general in the Los Angeles area (1996) as well as more specifically the spatial clustering of the motion picture industry in the Hollywood area (2002). He concluded that cultural industries have a locational logic and that place is a unique structure of mental associations that can be turned to commercial use. Neff (2005) argues that place is becoming more and more important in cultural production. She studied the co-location forces and social networks of the digital media industry in Manhattan. The growth of designer fashion industry in Auckland has also been studied (Larner et al. 2007).

Henriques and Thiel (2000) argue that the clustering of cultural industries cannot be explained merely by the size of the city. Rather, cities follow historical and cultural trajectories that make

them different from each other despite similar size. Relating to this Vang (2007) found that newspapers are not clustered in capital cities because of local buzz but because of access to central powers and major events.

The agglomeration of cultural industry firms in major cities raises the threat of cultural uniformity. However, Scott (2004, p. 461) found that this is not the case as such localised agglomerations enable greatly increased diversity at the global level. Nevertheless, Gibson and Kong (2005) claim that the work on the geography of the cultural economy is lacking in many respects and suggest several research agendas to be followed.

The revitalisation approach has developed through the growing interest of scholars, planners and politicians in how cultural and creative industries can help in creating new functions for deindustrialising city centres (Markusen et al. 2008, p. 26). Research in this stream includes mostly case studies on particular revitalisation projects and their outcomes. De Beranger and Meldrum (2000) monitored the creative sector development project of Manchester. Bayliss (2007b) reports on the miserable failure of the Dublin Digital Hub project and of the more successful Copenhagen creative city programme (Bayliss 2007a). Yusuf and Nabeshima's (2005) study on the environment for creative businesses offered by the big cities of East Asia calls for policies that would enhance their opportunities. The local revitalisation policies do not, however, have unequivocal backing. Turok (2003) claims based on his research on the film and television industries in Scotland that transnational organisations and government regulation are more important than localised networks for the performance of the firms.

The spatial clustering of cultural and creative firms indicates that local industry dynamics may differ from global dynamics. Strong industry concentrations may lead the industry evolution and at the same time in more peripheral locations the evolution of the industry may be lagging behind. However, the global markets for mass-produced and widely circulated cultural goods limit the extent to which the industry evolution in different locations may differ.

### **3.3 Management issues**

This section reviews the literature on management issues specific to the cultural and creative industries. Even though there must be many things in the management of such firms that are similar to firms in other industries, several authors hold the view that there are some unique characteristics and complications in this context that the managers and the managed have to face. This includes the assumption that there is an inherent tension between the business-oriented managers, i.e. suits, and the artists who are more interested in the creative side of things.

Here we will take a look at the literature on management within the cultural and creative industries from three viewpoints. Firstly, the fundamental dilemma between art for art's sake and art for profit is discussed. Secondly, the problems arising from the management of creative employees are reviewed. Finally, the cultural and creative industries are assessed from the employees' viewpoint.

Within the games industry the art versus commerce dilemma and the complexities of managing creative people have received considerable research attention and that research is reviewed in detail.

### *3.3.1 Art for art's sake and art for profit*

The fundamental dilemma between art and commerce is older than the idea of cultural or creative industries. The idea of the tension between the economic sphere and the arts can be traced back to Weberian sociology (Swedberg 2006). This dilemma has subsequently received considerable attention in the literature on the cultural and creative industries.

Eikhof and Haunschild (2007, p. 536) find that there is a paradox in the commercialisation of creativity. They state that as artistic motivation is brought to market it is weakened or even destroyed. This means that the commercialisation of art turns out to be impossible as the vital creative resources are destroyed in the process. The act of selling destroys what is to be sold. This view, however, is at the extreme end of the spectrum. From the artist's viewpoint the dilemma represents a tension between, on the one hand, a personalised world-view and aesthetic, and on the other hand, the service of a market with its own preferences. (Kibbe 1982, p. 121) This perspective frames the dilemma as differences in taste between the producers and the buyers. Thus the market does not destroy the artistic expression but shapes its direction. According to Hirsch (1972b) there is a clear gap between the critical standards employed by distributors and producers. Distributors perceive cultural products in terms of format and genre that are targeted at a heterogeneous mass market, whereas producers place high value on originality and uniqueness and target their creations at a more knowledgeable audience with more articulate tastes and standards. This leads to a conflict as distributors shape the work of producers to make it attractive to a wide audience while the producers are perhaps more interested in popularity in a much smaller subculture. Lampel et al. (2000, p. 265) conceptualise this as a balance between artistic and entertainment value. Cultural goods need an audience that can support them and that is acquired through the entertainment services that the goods can provide.

DeFillippi et al. (2007, p. 514) see the dilemma as inherent antagonism between communities governed by professional ethos and the organisational and corporate logics that they have to face. This view brings the tension to the level of the firm, where artists have to deal with managers responsible for bottom line and vice versa. According to Bilton and Leary (2002, p. 56) many creative people have an ambivalent relationship with business and they may not share the commercial goals of the firm.

While the topic of tension between the artistic and economic logics of the cultural and creative industries is widely recognised, empirical research on it is scarce. One of the few such studies is Glynn's (2000) research on the conflict between, on the one hand, financial return and, on the other hand, artistic creativity and excellence in the context of a symphony orchestra. In an overview of cultural industries research Lawrence and Phillips (2002) place the tension between art and commerce centre stage. They state that because of this tension management within the cultural industries requires new kinds of research approaches.

An alternative view to the tension between art and commerce is introduced by Cowen (2000, pp. 16-23). He takes the view that a strong commercial market and resulting financial independence is necessary for artists to be able to express their aesthetic aspirations. Cowen argues that, despite romantic connotations attached to the artists of olden times, such as Bach, Mozart, Haydn and Beethoven, they were all obsessed with earning money, and Charlie Chaplin, too, entered the business for money. After all, many are motivated by the massive pecuniary awards available for the most successful artists. Furthermore, Cowen finds that the growing markets for music, literature and the fine arts are benefitting artistic freedom as they have moved artists away from the system of patronage, where artistic direction was dictated by one individual. Markets create various tastes and can thus support a wider diversity of artistic directions.

However, prior to reaching the market the artists have to pass through several gates that shape artistic direction. For example, recording artists are not engaged in natural expression but in calculated and conscious activity where image, lifestyle and point of identification are carefully designed by the record label (Negus 1992, p. 62). Record company personnel do not discover readymade acts but bring out talent through artist development (ibid. p. 81; Thompson et al. 2007, p. 633). This is also a matter of power. Once the recording contract has been signed, the musician assigns the rights to his material to the company and the company can work on it as it sees fit (Thompson et al. 2007, p. 637). A further complication is that cultural and creative goods are sold according to the originality of the good and the creator and thus carefully designed offerings have to be made to look like authentic expressions of raw creativity. The phenomenon of manufactured authenticity in cultural industries has received some research attention (see Jones et al. 2005).

Denisoff (1975) takes a very practical stance and states that the description of the conflict as art for art's sake versus art for profit, or creativity versus accounting, misses the economic reality. Artists, records and record companies rise and fall by the bottom line. In practice this means that the artist would usually like to spend more time in the studio perfecting the sound while the record producer has the next act waiting in the corridor (p. 147). The cost-creativity conflict is at its strongest in the studio where the rent, engineers, sidemen and studio musicians are paid by the hour. The producer is the timekeeper and controller who reminds the artists when they are wasting money. But the artists often feel that musical quality is more important than the dollars. (pp. 161-163) A similar practical bottom line approach is taken in Hjorth-Andersen's (2003, p. 399) research on book publishing. According to him manuscripts are assessed on the basis of their artistic merit and possibilities for commercial success. For this reason rejection does not necessarily mean any lack of artistic merit.

Within the games industry the tension between creativity and revenue is particularly apparent in the interaction between the more creatively concerned developers and the revenue driven publishers (Johns 2006, p. 165). Grantham and Kaplinsky (2005, p. 184) describe game development as the whimsical side of the games industry that needs to be controlled to keep the development studio from harming the publisher or itself by missing deadlines, wasting budget money or playing around. Even though the creativity and revenue tension has been identified between the developers and

publishers, most research deals with game developers' internal dilemmas between the managers and artists.

According to Cohendet and Simon (2007, pp. 587-588) video game development is especially problematic because it entails a complex mix of technology, art and interactive story-telling. In the development process scenarios, interactivity, programming, graphics, sound, music and testing need to be integrated seamlessly through the work of various professions, such as script writers, game designers, 2D and 3D graphic artists, sound designers and programmers. As the managers need to make both the artistic and technological sides of the project happen within the constraints of time and money the tension becomes apparent. (ibid.; Autier and Picq 2005, p. 205) Baba and Tschang (2001) find that game development works best when the workers are given autonomy that encourages them to give their best and there is a benevolent dictator in charge of the project who makes informed decisions. This, however, does not remove the tension.

Baba and Tschang (2001) state that game development is by no means efficient as the projects entail considerable amounts of revisions of the basic structure of the game and the reusability of the code is minimal. New ideas are generated throughout the project and integrated into the game design (Tschang and Szczypula 2006). Teams need to be coordinated on a daily basis as the multitude of components that a videogame includes must fit together seamlessly (Tschang 2005, p. 127). Cohendet and Simon (2007) studied the conflict of efficiency and creativity in game development. They found that the creative people in such firms form communities of specialists and function in both formal projects and informal gatherings across company and project borders. These communities serve as sources of ideas and repositories of knowledge. This way the space for creativity is taken. On the other hand, there are strong integration forces implemented by the managers. These include projects, scripts and strictly defined interfaces. This way the commercial logic can be applied in everyday creative work. Furthermore, Cohendet and Simon (2007) argue that such methods of integration that improve the efficiency of the firm allow the generation of creative slacks with the help of which creativity can be expanded further.

Autier and Picq's (2005) study on the evolution of the game development companies revealed an interesting paradox. As the company grows it gets rid of creative skills, such as game experts, and the proportion of generic skills, such as management, increases. This is explained by the difficulty of managing such socially complex and ambiguous creative assets and the people behind them. These problems are aggravated as the organisation grows and thus the shift in skills is inevitable in growing firms.

The work reviewed above implies that management challenges grow disproportionately to firm size. Furthermore, Baumol's cost disease may prohibit the development of economies of scale in cultural and creative production. This means that efficiency gains and scale economies in creative work are debatable. The industry life-cycle theory assumes that there are cumulative efficiency gains and economies of scale in production which lead to the incumbent advantage. It appears that in cultural and creative production this is not a foregone conclusion.



### 3.3.2 *Managers and creators*

Scholars of management in cultural and creative industries hold the view that the management of employees within the cultural and creative industries differs from that in other industries. It is assumed that there are unique challenges and responses to them. Even though all human labour contains both creative and non-creative elements the ratio of the two can be radically different (Thompson et al. 2007, p. 627). Indeed, the production of cultural and creative goods also entails humdrum inputs (Caves 2003, p. 73). The unique challenges of cultural and creative management do not follow from fundamental otherness but from a clear difference in the extent to which creative inputs are required. According to Lampel et al. (2000) the unique challenges in cultural production are induced by unpredictable demand patterns and production processes that are difficult to control and monitor.

DeFillippi et al. (2007, p. 513) state that the conflict of the relentless creation of new genres, formats and products and their economic viability takes place in the most striking fashion within the cultural industries. For example, in the music business the main managerial challenge is to select a continuous stream of 'right' acts to make 'right' records in an environment where the aesthetic choices are endless (Thompson et al. 2007, p. 633). In the fashion business new products are introduced three or four times a year to a market whose response entails a high level of uncertainty. According to Mora (2006) the fashion industry is oriented towards the search for innovative solutions to people's desire for change, but at the same time stylistic elements associated with the brand need to be incorporated in each new design. Known and successful elements need to be combined with provocative and innovative elements (ibid.). In the games industry consumers expect the firms to constantly come up with new games, new universes and new scenarios. The majority of game products on the market are less than two years old. (Autier and Picq 2005, p. 205)

The unique challenges faced by managers in the cultural and creative industries follow from the intensity with which novelty needs to be introduced and commercialised. According to Hesmondhalgh (2002, p. 22) symbol creators are granted considerable autonomy because of romantic ideals about art and the need for originality. This makes them and their work hard to manage. In addition, the lack of objective standards for such novelty and originality aggravates the complications of management in this context.

Tschang and Szczypula (2006) contrast game development with mainstream product development and conclude that games are designed in a creative manner whereas mainstream products are designed in a rational manner. Furthermore they state that there are easily codifiable rules and technological constraints that guide the development of most mainstream products. Games, they continue, do not have such easily codified rules and there are few constraints in addition to the consistency demands of the game world. However, this dichotomy is appears too stark from the viewpoint of both mainstream product development and game development. Game development does have technological constraints relating, for example, to computing capacity and game engine performance and thus has to submit to the laws of physics just as any other product development has to. Some things are just not possible and these restrictions are kept in the minds of the game

designers. Moreover, in most cases the budget severely constrains the game development process. The picture of mainstream product development painted by Tschang and Szczypula (2006) is decidedly linear. It would probably be hard to find an actual product development process where the starting point was the finalised specifications and they had just been implemented step by step according to engineering theories. It is not uncommon for specifications to change because of problems encountered and some features to be prioritised over others. In mainstream product development there is ample room for creativity in addition to rationality just as game development also has rational elements. Even though game development probably has its own peculiarities it is not as far removed as this dichotomy suggests. As previously stated, management in the cultural and creative domain in general has to deal with a particularly high intensity of creation of novelty which is a difference in degree and not in kind.

In addition to the general high intensity of the creation of novelty within the cultural and creative domain particular management issues have been identified. Firstly, communication among the creative department, the rest of the organisation and the client suffers from the manager's reluctance to intervene in the creative area of the business as it is believed to be temperamentally and intellectually outside his mental ambit (Bilton and Leary 2002, p. 55). Secondly, managers in the creative and cultural domain have to deal with rising costs and risks as the project proceeds. This means constantly assessing whether to go on with the project and spending money on it or to cancel the project. In game development this means writing a concept paper and deciding on whether to sacrifice resources to develop that into a prototype with code and art to try to get a publisher to fund the rest of the project. If funding is secured a larger team will spend one or two years on finishing the game by the publisher's deadline. However, the publisher may also decide to kill the project before it is finished. (Tschang 2005) Finally, firms within the creative and cultural industries are often micro businesses where management is not seen as a core task or developed into a core competency (Jeffcutt and Pratt 2002, p. 228). This leads to playing around which in the context of game development has been termed 'feature creep' (Tschang 2005, p. 123). Feature creep means that new and unplanned features are added to the product during the development process. These additional "cool" features thought up during development risk missing the deadline and are seen as a discipline issue (ibid.).

In the literature several responses to these management issues have been suggested. First of all, Bilton and Leary (2002) point out that creativity requires boundaries. Management should not be about encouraging out of the box thinking but managers should create frames of reference in which creative thinking proceeds. According to Bilton and Leary (2002) creative processes thrive in a disciplined framework, an example of which is the "deadline magic". In game development this is pursued with frequent milestones (see e.g. Tschang 2005).

Secondly, the basic principles of any organisation, such as division of labour and communication need to be agreed on. Thompson et al. (2007) refer to the infrastructure of the production process as first-order creativity. Becker (1974) writes about artistic conventions that ease the division of labour and make collaboration easier between artists and support personnel. However, these conventions entail the risk of limiting artistic possibilities. In game development creativity appears in both

individuals and in groups and the group creativity manifests in the team bouncing ideas around (Tschang 2003). Such brainstorming practice may be efficient in bringing about ideas but it also serves as a communication mechanism through which all team members gain an understanding of the goals of the project. Furthermore, Tschang (2003) points out that no matter how creative the ideas are, implementation is vital for the success of the product. Thus the working practices should form an infrastructure that can carry the project through different phases in which different kinds of creativity are required. Kohashi and Kurokawa (2005) find that the success of the Japanese video game industry is a product of general Japanese management practices of lifelong employment and seniority-based wage system that do not fit well with the stereotypes of creative work. There is variation between firms in how much latitude they allow their workers, but in general the traditional Japanese management methods of strict hierarchies and clearly defined tasks also operate in game companies. The Japanese example may be somewhat extreme but in general management in the creative and cultural domain relies on division of labour and communication just as in any other industries.

Thirdly, work is often organised in short-term projects. This is the case in the music industry (Ordanini et al. 2008), in film and television productions (Coe and Johns 2004) and in the advertising business (Grabher 2002a; 2002b; 2004a; 2004b). Coe and Johns (2004) define television and film productions as “short-term coalitions of directors, actors, crew and various service subcontractors, with each element being contracted separately to the project”. For Grabher (2002a) temporary projects form workstations whereas networks and institutions function as reservoirs of knowledge in the advertising business.

The fourth management response to the complications brought about by the high intensity of novelty creation is continuous negotiating. Problems encountered at one part of the development process have an effect on other parts and adjustments have to be agreed on urgently. Mora (2006, p. 337) describes the production of innovation in fashion companies as the result of complex negotiations among employees. In addition, the process is directed by constant confrontation with material and economic constraints. As the designer draws a sketch of a dress it is only the starting point for team work that constitutes a gradual process. As such a sketch can be interpreted in many different ways, the person in charge of choosing the fabric and cutting has to make various decisions which is also the case with the sewing of the dress. The process incorporates continuous problem-solving on how to deal with the constraints of the material and this also means negotiations with the designer, who wants the dress to be as close as possible to the original sketch. In the music business the producer, or the artist and repertoire man, has what Peterson and Berger (1971) call an entrepreneurial task. The job of the producer is to create hits, but this has to be done within the budget constraints decided on by the corporate executives. The stylistic decisions are left more to the producer’s discretion. The performance of each producer is continuously monitored and rewarding and firing are done accordingly. This means that the stylistic direction forms in the interaction of the producer and the executives. In the game business designs are changed during the development process either because the initial design does not work well or because the designers want to make improvements. Such continuous problem-solving and uncertainty have led to some studios adopting a design philosophy of just designing on the fly as the

project proceeds. (Tschang 2007, p. 999) This solution is perhaps at the extreme, but in any case the collaboration of various specialist areas leads to a situation where the coordination of the project incorporates continuous bargaining for solutions that are acceptable to all specialist areas. In such a context, where negotiating and bargaining among employees and between managers and employees is prevalent, the managers take the role of an intermediary. The managers can function as intermediaries between the creators and the commercial imperatives (Hesmondhalgh 2002, p. 22) and as creativity brokers who connect talented people with each other, create productive relationships and environments where risks can be taken (Bilton and Leary 2002).

The responses identified in the literature to the unique managerial challenges brought about by the high intensity of the creation of novelty include providing boundaries for creativity, creating an infrastructure, arranging work in short-term projects and managing through negotiations and intermediating. It appears that the creative workers are prone to radical innovation which allows them to extend their creative expression, whereas the managers prefer incremental innovation as it is easier to manage and profits and losses are easier to estimate beforehand. In the negotiations some kind of a balance between radical and incremental innovation should be found. In the creative and cultural industries there is a similar requirement for novelty in products independent of market age. This is a clear deviation from the general industry life-cycle theory. However, cultural and creative production is not completely open-ended as much is taken for granted and not negotiated at the beginning of each project.

### 3.3.3 *Creative labour*

The cultural job market has been studied by cultural economists and sociologists. Low wages, oversupply of creative workers, non-monetary rewards from being an artist and artists' coping strategies have emerged as common themes. The financial compensation of artistic work has been found to be relatively low in several studies. Wetzels (2008) found that workers in entertainment, publishing and printing are paid less than employees in corresponding non-cultural industries. According to the findings by Blair et al. (2001) employment in film involves long hours, structured job insecurity and relatively low wages. Furthermore, Throsby (2001, p. 121-122) argues that formal training in cultural professions does not predict financial success as it does in many other industries and that there is a great degree of uncertainty attached to expected rewards. Hesmondhalgh (2002, p. 57) states that the reason for the low wages in cultural professions is that there is a permanent oversupply of creative labour.

It is characteristic of the cultural and creative industries that the minority does the majority of the artistic work (Menger 1999, p. 541). De Vany (2004, p. 4) shows that half the work in films is done by the square root of the number of willing actors and other artists. For the people who get to do any artistic work the payments vary greatly. The earnings distributions are skewed with a few well paid and many poorly paid artists (Menger 1999, p. 541; Throsby 2001, pp. 121-122). According to Benhamou (2003, p. 72) the gap between the very well-paid artists and the poorly paid ones is disproportionately large compared to the differences in talent. Zuckerman and Kim (2003, p. 33)

point out that such a dynamic follows from the preference of decision-makers to invest in talents that are known from past successes.

These characteristics of the job market raise the question of why so many people are willing to enter the market and continue to increase the oversupply of labour. The general answer is that people want to do art for art's sake and they gain non-monetary rewards from being an artist (Throsby 2001, p. 121-2). Bilton and Leary (2002, p. 58) hold that as the external rewards remain so low the only possible explanation is that the motivation comes from within. Thus in the cultural and creative domain work should not be assumed purely as a disutility (Caves 2003, p. 74), but the content of the job should be seen as a part of the compensation for it.

In addition to the attractiveness of artistic professions, the emergence of reservoirs and pools of artistic labour is a product of a low entry barrier. Only pen, paper and guitar are needed to start making music (Gander and Rieple 2004). However, artistic labour does not lie completely outside the economic reality. Hui and Png (2002) found that the supply of artistic labour responds to economic incentives in the film industry.

The coping strategies that poorly paid and often unemployed artists resort to include employment outside art (Throsby 2001, pp. 121-122) and the building of networks that increase the chances of finding artistic work (Antcliff et al. 2007; Haunschild 2003). However, empirical work on painters has shown that the majority of artists turn down lucrative work opportunities, even artistic ones, if they are not artistically fulfilling (Throsby 1994, p. 17).

The labour market of the games industry has been approached so far in only one paper. Cadin et al. (2006) found that game companies aim at developing stable employment relationships as much and as quickly as they possibly can. This was seen as a surprising finding as it differs greatly from the employment practices of the film industry<sup>4</sup> which was assumed to be a close counterpart.

The cost of artistic work varies greatly between artists with reputation and unknown ones. Artistic work performed by the latter is cheap and thus standardisation that would decrease the need for it does not give much cost advantage. Dominant artists, on the other hand, can name their price. The industry life-cycle theory assumes that as the dominant design emerges costs go down. In cultural and creative work no such cost reduction incentive operates. Products by dominant artists are more expensive to produce than other variants.

### **3.4 Industry dynamics**

The dynamics of individual cultural or creative industries have been studied to some extent. Such research can be divided into five themes, each of which deals with a specific phenomenon identified in the dynamics of such industries. The first one includes research on how such industries are

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<sup>4</sup> The employment practices of the film industry will be returned to in the discussion of flexible specialisation in section 3.4.3.

structured and how firms make sense of their environment. The sense-making process influences the actions of the firms and thus the competitive dynamics. Empirical work on this stream is scattered across industries. Concerning the games industry the majority of the research concentrates on console manufacturers, while game developers are left with the role of influencing the demand for consoles.

The second theme deals with the division of cultural and creative firms into majors and independents. Majors are the large firms that supply to the mainstream market whereas the independents are often seen as more artistically oriented and supplying to niche markets. The main issues addressed are the division of labour between the two kinds of firms and the viability of the independent firms in the long run. The empirics of this line of research are drawn predominantly from the music business, but the film industry and the games industry are also represented.

Flexible specialisation has become an object of much debate in the context of cultural and creative industries. The phenomenon concerns the increase of subcontracting and thus the number of firms that take part in the production of a cultural or creative good. While some authors argue that flexible specialisation has created unprecedented opportunities for small specialist firms, others see it as a new and more powerful method of increasing corporate control over all creativity. The film industry has served as the research site for most studies on this theme.

The fourth theme consists of studies on the relationship between industry concentration and product diversity. There are two competing views. The first one holds that as industry concentration has increased product diversity has decreased. The second one claims that despite increase in industry concentration product diversity has increased because of flexible specialisation. The empirics for this line of research are mostly from the music business.

Finally, research on innovations within the cultural and creative industries has pointed out the inability of technology-oriented approach to fully appreciate innovative activity in this context. The concept of stylistic innovation has been proposed but practical applications remain scarce. The idea of new genres as innovations has become somewhat popular. However, in industries where each product claims to be distinct and different the extent of difference required of a product to go as a major innovation is unclear.

These five themes are interconnected and many studies contribute to more than one of these themes. The games industry has been approached mainly in research on the first theme. There are several studies that map the history of the games industry and describe the competitive dynamics. However, such studies concentrate on the device manufacturing side of the game business and thus the more creatively oriented game development remains underrepresented.

#### *3.4.1 The interconnected industry system*

The study of the industry dynamics in the cultural and creative domain has adopted the framework of industry system or organisational field. Both concepts highlight, on the one hand, the interconnectedness of collaborating firms whose inputs are required to produce the final offering for

the consumer and, on the other hand, the effect that competing firms producing similar outputs have on each other. The industry system concept was introduced by Hirsch (1972a) whose emphasis has been on the sequence through which new ideas and products are filtered by the gatekeepers before they reach the consumer. The interest is on the power plays between the organisations and the techniques that are used. For Hirsch (1972a) the industry system of cultural industry is characterised by the use of contact men, overproduction and differential promotion as well as gatekeepers.

The organisational field concept applied to the cultural domain comes from Anand and Peterson (2000), whose interest is in how common focus and practices among firms producing similar outputs come into being. In cultural industries the mechanisms that shape the organisational fields include chart rankings (Anand and Peterson 2000) and award ceremonies (Anand and Watson 2004). Thus the industry system concept takes a vertical view of cultural production whereas the organisational field view looks at it more horizontally. The studies on the structure of and interactions in the cultural and creative industries are scattered somewhat widely and do not always have a clear link with each other. Relevant studies and their findings are summarised next.

Miège (1987) differentiates between five logics or structures by which cultural products are created. The first one is labelled “editorial production of cultural commodities” and includes the production of books, records and films. These are produced as a catalogue where the bestsellers offset the losses sustained on other products. Authors and performers are rewarded via royalties and this makes a few artists wealthy while the rest live hand-to-mouth. Small independent firms are dependent on the majors. The second logic is that of flow production of broadcasting where programming must be uninterrupted and therefore produced in a conveyor belt manner. Products that follow this logic include television and radio. The third logic is that of the production of written information which includes the national and local press. The fourth logic is the production of live entertainment which includes theatre, ballet and opera. Finally the fifth logic is that of the production of electronic information. This includes the production of management systems software, educational software and video games, for example. Miège (1987) argues that the modes governing their production have not become fixed, but are drifting towards editorial logic. Now, 20 years after Miège’s, proposition it appears to have been correct. Game development resembles the production of films, records and books with hits and misses and royalty-based compensation.

Peterson and Anand (2004) differentiate between three possible structures of creative industries. There may be (1) many small competing firms, (2) a few vertically integrated oligarchic firms or (3) “a more open system of oligarchy composed of niche-market-targeted divisions plus many small specialty service and market development firms where the former produce the most lucrative products and the latter produce the most innovative”. They state that the first structure is competitive and turbulent and nurtures innovation. The second one is stable and produces unimaginative products. In the third option competitiveness is managed by oligopolistic control and this structure produces diversity without innovation. It appears that large firms have a tendency to produce mainstream products whereas smaller firms are more specialised. Hsu (2006b) found that films that represent multiple genres attract a larger audience but are less satisfying to them. Single genre films have smaller but more satisfied audiences. There is thus a trade-off between audience

size and product value. Mezias and Mezias (2000) call for more research on the relationship between firm size, strategic specialisation and innovation within the creative and cultural industries.

The question of how firms make sense of industry structure and wider environment has been tackled in some studies on the music and film industries. In the early film industry the short films that were shown in nickelodeons were commodities that were sold in quantity. As consumers began to lose interest and foreign competitors entered the US market the film production firms formed into two cartels, the Motion Picture Patents Company and the Motion Picture Distributing and Sales Company. Thus firms aimed at controlling the environment by disabling the production of alternatives for the consumer. As these cartels made exclusive deals with cinemas, independent producers found it hard to reach the market. In addition the cartels were dedicated to showing short films whereas the independents were experimenting with longer feature films. This led them to search for alternative outlets in road shows. This eventually turned films into unique products instead of a commodity sold by the length. It also induced the vertical consolidation which left the market controlled by six integrated producer-distributors. (Mezias and Kuperman 2001) Concerning more recent developments Wikström's (2006) study on music industry decision-makers and their perceptions on changes in the media environment shows that music firms in general have responded defensively. They have remained focused on the physical product even though revenue through other media outlets has grown in importance.

In creative and cultural industries an important method of understanding competition is following charts and awards. Anand and Peterson (2000) studied the change in the method of compiling music album rankings from gathering weekly sales information from a sample of stores to recording each cash register transaction in most US stores. This took place in 1991, when Billboard Charts became based on the SoundScan method. Anand and Peterson (2000) conclude that such a change in the information about the market fundamentally altered the managers' sense-making and affected the behaviour of the record companies. They learned that albums sell best right after release and adjusted promotion timing accordingly. Certain music types, such as country and rap, also proved to be far more popular than the previous chart compilation methodology had indicated. The new chart system was also seen as more reliable and less prone to corruption through false sales reports and purposeful sampling of the reporting record stores. Furthermore, Anand and Peterson (2000) found that the more accurate and current data of the market encouraged fragmentation thereof and created opportunities for those who were able to utilize emerging niches. SoundScan altered the field information regime and that in turn altered the shape of the music market. However, in addition to the objective chart data decision-makers rely on subjective experience. Sorenson and Waguespack (2006) found that distributors allocate more resources, such as better launch dates and more promotion, to films with whose makers they have a prior relationship. At the end, as the effects of these favourable decisions are controlled, these films perform worse at the box office. In another paper Anand and Watson (2004) studied the role of award ceremonies in the evolution of the music market. They found that awards, such as the Grammys, distribute prestige among the industry participants, attract collective attention to the industry, offer a medium to resolve conflicts on the legitimacy of the participants and tighten horizontal linkages within the industry. Thus the award ceremonies help to define the industry and also affect the behaviour of the participants.



Studies on the games industry structure and dynamics have concentrated on the competition among console manufacturers. Game products have been included only as a factor that influences hardware sales. Thus the complementarity of hardware and software is acknowledged, but not symmetrically. Complementary software offerings have an effect on hardware sales but not vice versa. Many studies analyse competition between consoles as an object of network effects. For example, Schilling (2003) found that within the game console market the network effects can be divided into three different kinds of components: technological functionality, size of the installed base and the availability of complementary goods. Schilling (2003) also points out that the consumers' decision-making is affected by both the actual and the perceived situation with these three factors as well as future developments that are expected. Entrants are usually disadvantaged in this kind of competition. Shankar and Bauys (2003), on the other hand, found that the largest installed base does not necessarily lead to winning the market. Their study on the Sega and Nintendo 16-bit devices showed that these two products had asymmetric network effects because prices and advertising had differing influences on their abilities to gain market share. Initially the Sega device had a larger installed base but Nintendo was able to win in the end. Furthermore, Clements and Ohashi (2005) found that in the beginning of a new console generation hardware prices determine purchases more strongly than the availability and quality of games. Later on, however, console prices become less important and the role of complementary software in determining purchases becomes more influential. Gallagher and Park (2002) also analysed the importance of complementary software. They conclude that complementary products must be offered first and installed base built second. The only study so far to look at the situation from the game developers' perspective is that by Venkatraman and Lee (2004). They studied the factors affecting the game developers' choice of platform and found that developers prefer platforms (1) that are not crowded by other developers, (2) that still work with many developers, (3) that are dominant in the market and (4) that are new. The logic is that while attractive games can induce sales for a console the installed base in any case limits the number of game copies that can be sold. Thus developers want their games to be on a console that has a wide installed base, that has a limited number of competing game titles available and that will still be on the market for a significant time period as obsolete hardware makes complementary games obsolete as well.

The idea of organisational fields holds that common focus and practices arise in firms producing similar outputs in the cultural and creative industries. This is important, as such common focus and practices may correspond to the idea of dominant design or dominant business model. Furthermore, the dominance of certain products becomes visible in charts and awards. Industry structure has an effect on the level of innovation offered in products. However, consumer demand for innovation may also have an effect on industry structure. In the past cartels have been outcompeted by innovative independents. Thus the analysis of industry dynamics in the cultural and creative domain should take into account inherent product characteristics and value, consumer preferences, production processes and industry structure. Cultural and creative products have both stylistic and technological characteristics. These form two interdependent spheres and innovation in each has an effect on industry dynamics. Concerning games industry dynamics it appears that console manufacturing is a mature industry. However, much less is known about the dynamics of game

development which forms the side of the industry that fits more comfortably under the creative and cultural labels. Does maturity in hardware induce maturity in software? Or does hardware standardisation allow growth in diversity in software?

#### *3.4.2 Majors and independents*

The organisation of an industry into a few majors and countless independents is typical for the cultural and creative industries. This applies especially to film, music and games. This structure is a part of the cultural industries logic where creative input is loosely and reproduction and circulation are tightly controlled (Hesmondhalgh 2002, p. 56). The independents are numerous and pursue unique creative directions. The majors are few and control a large portion of the market. For example, in the music business, depending on the author, there are somewhere between four to six major global companies. According to Negus (1992, p. 1) 70 percent of popular music recorded was produced by five major companies. For Burnett (1996, p. 2) there were six majors whose sales covered more than 90 percent of the worldwide sales of recorded music. More recently Gander et al. (2007, pp. 612-613) defined four firms as majors whose joint market share was around 70 percent. Most of the major companies in the music business are products of complex series of mergers and acquisitions and their origins can be traced back to the beginning of the twentieth century (Negus 1992, p. 3). Also, Burnett (1992) points out that all of the majors are themselves divisions of even larger electronics and communications conglomerates. The same firms sell the CDs and the machines to play them on.

The independents are small firms that are typically neither publicly owned nor owned by a major parent corporation (Gander et al. 2007, pp. 612-613). Burnett (1996, p. 49) differentiates them from the minors. The minors are firms that are controlled by the majors and thus former independents that have been bought by a major. Usually the small independents that manage to put competitive music in the marketplace either lose their artists to the majors or are bought up by the majors (*ibid.*). While such acquisitions take place new independents are formed continuously. The churning of the small firms is also recognised in the film industry. Blair and Rainnie's (2000) study on the UK film industry highlights the successive waves in small firm formation and their relationships with the majors. According to DeFillippi and Arthur (1998, p. 134) the permanence of the firm is not a key aspiration in the film industry as no capital investments convert into fixed assets. The lack of fixed assets in the cultural and creative industries limits the damages of the churning process.

In the games industry the structure of majors and independents has developed naturally around the game platforms. Console manufacturers can decide who publishes games for their platform and such approved publishers can decide who develops the games. The majors consist of console manufacturers and reputable publishers, whereas the independents consist of alternative publishers and developers. According to Grantham and Kaplinsky (2005 pp. 189-190), in the early years of the games industry there were only independents, or bedroom coders, and no firm could exercise control over others. In the early 1990s the publishers began to exercise influence over the production chain. According to Johns (2006) the first wave of consolidation began in the early 1990s as the production costs grew dramatically with the introduction of the new consoles Sony

PlayStation and Nintendo 64. The search for economies of scale led developers and publishers to merge with or acquire competitors and the number of independents decreased.

In addition, tough measures were taken by console manufacturers to regulate software production. Nintendo especially retained complete control over cartridge production in order to be able to decide “whether, when, and how many copies of game software would be produced” (Aoyama and Izushi 2003, p. 428). Game developers were willing to submit to these terms because the installed base of Nintendo devices was superior. Grantham and Kaplinsky (2005) state that in the 2000s the publishers define “who produces what, under what terms, and for what returns”. Johns (2006) highlights the role of console manufacturers as they are the final jurors on which games will enter the consumer market. From the viewpoint of the game developer, both the publisher and the console manufacturer function as gatekeepers for their product. The majors keep the gates and the independents are kept by them.

Majors and independents have different resources and tasks in the cultural and creative industries. Gander and Rieple’s (2004) study on the music business concludes that, even though on the basis of transaction cost economics the acquisition of all the independents by the majors would be the optimal solution, this has still not taken place. This is because crucial resources of the independents, such as credibility in the eyes of artists and consumers, the ability to access knowledge and use it to predict future trends and the ability to spot and develop new artists, would be destroyed in such acquisitions. Furthermore, the two-stage approach of independents and majors provides necessary quality and time incentives to artists and producers that would be dampened in a large bureaucratic organisation. These incentives are more valuable than the potential savings in transaction costs. The independents are more endowed with the creative resources of artist development, whereas the majors excel in the humdrum resources of finance, distribution and promotion. This means that in partnerships the firms do not just protect their own resources from capture, but they shield their resources from institutionally hostile practices, policies and cultures of partner firms. The creative resources need to be shielded from the contamination of humdrum ways of working and vice versa. This way the partnerships between majors and independents remain valuable. (Gander et al. 2007)

Similar findings have also been reported of other cultural industries. Hesmondhalgh (2002, p. 22) states that the creative production often takes place in separate independent companies because the artists and the audiences are suspicious of the bureaucratic control of creativity. However, the “independents” are often tied to the majors through financing, licensing and distribution deals, which makes them dependent of the majors’ views on the creative direction. In the film industry the independents have historically served the role of filling the capacity of the majors. During the 1940s and 1950s the diffusion of television increased the demand for films which was served by the growing independent production. The Paramount decision<sup>5</sup> also induced growth in the demand for creative content in the motion picture industry. Because of these developments the percentage of films produced in-house by the majors decreased. (Gil and Spiller 2007) Zuckerman and

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<sup>5</sup> The Paramount decision by the US Supreme Court in 1948 outlawed the ownership and control of cinemas by the major film companies and this opened the theatre doors for independent films.

Kim (2003, p. 35) argue that independent film took on a new significance in the late 1980s and early 1990s as videotape recorders diffused and created a market for specialty films.

The relationship between the majors and independents has both competitive and complementary characteristics. Burnett (1996, p. 62) argues that in the music business independents and majors are not competitors but that they have a clear division of labour. Independents handle specialised styles and new performers through scouting and test marketing. The majors then grab proven contenders. For Burke (2003, p. 325) the task of the independents is to sign artists that have been turned down by the majors. These artists can be close substitutes for a major's existing line-up and be rejected because of low potential for additional sales and the associated cannibalisation effect. Thus the independents' sales come from new innovative styles and from cannibalising the majors' sales.

According to Hesmondhalgh (2002, p. 150) the games industry is a key example of an independent-friendly cultural industry. On the one hand, the independent developers have inside knowledge of the fan sub-cultures that the majors want to access and pay a premium for (p. 212). On the other hand, such small companies are often heavily reliant on the developments of the hardware sector governed by the majors (p. 210).

The viability of the independents is a key concern in many studies on the majors and independents. Mezias and Mezias' (2000) concerns include the conditions under which the independents can get their products to the audiences when the majors control the market. Hesmondhalgh (2002, p. 157) states that even though there are some superficial signs of a loosening of the majors' control in some cultural industries the main trend is still towards more careful control of creative work. In the games industry the independent developers usually have a very weak position in the negotiations with the majors. They are often unable to capture much value and the publisher retains the intellectual property rights to the games even though the initial concept and the creative input came from the independent developer (Johns 2006, p. 169). Grantham and Kaplinsky (2005) find that independent developers should take certain actions to improve their position. These actions include, for example, "new and improved products, available for a number of platforms" and value chain repositioning by becoming publishers themselves. Such actions, however, are out of reach for many independent developers as console manufacturers can decide who develops games for their hardware and becoming a publisher requires substantial capital investments.

However, there are also more positive views on the viability of the independents. Robins' (1993) study on the disaggregation of the motion picture industry found that independent films have outperformed studio films on average. Furthermore, the increased concentration of the generalists has had a positive effect on the founding of specialist firms. Also, specialists have been more active in the creation of new genres. (Mezias and Mezias 2000) In the games industry the independent developers can have a much stronger negotiating position if the firm has a reputation for having finished successful products or if there are particularly reputable individuals employed by the firm (Johns 2006, p. 169). In general, the subcontracting to small and medium-sized firms has increased in the cultural industries (Hesmondhalgh 2002, p. 151). This takes us to the topic of the next section on flexible specialisation.

The division of labour among majors and independents indicates different roles for them in the innovative activity of the industry. It appears that the majors are more prone to incremental innovation, whereas the independents are more prone to radical innovation. Majors seem to function more based on information internal to the industry whereas the independents bring in innovations based on information external to the industry. This would suggest that both routinised and entrepreneurial regimes remain in effect simultaneously in different parts of the industry instead of consecutively industry-wide.

### 3.4.3 *Flexible specialisation*

Relating to the division of firms into majors and independents there is an ongoing debate on what this structure means for the dynamics of the industry. On the one hand, the emergence of small specialist firms is argued to foster innovation and increase diversity, which is called flexible specialisation. On the other hand, the strong position of the majors is argued to lead to growing oligopolistic control of the industry.

In the cultural and creative industries context this debate originates in the work of Storper and Christopherson (Storper and Christopherson 1987; Christopherson and Storper 1989; Storper 1989; Storper and Scott 1990; Storper 1993) concerning the film industry, especially in Hollywood. The main argument is that the vertical disintegration of the film industry has led to increased output specialisation by the supplier firms who have a narrow scope of activity, but in that speciality they are able to innovate and thus have a wider range of potential variations. These innovative small firms outperform and replace the departments of the majors previously responsible for such specialist tasks.

Aksoy and Robins (1992) find Storper and Christopherson's conclusions idealistic and doubt the emergence of such mutually beneficial flexible specialisation in the motion picture industry. They state that the majors have kept their oligopolistic control and the films of the independents are distributed to fill the capacity. The independents function as shock absorbers and are dependent on the majors through financing and distribution. This way the majors have achieved both cost-cutting and product differentiation with low risk. Aksoy and Robins (1992) argue that the nature of the film product, i.e. global distribution, high risk with hits required to offset the misses and sunk cost in productions with expensive stars, itself induces concentration.

It should be noted here that Storper and Christopherson discuss the role of independents as suppliers of intermediate outputs whereas Aksoy and Robins discuss the role of independents as suppliers of entire films. In other contributions the latter role is under scrutiny and the independents supplying intermediate outputs are seldom discussed. For instance, Sedgwick (2002) argues that the growth of diversity in demand has led to decreased in-house production, which allows the major film studios to reduce their exposure to risk and at the same time maintain their dominance of the market. Film productions by the independents are seen as portfolio fillers that allow the major studios to concentrate on a few expensive hits. Concerning the music industry the picture is similar. Hesmondhalgh (1996) finds flexible specialisation to be a misleading concept to describe the new

dynamics of the music industry. According to him, it is easy and cheap to found an independent firm, but the majors still hold the power over the market. This means that independents are either bought up or die.

In practice flexible specialisation means that cultural productions, such as film and television, are “short-term coalitions of directors, actors, crew and various service subcontractors, with each element being contracted separately to the project” (Coe and Johns 2004, p. 194). Starkey et al. (2000) use the concept of ‘latent organisation’ that is formed from networks of specialised suppliers and that becomes active as new projects demand. This means that the skills required of film producers have changed. Lampel and Shamsie (2003) find that the ability to attract key creatives to take part in such short-term coalitions has become a crucial success factor for film production firms. Faulkner and Anderson’s (1987) study on film productions shows that there are patterns of recurrent ties between different professionals who are at similar levels of cumulative productivity in terms of earnings and awards. Bechky’s (2006) study on the other hand shows that these temporary organisations are organised around structured role systems that help in organising the work at hand and also create continuity between and across projects.

The extent to which the flexible specialisation logic applies across different cultural and creative industries requires further study. In the fashion business the findings on flexible specialisation are mixed. According to Djelic and Ainamo (1999), increased environmental turbulence has led to firms moving towards greater flexibility and modularity and to create new kinds of network forms for production, such as outsourcing manufacturing. On the other hand, vertical integration entails advantages in time-to-market and in knowing and learning consumer preferences through trying out many new designs and continuing to produce what sells (Richardson 1996). By integrating manufacturing and retailing the firms can achieve the kind of controllability of the process that is needed for flexibility and quick response.

Flexible specialisation has, however, increased the demand for short-term contract workers, but as Menger (1999) points out, at the same time the number of intermittent cultural workers has increased more rapidly than their work opportunities creating growing competition among such workers. Thus flexible specialisation increases the unemployment risk. In the performing arts this is compensated to some extent by wage premium for intermittent artists compared to steady ones. However, the artists who most frequently face unemployment are at disadvantage as employers prefer the more popular ones for their productions. In summary, vertical disintegration has enabled firms to transmit market risk to their subcontractors who in turn pass it on to individual workers. Similar findings have been reported by Blair et al. (2001) concerning the UK film industry and Haunschild (2003) concerning German theatres.

In the games industry, however, things appear to be different. The study by Cadin et al. (2006) on the employment relations in the games industry concludes that they are very different from those of the film industry. According to them game companies strive to develop stable employment relations “as much and as quickly as they possibly can”. They state that this way the game firms are not protected from bankruptcy but such stability is required to stand up to the instability of the volatile

industry. On the other hand, Autier and Picq (2005) found that as game companies grow the proportion of non-creative employees, such as managers, grows compared to game specialists. This suggests that growing game companies exploit subcontracting just like film and television production firms. Such subcontracting has both advantages and disadvantages for independent developers. The extent to which game developers are at the mercy of the major publishers depends on the kind of business they are in. There are different kinds of developers, such as work-for-hire developers, original IP developers and super developers (Grantham and Kaplinsky 2005, p. 193). Probably the work-for-hire developers that compete for contracts specified by the publishers have the role of shock absorbers whereas original IP developers can build strong brands and thus have more control over the terms on which they work. Super developers, on the other hand, that have the ability to develop games for many platforms and a track record of many successful products are in a way majors themselves. Gallagher and Park (2002) point out that in the very early games industry the device manufacturers produced most of the games in-house. However, since the third console generation<sup>6</sup> complementary software produced by outside publishing houses has assumed an important role in determining hardware sales. In the competition among the consoles success has been based on complementary products, installed base and the virtuous cycle between increases in switching costs and market share (ibid.). For example, in the late 1990s Nintendo reported working with 355 and Sony Computer Entertainment with 540 subcontractors while also producing games in-house (Aoyama and Izushi 2003, p. 432).

Flexible specialisation makes industry structures messy. However, flexible specialisation allows the formation of dominant technological solutions and ways of doing things to arise at many levels of the product and the production process. It also increases the opportunities for cultural and creative diversity at different levels as the number of actors involved is large.

#### *3.4.4 The relationship of concentration and diversity*

A very interesting and relatively independent research stream on cultural industry dynamics is that on the relationship between industry concentration and product diversity. This stream of research rests on the tradition of the cultural pessimism of Adorno and Horkheimer. In this tradition cultural industries are seen to produce cultural goods “on a large scale and in accordance with a strategy based on economic considerations rather than any concern for cultural development” (UNESCO 1982, p. 21). As the large firms control the means of production and the distribution circuits, the creative artists are left at the mercy of consumer demand that is dictated by such large corporations (ibid.). The starting point for the concentration and diversity research has been that large corporations are less interested in artistic values than small ones, and for this reason their products offer a low degree of diversity.

Similar arguments have also been built based on a more neutral basis where corporations are not seen as having a sinister agenda but as functioning based on risk calculations. In highly concentrated industries firms may use their market power to avoid providing significantly

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<sup>6</sup> The third console generation includes Nintendo Entertainment System, Sega Master System and Atari 7800, among others, launched in the mid-1980s

innovative, and thus risky, goods to consumers. DiMaggio (1977, pp. 440-441) draws an analogy between competition based on innovations in the cultural sector and price competition in other industries. As oligopolists in other industries are unwilling to rock the boat with price reductions, similarly oligopolists in cultural industries may be unwilling to upset the status quo by introducing highly innovative goods. This is aggravated by the unpredictability of consumer response to any such new offering which is inherent to the cultural and creative industries. (ibid.) These factors may make it tempting for large corporations in the cultural industries to offer moderately innovative and predictable goods without much diversity.

The theme of concentration and diversity has been especially popular in the USA because of their anti-trust laws. Cultural industries have had their own major anti-trust trial by which the Motion Pictures Patents Corporation was disintegrated (see Mezias and Boyle 2005). In addition, interest in the concentration of cultural producers and diversity in their offerings is based on the special position that the media industries have in society (see Wirth and Bloch 1995).

The first empirical study on the relationship of concentration and diversity was published by Peterson and Berger in 1975 and it concerned the music recording industry. The study is based on data from Billboard Hot 100 charts between 1948 and 1973. Peterson and Berger (1975) found that as the majors have oligopolised the market the diversity among products has decreased. This phenomenon was aggravated by the major firms' efforts to monopolise resources, such as distribution channels, songwriters and performers, by issuing long contracts with them. Popular performers were unable get their more experimental material to the market through alternative record labels as their contracts bound them to a single label. Also, even given the chance with such experimental material, the alternative independent labels would have faced serious difficulties in distribution. Peterson and Berger (1975) reached the conclusion that competition leads to diversity and concentration to homogeneity.

Peterson and Berger's (1975) paper went without much debate for 17 years before opposing views emerged. Lopes (1992) disagrees with Peterson and Berger (1975) and argues that market concentration has not led to homogeneity because the majors have adopted an open system approach to music production. The closed system of in-house development characteristic of the 1940s and 1950s has been replaced with an open system where music is produced by semiautonomous label divisions within each company, which establish links with independent labels and independent record producers. In the 1980s the ratio of labels to firms in the top 100 music charts has risen considerably indicating a greater number of decision-makers. Despite continuing market concentration in the 1980s, the numbers of new artists in the charts has risen. The number of established artists in the charts has remained constant since the early 1970s, which indicates that homogeneity has not increased. Despite the oligopolisation of the popular music market innovation and diversity have increased during the 1980s. "High market concentration produces no single, inevitable effect on innovation and diversity in large culture industries: instead, the effect of high market concentration depends on the organization of the specific industry and the structure of its market." (Lopes 1992, p. 70)



Burnett's (1992) findings are similar to those of Lopes (1992). Burnett (1992) states that there is no longer a negative relationship between concentration, measured as the percentage of top-selling records produced by the majors, and diversity, measured as the number of different top-selling records, in the music industry. According to Burnett's (1992) findings, the concentration of the recording music industry was at an all-time high during the 1980s but at the same time diversity increased considerably. This finding is accounted for by the adoption of the open system model of music production by the major companies. According to Burnett (1992, p. 765), the growing international youth culture and a differentiated audience forced the multinationals to continuously present new styles and artists to maintain their dominance.

The studies mentioned so far have measured diversity as the number of different artists that have reached the number one chart position or other top chart position in a given time frame. Thus all artists have been seen as different from each other independent of styles or genres. Alexander's (1996) study takes a different approach as it is based on an entropy index of actual music characteristics. In this methodology songs go into a matrix based on such characteristics and songs in different cells are treated as equally different from each other. Alexander (1996) finds that both very low and very high levels of concentration are correlated with product homogeneity. Thus the optimum environment for product diversity is a moderately concentrated market structure. In their reply Peterson and Berger (1996) argue that Alexander's metrics for music characteristics are flawed. They state that taking into account only a limited portion of possible music characteristics simplifies the situation too much. Furthermore, they criticise the classification of songs as either similar or different without accounting for different degrees of similarity. Two songs differing by one characteristic and two songs differing by all characteristics are calculated to contribute equally to diversity. Peterson and Berger (1996) end up taking the stance of Lopes (1992) and Burnett (1992) that creative control has been dispersed more widely inside the majors to competing divisions and numerous labels and this has contributed to a growth in product diversity.

In a later study Dowd (2004), too, found that the open system effect for diversity is stronger than the concentration effect for homogeneity. Lee's (2004) study, on the other hand, looks into the concentration of the radio industry and concludes that the consolidation of the radio industry did not have an effect on the number of distinct radio formats but the number of songs that were able to become hits decreased.

Very little research on the relationship of concentration and diversity has been conducted outside the music industry. This may be due to the exceptionally good availability of the music chart data on which the measures of both diversity and concentration have been based. The measurement of diversity, however, is not a straightforward matter. The measurements used so far have calculated diversity as the number of artists, records or songs that reach consumer popularity. There is no guarantee that these artists, records or songs are actually diverse in any culturally meaningful way. The measurements used indicate multiplicity rather than diversity (see Hesmondhalgh 2002, p. 76). Many voices do not guarantee different messages.

The challenge of measuring diversity has been tackled by Benhamou and Peltier (2007) using three different diversity measures in their study on the French publishing industry between 1990 and 2003. First, variety was measured by the number of titles published. Second, balance was measured in the distribution of sales among different titles. Third, disparity was measured by how much the products differed from each other regarding their content. The conclusion was that diversity measured by variety has increased, but when the measures of balance and disparity are used diversity seems to have decreased.

Despite its shortcomings, the research on the relationship of industry concentration and product diversity offers a useful building block for considerations of industry evolution in the cultural and creative domain. Eras of low and high degree of diversity at the first glance correspond to the eras of ferment and of incremental innovation. However, early motion pictures as well as early video games were rudimentary and homogenous. Motion pictures were initially sold as commodities and the first video games were similar Pong clones. The diversity of the product content took years to develop. Some sort of industry maturation was required for more culturally diverse products to emerge. It may well be that a degree of technological evolution and the development of dominant technological solutions enabled growth in content diversity. The open system model of cultural production increases diversity while associated powerful gatekeepers have the power to decrease it. However, horizontal differentiation and diversity in tastes create the requirement for cultural diversity in products just as the artists have the inherent drive to be original. Ultimately the question is whether the innovations produced in the cultural and creative domain can be classified into radical and incremental or competence-destroying and competence-enhancing ones. Technological innovations, such as the introductions of film projector, home computer and compact disk, are relatively easily classified. Innovations in content, i.e. new symbols, characters and styles, are far harder to fit into the conceptual frame of industry life-cycle model.

#### *3.4.5 Different kinds of innovations*

Many studies on innovation within the cultural and creative industries are concerned with technological innovations. Examples of such technological innovations that have received considerable attention include, for example, CD technology and its effects on the music industry (Burnett 1992) and the adding of speech to motion pictures (Moul 2001). In studies on the games industry, too, the emphasis has been mainly on technological innovations and on the hardware side of the industry. A good example of this is Gallagher and Park (2002) according to whom two dominant designs have emerged in the games industry, namely cartridge-based and CD-based systems. The balance between the success of the two solutions has shifted across consecutive console generations. Williams (2002), on the other hand, concludes that the games industry is mature as it has become concentrated and innovations have decreased. However, his study deals almost solely with the hardware side of the industry and presents no data to back up such claims concerning the software side, which he defines as the “vibrant and creative development fringe”.

The lack of emphasis on aesthetic and stylistic innovations in industry evolution has been noted by Tschmuck (2003) in his study on the music industry. He states that this is a “crucial oversight” as

the evolution of creative and cultural industries cannot be explained solely through technological innovations, but the analysis should be broadened to aesthetic and stylistic innovations. However, Tchmuck's (2003) work does not help us much in this respect as his analysis of innovations within the music industry is limited to technological innovations. In Mezias and Kuperman's (2001) work on the film industry two major changes in product are mentioned. The shift from kinoscope to projectors created the opportunity to serve larger audiences and the shift from short films to features enabled continuous consumer interest. Restricting the concept of innovation to such technical advances fails to fully appreciate the value of the cultural product, its demand and production process. Concentrating on equipment or film length is rather simplistic.

The solutions to this shortcoming are scarce, but the work of Cappetta et al. (2006) on stylistic innovation within the fashion industry is usable. In their framework firms face periods of ferment and periods of convergence. During the former many stylistic variations are present, whereas during the latter offerings converge to a single trend which corresponds to the dominant design of the industry life-cycle literature. They argue that even though fashion firms offer differentiated products there is convergence to an underlying trend that communicates different intangible meanings. Instead of technological compatibility there is social and aesthetic compatibility. In their empirical study Cappetta et al. (2006) find that there are periods of ferment during which more new styles are introduced compared to the periods of incremental change. During periods of ferment entrants are also more innovative than incumbents and during periods of incremental change the incumbents are more innovative. However, they find that incumbents still outperform entrants in both kinds of periods. They hypothesise that this is due to the strengths of the established brands to create popularity for new designs independent of the phase of the cycle. Cappetta et al. (2006) emphasise that in the fashion industry the designs converge to a trend, while in technological innovations one variant dominates. However, they also point out that stylistic and technological innovation may reinforce each other. New materials and developments in the production system broaden the possibilities for creating new styles.

The idea of new genres as innovations has reached a noticeable level of popularity in the creative and cultural domain. This conceptualisation has been followed by Peterson and Anand (2004) concerning the music industry and Perretti and Negro (2007) concerning the film industry. Most importantly, the idea of genres as dominant designs in video games has been put forward by Tschang (2007). In earlier work Tschang and Szczypula (2006) concluded that evolution in the game software industry is unbounded as there are no dominant designs. Later on, however, he took the stance that game genres, such as first-person shooter or real-time strategy, define dominant designs of game content. New genres are radical innovations whereas games that extend a genre are incremental innovations. He mentioned the following genres as established dominant designs: adventure, first-person shooter, role-playing, simulation, strategy, real-time strategy, music, MMORPG and virtual life. Furthermore, Tschang (2007) came to the conclusion that game development is a mature industry since no new dominant designs have emerged in recent years. The latest one of these, namely the artificial life genre, was brought to the market in 2000.

In addition, the emergence of large publishers, the importance of established IP and growing project and team size are mentioned as signs of industry maturity. Firms concentrate on well-established genres to avoid uncertainty. As a further indicator of industry maturity Tschang (2007) mentions that in 2002 of the top 20 publishers' titles only 25% were based on original IP. This begs the question whether 25% is a little or a lot in this situation. A quarter of products having never before seen unique characteristics is unthinkable in mature manufacturing sectors, such as automobiles, televisions or computers. Another debatable logic in Tschang's (2007) paper is that of the rationale for innovation. Tschang states that game developers innovate to test the innovativeness of a design, to make a name for themselves beyond subcontractor status or to satisfy the inner yearning of game designers to create novelty. This misses the economic reality as some firms may choose to innovate simply to stay in business. A good example of this is Miller and Shamsie's (1999) study on film genres by major Hollywood film studios between 1936 and 1965. It shows that declining demand encouraged firms to offer greater variety and broader distribution. Shrinking demand induced experimentation whereas healthy levels of demand allowed the firms to continue without changes. On the other hand, when firms did not get awards and when costs went up variety was reduced.

Research on innovations within cultural and creative industries has so far concentrated on technological innovations. The study by Cappetta et al. (2006) on stylistic innovation is an important step towards understanding other than technological innovation in this context. Furthermore, Cappetta et al. (2006) call for research on the complementarities between stylistic and technological innovation which they identify as a theme that is so far underdeveloped in the literature. It appears that in cultural and creative industries innovations should be classified into stylistic/aesthetic and technological, in addition to incremental and radical or competence-enhancing and competence-destroying, to analyse industry evolution.

Genres have been suggested as the concept corresponding to dominant designs in cultural and creative industries. This conceptualisation, however, has its shortcomings. Dominant designs are selected from a competing population and there is a limited number of them present at the same time. As a new genre emerges the competitive situation is not so clear as the new genre does not need to replace existing genres but attract enough demand to co-exist with previous ones. Thus the number of genres existing at the same time is not limited to the same degree as is the case with dominant designs. Furthermore, the limits of genres are more fluid than those of dominant designs. Films, music recordings, novels and games are often classified under several genres and different sources may classify them differently. With technological solutions there are rarely differences of opinion on which dominant design the solutions corresponds to. New genres may well serve as major stylistic innovations, but attention should not be limited solely to these.

### 3.5 Research questions

The literature on cultural industries poses several challenges to the industry life-cycle theory relating to innovative behaviour and competitive process. Discrepancies concerning innovative behaviour come from the assumption in industry life-cycle theory of an alternation of eras of radical and incremental innovations and concentration on technological innovations. In the literature on cultural industries it is emphasised that innovations are required continuously and especially in the stylistic or aesthetic domain. The competitive process, on the other hand, is posited in the industry life-cycle theory to build on increasingly well-defined performance metrics as well as on scale economies and cumulative learning. The literature on cultural industries, however, assumes fuzzy performance criteria independent of market age and also scale economies and cumulative learning are less clear.

First of all, the sequence of innovations posited in the industry life-cycle theory, i.e. radical innovation followed by incremental innovations, is challenged in the literature on cultural and creative industries. The constant requirement of novelty independent of market age dampens this fluctuation. It appears that managers are more in favour of incremental innovation whereas the creatives are prone to radical innovation. At the industry level the majors seem to prefer incremental innovation whereas the independents prefer radical innovation. Thus there is tension within the firms and a division of labour among them concerning innovation.

In addition, the direction of attention to technological innovations underlying the industry life-cycle theory fails to take into account stylistic or aesthetic innovations, which are frequent within the cultural and creative industries. Patterns in both technological and stylistic innovations build the industry life-cycle and they may be interconnected. Genres have been suggested as the concept corresponding to dominant designs in cultural and creative industries. New genres may well serve as major stylistic innovations, but in addition to them innovations come in the form of new symbols, characters and styles. The classification of these into minor and major, competence-enhancing and competence-destroying or radical and incremental is challenging. Industry concentration and product homogeneity have been found to correlate, which corresponds to the era of incremental innovation, whereas periods with a lower degree of concentration and associated product diversity correspond to the era of ferment. However, the diversity encountered today in films and games is far higher than that of early variants, which were clone-like and sold in bulk. Thus some sort of maturation was required for stylistic diversity to increase.

To understand the specificities of the life-cycle dynamics of the games industry, innovation patterns need to be analysed. The industry life-cycle theory predicts qualitative change in the nature of innovations as the life-cycle proceeds. This proposition is to be followed by formulating the following research question:

*Q1a. What kinds of patterns of innovation in hardware (technological) and software (technological and stylistic) can be detected in the history of the games industry?*

The next task is to analyse the connections between the innovation patterns among different classes of innovations, and this gives us the following research question:

*Q1b. What kinds of interconnections are there between the patterns of different kinds of innovations?*

Interconnections between innovative activity in hardware and software will shed light on the dynamics of complementary industries. The interconnections between technological and stylistic innovations within software will offer insight into the specificities of innovations within cultural and creative industries. This follows the call by Cappetta et al. (2006, p. 1286) to explore the complementarities between stylistic and technological innovations.

Furthermore, the patterns observed need to be explained through the micromechanisms that produce them. The interest here is on entries as well as on the procedures followed in the creation of new games. The innovation process is not seen as random but as a purposeful process directed by factors both internal and external to the firm. This results in the following research question:

*Q1c. What factors direct the innovation process?*

During the interviews it became apparent that the development firms actively communicate with each other. The next question thus aims at explaining this phenomenon.

*Q1d. What factors motivate communication among firms?*

The rest of the questions relate to the competitive process. The literature on cultural and creative industries highlights the non-utilitarian nature and the horizontal differentiation of the products. In addition, a specific characteristic of the cultural and creative industries is the plurality of gatekeepers whose scrutiny the products must pass to reach the consumer. Moreover, the consumers know which cultural products they like only after consumption and their preferences change through cumulative taste formation. All these characteristics imply that within the cultural and creative domain performance criteria are fuzzy and remain so independent of market age. This questions the accuracy of the assumption of the industry life-cycle theory of transition from vague to specific and well-defined performance criteria.

Furthermore, the economies of scale and cumulative learning that give rise to incumbent advantage appear not to be as strong in the cultural and creative domain as the industry life-cycle theory posits. The reproduction of creative content, i.e. manufacturing CDs, DVDs, books etc., seems mature, with large scales and low unit costs. However, the value of the product is manufactured in the creative process in which economies of scale and cumulative learning are less. Whether it is more efficient to develop several games at a time in the same studio or just one or a small number of games in each studio is not known. Furthermore, the extent to which game developers become more efficient through cumulative learning is perhaps not equal to the assumptions of the industry-life cycle theory as each product needs to be different from the previous ones. The work on cultural and creative industries implies that management challenges grow disproportionately to firm size.

Furthermore, Baumol's cost disease may prohibit the development of economies of scale in cultural and creative production. This means that efficiency gains and scale economies in creative work are debatable. In addition, dominant artists can charge a premium compared to lesser known variants, which goes against the assumption of cost reduction following the emergence of the dominant design.

To understand the competitive process in the games industry, concentration, entry and exit rates as well as firm numbers need to be analysed. Due to restrictions on data the industry concentration can be calculated only for the past two years and data on the entry and exit rates in the software side of the games industry can be collected only concerning Finnish firms. Statistics on the Finnish case are not representative of the global games industry but can indicate changes in the ability of the global market to absorb products from entering firms. This translates into the following questions:

*Q2a. What is the level of concentration in the games industry?*

*Q2b. How has the ability of the game market to absorb new entrants changed in 1990-2007?*

After diagnosing the competitive process, the micromechanisms that produce competition are explored. The first task is to find out how the executives of the firms perceive competition. This gives us the following research question:

*Q2c. What factors govern the ability of a game development firm to create successful products?*

This question looks at the situation from the viewpoint of the multitude of game ideas that go through a filtering process after which a small portion end up as hits. This view is complemented with the viewpoint of the development firm and its struggle to create a game that sells well. This problem is approached through the following research question:

*Q2d. What factors limit the sales of a game product?*

Questions 1a, 1b, 2a and 2c form a diagnosis of the evolution and the state of the games industry based on the concepts of industry life-cycle theory. Questions 1c, 1d, 2c and 2d explore the micromechanisms of the games industry that can explain the observed life-cycle dynamics. This is described in Figure 3.

<b>Dynamics:</b> Diagnosis	Q1a. Innovation patterns Q1b. Interconnections	Q2a. Concentration Q2b. Ability to absorb entrants
	Q2a. Innovation process Q2b. Communication	Q2c. Limits to ability Q2d. Limits to sales
<b>Micromechanisms:</b> Explanations		
	<b>Innovative activity</b>	<b>Competitive process</b>

**Figure 3.** Positioning the research questions.

The research questions comprise two analytical steps. The first step is the diagnosis of the industry dynamics and the second step is to explain such findings with the micromechanisms. The methods used in each step are described in the following chapter.





## 4 Data and methods

The objective of the empirical enquiry is to examine the applicability of the concepts and propositions of the industry life-cycle theory in the analysis of the games industry. The review of the literature on cultural and creative industries gives an indication as to what can be expected to be found. Tschang (2007, p. 990) suggests that it may be that particular creative industries do not settle down to a dominant design followed by the era of incremental innovations as such industries are driven by the ongoing tension of creative innovative and rational business interests. Whether this is the case within the games industry, or something more complex, remains to be seen.

The empirical enquiry comprises two analytical steps. The first one aims at understanding the dynamics of game hardware and software sectors through the concepts and variables of industry life-cycle theory. The second step aims at understanding the micromechanisms of the game development industry through interview data and qualitative systems dynamics modelling. This way the observations of the industry dynamics can be explained through the micromechanisms that produce them. Comparable two-step approach has been used by Huygens et al. (2001), whose study on the music industry evolution comprised a historical study based on secondary sources and a multiple-case study based on interview data.

### 4.1 Data and methods for understanding industry dynamics

As was already noted in section 2.4.2, industry life-cycle studies can be divided into those that investigate one or a small number of industries and those that investigate a wide panel of industries. The former usually combine qualitative and quantitative data (e.g. Abernathy and Clark 1985; Anderson and Tushman 1990; Henderson and Clark 1990; Klepper 2002a; Murmann and Homburg 2001), whereas the latter rely on quantitative data and the building of formal models (e.g. Agarwal 1998; Agarwal and Bayus 2002; Gort and Klepper 1982; Sarkar et al. 2006). As the purpose in the present study is to concentrate on one industry, i.e. the games industry, a combination of quantitative and qualitative data is used. In line with earlier research the evolutionary path of the industry is constructed by creating a detailed historical narrative.

Industry life-cycle studies usually track changes in the following variables: entries, exits, firm numbers, output, price, performance, concentration and inter-firm sales variability. In addition, the occurrence of different kinds of innovation is followed based on various innovation classifications. Entries and exits are often tracked based on industry directories, such as the *Thomas Register of American Manufacturers* (e.g. Agarwal and Gort 2002; Agarwal and Bayus 2004) that lists firms in a wide array of industries. In addition, industry specific listings including *Ward's Automotive Yearbook* (Abernathy et al. 1983) and *Disk/Trend Report* (Filson 2001) are often used. In general, industry life-cycle studies rely on a multitude of data sources in order to track changes in the

variables of interest and the occurrence of other industry events that have played a role in industry evolution. For example, Agarwal and Bayus (2002) report using data from the *Thomas Register of American Manufacturers*, industry associations, Government Statistics Bureaus, trade press, product directories and price guides, historical accounts and personal communications with experts. Similarly, Anderson and Tushman (1990) used directories, historical accounts, company reports, company installation censuses and trade press. Abernathy et al. (1983) used popular accounts on the industry, government reports, company histories, prior academic research, trade press and publications by industry associations specifically to trace innovations. Also patent data has been used to trace innovative activity (e.g. Agarwal 1998). Relevant performance metrics are often seemingly easily identified. For example, Anderson and Tushman (1990) determined square feet per hour and bottles per minute as the performance criteria for the glass industry, barrels per day for the cement kiln industry and microseconds per CPU cycle for minicomputers. Abernathy et al. (1983) applied a different approach as they determined performance criteria based on which features were advertised in car ads.

The data sources used in the present study were also various. The purpose of constructing a historical narrative on the evolution of the games industry was to understand the industry context and to be able to trace changes in variables of interest and the occurrence of innovations. The data have been collected from books, reports and websites. The books include monographs, such as Kent (2001), DeMaria and Wilson (2004), Forster (2005), Fox (2006) and Newman and Simons (2007), which are popular accounts on the history of the games industry. The reports are by governmental organisations, such as the British Department of Trade and Industry and the Australian House of Representatives, as well as industry organisations, such as the Entertainment Software Association (ESA) and the Entertainment & Leisure Software Publishers Association (ELSPA). Websites covering data on game hardware and software, such as gamefaqs.com, gamerankings.com, mobygames.com, gamedevmap.com, ultimateconsoledatabase.com, fan sites and company websites, have been used to gather data on game devices, games and their influence, genre classifications, developers, publishing dates and to corroborate details. Games industry related news websites, such as gamasutra.com, gamespot.com and developmag.com, have been used to gather information especially on recent events. Also prior academic research has been used to elicit facts.

The available data allow the tracing of many core industry variables. However, there are limitations and some assumptions have had to be made. First of all, innovations are tracked separately for hardware and software. For hardware the innovations are technological and they are followed through device generations. This approach is common in games industry related literature and press. The division of devices into generations is done following Kent (2001), DeMaria and Wilson (2004), Forster (2005) and Fox (2006). The tracking of innovations and changes in performance metrics is done with the help of a proprietary database of 117 home game devices introduced between 1972 and 2006. The database includes data for each device concerning producer, launch date, generation, whether the device was a commercial success, country of origin, game storage media, significant innovations introduced by the device and performance in three performance metrics introduced below. The database excludes unauthorised clone machines, such as Coleco Gemini, which is an Atari 2600 clone and Chitendo Vii, which is an inferior Nintendo Wii clone.

The performance metrics followed include CPU bit capacity, number of colours that the device can display and graphics rendering capability in polygons per second. The identification of these performance metrics was relatively easy as they have been often mentioned in games industry related literature as well as in advertisements for the devices.

Software innovations were classified into technological and stylistic following Cappetta et al. (2006). Technological innovations include the introduction of 3D graphics and motion capture, for example. Technological innovations were divided into major and minor. This kind of classification has previously been used in empirical work by Gort and Klepper (1982), for example. It is a simpler version of the classification used by Abernathy et al. (1983) where a seven-point scale is used to judge between innovations with very little impact and innovations that are major disruptions. In the present study, innovations introducing new functions are classified based on whether they are technologically trivial or technologically ambitious. For example, high score is a technologically trivial innovation whereas angles and zoom is an ambitious one. The trivial ones are deemed minor and ambitious ones major innovations. Innovations relating to graphics and visual realism are major when they introduce a new process into game development. Minor innovations are refined versions of doing something that has also been done before.

Stylistic innovations are to a considerable extent tied to genres. The aim is to identify an introduction innovation and a refinement innovation for each genre. The concept of refinement innovation has been used previously, for example, by Clark (1985) and Jovanovic and MacDonald (1994). In Clark's (1985) model refinement innovations are abundant and reinforce commitments to the existing dominant design. In the Jovanovic and MacDonald (1994) model an invention is followed by a single refinement innovation that commercialises the original idea. Here the analysis is done in the spirit of Jovanovic and MacDonald (1994), as for each genre an introduction invention and a refinement are identified. The introduction innovation corresponds to the game that first introduces the kind of gameplay that the genre defines. The refinement innovation corresponds to the game that is identified as having popularised the genre or created standards for the genre.

The classification of game related innovations is challenging. Such classification has been attempted by Sapsed et al. (2007) who defined game ideas presented by developers either disruptive or sustaining. In their classification game ideas for PC and consoles end up on the sustaining pile and ideas for mobile, online and DVDi games end up on the disruptive pile. Thus their classification is based on hardware choice rather than on software characteristics. Here the aim is to identify stylistic innovations on the basis of content characteristics rather than technological choices. Both technological and stylistic innovations in software are tracked and the classification into minor and major innovations is used for technology and into introduction and refinement innovations for game content.

In addition to classifying innovations as described above, the objective is to assess the interconnections of the innovation frequency in different innovation classes. This cannot prove

causality but will yield the order in which innovative activity has taken place in different innovation classes.

In terms of output, the available data allow the consideration of changes in console game sales in both units and dollars. Based on these, changes in price can be calculated. However, such data is available only for the period 1996-2007 and limited to the US market.

The hardware database allows the examination of entries and exits by generation. Thus, rather than the actual entry and exit timings of the firms, the analysis is based on the introduction of the first device by the firm (entry) and the emergence of the first generation in which the firm does not introduce any devices (exit). As international data for the entries and exits in game software are not available, Finnish firms are used as a sample of the international games industry. The data is gathered one firm at a time from the Business Register of Statistics Finland. The list of firms was constructed based on the listing of members at the Neogames<sup>7</sup> website, newspaper and magazine articles, Tekes project participant listings and trade expo participant listings<sup>8</sup>. The goal was to include all firms existing at some point since 1990. The firms were included in the data set if they claimed to be developing and/or publishing games or technology specifically for games. Thus firms that have not yet shipped a finished game were also included. It is probable that each and every firm did not end up in the dataset. However, this may be offset by the fact that some of the included firms had also other than game business and two of the firms each constituted of three legal entities that showed up as separate firms in the data set. Also, for this reason those legal entities that did not have any game business, despite the other entities of the firm engaged in games, were excluded. Even though Finland represents a small percentage of international game production, exit and entry trends in Finland reflect the ability of the international game market to absorb new entrants and their products as all Finnish firms aim at the international market.

The analysis on entries, exits and firm numbers is complemented with an analysis on industry concentration in game development. This is done with the help of the Herfindahl index and the four-firm concentration index. The Herfindahl index is commonly used to assess market concentration. It is the sum of the squares of the market shares of firms populating the market.  $H$  denotes the Herfindahl index,  $n$  the number of firms and  $s$  the market share of a firm. It ranges from  $1/n$  to 1. Smaller values indicate lower level of concentration whereas values close to 1 indicate a high level of concentration.

$$H = \sum_{i=1}^n s_i^2$$

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<sup>7</sup> Neogames is a Finnish state funded organisation that specialises in promoting game business, research and development. See [www.neogames.fi](http://www.neogames.fi). Its member listing can be seen as an industry directory.

<sup>8</sup> This means firms that have taken part in Game Developers' Conference or Electronic Entertainment Expo listed by Tekes, Neogames or conference organisers.

The reciprocal version of the Herfindahl index is also used because its interpretation is more convenient. It can be interpreted as the number of firms that would populate the market if all firms were the size of the largest ones. It ranges from 1 to  $\infty$ . The smaller the index the more concentrated and thus the more mature the industry.

$$H^* = \frac{1}{\sum_{i=1}^n s_i^2}$$

The four-firm concentration is a simpler index as it is the percentage of sales that the four largest firms in the market control.

The data used to calculate the values of these indexes come from the *Develop* 100 rankings that the *Develop* magazine has been publishing since 2004. These rankings list the most successful game developers according to their UK retail revenue. These rankings are only available for 2007 and 2006 covering the sales figures and thus the index values can be calculated only for 2006 and 2007 (see French and Walbank 2007; French et al. 2008). As it is not possible to observe a long-term trend, the values need to be compared to suitable signposts. For the Herfindahl index the comparison is made with the US Department of Justice guidelines and the maturation process of the early car manufacturing industry. The index values are calculated in four varieties. As many of the studios in the ranking are owned by other companies the values are first calculated by treating development studios as independent firms and secondly by assigning the sales of each studio to their owner. As the 100 firms in the ranking do not cover the entire market the index values are calculated firstly by treating the sales of the 100 studios as the entire market and then by filling the market with small firms according to the actual market size. The size of the market is retrieved for 2006 from the Games Investor Consulting Ltd. (2007, p. 45) report. For 2007 the UK market size is approximated based on the US sales for 2007 and the relationship that US and UK sales had in the 2000s. The US sales figures come from the ESA (2008). According to the ELSPA/TIGA (2005, p. 15) UK is the third largest game market after the US and Japan. In Europe the UK is the largest market with 32.8% of European sales followed by Germany with 17.9%, France with 15.3% and Scandinavia with 7.7 % (ibid.). For its size and because of its mainstream flavour the UK market can serve adequately as a proxy for the global game market.

## 4.2 Data and methods for understanding micromechanisms

Industry life-cycle studies often rely on data from one country. Most of them are based data from US industries and markets. Examples of these include Abernathy's (1978) study on the car manufacturing industry, Anderson and Tushman's (1990) study on the cement, glass and minicomputer industries and Klepper and Thompson's (2006) study on the laser industry. Also most panel studies are based on US data (e.g. Gort and Klepper 1982; Geroski et al. 1987; Agarwal and Bayus 2004). However, other countries have also served as data sources for industry life-cycle studies. Such studies include Cefis and Marsili's (2005; 2006) studies on manufacturing

industries using Dutch data, Santarelli and Vivarelli's (2002) study on electrical engineering industries using Italian data and Cacciatori and Jacobides' (2005) study on the building industry using UK data.

The studies based on US data seldom mention this geographic limitation at the title level. Exceptions to this rule include Klepper and Simons (2000) study on the US television industry, Dowell and Swaminathan's (2000; 2006) studies on the US bicycle industry and the study on the US brewing industry by Tremblay et al. (2005). The studies based on non-US data from one country more frequently mention the geographic limitation at the title level. Examples of such studies include Roberts and Amit's (2003) study on Australian retail banking, the study on the Dutch newspaper industry by van Kranenburg et al. (2002) and Wezel and van Witteloostuijn's (2006) study on the UK motorcycle industry. However, many studies based on non-US data treat the country serving as the data source as a sample of the global industry. Such studies include Levinthal's (1991) study on the newspaper industry using an Argentinean and Irish data sample, Santarelli and Vivarelli's (2002) study on electrical engineering industries using an Italian data sample, Czarnitzki and Kraft's (2004) study on R&D investments using a German data sample, Cacciatori and Jacobides' (2005) study on the building industry using a UK data sample, Cefis and Marsili's (2005; 2006) studies on manufacturing industries using a Dutch data sample and Kim and Park's (2006) study on the telecom industry using a Korean data sample.

In many studies on cultural and creative industries the data sample is severely limited. Some studies are based on data limited to a particular firm or production, including Robins' (1993) study on films produced by Warner Brothers, Power and Hauge's (2008) study on the evolution of the Burberry brand, Glynn's (2000) study on the Atlanta Symphony Orchestra and Dempster's (2006) study on *Jerry Springer the Opera*. Others are limited to the developments in a particular city, including de Berranger and Meldrum's (2000) study on the creative city initiative of Manchester and Grabher's (2001; 2004) studies on the ecology of advertising agencies in London. Understandably, many studies on the film industry concentrate on the developments in Hollywood (e.g. Storper 1989; Miller and Shamsie 2001; Elsbach and Kramer 2003; Lampel and Shamsie 2003; Sorenson and Waguespack 2006; Perretti and Negro 2007). Some studies, however, have tracked the entire US film industry (Mezias and Kuperman 2000; Mezias and Mezias 2000; Mezias and Boyle 2005).

Studies concerning the music industry have mostly used US data (Peterson and Berger 1975; Lopes 1992; Alexander 1996; Anand and Peterson 2000; Anand and Watson 2004; Dowd 2004), while some of the exceptions include Mol et al.'s (2005) study based on Dutch data and Burnett's (1992) study based on international data. Moreover, studies on music industry dynamics based on a data sample limited to one firm and its partners have been carried out (Gander et al. 2007; Ordanini et al. 2008). Studies on the fashion industry are often limited to Italian data (Mora 2006; Cappetta et al. 2006), while comparisons among different countries have also been conducted (Djelic and Ainamo 1999).

Similar to studies on other cultural and creative industries, studies on the games industry often rely on a data sample limited to one country. Many of the studies concentrating on the management

issues of game developers are based on UK data. Such studies include Grantham and Kaplinsky's (2005) study on innovation management, Readman and Grantham's (2006) study on capabilities essential in game development and the study on business clinics by Sapsed et al. (2007). Exceptions to this include Tschang's (2005; 2007) studies on rationalisation and creativity based on US data and Cohendet and Simon's (2007) study on creativity and efficiency based on Canadian data. Some studies also use data from several countries, including Johns' (2005) study based on mostly UK and East Asian data and Cadin et al.'s (2006) study based on data from US, Canadian and French firms. Most of the papers analysing competition among game devices and associated network effects are based on US data (e.g. Shankar and Bayus 2003; Clements and Ohashi 2005; Gallagher and Park 2002).

The sample used in the second step of the present study is limited to Finnish firms. The choice to use data from a single country was made for access reasons. Openness is a part of Finnish business culture, which was proven by most of the interviewees being enthusiastic to share their experiences and perceptions once the meeting for the interview was set. Thus this sample allowed the extraction of good quality interview data. Moreover, the Finnish firm population is relatively small and a substantial portion of the firms could thus be accessed. This aided in tracing links between the firms in the sample. Furthermore, all of the Finnish firms aim at the international market and pitch their game ideas to the same global publishing companies and mobile operators as do British, French, Australian and Canadian firms. This makes their business logic very similar to other game development regions as in very few countries the domestic market is large enough to sustain domestic game production. Exceptions to this rule include USA and Japan, where domestic markets may be sufficient to cover the costs of large-scale game development projects. However, also in those countries the business of game development is dependent on the favourable attitude of the gatekeepers.

Data was gathered through semi-structured interviews with executives. The number of interviewees was set at 11 and they represented eight different firms. It was soon realised that interviewing several people in the same firm, especially in small firms, results in redundant information. On the other hand, gaining access to each firm turned out to be the most time consuming part of the data collection process. As the aim was to achieve a profound understanding it was decided to concentrate efforts on a limited number of firms and conduct in-depth interviews.

The sampling strategy used in this study has characteristics of both representative and theoretical sampling. The chosen firms differ in terms of age, number of employees, position in the value chain, technological platform and content strategy. Thus the firms represent the variation originating from differences in these factors. However, these differences are also theoretically meaningful. The business is conjectured to be different for (1) new start-ups and seasoned firms, (2) for small and large firms, (3) for firms that publish their own games in contrast to firms who only do game development, (4) for firms producing mobile games compared to firms making console or PC games and (5) for firms developing only particular kind of content in contrast to those willing to do any kind of content. Such decisions, or inevitabilities, lead to different kinds of business environments.



The proportion of firms in the sample developing games for each platform type was roughly determined on the basis of such proportion in the entire Finnish population. In a survey of the Finnish games industry by Neogames (2006) 70% of the respondents reported developing mobile games whereas 20% reported developing console or PC games and 10% reported developing games for other platforms. Furthermore, the firms were chosen from among those firms that have managed to turn game development into a real business and where the majority of the turnover comes from game-related business. This means that hobbyists' firms as well as those with games as a minor part of the business were discarded. In Table 10 the chosen firms are introduced. They were chosen from the population of 80 Finnish game firms (Figure 23, Chapter 5.5.1) on the basis of the criteria presented above.

**Table 10.** The sample and the basis for theoretical and representative sampling.

Firm	Founded	Employees	Platform	Subcontractor	Developer	Publisher	Content strategy
Alpha	2004	35	Mobile		•	•	Content includes a statement
Beta	2002	27	Mobile	•	•		Anything goes
Gamma	2000	24	Mobile		•	•	Anything goes
Delta	1999	100	Mobile		•	•	Social and casual
Epsilon	2000	170	Online, mobile, handheld, console		•	•	Social
Zeta	2002	9	PC, online	•	•		Based on Finnish culture
Eta	1995	25	Console, PC		•		Action-adventure
Theta	1995	13	Console, PC		•		Creative but not too creative

The interviews were conducted during March-April 2006. During the 18 months following the interviews the firms went through some changes mainly in the number of employees. The situation of the firms in November 2007 is presented in Table 11. The information about the changes was collected from the firms' websites and press releases as well as through personal communications with the interviewees. The references have not been itemised in order to preserve the anonymity of the firms. Two of the firms filed for bankruptcy whereas the rest grew steadily. Two of the firms were sold abroad and two of the firms both acquired a firm.

The structure of the interview was created to reflect the theoretical framework. The questions were divided into four themes: (1) the early phases of the firm and the innovation process, (2) how and what kind of competition the firm faces, (3) what other forms of interaction there are between firms and (4) general issues of the games industry in Finland. The fourth theme could be seen as introductory and might have served better as the first theme. However, it was kept to the end because the other three themes had to be prioritised in case of time running out. The interview questions that were originally in Finnish are attached as Appendix 2 in English. The interview questions were grouped under the actual questions that were essential in answering the research questions. For example, it was essential to find out what kinds of selection mechanisms operate

within the industry. However, the interviewees would have found it hard to relate to such a question. For this reason the interview questions to elicit this information were phrased as: (1) What would be the dream situation for this firm? (2) What keeps you from getting there? The interview questions were iterated through two pilot interviews with an industry veteran to make sure that a common ground of discourse was achieved.

**Table 11.** Major changes after the interviews.

<b>Firm</b>	<b>Employees</b>	<b>Major changes</b>
Alpha	50	Acquired a 3D technology firm.
Beta	>40	Acquired a game developer. The whole firm has been sold to an international heavy league player.
Gamma	0	Chopped in half, both parts sold abroad. Studio part left in Finland has filed for bankruptcy.
Delta	>130	Reports growth in casual games market. Income from in-game advertising.
Epsilon	200	Steady growth and internationalisation. Acquired a Finnish online media firm.
Zeta	0	Filed for bankruptcy.
Eta	34	The game under development at the time of the interview is still under development.
Theta	16	New console project has been successful.

The interviews were taped and transcribed. Each interview took about two hours and resulted on the average of 24 pages of text (shortest 16 pages, longest 44 pages). In addition, notes were taken throughout the interviews to make it possible to revert to a given topic. This was also done as a safety measure to secure data in case of technical problems with the recorder, but the tapes turned out to be of good quality. Afterwards the firms were followed through their press releases and personal communications in connection with respondent validation. Thus, measures were taken to bring longitudinal elements into the data and its context. The data was read in a literal and interpretative manner (see Mason 2002, p. 78, 149; Lee 1999, p. 33). The literal content gave information on the actions, strategies and experiences of the firms whereas the interpretative reading gave information on assumptions, norms and attitudes, such as whether something was seen as a fair or unfair practice.

The main themes of the study were articulated before the interviews and the interviews were guided by those concepts. For this reason the coding based on those themes was unnecessary. Some instances of the themes did appear within other themes, but finding them was not a great challenge. The larger part of the organising, sorting and indexing took place within the themes. Data were sorted to create an understanding of each theme and its issues. Data were reduced by omitting details that did not make a difference to the overall understanding whereas data was complicated by collecting different experiences and thus, for example, not all firms encountered each and every difficulty described among the findings.

The findings underwent respondent validation. All the interviewees had an opportunity to comment on research papers in which the preliminary findings were presented. Some interviewees were very active in this and provided more information, some replied that everything looked fine and some remained passive.

The interview data was then used to construct a qualitative systems dynamics model of the micromechanisms of the games industry. Qualitative systems dynamics modelling originates from formal systems theory and computer simulations (Wolstenholme 1999). It has been used in modelling business operations since the 1950s, albeit the early applications dealt mainly with the flows of tangible physical entities, such as materials, manpower and capital equipment (see Forrester 1958). Since then systems theory has been developed to accommodate more abstract variables and the complexities of human interactions. Checkland (1991) labels his approach 'human activity systems' and Senge's (1990) bestseller has popularised qualitative systems thinking in management and policy circles.

In the present study the goal of the model-building exercise was to trace causes and effects. The building of the model comprised three steps. First, variables were identified from among the sorted data. These included, for example, the cash stock of the firm, the reputation of the firm and the sales of a particular game. Variables were identified from among the factors that emerged from the interviews as having an effect on other factors or as being affected by other factors. As it was soon realised that the number of variables and links between them is substantial, the model was built in four parts roughly corresponding to the interview themes.

Second, the interconnections between the variables were identified on the basis of the sorted data. For example, the sales of a particular game were deemed to affect the cash stock of the firm and the cash stock was deemed to affect the viability of the firm. Such interconnections were tagged with either plus or minus signs, as has previously been done by Senge (1990), Coyle (2000) and Sterman (2002), or with sentences, as has previously been done by Checkland (1991), to describe the nature of the interaction. A plus sign signifies that an increase in the variable at the beginning of the arrow induces an increase in the variable at the end of the arrow. An example of this is non-monetary rewards increasing motivation. In the case of a minus sign an increase in the former induces a decrease in the latter. An example of this is sweat capital, i.e. working without pay, decreasing the ability of the firm to attract skilled labour. Wording was used for more complicated linkages, such as ideation producing alternatives for concept selection and publishing deal forcing the developer to finish the game.

Thirdly, the limits of the model were defined by identifying external variables, i.e. variables on which no other variable inside the model has an effect. Such external variables eventually included founders' backgrounds and the excess money that consumers have, for example. The formulation of the states of these kinds of variables was beyond the scope of the model and they were taken as a given. Founder's backgrounds were deemed to have an effect on the viability of the firm and excess money was deemed to have an effect on sales, for example.

Qualitative systems dynamics modelling can be seen either as a step towards quantitative modelling or as the modelling end in itself. Sterman (2002) argues that settling for qualitative modelling is a manifestation of academic laziness, whereas Wolstenholme (1999) and Coyle (2000) argue that both quantitative and qualitative modelling have their advantages and purposes. Here the choice has been made for qualitative modelling as the research task in hand requires the formation of qualitative propositions rather than quantitative hypotheses. Many of the authors on qualitative systems dynamics modelling (Coyle 2000; Sterman 2002) stress that all models are wrong. This means that it is not possible to validate a model in the sense of establishing truthfulness. A model is always a simplification of reality. It is a tool to think with and intended for answering reasonably well-defined questions (Coyle 2000, p. 238).

The purpose here was to be able to explain the deviations that were found in the first step between the propositions of the industry life-cycle theory and the empirical material concerning the games industry. Such an approach has not so far been commonly used in understanding industry life-cycle dynamics. Its strength lies in its ability to shed light on how the actors perceive situations, make decisions based on them and thus at the micro level construct the process of industry evolution. The aim was to identify variables and links between them that govern the micromechanisms of the industry. In the cultural industries context systems dynamics modelling has been used by Crossland and Smith (2002) to model demand and price formation for fine arts, by Wikström (2006) to model the changes that new distribution channels induce in the music industry and by Tschang (2007) to model the tension between creativity and rationality in game development. In all of these models the goal has been to chart causes and effects. Thus this method has proven its usefulness in the cultural industries context.



## 5 Dynamics of the games industry

The following sections provide an analysis of the evolution of the games industry. Firstly, the early phases of the industry, its formation and structure are discussed. Thereafter, the technological evolution of game hardware is reviewed. This is followed by an overview of technological and stylistic innovations in software. After the evaluation of the concentration level of the game development sector, the changes in the ability of the game market to absorb new entrants is traced. Such analyses allow us to determine conformities and deviations between the industry life-cycle theory and the evolution of the games industry.

### 5.1 The history and dynamics of the games industry internationally

#### 5.1.1 *The introduction of electronic games*

There are several differing stories of the first electronic game. According to the earliest, the first game was developed in the UK. In 1951 the British company Ferranti developed the first commercial computer, the Ferranti Mark 1, in cooperation with the University of Manchester. Based on this computer they developed a game console, Nimrod, and a strategy game, *Nim*, to be played by trade exhibition visitors. After the exhibitions it was disassembled and forgotten. (Lange 2002, p. 47)

According to Poole (2000, p. 15) and DeMaria and Wilson (2004, p. 10) the first game was developed in 1958 in a US government research facility, the Brookhaven National Laboratory, by William A. Higinbotham. His game was a simple two-player tennis built for the purpose of being an entertaining exhibit for visiting members of the public.

A more often cited story of the first game is the arrival of the model PDP-1, a new mainframe computer, at the MIT electrical engineering lab and the subsequent development of *Spacewar!* in 1962 (Poole 2000, pp. 15-16). Kent (2001, p. 18) and Aoyama and Izushi (2003, p. 426) also note *Spacewar!* as the first game. According to Poole (2000, p. 17) *Spacewar!* had the characteristics that are also essential for today's videogames, namely "simple rules with innumerable combinational possibilities, the competitive urge to destroy your opponent's spaceship, the pleasure of mastery over a well-defined, consistent system, the challenge of reacting instantly to craft governed by inertial physics, and the sensual buzz of playing with animated patterns of light." The above-mentioned games mark the emergence of the technologies and concepts on which the games industry is based.

Electronic games reached consumers first at the arcades. The first coin-operated electronic game was probably *Galaxy War*, a version of *Spacewar!*, which appeared on the Stanford University

Campus in the early 1970s (DeMaria and Wilson 2004, p. 13). Probably the best-known arcade game was *Pong*, which was produced by Atari in 1972 and which became an instant hit (Aoyama and Izushi 2003, p. 427; Poole 2000, p. 20). According to Nolan Bushnell a total of 38,000 *Pong* machines were sold and installed (Mäyrä 2008, p. 41).

Soon thereafter games became available for home use. According to Mäyrä (2008, p. 41), the concept and working system for playing games on a television set was developed by Ralph Baer in the late 1960s. This machine was launched in late 1971 in the USA and was called the Magnavox Odyssey. The system included twelve built-in games. (Kent 2001, p. 25; Schilling 2003, p. 7; DeMaria and Wilson 2004, p. 18)

However, Odyssey could not compete with Atari's home Pong released shortly afterwards. Home Pong was distributed through the Sears department store chain in the USA and became hugely popular. According to Schilling (2003, p. 7) in its first year the home Pong earned over 1 million USD in revenue. The burgeoning demand came as a surprise as Atari signed a deal to deliver 150,000 machines for the 1975 Christmas market even though they did not have the facilities for such large scale production at that time (Kent 2001, p. 83).

There were also other home game machines, such as Coleco's console Telstar that came out in 1976, Fairchild Camera and Instrument's Channel F console that was also launched in 1976 and RCA's Studio II game system released the following year (Kent 2001, p. 98). The last two had game cartridges that allowed several different games to be played on one device. In 1977 Atari also launched a system with cartridges, namely the Video Computer System that came with nine game cartridges (Kent 2001, p. 107; Schilling 2003, p. 7). Prior to the release Atari was sold to Warner Communications (Kent 2001, p. 105).

As the early game consoles appeared in department stores home computers became available through specialist retailers. Apple II, Tandy TRS-80 and CBM Pet were all launched in 1977 (Forster 2005). Such devices were marketed for business and other more serious purposes, but were also used for creating and playing games. The message was that you should not buy just a console when a computer can do so much more. In 1979 the first portable game system, Microvision by Milton Bradley, became available. Mobile phones got their first games in 1997 when Nokia placed a game called *Snake* in their 6110 phone and following models (Newman and Simons 2007, pp. 194-196). Online games were already developed for the PLATO network in the 1960s in the USA (DeMaria and Wilson 2004, p. 306). For a long time online games were created and played mainly in university circles. The first commercial graphic massively multiplayer game in the open Internet was probably *Meridian 59* launched in 1996 (Mäyrä 2008, p. 128)

### 5.1.2 Industry formation

The formation of the games industry was not smooth. The nascent game market crashed around 1976 and 1977 because there were too many rival home devices and the stores began to reduce the prices which forced some firms out of business (King 2002, p. 19; Kent 2001, p. 107; Poole 2000, p. 20). At this point the future of the games industry seemed non-existent in the USA

but in Japan its takeoff was just beginning. The Japanese Pachinko<sup>9</sup> manufacturer Taito launched *Space Invaders* in 1978 and soon the game was available in every arcade and coffee shop in Japan (Poole 2000, p. 20; Masuyama 2002, p. 36).

In 1983 the games market crashed in the USA for the second time (King 2002, p. 19). Oversupply and substandard games were blamed for the disappearance of demand (Aoyama and Izushi 2003, p. 427; DeMaria and Wilson 2004, p. 104). Atari incurred serious losses and was sold off in 1984. In 1988 Coleco filed for bankruptcy (Kent 2001, p. 240, 255). In 1983 Mattel closed down the Mattel Electronics department and the rights to Intellivision were sold. In 1982 the very expensive E.T. film licence game by Atari for the VCS was a miserable failure and contributed to a loss of faith in the video games industry (DeMaria and Wilson 2004, p. 99). The industry recovered again through Japanese imports. Nintendo Famicom, known as Nintendo Entertainment System or NES outside Japan, was launched in 1983.

The crash of 1983-84 was due to too many firms trying to get a piece of the market and the market not being able to absorb such a quantity of products. In addition, many of the games were “rush jobs of dubious quality and appeal”. Many of the newer companies began dumping their games as they needed cash to pay their suppliers. This also led the established companies, like Activision, to dump their massive inventories. Finally Atari resorted to literally dumping their cartridge inventory in the desert of New Mexico. As Atari collapsed, the credibility of the whole industry suffered. Retailers stopped stocking games and consumers thought that games were ‘out’. (DeMaria and Wilson 2004, p. 104)

The crashes in the early games industry appear to be caused by overshooting: too many firms, too many products and not enough paying customers. However, a significant drop in market size accompanied the shakeout. Consumers became disillusioned with the products of the new industry and demand disappeared. The shakeouts were not followed by eras of incremental innovation, but a discontinuity. Both times superior products from Japan were required to reinstate the market.

The separation into hardware and software made it possible for independent game developers to emerge. The first home consoles came packaged with built-in games. As hardware and software were separated it was possible to play several games on one machine. Early game consoles and home computers were open systems in the sense that the device manufacturers did not control whose games were played on their systems. This approach was maintained in computers, but not in consoles. Games were published for Commodore 64, Amiga, Macintosh and IBM PC without any corporate oversight. This was partly due to the fact that computers could make profits on their own as they had also other uses besides gaming. This means that throughout the history of the games industry home computers have been the platform that is available for all game developers independent of their connections with hardware manufacturers or publishers.

Console manufacturers soon realised that the profit potential was in games and not in the consoles. Thus, console manufacturers began extracting revenue from licensing the rights to publish games for

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<sup>9</sup> Pachinko is a Japanese pinball-like game played at arcade halls.



their consoles. This also meant that the cartridge format allowed the console manufacturers to dictate who publishes what and for which device. This era of console domination took place until the late 1990s (Grantham and Kaplinsky 2005, p. 190).

As hardware was becoming more sophisticated more interesting software could be developed. This was enabled by the division between hardware and software which meant that firms could concentrate on the development of only one of these. Electronic Arts, one of the current game development giants, was founded in 1982 and made many games for Commodore 64. EA shipped its first products in May 1983 and three of the six games became hits. In 1984 EA licensed a baseball player's face to be included in a game which was the first deal of this kind. (Kent 2001, pp. 260-265) Other early game developers included Accolade, Supreme Brain Software and Infocom (DeMaria and Wilson 2004, p. 110-115). Origin Systems Inc. was one of the innovators bringing a series of sequels to a successful game. One of the earliest of such game series was their *Ultima* series, of which the first game was released in 1980 and new releases were made throughout the 1980s and 1990s (p. 120). The emergence of independent developers also enabled the emergence of different game-related professions. Crosby (2000) lists these as game designers, artists, sound designers, programmers, testers and producers. In addition, development firms hire intellectual property lawyers, market analysts, technical support workers and foreign language translators.

According to Grantham and Kaplinsky (2005, p. 190) in the 2000s the domination of the console manufacturers changed into the domination of publishers. This means that to a growing extent publishers can decide who gets to make games and what kinds of games they are. There is also variation in the role of developers. Grantham and Kaplinsky (2005, p. 193) divide them into super developers, original IP developers, work-for-hire, niche developers and service providers. Super developers have the capabilities to develop games for many platform types and are well-established companies. Original IP developers create their own content and try to offer it to publishers, whereas work-for-hire publishers compete on licence-based projects from publishers. Niche developers have a strict strategy on which genre to concentrate, but they can be either developing original IP or making work-for-hire in that niche. Service providers do not develop game titles but sell specialised services, such as audio, to other developers. Traditionally developers have been assigned to three groups. First-party developers are in-house studios owned by console manufacturers. Second party developers are independent companies whose games are published by console manufacturers. Third party developers get their games published by independent publishers. (see ELSPA/TIGA 2005, p. 21)

The history of the games industry is heavily concentrated on the USA and Japan. However, Europe has been involved from an early stage. France has a robust home-grown games industry with its own international stars Infogrames and Ubisoft. The UK has also had a lively games industry since the early 1980s, whereas in Germany the industry began to emerge only in the mid-1990s. (Lange 2002, pp. 52-53) In a report prepared for the UK Department of Trade and Industry, Australia, Canada, France, Singapore, South Korea, United Kingdom and United States are identified as major game development countries (Games Investor Consulting Ltd. 2007). Data on

the industry volume in these countries is presented in Table 12. The omission of Japan is probably due to unavailability of data.

**Table 12.** Industry volume in major game development areas (collected from Games Investor Consulting Ltd. 2007).

Country	Independent developers	Publishers	First company founded	First global hit	Development jobs in 2005
Australia	45	15	1980	1982	1 250
Canada	110	21	1985	1985	6 100
France	85	20	1983	1987	1 750
Singapore	25	15	1999	NA	500
South Korea	211	20	1994	1998	9 000
United Kingdom	160	70	1982	1983	8 000
United States	650	120	1971	1972	25 000

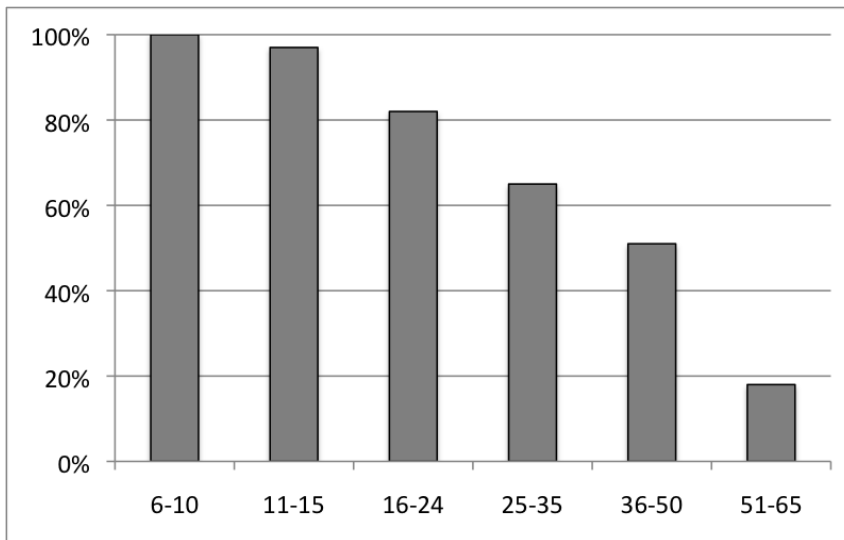
These figures show that the United States is the number one country in game development. The United Kingdom, South Korea and Canada are also very strong. These countries have been active in game development since the early 1980s. South Korea is a newer game development country that has become a strong player in the international market. Canada overtaking France and growing to match the UK is explained by the generous support to Canadian firms in the form of tax exemptions, subsidies and grants by the Canadian government (Games Investor Consulting Ltd. 2007, p. 2). In Finland the first game firms were founded in the early 1990s and the first international hit was Max Payne developed by Remedy Entertainment in 2001. Finnish game firms employ around 1000 people. (see Figures 22 and 23 in section 5.5.1)

### 5.1.3 Market structure

The United States is the largest game software market. According to Spectrum Strategy Consultants (2002, p. 10), the United States accounted for 36% of the global market. Japan and the UK held 20% and 9% respectively. In 2005 the situation had changed with the US market accounting for 39%, Japan for 15% and UK for 12% of the international game software market (ELSPA/TIGA 2005, p. 15).

According IDSA (2001a) 60% of all Americans play interactive games on a regular basis. A more recent survey found that 65% of American households play computer or video games (ESA 2008, p. 2). In the UK 59% of the population define themselves as gamers (Games Investor Consulting Ltd. 2007, p. iii). In 2004 in the United States 50% of households owned at least one game console (Crandall and Sidak 2006). In 2007 in Australia 79% of households owned either a computer or a console (Brand 2007, p. 5). In the UK playing games declines with age (Figure 4). 100% of children between six and ten years of age play some form of electronic games whereas only 18% of people between 51 and 65 years of age consider themselves gamers (Pratchett 2005, p. 4). These figures may reflect the percentage of people in each age group who have played video or computer games while growing up and have continued the habit later in life. That would mean that

as younger generations age they are more and more avid gamers, also later in life. In the United States the average age of a gamer is 35 (ESA 2008, p. 2) whereas in Australia the average age is 28 (Brand 2007, p. 5).



**Figure 4.** UK gamers as a percentage of age groups (Pratchett 2005, p. 4, data from 2005).

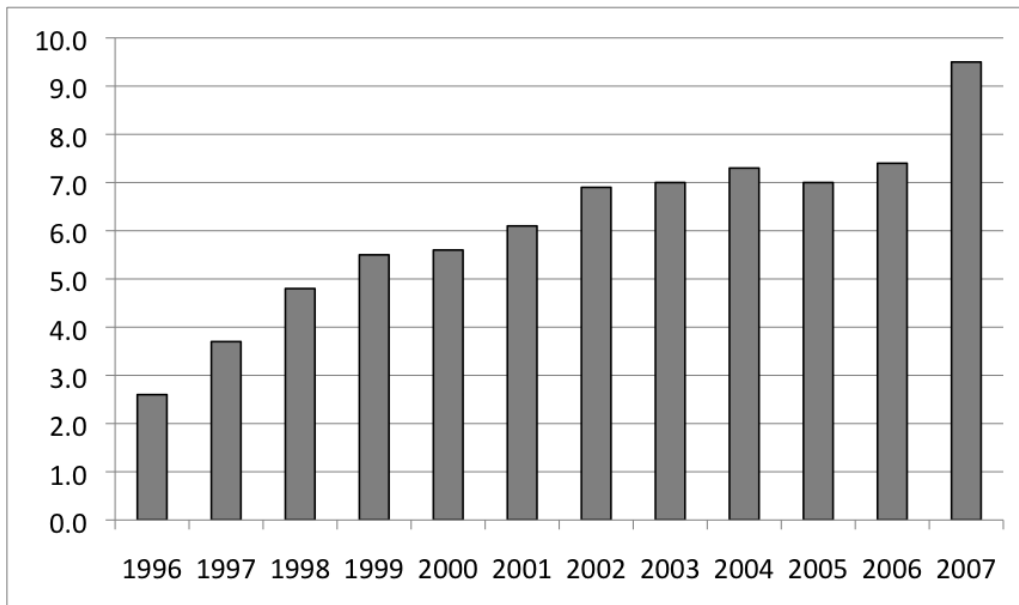
The gamer population is dominated by men, but not to a significant extent. In the USA 40% of gamers are female and 60% male (ESA 2008, p. 3) whereas in Australia females make up 41% of the gamer population (Brand 2007, p. 5). In 2008 European gamers own an average of 36 games. Males have an average of 39 games and females 31. The variation in the population is great as those who consider themselves heavy gamers own an average of 67 games. The UK is the leader in Europe with an average of 43 games per gamer. Surprisingly, there is very little variation between the age groups. (Nielsen Games 2008, p. 29) The above figures indicate that computer and video games have become a mainstream form of entertainment comparable to films and music.

Game development is a growing industry. Siwek's (2007, p. 20) study on the economic contribution of the game software industry to the US economy shows that employment in the sector grew from 20,177 in 2002 to 25,007 in 2006. This gives a compound annual growth rate of 4.444%. The growth also shows in sales (Table 13). In 2003-2004 the game software industry grew 4.45 times faster than the US GDP and in 2005-2006 5.43 times faster. These are impressive figures, even though in some years the growth is slower.

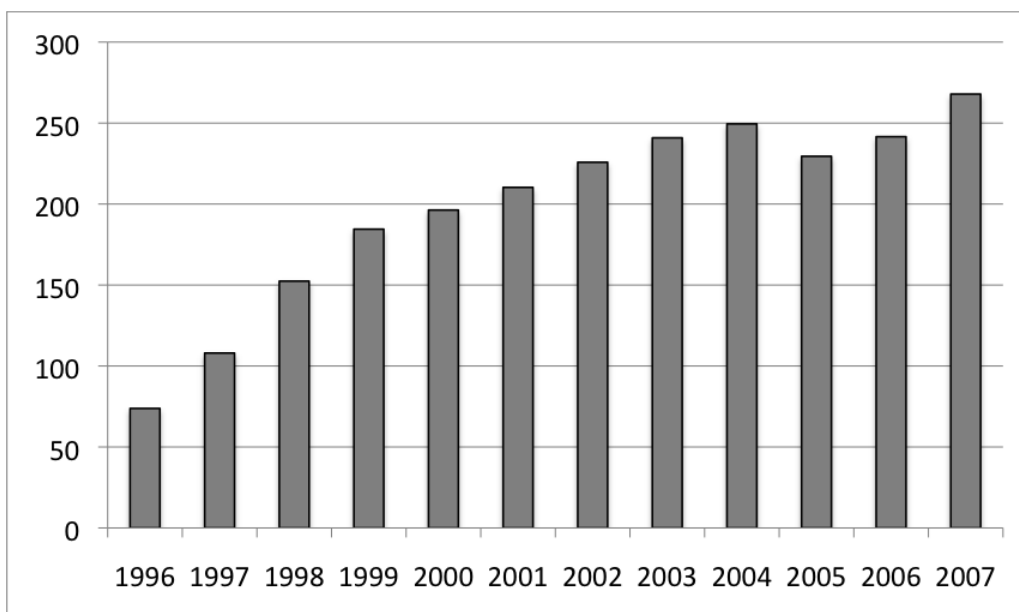
**Table 13.** Growth in entertainment software compared to GDP in the US (Siwek 2007, p. 30).

Year	Real annual growth Entertainment software	Real annual growth US GDP	Times share
2003-2004	17.34%	3.90%	4.45
2004-2005	3.87%	3.20%	1.21
2005-2006	17.91%	3.30%	5.43

The Entertainment Software Association's 2008 Essential Facts report plots the growth of the industry from 1996 to 2007. Sales almost quadrupled during that time (Figure 5). Growth in the number of units sold is similar (Figure 6).

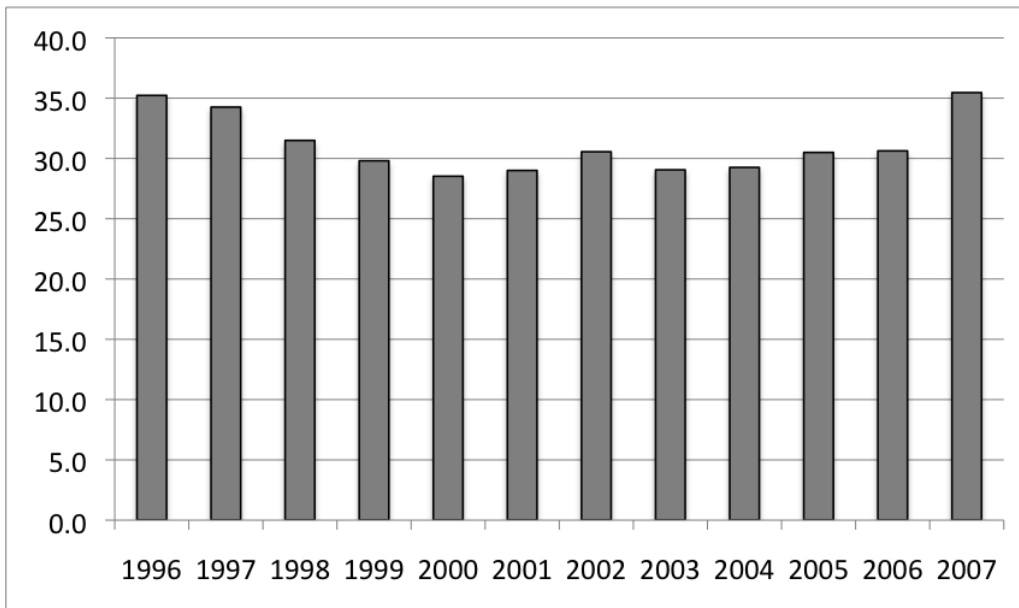


**Figure 5.** Market size trend in billion dollars in the United States, inflation adjusted (ESA 2008, p. 11).



**Figure 6.** Market size trend in million units in United States (ESA 2008, p. 11).

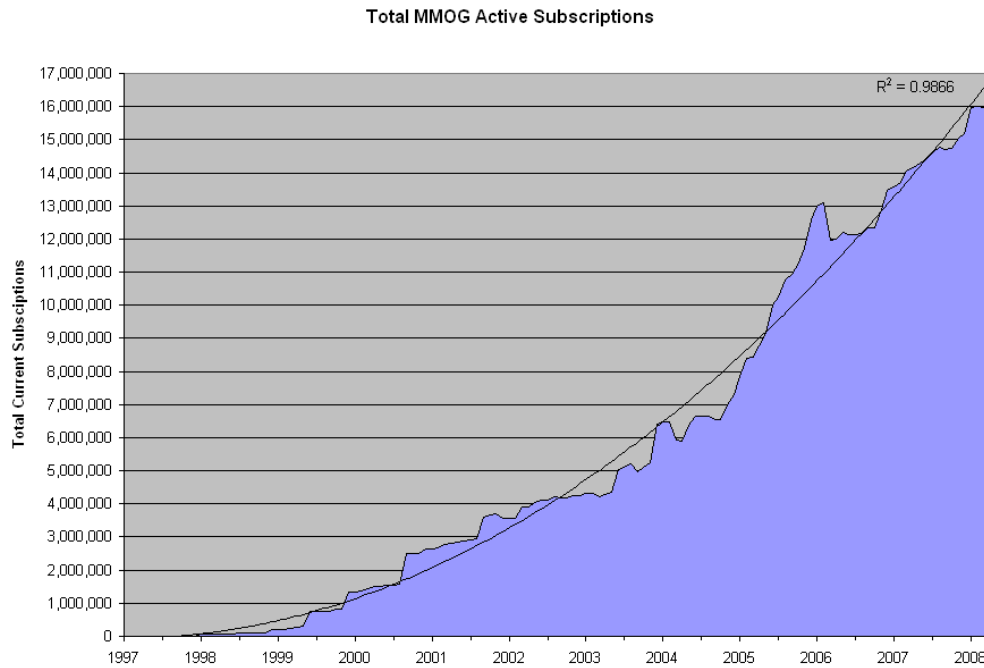
These figures allow us to calculate the change in the unit price (Figure 7). The unit price was relatively stable during the 12 years that the data cover.



**Figure 7.** Price per unit trend in United States in inflation adjusted USD (based on data from ESA 2008, p. 11).

The industry life-cycle theory posits that as an industry matures, sales stabilise and price decreases. So far the game software industry is not showing such dynamics. Sales are still growing in both dollar and unit terms and price has remained stable. It may be that the industry has not yet reached the stage at which such phenomena occur and they are thus yet to come. It may also be that the dynamics of the games industry do not conform to those of more traditional manufacturing industries based on which the industry life-cycle theory was developed. Hayes and Dinsey (1995, p. 65) state that games sell almost as many units at £49.99 as they would at £39.99. This implies that the firms are not striving for decreases in price as they would not create a decisive competitive advantage over other producers.

Additional evidence on the growth of the game market comes from online game subscriptions. The website mmogchart.com plots the growth in the number of active online game subscriptions. Figure 8 covers such data between the beginning of 1997 and April 2008. Each active subscription consists of a consumer paying a monthly flat rate for playing. As a consumer can have an active subscription to several online games at a time, this data should be interpreted as growth in sales rather than purely as growth in consumer base.



**Figure 8.** Growth in the number of active massively multiplayer online game subscriptions (retrieved from mmogchart.com).

Besides growth, the game market is also showing two notable characteristics, namely games falling into either the hit or miss category and the obligation for the firms in most countries to go onto the international market. The division of games into hits and misses is noted by Guérin (2006), according to whom thousands of games are produced each year of which around 200 end up as hits. In the UK in 2000 the top 99 games accounted for 55% of all sales. The 99 games represented 3.3% of games developed. (Spectrum Strategy Consultants 2002, p. 12) Another industry characteristic coming across from the reports is the inability of the home market to sustain the domestic game software production. For example, Australia has one of the highest per capita consumptions of entertainment products in the world, but it is still a small market by sales volume (Standing Committee on Communications, Information Technology and the Arts 2004, p. 58).

Currently the games industry is facing several challenges, such as the relation to violent behaviour of young people and low appreciation as a form of culture. Traditionally TV has been blamed for turning viewers into mindless drones but during the last two decades attention has been directed increasingly to games in this respect. Violence is related to games in societal debate even though, according to Thompson (2002, p. 24), most of the popular kinds of games are non-violent. There have been two US Senate hearings on game violence. The first one in 1993 resulted in a rating system on games (Kent 2001, p. 472). Because of several gun incidents at US schools there were again senate hearings in 1999 on game and film violence. However, the latter hearings did not have a great influence on the industry (p. 555). Thompson (2002, p. 26) argues that the easy access to guns in the USA has more of an effect on gun violence than shooting games do. Another threat is the isolation of young people into the game world rendering them unable to function in the real world and in social situations. However, games can be a social hobby with countless discussion

boards on the Internet and friends gathering to play together. (ibid., p. 28). There are no signs of the conception of the violent nature of games fading. The British Prime Minister Gordon Brown announced in September 2007 that he would protect children from “harmful violence and sexual imagery” by reviewing legislation on the promotion and sale of video games to minors (Ingham 2007). The games industry has responded with their own investigations. In 2001 the Interactive Digital Software Association published the “Video Games & Youth Violence: Examining the Facts” report that emphasises the decrease in youth violence that has taken place as video games have become increasingly popular (see IDSA 2001b).

In addition to being condemned for violence, games have been labelled as not good enough to be called culture, not to mention art. Jenkins (2000, p. 118) compares the position of games to that of jazz music, the Broadway musical, the Hollywood cinema and the comic strip in the 1920s. At that time cinema was suspicious because of commercial motivations, technological origins, violence and eroticism (ibid.). Indeed, in a similar fashion games are now “popular but despised, thought to be beneath serious evaluation” (Poole 2000, p. 13). The aversion to games is similar to the attitudes that new cultural forms usually face. Cowen (2000, p. 185) states that parents and the elderly people are usually cultural pessimists who perceive the new cultural ideas popular among younger generations as cultural corruption. For example, popular music has been blamed for encouraging drug use, rooting for communism and corrupting white youth with ‘black’ sounds. Artists have also been blacklisted from radio and even imprisoned for indecent behaviour. (Denisoff 1975) Nowadays cinema is recognised as an art form and perhaps in the future that will also be true for games. Another aspect of the common attitude against games is the fear that games will somehow replace more traditional art forms (Poole 2000, p. 3). Poole points out that films did not replace theatre just as the Internet did not replace the book. King (2002, p. 17) concludes that fundamentally games are experiences that people can share and such activities are important for society as a whole.

## **5.2 Innovation and competition in hardware**

The evolution of hardware is here outlined in generations as is common in games industry related literature and press. The division of devices into generations is done following Kent (2001), DeMaria and Wilson (2004), Forster (2005) and Fox (2006).

### *5.2.1 First generation 1972-1977*

The first generation of game devices consisted of four dedicated consoles. They all had built-in games which meant that the game library was determined in device manufacturing. The Magnavox Odyssey had 12 built-in games, Atari’s Pong had just one game, Coleco’s Telstar three games and Nintendo’s Colour TV Game 6 had six games. All these games were variants of *Pong*. In hardware terms Odyssey was a compilation of capacitors and transistors whereas Atari’s Pong relied on a specific Pong chip which was the first chip of its calibre to be used in consumer electronics. Coleco

also used the Pong chip through a licensing agreement. Colour TV Game 6 was the sole non-US contestant. However, it was sold only in the domestic Japanese market.

Of these machines Pong was the most successful. Technologically these machines were fairly similar, even though Pong and Color TV Game 6 had four colours and the other machines were monochrome. However, Pong was affordable at a launch price of 100 dollars, it got considerable media exposure and was retailed through the Sears department store network.

### 5.2.2 *Second generation 1977-1983*

The first generation can be seen as a practice run for the proper competition that started with second generation devices. Between 1977 and 1984 18 consoles, 26 home computers and two hand-held devices were brought to market. Home computers were sold for many other purposes in addition to playing games, but games were popular applications and consoles and computers competed for the same consumer base. The most popular home computers included Apple II, Atari 800, Sinclair XZ Spectrum and Commodore 64 whereas the consoles that became bestsellers were Atari VCS and CBS ColecoVision. Most of the devices were of American and Japanese origin, but the British were especially active in launching home computers and some devices also came from Germany and Hong Kong.

The grand innovation that separates the first and the second generation machines is the division into hardware and software. For the second generation machines games came on cartridges (73% of the devices), tapes (49%) and disks (31%). The successful devices had either all the three media available or at least two. Two devices still had built-in software. Nintendo's Game & Watch handheld product line consisted of around 70 different devices with a unique game in each. RCA's Studio II was an exotic construction as it had five built-in games in addition to cartridges. Cartridges had the advantage of being 'ready-loaded' whereas disks and tapes had loading times (Hayes and Dinsey 1995, p. 21).

The second generation devices also made a transition in hardware components. The dominant technology was an 8-bit CPU. Exceptions to this included Mattel's Intellivision, which was the first 16-bit console and Milton Bradley's Microvision, which was based on 4-bit chips placed in the game cartridges. Compared to the first generation monochrome machines the second generation consisted of colour devices. Most of the devices had a 16-colour palette while the range was from monochrome to 256 colours.

The experimentation with expansion modules and peripherals began with the second generation devices. In 1982 IntelliVoice, a speech synthesizer module, became available for Intellivision and was used in some games, such as *B-17 Bomber* (DeMaria and Wilson 2004, p. 71). ColecoVision could be attached to "Expansion Module #1", which made it possible to play Atari 2600 cartridges on it (p. 95). In 1983 Amiga Joyboard, a predecessor of Nintendo Wii balance board, was marketed to Atari 2600 players along with the *Mogul Maniac* slalom ski game.



The second generation came to an end with the game market crash of 1983. The market could not support numerous rival devices and many firms faced hard times. In addition, Hayes and Dinsey (1995, p. 255) argue that the ability of anyone to publish a game on disk or tape caused the market to flood with inferior software and this was particularly damaging to Atari. Prior to the release of the VCS, Atari was sold to Warner Communications (Kent 2001, p. 105). In 1983 Mattel closed down the Mattel Electronics department and the rights to Intellivision were sold (DeMaria and Wilson 2004, p. 72). In 1988 Coleco filed for bankruptcy (Kent 2001, p. 255).

### 5.2.3 *Third generation 1983-1989*

The US market had disappeared, but in the meantime the Japanese market was booming. In 1983 Nintendo launched the Famicom console in Japan, which became a huge hit. It had better graphics than the Atari VCS and the controls were also more advanced (Kent 2001, p. 279). In addition, its competitiveness was based on original hit software, such as *Super Mario Bros.*, that was released in 1985 (Aoyama and Izushi 2003, p. 427). The entry to the US market proved challenging as the retailers believed that the demand for home game systems no longer existed. In 1985 the Famicom, now called NES (Nintendo Entertainment System), was released on the US Christmas market. Nintendo offered a money-back guarantee to the retailers and reached moderate sales (Kent 2001, p. 297).

Another serious competitor, Sega (Service Games), was a Japan-based firm founded by two Americans in 1952 with the business of installing jukeboxes in US military bases. They already imported and manufactured mechanical games for arcades in the 1950s and in the late 1970s they included arcade video games in their product line. (DeMaria and Wilson 2004, p. 232-233) A year after Nintendo Sega entered the US market with the Master System that was technologically superior to NES but deficient in marketing as well as in game and character development (Schilling 2003, p. 8). Throughout the 1980s Nintendo could count on their *Super Mario* and *Legend of Zelda* game series (DeMaria and Wilson 2004, p. 236).

Atari also retaliated with Atari 7800 released in 1984 and Atari ST in 1985. Commodore introduced the hugely popular Amiga computer in 1985. (Poole 2000, p. 4) From 1986 to 1990 several million NES units were sold every year (Kent 2001, p. 347) and it almost achieved a monopoly of the US game market (Schilling 2003, p. 8).

The third generation of game devices is marked by the formation of the razor and blades business model. This was first introduced by Nintendo with its Famicom. The consoles could be sold at a negligible profit as each cartridge brought additional revenue for the hardware manufacturer. For the third generation devices games were sold on cartridges for consoles and on disks for computers. The console manufacturers preferred the cartridge format as it ensured licensing revenue as it was hard to counterfeit.

Advances were made in CPU technology and the third generation included 8-bit, 16-bit and 32-bit devices. The third generation is often labelled the 8-bit era and this applies to the consoles. Nintendo Famicom, Sega Master System and Commodore 64 Game System were all 8-bit devices.

However, the home computers, such as Atari ST and Commodore Amiga, had more complicated architectures with CPUs having both 16-bit and 32-bit components. The colour palettes increased to 4,096 colours, but the most popular console, Famicom, had only 52 colours. In graphics terms, the third generation machines produced static stiles and moving sprites (Mäyrä 2008, p. 92) which would not impress anyone nowadays. The consoles were launched at a selling price of 200 dollars but with computers the range was wider. Atari 7800 sold for 140 dollars, whereas the IBM PC/AT sold for 4,700 dollars. The third generation was increasingly US and Japan-centred.

In terms of peripherals experimentation continued. The Nintendo Entertainment System came with a light gun called Zapper to be used in various shooting games. In 1987 Bandai released an Atari peripheral called Exus Foot Craz which was a small pad with coloured, touch-responsive spots the player needed to step on. The device was packaged with two games, *Video Jogger* and *Video Reflex*. The purpose was to guide the character with stepping motions. A year later Nintendo purchased the Foot Craz and rebranded it as Power Pad. It came with games that featured gameplay simulating track and field sports, dance aerobics and other tests in running or jumping skills. (Mäyrä 2008, p. 142)

#### 5.2.4 Fourth generation 1987-1994

Sega next introduced the Mega Drive in 1988. Compared to NES it had better graphics, more detailed characters and faster action (Kent 2001, p. 401). According to DeMaria and Wilson (2004, p. 244) Sega succeeded in targeting Mega Drive at older players, leading to good sales. It was marketed as a more mature game device, a product that gamers graduated to through playing on NES. In the US market Mega Drive was called Genesis and it was advertised with the slogan “Genesis does what Nintendon’t” (Kent 2001, p. 405). The Christmas after the release was successful for Sega as Genesis took 90 percent of the American Christmas sales (DeMaria and Wilson 2004, p. 244). Sega became the leading sports simulator with *Joe Montana Football* and *John Madden Football* (Kent 2001, p. 407) but it lacked a mascot. To match Nintendo’s Mario, Sega launched in 1989 their own mascot, Sonic the Hedgehog, which ‘had attitude’ and starred in simple but fast games. Sonic the Hedgehog came packed with the system and was a hit also sold separately (Kent 2001, pp. 429-431).

The next contender in the console war was the TurboGrafx-16 by NEC, also known as the PC Engine, which was released in 1989 in the USA (Kent 2001, p. 411). It had already been released in Japan two years earlier. Despite its merits in the number of colours and potential for larger games it flopped before Christmas 1990. This was because the available games were not Americanized but were the same Japanese selection available on the home market. This was at least partly due to an exclusive deal between NEC and the Japanese developer Hudsonsoft making it impossible for NEC to use any other game developers (DeMaria and Wilson 2004, p. 245). TurboGrafx-16 was, however, popular in Japan, surpassing Mega Drive in sales (DeMaria and Wilson 2004, p. 245) As Turbografx-16 failed to attract a significant market share in the global market the competition narrowed down to Sega versus Nintendo (DeMaria and Wilson 2004, p. 248).

With no handheld releases during the third generation, Nintendo Game Boy was introduced packed with *Tetris* in 1989, and became a hit. Atari's portable machine Lynx was launched simultaneously. This was more advanced but lacked backup from marketing. (Kent 2001, pp. 416-419) Game Boy was a long-lived machine and benefited greatly from the Pokémon craze of the 1990s as *Pokémon Red* and *Pokémon Green* were released in 1996 by Game Freak (Masuyama 2002, p. 35).

Shortly after the release of Game Boy Nintendo launched its next-generation console, Super Famicom, marketed as SNES (Super Nintendo Entertainment System) outside Japan (Aoyama and Izushi 2003, p. 427). According to Kent (2001, pp. 431-432) it had more colours and improved audio features compared to the competitors, whereas Genesis had more processing power. In 1991 Sega had 55% of the market and Nintendo 45% (Kent 2001, p. 434). One of the strengths of Sega was that Electronic Arts was making games for the Genesis (DeMaria and Wilson 2004, p. 248). Although SNES had few good games in the launch and many titles were delayed, it still had *Super Mario World* to enhance sales (Kent 2001, p. 448). During 1994-1995 Sega was the market leader (Schilling 2003, p. 9). Sega had released a CD peripheral for Genesis in 1992 and in 1995 Nintendo still had no CD-ROM drive (Kent 2001, p. 453-454).

During the 1990s the popularity of PC gaming increased. This was due to several very good games as well as the introduction of Windows 95, which provided better opportunities for PC games (Kent 2001, p. 519). One of the earliest PC successes was the *SimCity* series by Maxis, the first game of which was released in 1989 for IBM PC as well as Macintosh, Amiga and Commodore 64 (DeMaria and Wilson 2004, p. 262).

During the fourth generation CD became commonplace as a game medium. Nintendo retained the cartridge format but Sega, Atari, Fujitsu, NEC, SNK, Commodore and Philips changed to CD. Another important technological accomplishment was the 16.8 million colours that Fujitsu FM Towns, Commodore CDTV and SNK Neo Geo CD were able to display. This is the truecolour standard enabling high quality photograph-like reproduction. Thus the performance in the number of colours reached the ultimate goal. The fourth generation is labelled the 16-bit era, but there were also 8-bit machines such as the Turbografx-16 and the handhelds. In addition, SNK Neo Geo and Commodore CDTV mixed 16-bit and 32-bit technology.

Launch prices varied among the different kinds of devices. In the handhelds Nintendo Game Boy sold at 180 dollars, Atari Lynx at 190 dollars and Sega Game Gear at 150 dollars. Consoles ranged from 200 dollars for Nintendo SNES to 700 dollars for Philips CDi. Japan dominated, as 10 of the 17 devices were developed and manufactured by Japanese firms.

### 5.2.5 *Fifth generation 1993-1997*

In 1993 Atari made a surprising re-entry to the game console market with the technologically advanced Jaguar (Schilling 2003, p. 12). It was inexpensive but there were only a few games and they were not too good. Even the rare good games such as *Tempest 2000* and *Alien vs. Predator* could not save Jaguar (Kent 2001, p. 489). It was discontinued in 1996 (DeMaria and Wilson 2004, p. 278).

In 1994 (in Japan, in 1995 in the rest of the world) Sega again launched a new console, the CD-based Saturn, but the game *Virtua Fighter* was the real star of the day (Kent 2001, p. 501). It was not packed with the console but as many game copies as consoles were still sold (p. 502). The competitor was Sony's PlayStation, but Saturn was more popular (ibid.) Saturn was the first Internet-enabled console, which proved slightly premature (DeMaria and Wilson 2004, p. 282).

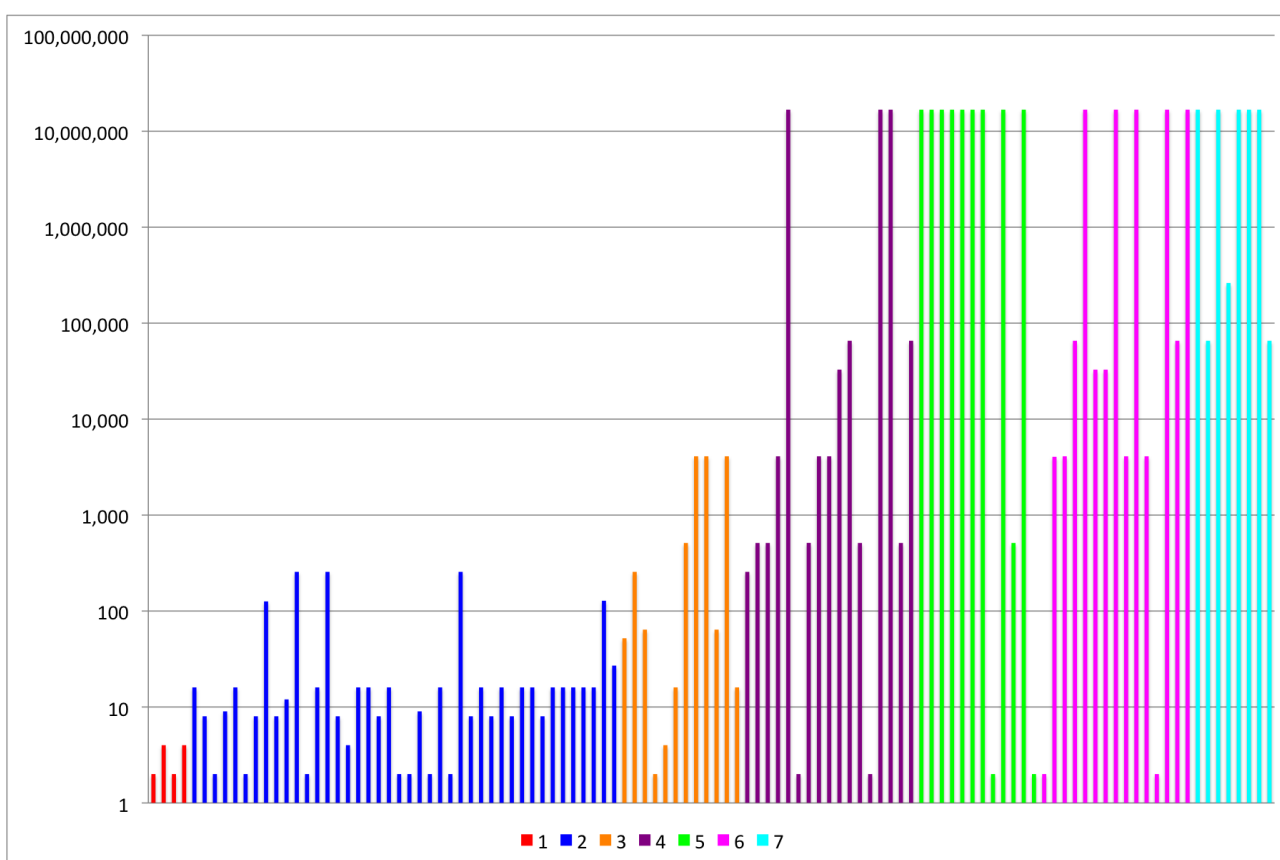
In the early 1990s Sony and Nintendo had entered into a contract to create a CD-peripheral to the SNES. As the deal fell through Sony decided to make a CD-based console, PlayStation, on their own (DeMaria and Wilson 2004, p. 283). Initially Sega Saturn was more popular but eventually Sony PlayStation's market share increased. By 1999, PlayStation had a 55% market share in the USA and a 70% market share in Japan (Aoyama and Izushi 2003, p. 428). The rise of PlayStation is due to their content strategy. Sony negotiated an exclusive six-month deal for *Mortal Kombat III* ensuring good sales in the period after the launch (Kent 2001, p. 506). Sony also signed a deal with Electronic Arts and convinced several other game developers to produce solely PlayStation titles (Schilling 2003, p. 12). Another wise content move was the release of *Lara Croft* by Eidos exclusively for PlayStation and PC (DeMaria and Wilson 2004, p. 286). Moreover, the price of PlayStation at \$299 was more attractive than Saturn's \$399 price (Kent 2001, p. 516).

In the meantime Nintendo struggled with its delayed new console Ultra 64 (Kent 2001, p. 516). Finally in 1996, after more than two years of announcements, Nintendo launched the Nintendo 64 console (Schilling 2003, p. 12). *Super Mario 64* was the lead game for Nintendo 64 and, according to Kent (2001, p. 530), the console release had been delayed in order to perfect the game. This was the game in which Mario switched from 2D to 3D. Another important 3D title was *Legend of Zelda: Ocarina of Time* (1998), both in-house productions. Nintendo 64 had trouble in attracting game developers (Poole 2000, p. 5) because it was still based on cartridges instead of the dominant CD technology. Every N64 game title reached best-seller status because of a limited selection. Saturn and PlayStation game sales were spread across five times as many game titles. (Kent 2001, p. 539) Nintendo 64 first sold at \$250 (Kent 2001, p. 531) but as PlayStation's price was cut to \$199 both Nintendo 64 and Sega Saturn followed (Kent 2001, pp. 531-532). In August 1997 the market shares were Nintendo 64 40%, Sony PlayStation 47% and Sega 12% (Kent 2001, p. 558).

In addition to the three giants Sega Saturn, Sony PlayStation and Nintendo 64, the fifth generation included several multiplayer consoles. Multiplayers were devices designed as living room entertainment centres capable of playing audio and photo CDs in addition to playing games on CD-ROM. Probably the best known of these was the 3DO Interactive Multiplayer by Panasonic. Other competitors included Apple Bandai Pippin and Pioneer's Laser Active. The latter introduced laser disks as a game medium. The fifth generation multiplayers also competed with the fourth generation equivalents Commodore CDTV and Philips CD-i. The multiplayers were expensive devices compared to the mainstream game consoles and pricing was also a method to position a high-end adult product in contrast to juvenile game consoles. 3DO Interactive Multiplayer launched at 700 dollars, Apple Bandai Pippin at 600 dollars and Pioneer LaserActive at 1,000 dollars while the consoles cost approximately 300 dollars.

The fifth generation devices were divided between cartridge and CD as the game medium. In addition to the Nintendo 64, the handhelds Nintendo Virtual Boy, Sega Nomad and Tiger Game.Com relied on cartridges, whereas the other consoles were CD-based. Exceptions to this included the Pioneer LaserActive with laser disks and Atari's Jaguar with both cartridge and CD ports. The fifth generation is labelled the 32-bit era, seven of the 13 devices actually being 32-bit. Atari Jaguar and Nintendo 64 were 64-bit. The handheld Tiger Game.Com and Bandai's Playdia for children were only 8-bit.

The truecolour of 16.8 million colours became a standard feature in fifth generation consoles, as is shown in Figure 9. However, there have subsequently been several devices with a much lower colour count. These devices are usually handhelds in which technological advancement lags behind that of consoles. This is due to the smaller size and limited battery power of the handheld devices.



**Figure 9.** Number of colours in each device, by generation, logarithmic scale.

Once the truecolour level was achieved the development efforts in graphics took a turn in a different direction. As graphics were now 3D instead of 2D, the relevant performance metric was rendering capability in polygons per second. PlayStation was able to render 360,000 polygons per second, which marked a change in the fundamentals of digital games (Mäyrä 2008, p. 94). Sega Saturn rendered 500,000 polygons per second, but Sega had decided to render quadrilaterals instead of triangles, which made game programming challenging and many games ended up unable to benefit from the substantial rendering capability. Nintendo 64 rendered 100,000 polygons per second. Japan continued to dominate as the bestselling PlayStation and N64 were both Japanese.

On the peripheral front the fifth generation saw the first dance mat developed for home use. In the late 1990s Konami introduced music and rhythm games and the most successful of these was the 1998 *Dance Dance Revolution*, which included a dance mat (Mäyrä 2008, p. 142).

#### 5.2.6 Sixth generation 1998-2004

Despite the problems with its fifth generation Saturn, Sega was not discouraged, but released yet another console, Dreamcast. It was launched in 1998 in Japan and a year later in the rest of the world. According to Schilling (2003, p. 13) it was a “short-lived success” whereas Poole (2000, p. 5) describes it as “Sega’s triumphant re-entry”. According to DeMaria and Wilson (2004, p. 312) it was technologically superior but the games were weak. Shortly afterwards PlayStation 2 was announced and it was realised that Dreamcast would be technologically inferior (Kent 2001, p. 561). Despite good sales in the Christmas season 1999, Sega announced that they would not be making any more consoles (Kent 2001, p. 564, 582). When PlayStation 2 reached the retailers in 2000 (DeMaria and Wilson 2004, p. 314), its strengths included the availability of several EA games at launch, such as *Madden NFL 2001*, *NASCAR* and *SSX* (Kent 2001, p. 580).

In the 2000 Christmas season there was a shortage of PlayStation 2 devices. This suddenly made Sega’s Dreamcast very attractive and Sega’s new games *NFL2K1*, *NBA2K1* and *Shenmue* also sold well, making it a good Christmas for Sega. (Kent 2001, p. 587) In 2001 the sixth console generation was completed with two new consoles, namely Microsoft Xbox and Nintendo GameCube (DeMaria and Wilson 2004, pp. 316-318). The best selling game for Xbox was *Halo 2* and for GameCube *Super Smash Bros. Melee*.

The sixth generation included six consoles and ten handhelds. In addition to the well-known Dreamcast, PlayStation 2, Xbox and GameCube, there were the exotic Japanese XaviXport and the UK Nuon. XaviXport by SSD is a niche console that uses different sports equipment as controllers, the seven available games all being sports simulations. Nuon was a standard based on which several electronics companies have manufactured multiplayer type consoles. Nuon, however, was a short-lived product. Handhelds were produced by the Japanese Bandai (three products), Korean Game Park (one product), Nintendo (two products), Nokia (one product), Japanese SNK (two products) and American Tapwave (one product). Of these the Nintendo Game Boy was the only successful product line. In the sixth generation the Japanese firms continued to dominate; of the successful products the American Xbox is the only one that is not Japanese.

In the fourth and fifth generation devices CD has been the dominant game medium. In the sixth generation this changed as DVD gained ground. Xbox, PlayStation 2 and Nuon were DVD based, whereas GameCube used Mini-DVDs. The handhelds relied on cartridges, with the exception of Game Park GP32, Nokia N-Gage and Tapwave Zodiac using memory cards.

The rendering capability increased substantially compared to the equipment of the previous generation. Dreamcast rendered seven million polygons per second, GameCube 12 million, PlayStation 2 66 million and Xbox 125 million. The sixth generation consoles were marketed as 128-bit devices, but in terms of CPU architecture this is not exactly true. GameCube and Xbox had

32-bit CPUs while Dreamcast and PlayStation 2 had 64-bit CPUs. This is because after the 32-bit processing power was achieved the advances became increasingly dependent on factors like the speeds of the central and graphics processing units, memory size and bandwidth.

Following the multiplayer tradition, PlayStation 2 was able to play DVD films and thus was a reasonably priced DVD player at 300 dollars. Other consoles sold for around 200 to 300 dollars. The handhelds bifurcated into cheap and expensive. Bandai's WonderSwan's sold for less than 100 dollars, likewise SNK's Neo Geo Pocket line. Nokia N-Gage and Tapwave Zodiac both sold for 300 dollars, which is more like a console price. N-Gage, however, was the first game device with a mobile phone whereas Zodiac included a PDA. Ultimately the most successful handheld was Nintendo's Game Boy Advance originally priced at 100 dollars.

The sixth generation included many peripheral experiments. Sony Eye Toy introduced computer vision based gaming. *Eye Toy: Play* was introduced in 2003. Another new peripheral was microphone used in Sony's karaoke game *SingStar*. The guitar shaped controlling peripheral by Harmonix Music Systems in 2005 used in *Guitar Hero* game followed the musical theme. (Mäyrä 2008, p. 144) With the rise of the party genre came the Buzz! buzzers designed for use in game show types of games like *Who Wants to be a Millionaire*. The first Buzz! game was *Buzz!: The Music Quiz* for PS2. A further interesting peripheral was the Trance Vibrator that went with the PS2 version of the rail shooter game *Rez*. The purpose of the vibrator was to put the player in closer contact with the game world by the pulse of the music felt through the peripheral. (Newman and Simons 2007, p. 168-169)

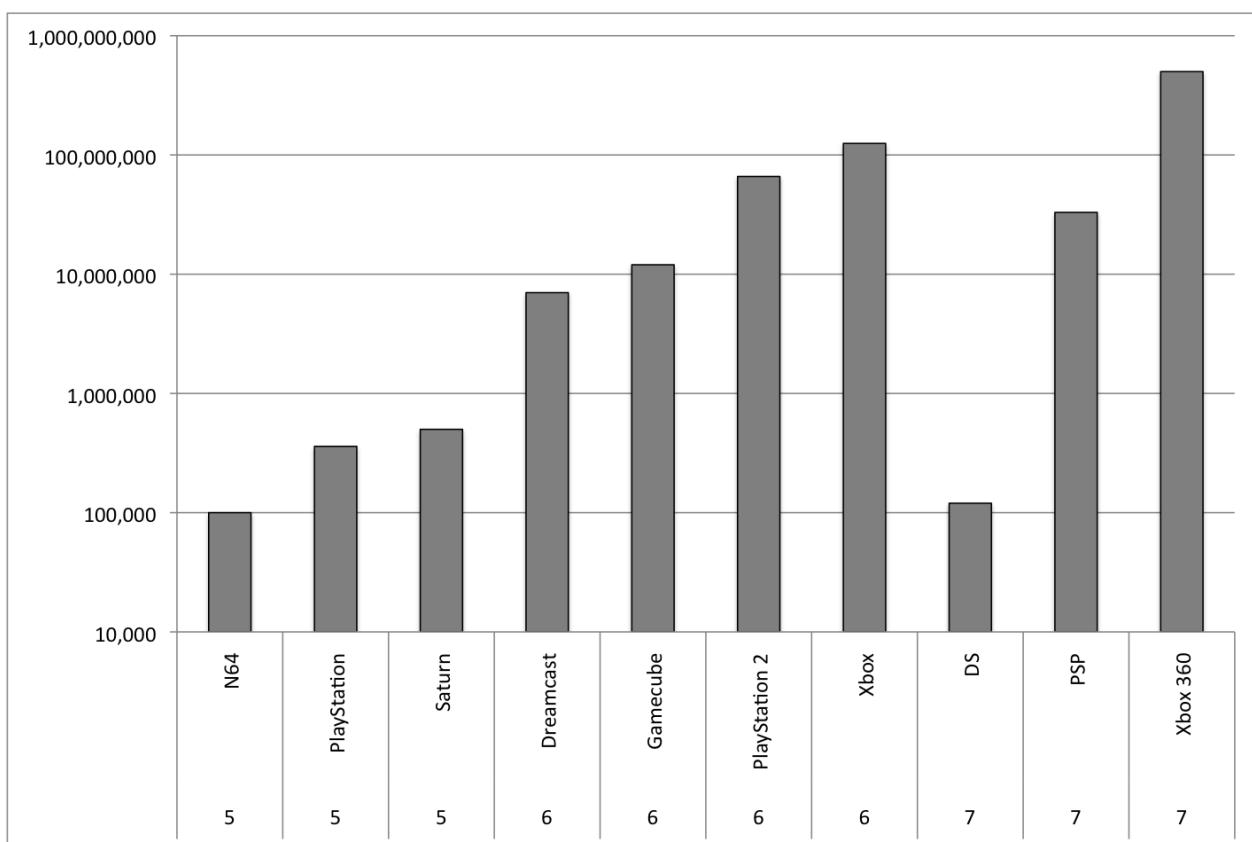
#### 5.2.7 Seventh generation 2004 ->

In the most recent console generation the big players are Nintendo Wii, Sony PlayStation 3 and Microsoft Xbox 360. The launch of Xbox 360 was timed for the 2005 Christmas season. There were 18 game titles available at launch and they included several well-known franchises, such as *Quake 4*, *Call of Duty 2* and *Madden NFL 06* (Rosmarin 2005). Furthermore, there were other games in the production pipeline. *Halo 3* published for Xbox 360 in September 2007 was reported to be the biggest entertainment launch in history with sales of 170 million USD on the first day in the United States alone. This was a new record, beating the previous record holders the film *Spider-Man 3* and the novel *Harry Potter and the Deathly Hallows*. (Long 2007)

According to a Forbes article in September 2007 Nintendo Wii was the sales leader with more than nine million units sold worldwide during the 11 months it had been on the market. Sony's PlayStation 3 sold 3.7 million units and Microsoft's Xbox 360 8.9 million units during the same period. At this point the new Xbox had already been available for 23 months, more than twice as long as Wii. (Ewait 2007) PlayStation 3 encountered problems. It was launched after several delays in late 2006 in the USA and Japan and in early 2007 in Europe (Reiss 2006). On the other hand, throughout 2007 Xbox 360 was the leader, with PlayStation 3 in second place and Nintendo Wii third with the IGN Platform Buzz Index. This index is based on page view and purchase intent data. (IGN Gamermetrics 2007) However, they predicted that PlayStation 3 would overtake Xbox 360 in

2008 because of expected exclusive game titles, such as *Metal Gear Solid 4: Guns of the Patriots*, *Killzone 2* and *LittleBigPlanet* (Williams 2007).

Technologically the seventh generation devices do not greatly differ from those of the previous generation. All the devices have either 32 or 64 bit CPUs. Most display a truecolour level of 16.8 million colours, but of the four handhelds only Sony PlayStation Portable displays so many colours. However, there was a significant increase in the graphics rendering capability. Figure 10 compares the rendering capabilities of the fifth, sixth and seventh generation devices on which reliable data in this respect is available. The handheld Nintendo DS is more powerful than the fifth generation N64 console and the portable PSP's rendering capability is of the same order as the sixth generation consoles. The seventh generation Xbox 360 renders 500 million polygons per second which is quite an impressive advance on the 125 million rendered by the sixth generation Xbox.



**Figure 10.** Graphics rendering capability in polygons per second, logarithmic scale.

In terms of the peripherals a notable innovation was the Wiimote remote controller and the Wii Fit balance board introduced with the Nintendo Wii console. The Wiimote has an integrated accelerometer which enables it to sense tilt and motion along three axes. There is also an optical sensor which detects the direction pointed at. (see Mäyrä 2008, p. 145) In the handheld front an interesting innovation was the two screens in Nintendo DS which allow the division of information and gameplay. (Newman and Simons 2007, p. 230)



Even though the three consoles mentioned above attracted most of the media attention there are also other seventh generation consoles. ZAPit Games introduced Game Wave in 2005, Envizions Computer Entertainment introduced Evo: Phase One in 2006 and Mattel introduced Hyperscan, also in 2006. Game Wave is a party game system integrated with a DVD player whereas Evo is marketed as a media centre. Hyperscan is a simple system for children. The seventh generation portable devices include the immensely successful Nintendo DS and Sony PSP, the very short-lived Gizmondo by Tiger Telematics and the Linux-based GP2X by Game Park.

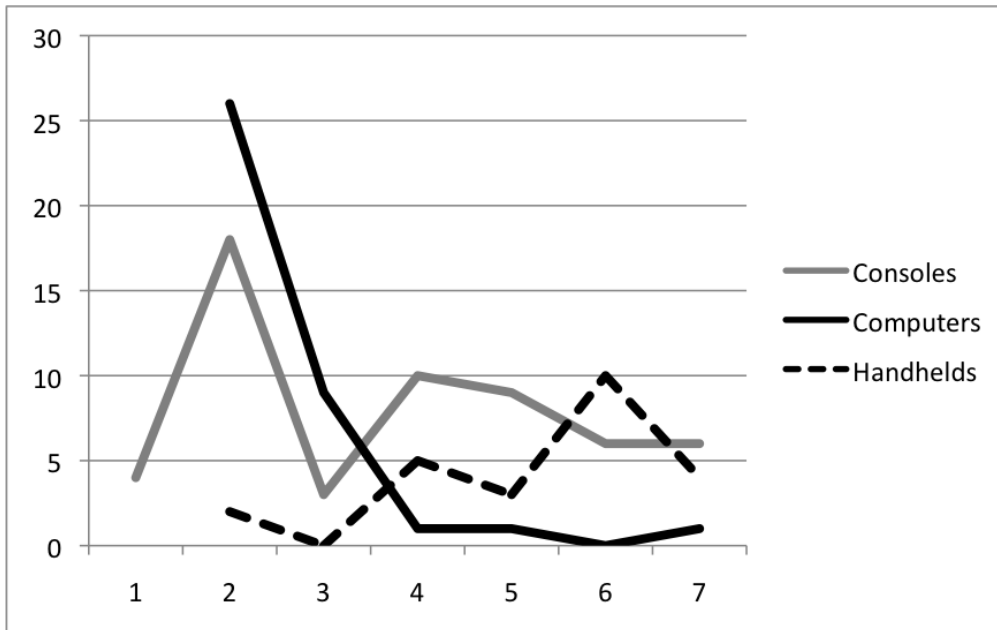
While Nintendo expended a considerable amount of resources on the portable Game Boy series Sony abandoned the plan to develop a competing portable device, the reason being that Sony saw mobile phones as the future portable platform. (Aoyama and Izushi 2003, p. 429) However, despite numerous positive growth estimates the mobile gaming sector is taking a long time to fulfil the expectations. The failure of WAP in 2001 damaged belief in mobile gaming success (Kangas et al. 2004, p. 87) and other failures have followed. In November 2005 Nokia reported that they had sold only two million N-Gage devices despite an ambitious target of six million. However, Nokia also announced the plan of bringing games developed for the N-Gage to other N series phones. (Mäntylä 2005a) Apparently Sony recovered its faith in portable devices as their PlayStation Portable has been in the market since 2004 competing against Nintendo's portable DS that was also launched in 2004. In September 2007 Sony Ericsson announced plans for a mobile phone with integrated PlayStation console. However, the technology for such a PlayStation phone is still some way from being perfected (Palmer and Parker 2007).

According to Ollila et al. (2004) the mobile game sector is challenging because of wide diversity in devices, standards and national tastes in content. Thus universal hits like those emerging on consoles or PC are currently impossible for the mobile phone. Japan and South Korea are the only countries where mobile gaming is mainstream consumer behaviour, whereas in the USA and Europe the challenge is still to attract consumers to try mobile games for the first time (Kangas et al. 2004, p. 9, 66) According to Ollila et al. (2004) the obstacles critical for the rise of the mobile gaming sector are the proliferation of more advanced phones, network coverage and data transfer speeds. On the other hand, in many countries the main obstacle is still mobile phone penetration (Kangas et al. 2004, p. 10). Both rapid growth (Mannila 2007) and downswings (Reiss 2007) in the mobile game sector have been reported.

#### 5.2.8 *Generational overview*

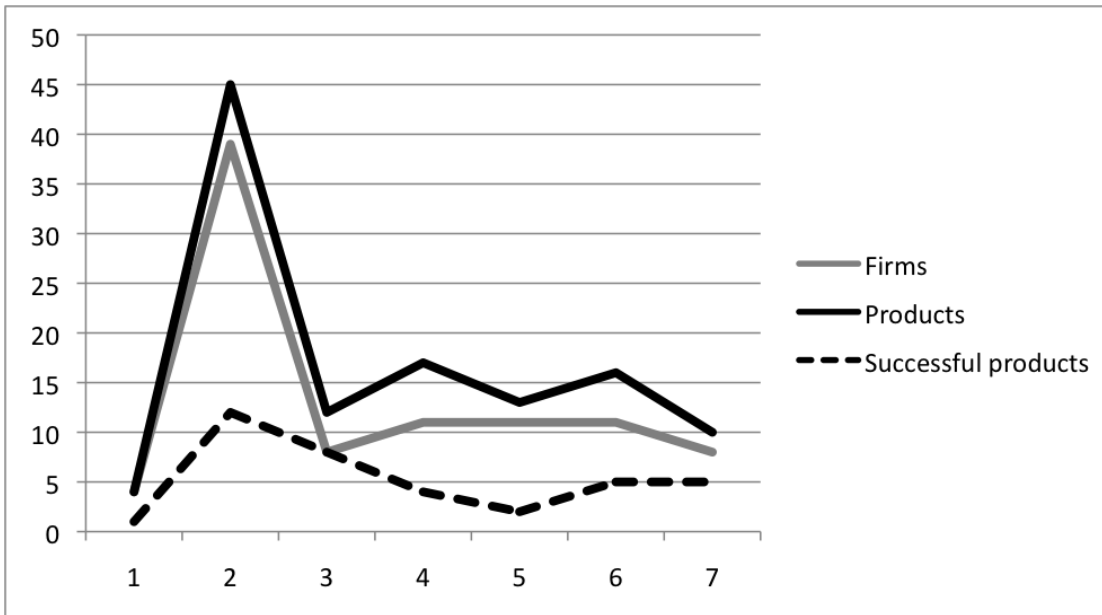
The history of game hardware has witnessed several major changes in both devices and industry structure. First of all, the division of new product introductions into consoles, home computers and handhelds has evolved from the consoles only approach of the first generation to the near tie between consoles and handhelds in the most recent generation (Figure 11). The first generation devices were all consoles, but in the second generation computers became more numerous. Home computers became heavily standardised multipurpose devices. Since the fourth generation home computers specifically designed for gaming have been scarce. At the same time consoles became the most common platform type. Since the sixth generation handhelds have been as numerous as

consoles in new product introductions. This may be due to advances in handhelds allowing them to reach console levels in some performance criteria. However, the handhelds still have small screens suitable for very different purposes than consoles. Killing time at the airport is a perfect showcase of the merits of the handhelds, whereas the consoles' detailed graphics and special effects on the plasma screen offer a very different game experience.



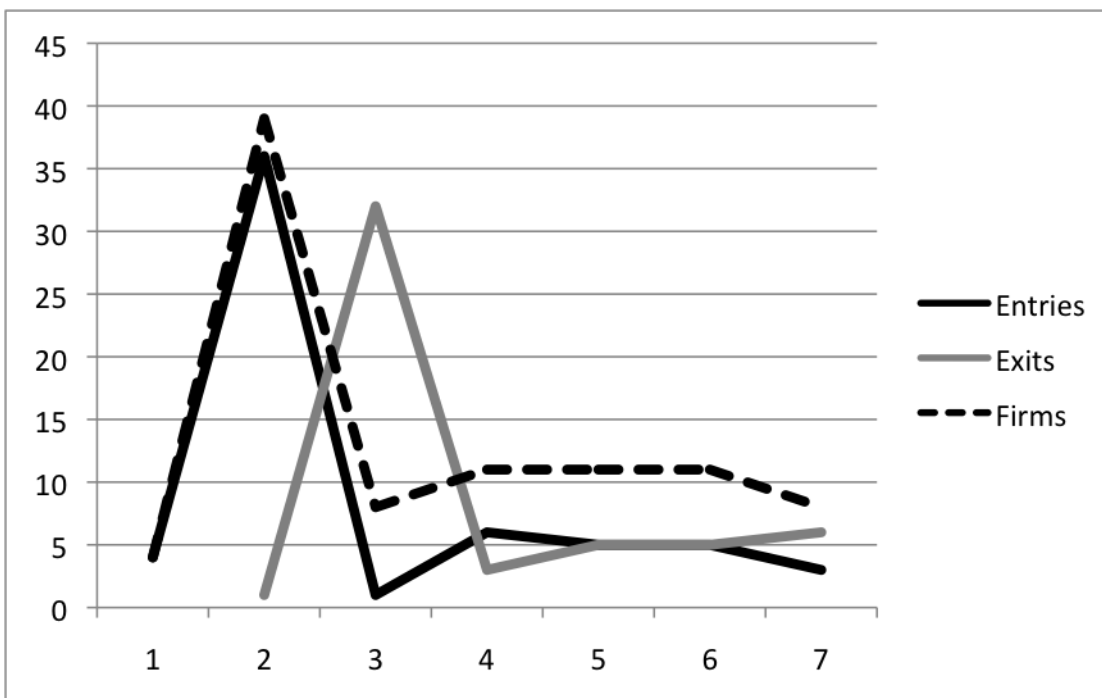
**Figure 11.** Numbers of different kinds of devices in each generation.

Some of these devices have been successful and some have been miserable failures causing bankruptcies. Figure 12 presents the number of products and successful products in each generation in addition to the number of firms that have manufactured them. In each generation most firms introduced just one device. The number of successful devices has stabilised at around five per generation. The slump in the fifth generation was caused by the fierce battle by Nintendo 64 and Sony PlayStation. Since then handhelds have become as popular as consoles. An interesting recent development is that game development still continues for the previous generation Xbox and PlayStation 2 even though Xbox 360 has been on the market since 2005 and PlayStation 3 since 2006. In earlier generations the fadeout of game development for previous generation machines was significantly faster. In addition to games for PlayStation 2, many retailers still stock the device itself. Thus the competition is currently both within and between device generations.



**Figure 12.** Number of firms, products and successful products in each generation.

As many devices have been failures many firms have been forced to exit. The firm numbers peaked in the second generation. Between the second and third generations there was a shakeout after which firm numbers stabilised to a level approximately 25% of the peak. The entry rate went through a slump right after the shakeout, but stabilised around 50% of the firm numbers in each generation. Thus there was considerable churning as in each generation half the firms exited and were replaced by new entrants. Such high entry and exit rates after the shakeout diverge from the assumptions of the industry life-cycle theory.

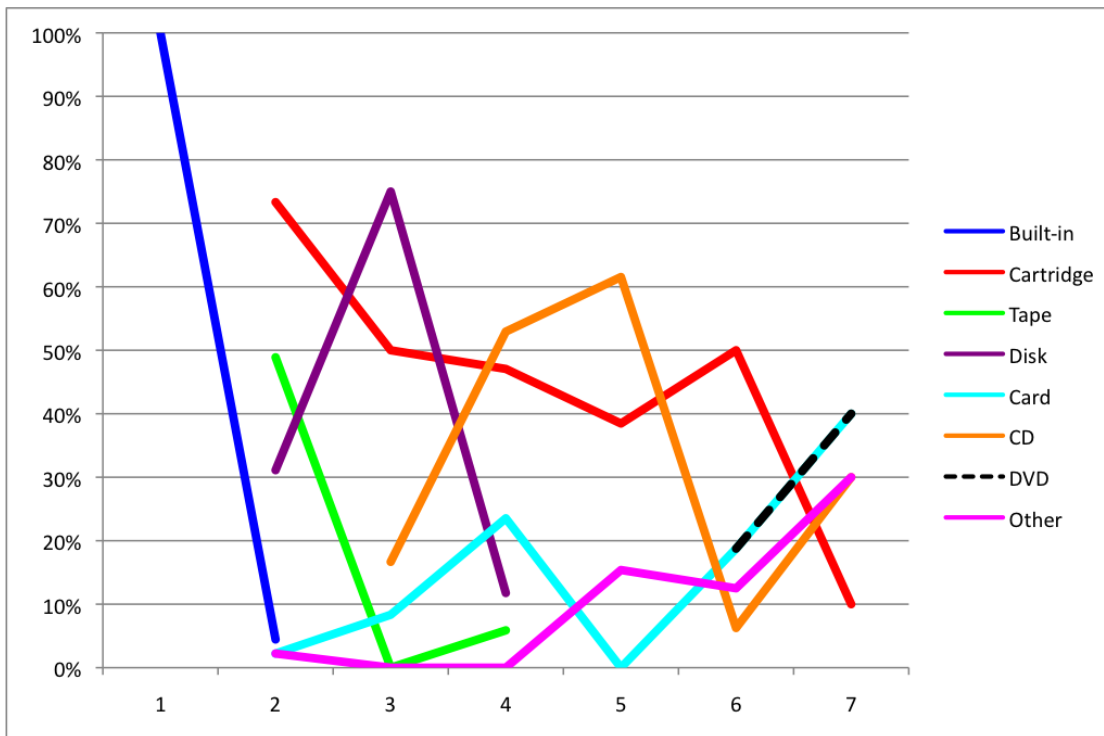


**Figure 13.** Entries, exist and firm numbers in each generation.

With new generations new performance criteria of interest have emerged. There have been very clear performance criteria from early on, making the comparison of the products relatively easy. The earliest metric used to differentiate the devices was the number of colours that the device could display on screen. This avenue of development was exhausted when truecolour, i.e. 16.8 million colours, became a standard feature in fifth generation machines. During the third generation CPU capacity became another important factor communicating the value of the device. However, by the sixth generation the pursuit of more raw CPU capacity had ceased as complicated coprocessor architectures had become the norm, rendering increases in CPU bits superfluous. Since the sixth generation polygon rendering capability vital for 3D graphics has become the variable of interest.

It is noteworthy that the number of colours and polygon rendering capability have both undergone exponential growth. The number of colours ceased exactly at the truecolour level and no incremental increases have appeared, or would have made a difference, in more advanced devices. Thus there was no levelling off but a sharp halt. The polygon rendering capability is still growing exponentially and no final level is in sight. It may be that there is a perpetual introduction of new performance criteria and exponential development in them as a non-utilitarian product does not have a natural limit at which performance suffices for the task at hand. As there is no (utilitarian) job to be done the consumer will value any new avenue of development if it contributes to more immersing and enjoyable entertainment. Perhaps it will be the physiological limitations of the human eye that eventually curtail the need for advances in the quality of graphics.

In addition to these performance metrics a notable development has been the change in the storage media. Figure 14 plots the usage of different storage media as a percentage of the devices. In the first generation all devices had built-in games. In the second generation cartridges had become the most popular media with disk in the third generation. The fourth and fifth generations were dominated by CD whereas the cartridge made a surprising comeback in the sixth generation. This is due to the rise of the handhelds where cartridges continued to be a popular storage medium. In the seventh generation DVD is the medium of choice even though CD is still strong. Other media used in seventh generation devices include mini-DVD for PSP, proprietary optical disk for Wii and Blu-ray disk for PlayStation 3. There has been a distinct dominant design in each generation. However, this changed every few years and even the most recent generation has introduced several new storage media.



**Figure 14.** Percentage of devices using particular storage media in each generation.

In recent years hardware diversity has also been created by mobile phone, iTV (interactive television) and casual web browser games. Mobile gaming has the challenges of the divergent features of different phone models, non-standardised support for various operator services and various telecom regulations for using positioning information. However, Mäyrä (2008, p. 147) argues that location-based multiplayer experiences are a promising concept for mobile gaming. Especially in the UK, iTV game business models have been explored since the early 2000s. According to Spectrum Strategy Consultants (2002, p. 14) it remained a niche concept and it does not appear to have become hugely popular since that assessment. Casual web browser gaming on the other hand appears to have become popular. Casual gaming on home computers was popularised by *MineSweeper* included in all Microsoft operating systems since 1991. In web browser based casual gaming the business model relies on advertising. For example, *Sissyfight 2000* (launched in 2000) and *Hapland* (launched in 2005) have showcased the power of web browser casual games in attracting gamers (see Newman and Simons 2007).

The conclusion on the evolution of game hardware is that it is not showing many signs of maturation as defined by the industry life-cycle theory. The number of firms declined after the second generation peak value, but the entry and exit rates remained high at around 50% per generation. There have been exponential increases in key performance metrics and so far there is no sign of stagnation in this respect. Furthermore, there are no easily identifiable dominant designs. In most generations there has been a clear dominant storage medium, but this has changed in all but one transformation between generations (CD was dominant in both fourth and fifth generation). It appears that the most influential dominant design is the business model of hardware and software sold separately. The use of separate storage media to sell games on allows narrow profit margins on

hardware and greater profits on software, which in turn makes it psychologically easier for consumers to invest in a game device.

### 5.3 Innovations in software

#### 5.3.1 *Era of ferment?*

The first games were crude, simple and very much alike. The huge success of *Pong* in the arcades attracted many firms to produce clones. These included Midway's *Winner*, Williams' *Paddle Ball*, Chicago *Coin's TV Hockey*, Sega's *Hockey TV*, Taito's *Pro Hockey* and Brunswick's *Astro Hockey* (DeMaria and Wilson 2004, p. 22). Also, all the first generation home consoles housed only *Pong* clones, a total of 25 of them. Thus in terms of software the early phase of the games industry was an era of very little product variation. *Pong*, however, was not the first arcade game. The first one was called *Galaxy War*, a version of the pioneering *Spacewar!*, and it was introduced around 1971 at Stanford University campus (DeMaria and Wilson 2004, p. 13).

In addition to *Pong*, classic arcade games included *Computer Space* (1971), which was another version of *Spacewar!*, *Lunar Lander* (1973), *Asteroids* (1979) and *Battle Zone* (1980). The first one of these games was manufactured by Nutting Associates, but developed by Nolan Bushnell and Ted Dabney, who later founded Atari. The rest were Atari games. (Poole 2000, pp. 18-19; Kent 2001, pp. 130-132; Aoyama and Izushi 2003, p. 427) In terms of gameplay *Computer Space*, *Asteroids* and *Battle Zone* were all shooting games whereas *Lunar Lander* was about landing safely on the rugged surface of the moon. With the exception of *Battle Zone* with a war theme, all the games were themed by the then topical space race. *Computer Space* had raster graphics whereas the others used vector graphics. Taito's *Space Invaders* (1978) followed the space theme and shooting action and was based on raster graphics. Atari's fourth game, *Gotcha* (1973), was a different type of game as it introduced maze chasing to the arcades (DeMaria and Wilson 2004, p. 24). This game can be seen as a precursor of *Pac-Man*.

Even though the content variation in early games was not spectacular, some important gameplay innovations were introduced. The arcade version of *Pong* was the first commercial game to introduce two-player action, which turned gaming into a social experience. *Space Invaders* was the first game to record high scores adding to the social side of gaming and motivating skill accumulation. Another gameplay innovation introduced in the *Space Invaders* was multiple lives. This would become a common feature in later games. Mäyrä (2008, pp. 59-64) also notes that the crude animations of alien figures in *Space Invaders* were the first animated characters. Furthermore, Namco's *Rally-X* (1980) added another standard feature of arcade gameplay, namely the bonus round.

In the early 1970s the only available computers were mainframes used in universities, government institutions and large corporations. *Hamurabi* (1971) is the earliest well-known game developed for the mainframe environment. *Hamurabi* is a text-based simulation of ruling a kingdom, buying and

selling land, buying grain and distributing it to subordinates. It was later ported to BASIC and the program code spread in book form to early home computer owners to type in and play. Another early mainframe game was *ADVENT*, also known as *Colossal Cave Adventure*, which was developed by two computer science students at Stanford University using the university mainframe. This game was a text-based adventure which is today an almost extinct genre (Mäyrä 2008, p. 78).

Networked play was introduced in the late 1970s. Both *MUDI* developed at the University of Essex and *Avatar* developed at the University of Illinois have been called the first Multi-User Dungeon. Both opened in 1971 and allowed social multiplayer experience of the role-playing type. Of these *MUDI* was more advanced as it introduced the administration structure that has become a standard in later Massively Multi Player games. Experienced players were given responsibilities for administering the game. (Mäyrä 2008, p. 122)

In the early games stylistic innovations were limited by the degree of technological sophistication. Unsophisticated graphics impeded the creation of the game environment as well as the development of characters. Furthermore, the primitive level of hardware imposed limits to the size of the game programs in terms of the number of lines of code which determined the number of different kinds of events possible in the game.

Electronic games are both technological and stylistic products. Technological innovations enable different kinds of movement on screen, more developed presentation of characters and environment, more accurate simulation of real-world phenomena and so on. Stylistic innovations include the creation of new characters, styles and gameplay as well as the formation of new genres.

### 5.3.2 *Technological innovations*

It is emphasised in many texts on game development that, compared to other cultural products, such as films, the particular challenge in creating games is the requirement for technology development by the team. Guérin (2006) describes game development as equivalent to film production with the addition that the team creates their own cameras and microphones for each film. However, game development also differs from film production in the sense that the characters and environments appearing in games need to be created by the developers. Thus the challenge in game development is to both create the characters, stories and action and also to build technologies that capture and recreate them. In addition, the interactivity of games forces game developers to take into account and prepare for each and every contingency that the player might face.

It would be impossible to gather an exhaustive list of all technological innovations concerning game software. Here the emphasis is on innovations that affect gameplay, that are not incorporated into the devices discussed earlier and that are evident for game players.

Technological software innovations fall roughly into three types. Innovations in graphics improve the appearance of the game, usually with the objective of photorealism. Innovations in simulation improve the physical realism of the game in terms of Newtonian physics. This means that cars accelerate, decelerate and skid and balls fly and bounce as you would expect them to on the basis of

real life experience. Innovations in gameplay allow new kinds of game experience in terms of the objective of the game and the alternatives that the player can choose from.

The development of graphics has been very much tied to the capabilities of the hardware. While many of the early games were text-based, raster graphics as well as complementary vector graphics were used early on. *Pong* is an example of a game with raster graphics where images are represented as an array of pixels. It does not allow zooming or variation in the viewing angle.

Vector graphics uses primitive geometric shapes such as lines, points and curves to represent objects on the screen. These are based on mathematical equations and thus zooming becomes possible by changing the multipliers in the equations. Vector graphics is still a 2-dimensional method, even though it allows pseudo-3D, also called 2.5D, representation. An early example of 2.5D graphics is *Battle Zone* (1978) where the 2D graphics created a 3D perspective and the gameplay was done in 2D. Such early pseudo-3D games, however, presented shapes only by their outlines. There were no surfaces, just lines. Surfaces and more detailed imagery came soon with the arcade games *Zaxxon* by Sega and *Q\*bert* by Gottlieb. They were both released in 1982 in the arcades and afterwards to second generation home devices (DeMaria and Wilson 2004, p. 84-87). An Atari arcade game *I, Robot* from 1983 was the first commercial game to have filled 3D polygon graphics and shading. It still took a decade before such graphics became commonplace in home game devices. Shading has subsequently gone through many developments. Gouraud shading is a computationally efficient way to achieve smooth alternations in lighting without having to calculate the lighting conditions for each pixel. An early game to benefit from this technology was *Strike Commander* (1993) by Origin Systems.

Another development was the use of fractal graphics. This was done, for example, in EA's *Starflight* (1986). The galaxy was different in every game session as the planets were generated from fractal graphics. This allowed the exploration of a very vast galaxy as it did not need to be created planet by planet by the game designers as the graphics logic did the work. (DeMaria and Wilson 2004, p. 164-183) In the late 1980s the games industry started to use rotoscoping technology that had been used in film animations for decades. Rotoscoping entails tracing over live-action film movement frame by frame to create a smooth and realistic animation. An early game to make use of this technology was *Prince of Persia* (1989) by Brøderbund. Digital rotoscoping was invented by Smoking Car Productions who commercialised it in their 1997 game *The Last Express*. Another innovation in animation was the use of claymation by The Neverhood in a game of the same name from 1996. Graphics realism was also advanced with motion capture. Acclaim Entertainment developed motion capture technology for games in the early 1990s. They showcased the technology at SIGGRAPH '93 conference and Acclaim Motion Capture System was released in the public domain in 1994.

In the early 1990s graphics were still 2.5D. The best-selling *Doom* (1993) was dubbed a pioneer in immersive 3D graphics but technically the graphics were pseudo-3D. The environment was modelled in 3D, but gameplay and movement was limited to a 2D plane. Another important pioneer of 3D was *Virtua Fighter* released in 1993 in the arcades and later for Sega Saturn. It introduced a



moving camera that showed the fighters from all angles and zoomed in. It has been defined as the first 3D-polygon fighting game. However, the actual fighting was done in 2D. (Newman and Simons 2007, p. 236-238) Even though 3D graphics have subsequently become prevalent, pseudo-3D has been used in games where the gameplay does not require free-roaming in 3D space. For example, side-scrolling platform games do not need 3D graphics. An example of these is *New Super Mario Bros.* (2006), which included a beautiful 3D environment, but the player could move only in 2D.

The evolution of the graphics capabilities came together with the use of CDs as the storage medium for games. CDs have a large storage capacity and thus allow more intricate graphics. The first huge CD-ROM hit game was *The 7<sup>th</sup> Guest* (1990) by Trilobyte Software (DeMaria and Wilson 2004, p. 257). In 1993 CD-ROM drive was becoming a standard in home computers and *The 7th Guest* and *Myst* (1993) were important games for showing and using the potential of the new medium (p. 259). However, the first game on CD was already released in 1986 when Cinemaware published *Defender of the Crown* in that format.

Full 3D graphics have been used since the mid-1990s. Examples of early games with full 3D include *Descent* (1995) and *Quake* (1996). They allowed free-roaming in 3D space and made any viewpoint possible. However, this was not the end of the evolution of graphics as innovations such as ragdoll physics in the early 2000s and developments in lighting and shadowing in mid-2000s have allowed the representation of increasingly photorealistic worlds. The development of graphics engines has also allowed incrementally increasing detail in 3D models. Ragdoll physics refers to the modelling of non-rigid bodies, such as dead opponents, whose falling and tumbling needs to differ from rigid body objects that bounce. Ragdoll physics algorithms are supported, for example, by the Unreal Engine 2 used in the *Unreal Tournament* (2003). “Next-generation effects”, such as volumetric lighting and bump mapping, have been used in games like *Half-Life 2* (2004) and *Peter Jackson’s King Kong* (2005) (Newman and Simons 2007, p. 148-149).

As graphics have become more and more advanced, graphics engines have come to be sold by game development studios to other developers. An example of a popular product is the Unreal Engine developed by Epic Games. It was first introduced in the 1998 first-person shooter *Unreal*. It has been licensed to many developers since then and new versions have been introduced. The first Unreal Engine from 1998 included collision detection which handles situations where solid objects intersect. This ensures that people do not walk through walls or each other. The second version, Unreal Engine 2, was launched in 2002 and included ragdoll physics. Unreal Engine 3 released in 2007 had improvements in lighting and shadowing, such as high-dynamic range rendering, per-pixel lighting and dynamic shadows. Unreal Engine 4 is under development.

Attention should not, however, be directed solely to the development of graphics. Prior to graphics engines striving for photorealistic worlds and accurate representations of Newtonian physics, other important aspects or realism have been developed. *Earl Weaver Baseball* (1987) by Electronic Arts was the first game to simulate wind conditions, fielders’ and runners’ speeds and ball velocity. Prior to this randomness was used to determine where the ball lands and who is able to reach it. (DeMaria

and Wilson 2004, p. 164-183) Another EA game *Indianapolis 500: The Simulation* (1989) set a new standard for realism in racing games. The car could spin and drive in the wrong direction on the track which was not possible in earlier games. (p. 164-183) Another development in racing realism was *Grand Prix Legends* (1998) by Papyrus Design Group which was the first game to simulate a proper clutch (pp. 298-9).

Even though all the above mentioned innovations affect gameplay, more specific gameplay innovations are also discernible in the history of games. A very important one is non-linear gameplay. Early games had straightforward missions, such as killing the enemy, landing on the moon, catching the competitor or hitting the ball with the paddle. Linear games have a predetermined order in which challenges are confronted. For example, the mission in *Donkey Kong* is to pass through four phases by avoiding obstacles in order to save the princess.

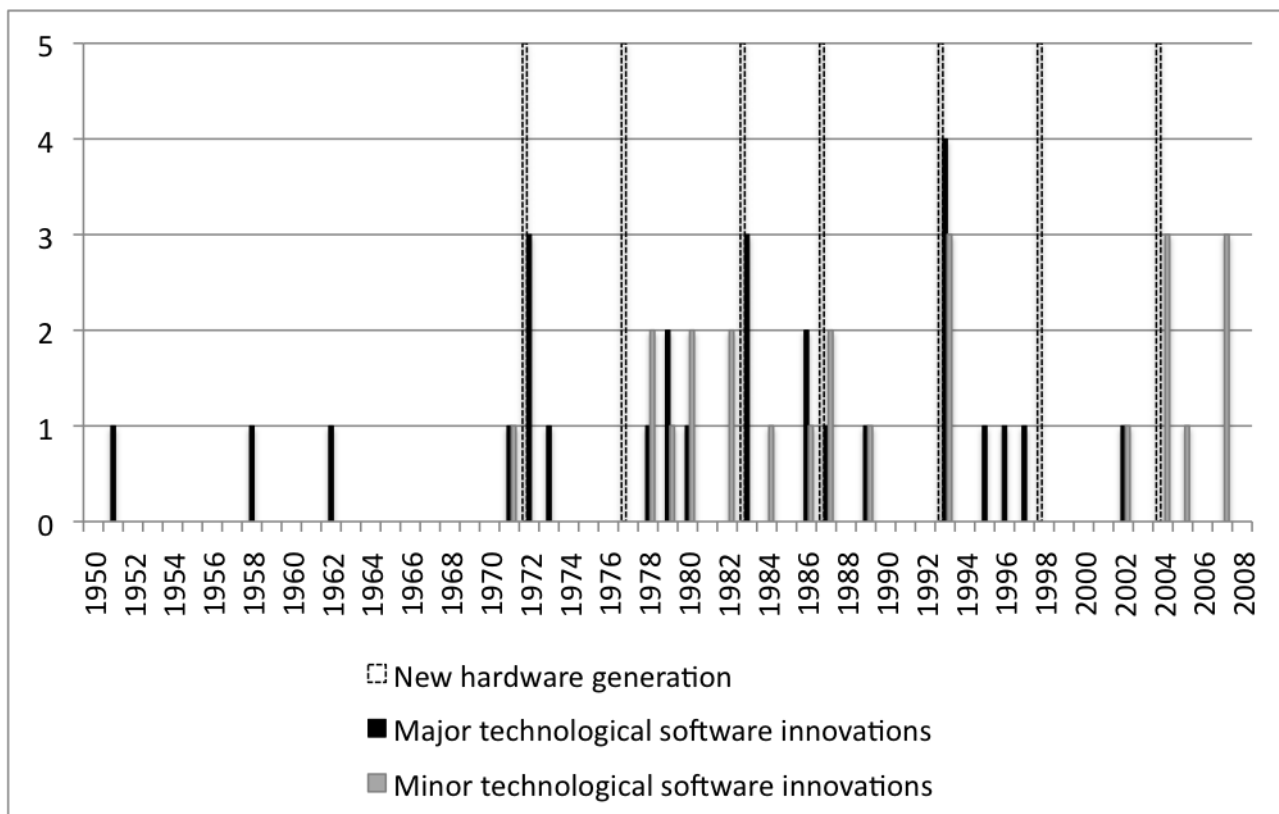
Non-linear games, on the other hand, allow the completion of tasks in alternative order and the exploration of side-quests and subplots that are not mandatory in terms of winning the game. Early non-linear games include the space trading game *Elite* (1984), the action game *Metroid* (1986) and the city building simulation *SimCity* (1989). In *Metroid* the purpose is to complete the game. There are, however, different kinds of endings depending on how the game has been played. *Elite* and *SimCity* are different in that the game never ends. In *Elite* the player aims at more and more spaceship upgrades whereas in *SimCity* the building of the city does not reach any ultimate goal. These are thus sandbox games meaning that the player can keep on upgrading and building without ever winning the game. The full exploration of 3D space that came in the mid-1990s coined the term 'free-roaming' which also refers to non-linear gameplay.

Other games notable for technical gameplay innovations include *Maniac Mansion* (1987) by Lucas Arts, *Doom* (1993) by id Software and *Warcraft: Orcs and Humans* (1994) by Blizzard. *Maniac Mansion* introduced multiple user-selectable characters with significantly different abilities and critical clues contained in numerous cut-scenes (DeMaria and Wilson 2004, p. 198-205). The player could choose with which character she played the game and this selection had an effect on the outcome. Cut-scenes as a method of storytelling allowed the development of more intricate stories as the game graphics of 1980s were somewhat underdeveloped. Animation could offer more detail and more immersive experiences.

*Doom* is a landmark game in that it offered several technical gameplay innovations. The Doom engine was capable of recording player action and this turned games into a spectator sport (Mäyrä 2008, p. 105). *Doom* also introduced the Deathmatch mode, which was a new kind of multiplayer experience. Previously multiplayer gaming had been turn-based or split-screen. Thus players could only play one at a time and take turns in competing on who scores the highest or alternatively play simultaneously by splitting the screen into two. Now players could shoot their friends and foes by setting up a Local Area Network. (ibid. p. 110) Deathmatch type play was popularised further in *Quake* (id Software, 1996) and *Unreal Tournament* (Epic, 1999). *Doom* also contributed by popularising modding, i.e. the creation of game modifications by players (ibid.). However, the first game to allow user-created levels was *Lode Runner* (1983) by Brøderbund.

*Warcraft: Orcs and Humans* greatly contributed to the creation of the real-time strategy genre. Prior to this strategy games had been turn-based, which meant that players had to wait for their turns to make a move. In 1997 Blizzard launched Battle.net together with the real-time strategy game *Diablo*. This allowed multiplayer gaming over the Internet (DeMaria and Wilson 2004, p. 268-271).

Figure 15 maps the technological innovations in software in relation to hardware generations. The division of innovations into minor and major is a subjective judgement as these innovations do not contribute to advances in easily measurable performance criteria. Many of the innovations introduce a new function, such as high score (1978), free movement (1980) or angles and zoom (1993). Many of the innovations improve the graphics and physical realism of the game, such as pseudo-3D graphics (1978), motion capture (1993), ragdoll physics (2002) or volumetric lighting (2004). All of the included innovations are major in that they stand out in an environment where most games come with something technologically unique in them but naturally not each and every game is included. The innovations introducing new functions are classified based on whether they are technologically trivial, such as high score, or technologically ambitious, such as angles and zoom, to implement. The trivial ones are deemed minor and demanding ones major innovations. Innovations relating to graphics and visual realism are major when they introduce a new process into game development, such as motion capture. Minor innovations are refined versions of doing something that has also been done before as well. Volumetric lighting, for example, fits into this category.



**Figure 15.** Major and minor technological innovations in software in relation to the introduction of new hardware generations.

The introduction of the first, third and fifth hardware generation coincides with several major innovations in software, whereas the introduction of the fourth and sixth hardware generation coincides with several minor software innovations. The second and the sixth hardware generation were not accompanied by software innovations. Of the 51 technological software innovations appearing in the Figure, 19 took place simultaneously with the introduction of a new hardware generation and 31 at other times. If we include the years 1972-2007 we have 46 innovations. Of those 19 coincided with the introduction of new hardware generations and 27 did not. An average of 2.7 technological software innovations took place in new hardware generation introduction years and an average of 0.75 per year at other times. Thus technological innovations in software coincided to a considerable extent with the emergence of new hardware generations.

### 5.3.3 *Stylistic innovations*

The analysis of stylistic innovations rests on introductions and refinements of genres. The idea of genres as dominant designs has been put forth by Peterson and Anand (2004) concerning the music industry and Perretti and Negro (2007) concerning the film industry. The idea of genres as dominant designs in video games was evinced by Tschang (2007). In earlier work Tschang and Szczypula (2006) conclude that the evolution in the game software industry is unbounded as there are no dominant designs. Later on, however, Tschang (2007) takes the stance that game genres, such as first-person shooter or real-time strategy, define dominant designs in game content. New genres are radical innovations, whereas games that extend a genre are incremental innovations.

According to Tschang (2007) the following genres are established dominant designs: adventure, first-person shooter, role-playing, simulation, strategy, real-time strategy, music, MMORPG and virtual life. There are, however, many genre classifications of which some are introduced and compared here (Table 14). IDSA<sup>10</sup> (2001a) uses the following genre classification: strategy/RPG, action, sports, racing, family entertainment, children's entertainment and other. A year later IDSA (2002) uses a slightly different genre classification including sports, action, strategy/RPG, racing, fighting, first person shooters, other shooters, family and child.

Nielsen Interactive Entertainment's (2005, p. 16) genre classification includes action-adventure, sports, racing, strategy, shooters, fighting, role play, simulation, platform, puzzle and music. ESA (2008, p. 5) uses the following classification: action, sport games, racing, shooter, role playing, family entertainment, fighting, adventure, strategy, other, children's entertainment, arcade and flight. Poole (2000, p. 21-42) divides games into shoot-'em-ups, racing, platform, beat-'em-ups, God, real-time strategy, sports, role playing and puzzle. Hayes and Dinsey (1995, p. 33) name eight genres: beat'em up, platform, puzzle, racing, RPG, shoot'em up, simulation, sports and other.

Gamerankings.com has an elaborate genre classification system consisting of nine main genres divided into 158 sub-genres. The main genres are action-adventure (divided into 25 sub-genres), action (five sub-genres), adventure (nine sub-genres), driving (18 sub-genres), miscellaneous (22 sub-genres), RPG (10 sub-genres), simulation (16 sub-genres), sports (37 sub-genres) and

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<sup>10</sup> IDSA, Interactive Digital Software Association, is the predecessor of ESA, Entertainment Software Association.

strategy (16 sub-genres). For example, under the simulation genre there are the sub-genres of flight, general, sci-fi, ship, submarine, tank and train. Sci-fi simulations, for example, are divided into simulations done with futuristic jet, futuristic sub, large spaceship and small spaceship.

**Table 14.** Comparison of genre classifications.

	Adventure	Action	FPS	Other shooters	RPG	Strategy	RTS	MMORPG	Simulation	God	Sports	Racing	Fighting	Platform	Puzzle	Music	Family ent.	Children's ent.	Virtual life	Flight	Arcade	Other
Tschang (2007)	•		•		•	•	•	•	•							•			•			
IDSA (2001a)		•				•					•	•					•	•				•
IDSA (2002)		•	•	•		•					•	•	•				•	•				
Nielsen I E (2005)		•		•	•	•			•		•	•	•	•	•	•						
The ESA (2008)	•	•		•	•	•					•	•	•				•	•		•	•	•
Poole (2000)				•	•		•			•	•	•	•	•	•							•
Hayes & Dinsey (1995)				•	•				•		•	•	•	•	•							•
Gamerankings.com	•	•	•		•	•			•		•	•										•

There appears to be a consensus on the existence of action, shooting, RPG, strategy, simulation, sports, racing and fighting genres. However, the variation among these classifications is considerable and the terms are not well established.

The classification of games into genres can be done based on the iconographic characteristics or the nature of the interaction. Apperley (2006) argues that conventional game genres rely excessively on the visual aesthetics of the game and overlook the interactive characteristics. Wolf (2002) also states that genre classification should be based on the nature of interactivity instead of iconography. In order to achieve this he classifies games into 42 genres as follows: abstract, adaptation, adventure, artificial life, board games, capturing, card games, catching, chase, collecting, combat, demo, diagnostic, dodging, driving, educational, escape, fighting, flying, gambling, interactive movie, management simulation, maze, obstacle course, pencil and paper games, pinball, platform, programming games, puzzle, quiz, racing, role playing, rhythm and dance, shoot'em up, simulation, sports, strategy, table-top games, target, text adventure, training simulation and utility. These descriptions of interaction are, however, at very different levels of abstraction. Dodging, fighting, driving and flying are very concrete tasks, whereas strategy or action are higher-level concepts that can include all of these concrete tasks in their gameplay.

Different genre classifications serve different purposes. Wolf's (2002) classification is designed for academic genre studies, whereas the classifications presented by the industry organisations serve the purpose of helping the general public to make sense of the wide variety of products. The gamerankings.com classification helps gamers to find reviews on particular kinds of games. For game development firms genres may serve marketing purposes or as focusing devices during projects inside the development team. Furthermore, Mäyrä (2008, p. 70) points out that the genre system is in constant flux as new influential games with certain combinations of features create

pressure to establish a new genre. The audience expects the stability of genres to be tempered by innovation, either technical or stylistic (Apperley 2006).

The three games labelled as the first game in different sources are of different genres. Ferranti's *Nim* (1951) is a strategy game, Brookhaven National Laboratory's *Two-player tennis* (1958) is a sports game and MIT's *Spacewar!* (1962) is a shooting game. However, it would be an exaggeration to say that these games created such genres. These games were important innovations in the content domain but they were simplistic and narrow as representations of the genres that later formed. Thus the aim here is to identify an introduction innovation as well as a refinement innovation for each genre. We therefore consider the evolution of game genres.

#### 5.3.3.1 Strategy

The game that pioneered the strategy genre, *Nim* (1951), was a text-based game of mathematical strategy. It was a turn-based game as the players made their moves consecutively as in most card and board games. The *Nim* game concept is centuries old originating from China. Another pioneer of the strategy genre was *Empire*, which was released in the PLATO network in 1972. This game was about ruling a kingdom in space, building ships, creating the industry to build them, exploring for raw materials to feed the industry, trading with other empires and shooting when needed.

The pioneering games, however, were available only to an exclusive audience. *Nim* was shown at trade fairs, whereas *Empire* was restricted to those with access to the PLATO network controlled by the universities. Turn-based strategy games became available on home devices when a version of *Dungeons & Dragons* (*D&D*) was published for Mattel's Intellivision in 1982. In the 1980s Strategic Simulations, Inc. got a licence for *D&D* and developed versions for the third generation home consoles NES and Master System as well as some home computers. Turn-based strategy has subsequently been applied in many war games, such as the *Panzer General* series (1994 onwards) and *Steel Panthers* series (1995 onwards).

An influential early 1980s innovation in the strategy genre was the introduction of real-time gameplay. This meant that the players could make moves without waiting for their turn. Early games of this kind include *Stonkers* (1983), *The Ancient Art of War* (1984) and *Herzog Zwei* (1989). The intertwining of genres dates back to early game products. For example, *Choplifter* (1982) developed by Brøderbund had elements of both strategy and shooting games. The mission of the game was to rescue hostages and it was connected to the Iran hostage crisis that took place around that time (DeMaria and Wilson 2004, p. 124-133). *Dungeons & Dragons* was also a mixture of genres as in addition to turn-based strategy it was a role-playing game and a fantasy game.

According to DeMaria and Wilson (2004, p. 185-186) the real-time strategy genre was established as late as in 1992 with *Dune II: The Building of a Dynasty* by Westwood. This was the first time that the term 'real-time strategy' was used in marketing. Another influential game in creating the real-time strategy format was *Warcraft: Orcs and Humans* (1994) released by Blizzard. Blizzard developed many popular RTS series including the *Warcraft* series, the *Starcraft* series and the *Diablo* series. Blizzard was also a pioneer in playing over the Internet. In 1997 Battle.net was

launched together with *Diablo*. Battle.net did not charge a fee and gathered a lot of traffic. This was just a practice run for *World of Warcraft* (2004), which became the most popular MMORPG to date. The social environment, in addition to gaming, contributed to its success (Newman and Simons 2007, p. 245-247).

According to DeMaria and Wilson (2004, p. 297) there was an RTS glut in the mid-1990s. In addition to *Dune* and *Warcraft* series *Age of Empires* (1997) released by Ensemble Studios contributed to the popularity of RTS games. However, there was considerable variety in the strategy games. *Populous*, first released in 1989 by Bullfrog Productions, was an immensely popular strategy game, but totally different from the *Warcraft* types of RTS games. In *Populous* the player was a god who looked down on her worshippers, used 'divine intervention' and aimed at conquering the enemy force ruled by another deity. Another landmark game was *Civilization* (1991) by Microprose. It was also a God game, but a turn-based one. In *Civilization* the goal is to spread the settlement to unclaimed areas, to develop technologies, to engage in warfare and diplomacy as well as to build Wonders of the World. In *Populous* time proceeds from prehistoric to medieval, whereas in *Civilization* the time scope goes all the way from the prehistoric to futuristic space race. Both of these games generated long-lived series. *Populous* was released for Nintendo DS in 2007 and *Civilization Revolution* in 2008 for Nintendo DS, PlayStation 3 and Xbox 360.

#### 5.3.3.2 Sports

Sports genre was pioneered by *Pong* in 1972. In terms of appearance and gameplay it was simple and unsophisticated. Arcade games in the late 1970s and early 1980s took up more complicated sports to simulate. *Atari Football* (1978) was a pioneer in this respect. In 1983 Konami brought *Track and Field* to the arcades and later on to home computers (Newman and Simons 2007, p. 228-229). Another 1983 arcade sports game was *Hardball*, a baseball game developed by Acclaim. Epyx released the popular *Summer Games*, *Winter Games* and *California Games* for Commodore 64 between 1984 and 1987.

Electronic Arts is currently the leading sports game company and the basis for its success was built in the early 1980s. *One on One* (1983) basketball game for home computers was the first true licensed sports game as the characters carried the names Julius Erving and Larry Bird (DeMaria and Wilson 2004, p. 164-183). Other early EA sports games included *Earl Weaver Baseball* (1987) and *John Madden Football* (1988). These games made Sega Master System the leading sports simulator (Kent 2001, p. 407). Sport remains a highly popular genre today and its scope appears to have been broadening throughout its history. The gam rankings.com classification divides the sports genre into 37 categories covering all kinds of popular sports, such as football, tennis and golf. However, there are also games on less popular sports, such as volleyball, and on newer sports, such as snowboarding and wakeboarding. Games about fishing also go under the sports genre. It is noteworthy that the sports games have very different game mechanics. The mechanics that include a ball, two goals and a few players moving around the field go with many traditional sports, but the mechanics for golf, wakeboarding and fishing, for example, have considerable variety.

During the early phases of sports games healthy and wholesome sports like basketball and baseball soon got more violent companions. Nintendo's boxing game *Punch-Out* came into the arcades in 1984 and was released as *Mike Tyson's Punch-Out* for NES in 1987. Fighting, however, was not a novel concept as the 1979 *Warrior* arcade game by Cinematronics was the first one-on-one fighting game. This was not boxing but fencing. The fighting genre was popularised as late as 1991 with Capcom's *Street Fighter II* (DeMaria and Wilson 2004, p. 280-281). It was followed by Midway's *Mortal Kombat* (1992), which raised controversy with its imagery that included fatality moves. As the opponent was brought to the ground the announcer would say "Finish him" or "Finish her" and the player then tried to perform a special fatality move that made blood splash. The version that came out on Nintendo SNES was less gory as Nintendo wanted to profile itself as a family brand. This turned against Nintendo as the more violent Sega version helped Sega to outstrip Nintendo in console sales (Kent 2001, p. 466). *Mortal Kombat II* by Acclaim was released in 1993 for the fourth generation consoles. This was the first multiplatform launch as the game became available for SNES, Mega Drive, GameGear and Game Boy on the same day all around the world. That day was known as Mortal Monday (Hayes and Dinsey 1995, p. 38). When *Mortal Kombat II* came out it was equally violent on both consoles and the Nintendo version outsold the Sega version (Kent 2001, p. 480). *Virtua Fighter* (1993) by Sega is another 'genre-defining' fighting game and its specialty was the 3D graphics that allowed the player to change the camera angle and zoom in. The fighting was still done in 2D. (Newman and Simons 2007, p. 236-238)

Fighting is nowadays a genre of its own, but the reason for distinguishing it from sports may be more a marketing move than due to differences in gameplay or theme. Boxing and death move fighting certainly have more in common than boxing has with golf, volleyball or surfing.

### 5.3.3.3 Shooting

According to Mäyrä (2008, p. 65) *Space Invaders* (1978) created the genre of shooters. It was a test of accuracy and hand-eye coordination skills. However, it was not the first shooting game as MIT's *Spacewar!* (1962) entails shooting. Other early shooting games include *Asteroids* (1979) and *Battle Zone* (1980).

The great success for shooting games emerged in 1992 with id Software's *Wolfenstein 3D*. It was the first game labelled as a 'first-person shooter'. Two years later id Software released *Doom* which was a more advanced version of free movement in 3D environment and fast shooter-style action represented from a first-person perspective (Mäyrä 2008, p. 101). According to Kent (2001, p. 459) *Doom* created a phenomenon unlike any PC game before or after. The *Doom* series was followed by the *Quake* series from 1996 onwards.

First-person shooters became a very popular phenomenon in the mid and late 1990s. LucasArts followed the trend by releasing *Star Wars: Dark Forces* (1995) and followed up with several *Jedi Knight* sequels. Parallax Software released *Descent* in 1995. *Half-Life* released by Sierra in 1998 added drama, story and character development to the genre. The first-person shooter genre was



further developed by *Deus Ex* (2000) by Ion Storm Austin. It included an open game-world, real-world causality and no trivial puzzles. (Newman and Simons 2007, pp. 24-26)

The shooter genre has considerable variety even though the games have in common fast action, 3D environment and shooting. *Duke Nukem 3D* (1996) by 3D Realms added comedy to the genre through humour, weird aliens and strippers. *Grand Theft Auto* (1997) by DMA Design added driving, robbing and assassinating to the genre staples (Newman and Simons 2007, p. 62-64).

The definition of shooting as a genre of its own is a compromise, as shooting games could go equally well under 'action'. The war games that go under 'strategy' also include quite a bit of shooting.

#### 5.3.3.4 Simulation

Simulation games have been available at least since the 1971 text-based simulation *Hamurabi*. In a sense all games are simulations of something. Thus the simulation genre could be broken into several genres according to what is simulated. The topics of simulation are plentiful, ranging from flying an aircraft to building the car manufacturing industry or feeding a pet.

The first *Flight Simulator* was released in 1979 by SubLOGIC. It was bought by Microsoft and their first version came out in 1982. Microsoft has continued developing new versions; the latest one came out in 2006. Another early addition to the simulation genre is management simulations. Blue Chip Software released the stock market simulation *Millionaire* in 1984. They later developed the commodities market simulation *Tycoon*, the real estate market simulation *Baron* and the art and collectibles simulation *Squire*. In 1990 Microprose launched the railway business simulation *Railroad Tycoon*. Impressions Games followed in 1992 with the airline simulation *AirBucks* and with the car manufacturing simulation *Detroit* in 1993. *Theme Park* (1994) and *Theme Hospital* (1997) by Bullfrog Productions extended the management simulation category. Another addition was sports management simulations, such as *Championship Manager* (1992) by Sports Interactive, *Premier Manager* (1992) by Realms of Fantasy and *Ultimate Soccer* (1995) by Impressions Games.

Parallel to management simulations the ultimate city simulation *SimCity* was released in 1989 by Maxis. It was followed by games with the same general idea but on a very different scale. *SimEarth* took the simulation to a global scale whereas *SimAnt* took place on a miniature scale. *SimCity* could also be classified as a God game whereas the 2000 release *The Sims* could go under the artificial life genre.

Military is another theme simulated in many games. Lucas Arts has developed military simulations since the early 1980s. These include *PHM Pegasus* (1986), *Strike Fleet* (1987), *Battlehawks 1942* (1988), *Their Finest Hour: The Battle of Britain* (1989) and *Secret Weapons of the Luftwaffe* (1991). These simulations were intended to be historically accurate representations of World War II battles (DeMaria and Wilson 2004, p. 198-205).

In the mid-1990s pet simulations were introduced as a new type of simulation game. This category was pioneered by *Petz* (1995) by PF Magic. The purpose of the game is simply to take care of a pet. It predates the digital pet Tamagotchi, which was launched in 1996. Newman and Simons (2007, p. 136-138) define pet simulation as a genre of its own with several varieties. *Pokémon* (1996) is based on collecting pets, *Monster Rancher* (1997) is about animal breeding and *Nintendogs* (2005) is about taking care of a pet as is also *Purr Pals* (2007), whereas *Dog's Life* (2003) is about saving dogs. Analogous with taking care of a pet, the goal in *Viva Piñata* (2006) is to develop a successful garden. There are also online communities (e.g. *Creaturebreeder*, *Horseland*) that simulate animal breeding.

Pet simulations are a form of artificial life, but the artificial life genre was already pioneered in 1986 by *Alter Ego* (DeMaria and Wilson 2004, p. 227). It is a game about growing up, psychological development, changes in physical characteristics, social skills and occupational potential. As the character grows up it faces the challenges of applying for scholarships, getting a job and developing relationships. *Little Computer People* by Activision was another pioneer in the genre and is perhaps the first commercial example of artificial life. Every disk that the game came in was customised and thus each little computer person was unique. The first game did not sell well and the plans for sequels with furniture and equipment traded by little computer people living in apartment buildings were cancelled. (ibid.) The Finnish online community *HabboHotel* later pursued this concept successfully.

#### 5.3.3.5 Adventure

Adventure games also originate from text-based games. *ADVENT* (1976) was a text-based adventure game including elves, dragons and magic words. Adventure games became available for home computers soon after. *Adventureland* designed by Scott Adams was released in 1978. However, not all early adventure games were based on magical creatures and wizardry. Sierra released *Softporn Adventure* and *Leisure Suit Larry* in 1981 which formed the 'adult adventure' sub-genre.

Sierra also developed other kinds of adventures. Their first title was *Mystery House: Hi-Res Adventure #1* (1980). This was followed by the *King's Quest* adventure series from 1984 onwards. It was the first third-person adventure. The innovation here was that the character had a personality of its own that was not the same as that of the player (DeMaria and Wilson 2004, p. 134-143). Later releases included *Police Quest* and *Space Quest*.

During the 1980s Lucas Arts also became engaged in adventure games. Their games were deliberately comical with names like *Zak McKracken and the Alien Mindbenders* (1988) and *The Secret of Monkey Island* (1990). *Maniac Mansion* (1987) introduced the innovation of multiple selectable characters. The players could choose who they are and this choice also had an effect on what they were capable of. In 1994 Looking Glass Technologies released the first 3D first-person adventure game *System Shock*.

Cyan Worlds released several adventure games including *Manhole* (1988), *Cosmic Osmo* (1989), *Myst* (1993) and *Riven* (1997). DeMaria and Wilson (2004, p. 258-261) call these representatives of the world exploration genre. It is characteristic for these games that there are no enemies, no risk of dying and the goal is simply to look around and find out what is going on in different parts of the universe.

The most critically acclaimed game so far is Nintendo's 1998 adventure release *The Legend of Zelda: Ocarina of Time* (Newman and Simons 2007, pp. 98-97). It tops several rankings, including GameRankings.com. Thus adventure games enjoy a high level of popularity even though their media exposure does not match that of shooting, fighting and assassinating games.

#### 5.3.3.6 Role-playing

Role-playing games (RPG) emerged simultaneously for home computers and for networked play. For the home computers the early RPGs included *Temple of Apsai* (1979) by Epyx, *Akalabeth* (1980) by Origin Systems and *Wizardry* (1981) by Sir-Tech Software. The early networked RPGs *Avatar* and *MUD1* were launched in 1979.

*Ultima* series launched in 1980 by Origin Systems is a very long-lived RPG series that went online in 1997. According to Mäyrä (2008, pp. 82-82) thematic depth reached new heights in the *Ultima* series. There were no random obstacles but all challenges were connected to the theme and storyline. The purpose of the game was self-improvement. The quest could be concluded only after the character had reached 'avatarhood'.

Other early RPGs include the *Bard's Tale* trilogy by Interplay from 1985 onwards. The first RPG to have really well drawn indoor and outdoor locations and to allow full exploration of both was *Might and Magic: The Secret of the Inner Sanctum* (1986) by New World Computing. Their later RPG series *Heroes of Might and Magic* has been released from 1995 onwards. The *Final Fantasy* series from 1987 with a dozen sequels by Square Enix is an important contributor to the popularity of the RPG genre (Newman and Simons 2007, p. 52-53).

Even though role playing games have used networked play since the beginning, the first commercial massively multiplayer online role playing games (MMORPG) appeared only in the mid-1990s. *Meridian 59* (1996) by 3DO is one of the earliest. As the gameplay was dependent on attracting large populations the gamers were required to make flat-rate subscriptions (Mäyrä 2008, p. 128). This committed the subscribers as active gamers. *Ultima Online* (1997) became the first real hit in the emerging MMORPG genre. The most popular such game to date is *World of Warcraft* (2004) by Blizzard.

The classification of games into either RPG or strategy is ambiguous, as the two genres are so closely related. In most strategy games the player takes the role of a character, whereas in most RPG games there are strategic as opposed to tactical elements. Another complication is the science fiction category pioneered by *Rescue at Rigel* (1980) by Epyx and *Star Control* (1983) by Accolade. Such games could go under the RPG genre or form their own science fiction genre.

### 5.3.3.7 Platform

Platform games emerged in the early 1980s, but the groundwork for them was laid by maze games, such as Atari's *Gotcha* (1973) and Namco's *Pac-Man* (1980) (Kent 2001, p. 140; Masuyama 2002, p. 38; Mäyrä 2008, p. 69). *Donkey Kong* was the first proper platform game released by Nintendo in 1981. The sequel *Donkey Kong Jr.* came to the arcades in 1982. Mäyrä (2008, p. 73) states that *Donkey Kong* introduced the platformer as a particular kind of genre where gameplay consisted of running, jumping and climbing. *Donkey Kong* also introduced a background story that motivated the action. The goal was to save the girl from the gorilla. Furthermore, *Donkey Kong* included non-interactive animations that advanced the storyline. (ibid.)

In 1982 Activision created *Pitfall*, which is perhaps the best known game for Atari VCS. It is also the first game to feature a side-scrolling environment in which the character runs and jumps (DeMaria and Wilson 2004, p. 66). *Lode Runner* (1980) by Brøderbund is another early platform game. Its special feature is the ability of the player to create game levels. For home computers the platform genre was introduced by the *Miner Willy* series from 1983 onwards.

*Super Mario Bros.* was released in 1985 by Nintendo. According to Newman and Simons (2007, p. 213-215) it popularised the side-scrolling platform genre. It also created the mascot concept for advertising. Others that followed this genre include *Prince of Persia* (1989) by Brøderbund, *Earthworm Jim* (1993) by Shiny Entertainment and *OddWorld* (1997) by OddWorld Inhabitants. These games have very similar themes. In *Super Mario Bros.* two Italian plumber brothers strive to save Princess Toadstool from the evil demon king. Similarly in *Prince of Persia* the prince has 60 minutes to save the princess from either marrying the evil ruler or dying. In *Earthworm Jim* the main character is given a cyber suit and with the powers that come with it he battles against the evil queen to save the princess. In *OddWorld* the goal is to escape from slavery and imminent death threatened by the evil ruler. Despite a similar goal setting the games have very different graphics and style.

The Mario franchise has been continued with each new console generation. *Super Mario 64* (1996) was the first 3D platform game. Side-scrolling linear gameplay was replaced by multiple challenges that could be tackled in many different orders. The Mario game for Nintendo DS *Yoshi Touch & Go* (2005) is a platform game where instead of controlling the characters, Mario and Yoshi, the player controls the environment and aims to provide a safe path for the two little friends. (Newman and Simons 2007, p. 248-250)

### 5.3.3.8 Puzzle

As a predecessor of platform games, *Pac-Man* can also be seen as a predecessor of puzzle games. The puzzle genre, however, was created by *Tetris*, which was launched by Spectrum HoloByte in 1986 for home computers. The game was designed by the Soviet scientist Alexey Pajitnov in Moscow. Tetris was the lead game, i.e. heavily marketed together with the newly launched device, for Nintendo Game Boy released in 1989. The legal ownership of the game licence was dubious

from the beginning and several times led to legal action. The end result was that many companies made a handsome profit on the game; the designer did not.

Other notable early puzzle games include *Solitaire Royale* (1987) by Spectrum HoloByte. It was the first commercial solitaire. In 1991 DMA Design released *Lemmings* which, according to DeMaria and Wilson (2004, p. 295), is one of the greatest puzzle games ever. The purpose of the game is to guide a herd of lemmings through a safe path. To achieve this the player is required to assign tasks, such as digging, blocking and bombing, to particular lemmings. These skilled lemmings can dig a new route and block certain directions from the otherwise aimlessly moving herd. *The 7<sup>th</sup> Guest* (1993) by Trilobyte Software represents another type of puzzle game which comes closer to a horror story. The task of the player is to solve puzzles in a haunted house to find out what has happened. *Bust-A-Move* (also known as *Puzzle Bobble*) developed by Taito and released in 1994 is one of the longest running puzzle series. It has similarities with *Tetris*, as the goal is to remove objects, this time bubbles, by strategising their location in relation other objects of the same colour. Around 20 games appeared in the Bust-A-Move series between 1994 and 2008.

Puzzle games are often casual games, i.e. the goal of the game is easy to understand and the number of alternative moves available to the player is restricted. *MineSweeper* packed with Windows operating system since 1991 is a good example of this. Another popular widely available puzzle game is *Bejeweled* (2001) by PopCap Games, which was originally a web browser game. It has subsequently been ported to countless platforms from consoles to PDAs.

#### 5.3.3.9 *Driving*

The driving or racing genre was pioneered by Atari's *Gran Trak 10* (1974). In this game driving was done against the clock. Namco's *Pole Position* (1982) introduced racing against other cars controlled by artificial intelligence. Most driving games are built as an accurate as possible simulation of real-life car racing. Notable games in this respect include Sega's *Out Run* (1986), Papyrus Design Group's *Indianapolis 500: The Simulation* (1990) and Namco's *Ridge Racer* (1993). Each of them represented considerable advances in graphics and game dynamics. The *Gran Turismo* series (1997) by the Japanese developer Polyphony Digital introduced realistic racing with playability (Newman and Simons 2007, p. 13-14).

In addition to racing simulations, the driving genre includes many kinds of games with driving type of action. Psygnosis' *WipEout* (1995) is an anti-gravity game where, instead of driving, the vehicles hover. The *Burnout* (2001) series by the UK developer Criterion games is about crashing, taking risks and causing damage (Newman and Simons 2007, p. 13-14). Sega's *Crazy Taxi* and *Emergency Ambulance Driver* are examples of driving taking place outside the racing track.

#### 5.3.3.10 *Edutainment*

The first game to go comfortably under the edutainment label is *The Oregon Trail* (1974). It was developed by MECC (Minnesota Educational Computing Consortium) and published by the edutainment pioneers Brøderbund and The Learning Company. The purpose of the game was to

teach schoolchildren about the 19<sup>th</sup> century pioneer trail of US settlers. Another early edutainment game by MECC was *Lemonade Stand* (1974). It was a basic economic simulation where the weather determines the customer potential and the player makes the decisions on how much to produce, how much to charge and how much to advertise each day.

Later edutainment games include *Rocky's Boots* (1982) by The Learning Company. DeMaria and Wilson (2004, p. 229) describe it as a construction set. The gameplay requires the player to construct sequences of logic gates. Brøderbund released *MasterType* in 1983 and the *Carmen Sandiego* series from 1985 onwards. The former was about learning to type, whereas the latter was a game that required the player to use almanacs to solve the mystery. In 1984 Davidson & Associates released the first game in the *Math Blaster* series. This was followed by MECC's *Number Munchers*.

There are edutainment games on traditional school subjects as well as on other topics. Sega's 1994 game *Tails and the Music Maker* teaches children about music. Even though not advertised as edutainment games *Versailles 1685* (or *Versailles: A Game of Intrigue*) and *Egypt: 1156 B.C.: Tomb of the Pharaoh* developed and published by Cryo Interactive in 1997 can be seen as vehicles for teaching history. The latter was developed in conjunction with the French government office Réunion des Musées Nationaux. *JFK: Reloaded* (2004) by Traffic Software recreates the John F. Kennedy assassination. The player is in the role of Kennedy's assassin, Lee Harvey Oswald, and scores according to how well the performance matches that described in the report of the Warren Commission. Thus, even though edutainment games have not become best-sellers there is considerable variation in their subjects of study.

#### 5.3.3.11 Music and rhythm

The development of the music and rhythm genre is tied to that of the exercise genre as dance mat type peripherals have been used in both. The first such peripheral was Amiga Joyboard for Atari 2600 console released in 1983. The only game that used it was a slalom ski game called *Mogul Maniac*. In 1987 Bandai released the Exus Foot Craze dance pad, also for Atari 2600. It was later purchased by Nintendo and branded as Power Pad for NES. Its lead game was *World Class Track Meet*. Power Pad was compatible with a dozen games including *Dance Aerobics* and *Street Cop*.

NaNaOn-Sha's *Parappa the Rapper* (1996) is a pioneer in the music and rhythm genre. The purpose of the game is to repeat a sequence of sounds with the correct timing. This results in rap-like music and points. Additional points come from freestyling, i.e. modifying the sequence but keeping to the rhythm. In 1997 Konami released the first game, *Beatmania*, in its Bemani rhythm game series. In *Beatmania* the player is a DJ who creates music according to instructions on the screen. The second Bemani game *Dance Dance Revolution* (1998) became the first dance mat hit (Mäyrä 2008, p. 142). In this game the challenge is to step on parts of the mat with the correct timing following the instructions on screen. Similarly the goal in Namco's *Donkey Konga* (2003) is to beat the bongo drums based on instructions on screen. *Osu! Tatakae! Ouendan!* (2005) by iNIS is a variation of the instruction based music and rhythm game. The purpose is to help government

agents to complete missions by tapping markers on the screen in time with the music. In Europe the game is known as *Elite Beat Agents*.

The music and rhythm genre has become popular with Sony's *SingStar* and Harmonix Music Systems' *Guitar Hero*. The karaoke game series *SingStar* was launched in 2004 and has so far been followed by over 20 versions, and also localised ones, with different kinds of music to sing. *Guitar Hero* was first released in 2005 and a dozen versions with different music and for different platforms have been produced. (Mäyrä 2008, p. 144)

In addition to the popular mainstream music and rhythm games there are minority variants, such as *Vib Ribbon* (1999) by NaNaOn-Sha and *Electroplankton* (2005) by Indies Zero. The purpose in *Vib Ribbon* is to download the game into the hard drive and insert any music CD based on which game levels are created. Thus the player can choose any kind of music to play against with the goal of becoming a fairy princess. (Newman and Simons 2007, pp. 233-235) The purpose in *Electroplankton* is to create music by interacting with plankton. (ibid. pp. 41-42)

The exercise genre has not been immensely popular. ResponDesign's *Yourself! Fitness* (2004) is a game with yoga, pilates and cardio exercises among others guided by a personal trainer. Nintendo's *Wii Fit* (2007) has a similar concept complemented with a balance board and balance games. *Wii Fit* may prove to be the first hit in the exercise genre as it has reached considerable sales especially in Japan.

### 5.3.3.12 New candidates

New candidate genres include the casual game genre, the party genre, the alternative reality genre, the communication genre and the mental development genre. The casual game genre has its roots in early puzzle games such as *Tetris* (1986), *MineSweeper* (1991) and *Snake* (1976). Casual games are not defined by theme or gameplay, but by the low learning curve that makes them easy for the whole family to enjoy. The growing interest on casual games is due to the aim of attracting women and older people, i.e. typically non-hardcore gamers, to buy games. A console game representative of this genre is *WarioWare, Inc.: Mega Microgame\$* (2003) by Nintendo. It is a collection of simple microgames that last no more than five seconds (Newman and Simons 2007, pp. 239-242).

Party genre is closely related to the casual genre, the main difference being that party games are multiplayer games. *Mario Party* (1998) by Hudsonsoft is a pioneer of this genre. It features Mario and friends in games that resemble traditional board games. Other representatives of the party genre include games that use The Buzz! buzzers. These handsets allow the players to buzz and choose among alternatives just as in a game show. The first game to use the buzzers is *Buzz!: The Music Quiz* (2005) by Relentless Software for PlayStation 2.

Mäyrä (2008, p. 148) suggests that EA's 2001 release *Majestic* pioneered the alternative reality genre. It invited players to solve a mystery involving conspiracy elements. Emergent player networks formed up to address the game's challenges.

Newman and Simons (2007, pp. 5-7) suggest that Nintendo's *Animal Crossing* series from 2001 laid the groundwork for the communication genre. This game is utterly simple and purposeless. Newman and Simons describe it as a game version of the sitcom *Seinfeld*. *Seinfeld* is defined by its creators as a show about nothing and similarly *Animal Crossing* is a game about nothing. It involves animals living in a village sending letters to each other. The player can collect furniture, dig holes, celebrate Halloween, take part in fishing contests and do many other equally meaningless tasks.

The mental development genre was pioneered by *Dr. Kawashima's Brain Training: How Old is Your Brain?* (2005) by Nintendo. Whether this is just a cleverly branded puzzle game or the forerunner of a new genre will be determined by future games.

#### 5.3.3.13 Other stylistic innovations

Many of the innovations listed concerning genres could just as well be classified as innovations in characters, stories, styles or gameplay. Notable stylistic innovations not yet included in the genre innovations include licensing deals, mascots and the gender of the hero.

Licensing film themes to games begun with the very expensive E.T. license bought by Atari and turned into a game for the Atari VCS in 1982. It was a miserable failure (DeMaria and Wilson 2004, p. 99). The following year Atari launched the first *Star Wars* game for arcades with more success. Film-related licences have subsequently been popular and fairly profitable. However, according to Poole (2000, p. 72) games based on film licences, such as *Batman*, *Rambo*, *Aliens* and *Raiders of the Lost Ark*, have been "painfully substandard". Licensing the other way around, namely from games to films in projects like *Street Fighter: The Movie*, *Mortal Kombat* and *Super Mario Bros* according to Poole (ibid.) have been even worse. A notable exception is the *Lara Croft* film series that has been lucrative if not artistically exceptional.

In sports games licensing has played a significant role. In 1984 Electronic Arts already licensed the rights to use a baseball player's face in their games (Kent 2001, p. 265). Even though it was the first deal of its kind, Mattel had already licensed the rights to NFL and NBA to use sports games (ibid.). Furthermore, *Mike Tyson's Punch-Out* was one of the big Nintendo games in 1987 (ibid., p. 353-5). Such licensing, however, was not limited to sports. In 1989 Sega released the game *Michael Jackson's Moonwalker* (ibid., p. 408).

Using mascots is a notable marketing innovation. *Pac-Man* was the first game brand to be merchandised to lunchboxes, cereal and toys. *Pac-Man* was also the first likeable character that the player could identify with. (Mäyrä 2008, pp. 68-69) The mascot concept was developed to its full extent in Nintendo's Mario. Mario made his first appearance in *Donkey Kong* in 1981. Since then Mario has been Nintendo's mascot and starred in more than 200 games. During the console wars of the late 1980s Sega introduced their own mascot Sonic the Hedgehog. Compared to Mario, who was healthy and wholesome, Sonic 'had attitude' (Kent 2001, pp. 429-431).



Finally, as a cultural innovation *Tomb Raider* (1996) by Eidos is significant. It is the first game since *Ms. Pac-Man* to have a heroine (DeMaria and Wilson 2004, p. 286). This may seem trivial, but it illustrates the transformation of games into a mainstream form of entertainment.

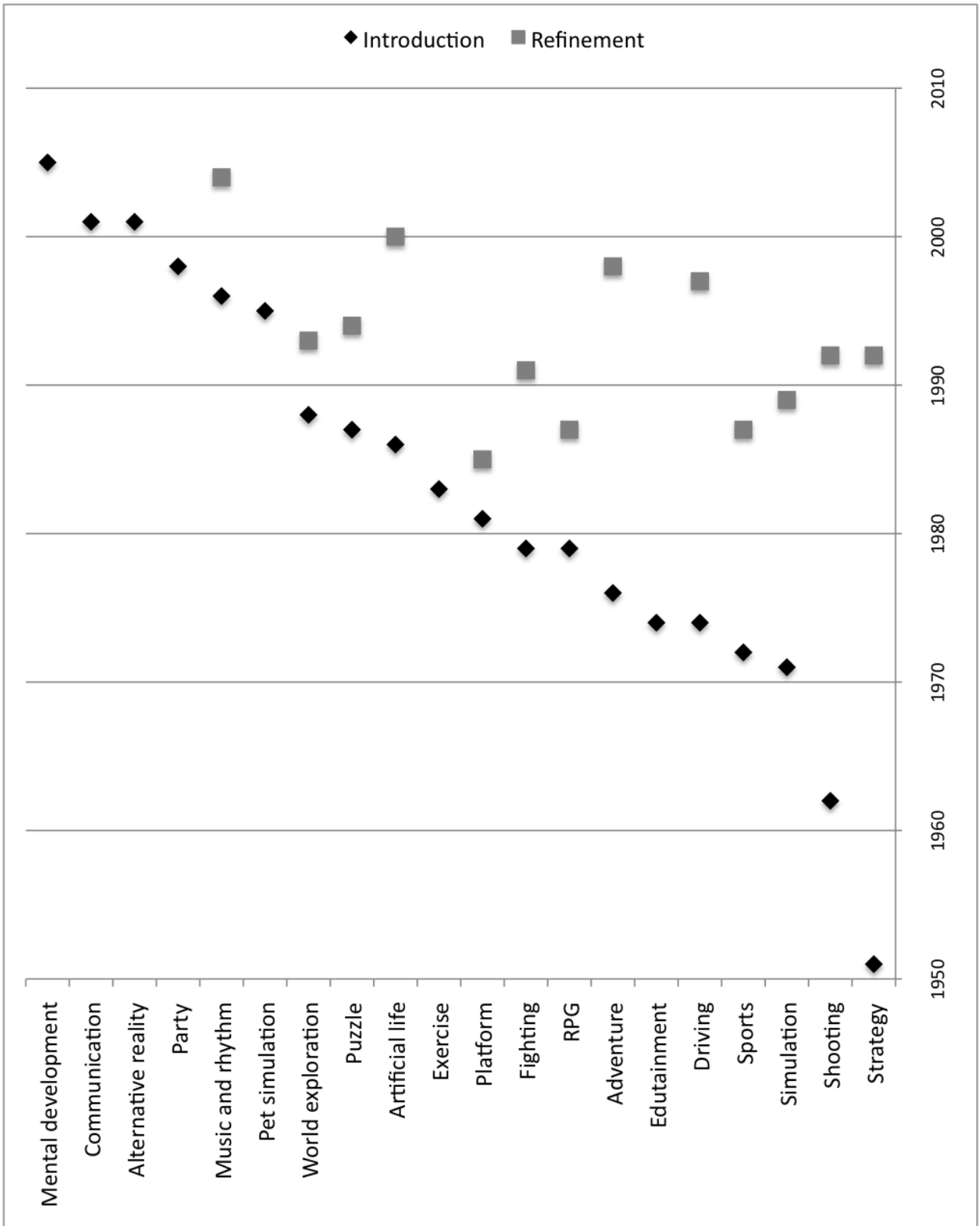
The evolution of game content from the early bat and ball games into the complex storylines, characters and gameplay of today has been enabled by developments in hardware, but the role of copyright protection should not be underestimated. During the 1980s there were several court cases that served to define future copyright protection (Kent 2001, p. 368). The creation of characters and storylines became profitable once the copyright laws protected them.

#### 5.3.3.14 The pattern

Figure 16 presents the timing of the birth of each genre. For each genre two games are identified. The first one is the game that introduced the genre. The second is the one that refined the genre. The identification of the first one is easy as there are many sources where games are classified into genres and the task is then to single out the earliest. The refinement innovation is more of a subjective judgement. They are identified from games that are mentioned in game related literature and press to have popularised a genre or to have created the standards for a genre. Not all genres have refinement innovations. For newer genres this is due to their age and for older ones it is due to the lack of a game achieving best-seller status. The latter is the case with edutainment games, for example. The games that are identified this way are listed in Table 15.

**Table 15.** Introduction and refinement innovations of each genre.

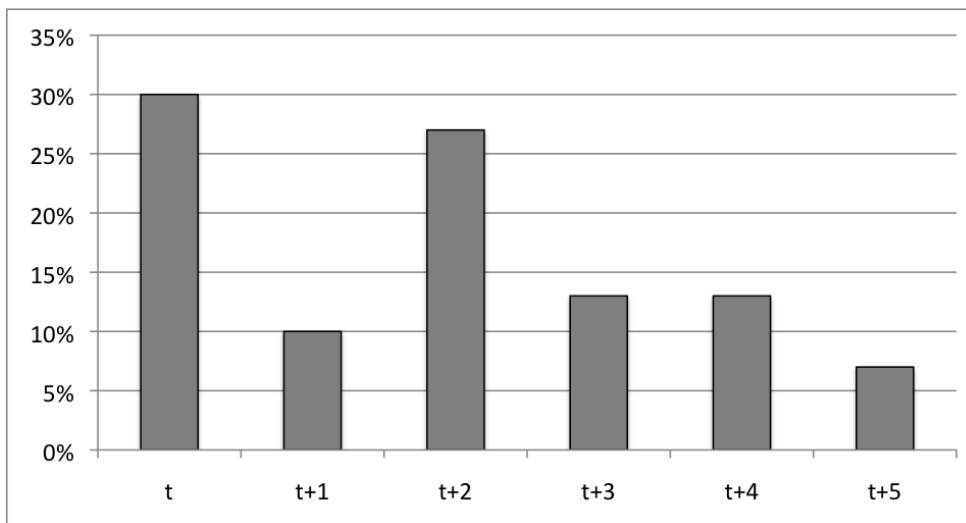
Genre	Introduction innovation		Refinement innovation	
	Game	Year	Game	Year
Strategy	<i>Nim</i>	1951	<i>Dune II</i>	1992
Shooting	<i>Spacewar!</i>	1962	<i>Wolfenstein 3D</i>	1992
Simulation	<i>Hamurabi</i>	1971	<i>SimCity</i>	1989
Sports	<i>Pong</i>	1972	<i>Earl Weaver Baseball</i>	1987
Driving	<i>Gran Trak 10</i>	1974	<i>Gran Turismo</i>	1997
Edutainment	<i>The Oregon Trail</i>	1974		
Adventure	<i>ADVENT</i>	1976	<i>The Legend of Zelda: Ocarina of Time</i>	1998
RPG	<i>Temple of Apsai</i>	1979	<i>Final Fantasy</i>	1987
Fighting	<i>Warrior</i>	1979	<i>Street Fighter II</i>	1991
Platform	<i>Donkey Kong</i>	1981	<i>Super Mario Bros.</i>	1985
Exercise	<i>Mogul Maniac</i>	1983		
Artificial life	<i>Alter Ego</i>	1986	<i>The Sims</i>	2000
Puzzle	<i>Tetris</i>	1987	<i>Bust-A-Move</i>	1994
World exploration	<i>Manhole</i>	1988	<i>Myst</i>	1993
Pet simulation	<i>Petz</i>	1995		
Music and rhythm	<i>Parappa the Rapper</i>	1996	<i>SingStar</i>	2004
Party	<i>Mario Party</i>	1998		
Alternative reality	<i>Majestic</i>	2001		
Communication	<i>Animal Crossing</i>	2001		
Mental development	<i>Dr. Kawashima's Brain Training</i>	2005		



**Figure 16.** Introduction and refinement innovations of each genre.

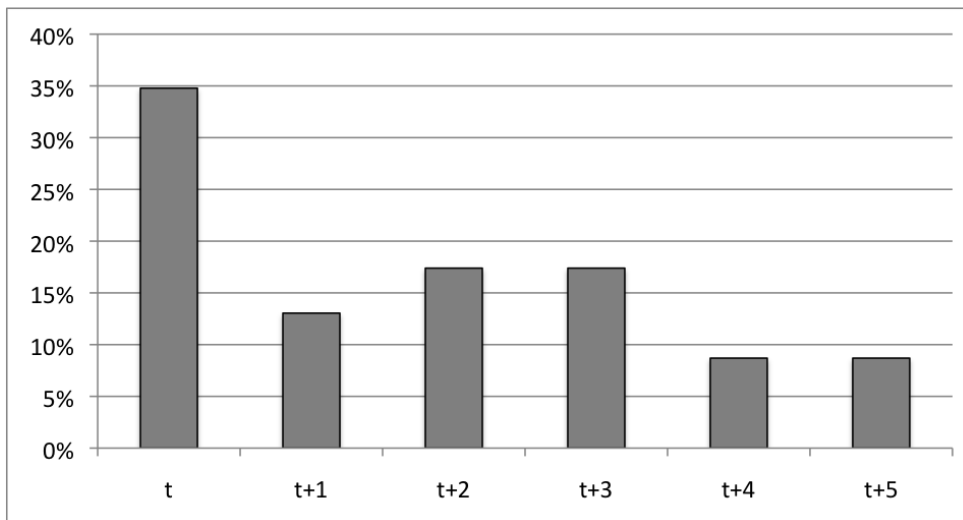
Whether these are the exact titles that have introduced or refined a genre is of lesser significance than the years. Thus the object of the exercise is to get the years roughly right to see what kind of pattern they form. The introductions appear to follow a steady trend from the early 1970s to the mid-2000s. Introductions of new genres have taken place every two years on average since 1970. There are noticeable gaps in the mid-1980s and early 1990s. The former of these coincides with the game market crash of 1983 and the latter with the fierce competition among fourth and fifth generation devices by Nintendo, Sony and Sega, which eventually caused Sega to abandon console manufacturing. The refinement innovations do not reveal a clear trend. The time-frame between introduction and refinement varies from four years in the platform genre to 41 years in the strategy genre.

The interconnection between genre innovations and device generation introductions is shown in Figure 17. In the figure the percentage of genre innovations taking place in the years of new device generation introduction is calculated (t). The figure also shows the percentage of genre innovations taking place in the year following device generation introduction (t+1) and four years after that (t+2, t+3, t+4, t+5). Only those genre innovations occurring after the introduction of the first home game device generation in 1972 have been included in the calculations. It appears that genre innovations are most likely to take place during the first three years after a new device generation is brought onto the market.



**Figure 17.** Percentage of genre innovations taking place in new device generation introduction years and the following five years, all generations.

During the 1970s and early 1980s many game innovations were first introduced in the arcades. Thus it is reasonable to assume that later on the link between the introductions of new hardware generations and genre innovations is stronger. Figure 18 includes genre innovations from 1983 onwards and their timing in respect to the introduction of third, fourth, fifth, sixth and seventh hardware generation. It appears that since 1983 genre innovations have been most likely (35%) to occur apace with the introduction of new hardware generation. During the following five years the probability decreases.



**Figure 18.** Percentage of genre innovations taking place in new device generation introduction years and the following five years, third generation onwards.

Tschang (2007) concludes that game development is a mature industry since no new dominant designs, i.e. genres, have emerged in recent years. According to him, the latest one of these, the artificial life genre, was brought onto the market in 2000. In light of the research presented in this chapter there have been several genre introductions since artificial life, which was in fact already introduced in 1986. Thus the maturity of the games industry should not be argued for on the basis of the levelling off of genre introductions as this is not the case.

Genre innovations do not conform to the idea of discontinuities advancing the price-performance frontier posited in the industry life-cycle theory. Rather new genres are widening innovations that introduce different kinds of entertainment. Genres serve as focusing devices in marketing and perhaps also in game development projects. Nevertheless each game needs to bring something new onto the market to justify any sales. A new game in an existing genre broadens the genre definition. This leads to the conclusion that even though games conform to genres to a significant degree, genres also conform to games that are introduced.

#### 5.4 Industry concentration in game development

The games industry has been regularly going through waves of consolidation by which device manufacturers have bought up publishers, publishers have bought up developers and developers have also bought up other developers leading to firm growth in both size and influence. This has made many aspiring developers and industry insiders worry about the seemingly impossible challenges that independent developers have to face in getting their game title to the consumer. A common view is that the in-house developers cannot and will not produce the level of originality that the independents at their best can. Independent developers still develop many of the most successful game titles. Examples of these include *Grand Theft Auto* developed by an independent Scottish firm DMA design, *Halo: Combat Evolved* developed by Bungie Studios, an American

independent developer that became a subsidiary of Microsoft during the project, likewise *Tomb Raider* started by the independent Core Design which became a subsidiary of CentreGold during the project. Somehow such independent developers manage to create an appealing concept and penetrate the wall set up by major global players and are frequently bought afterwards. The publishers buy such developers to ensure a good in-house team, to ensure that this particular team will not develop games for competitors, to secure the IPs related to a hit title and to keep the mark-up from all future games by that team in-house. This process can be described as a tide where innovative start-ups emerge, are tested in the market and become parts of established firms. It is an integral part of the industry dynamics.

This dynamic was already present in the 1980s, but the major wave of industry consolidation began in the early 1990s resulting in the formation of large game companies (Johns 2006, p. 165). One example of such a formation process is the American developer and publisher Activision. Activision already acquired the developers Infocom and Gamestar in the 1980s (DeMaria and Wilson 2004, p. 302-3). During the 1990s Activision acquired the developers Raven Software, Neversoft Entertainment and Expert Software in addition to few European distribution companies. They also made an equity investment to found Pandemic Studios. In the new millennium Activision continued to acquire developers and to make equity investments in such companies. Acquisitions included Treyarch Invention, Z-Axis, Luxoflux Corporation, Infinity Ward, Shaba Games, Vicarious Visions, Toys for Bob, Beenox and RedOctane. In September 2007 Activision announced that it had acquired the UK-based developer Bizarre Creations. The motivation for the purchase was reportedly the ongoing strategy of Activision to enter new genres. (Boyer 2007b) In December 2007 a merger between Activision and Vivendi Games was publicised. The new company was to be the largest game publisher leaving Electronic Arts in second place. (French 2007b)

During the 1990s Electronic Arts acquired Distinctive Software in 1991 to make sports games, Origin Systems in 1992, Bullfrog Productions, Maxis, Westwood, DreamWorks game division and finally Kesmai. (DeMaria and Wilson 2004, p. 302-3) In addition, Wikipedia lists 24 current and 11 former EA development studios. A significant number of these were formed through acquisitions. Furthermore, in October 2007 Electronic Arts acquired independent developers BioWare and Pandemic to fill a gap in their genre selection (French 2007a).

The case of Ubisoft is likewise complicated. During the 1990s they acquired The Learning Company, which had previously acquired Software Toolworks and Brøderbund, which in turn had previously acquired Mindscape which had acquired Strategic Simulations Inc. (DeMaria and Wilson 2004, p. 302-3) In the spring of 2007 Ubisoft acquired the German developer Sunflowers (Boyer 2007a) and later on the same year the Japanese developer Digital Kids (Graft 2007). In October 2007 Ubisoft announced that, despite persistent rumours, it would not be acquiring SCi. The other rumoured interested parties included Time Warner, an unnamed Chinese company and Electronic Arts. (Jenkins 2007) SCi is a UK based game publisher which had previously acquired Eidos famous for the *Lara Croft* game series. In late 2004 Electronic Arts had already purchased a 20 percent share in Ubisoft, which claimed the purchase to be hostile (Feldman 2004).

According to Johns (2006, p. 166) the motivation for acquiring game developer firms stems from the increasing game development costs. According to Tschang (2005, p. 114) the average number of personnel in a game development team has traditionally been between 15 and 30, but nowadays there are teams of 100 or more people. This also means that development budgets are growing. Tschang reports that around 1998-2001 the average game development budget was just over 2 million USD, whereas later on the budgets increased to 10 million USD or more. As a result of the growing project size, publishers wish to increase their proportion of the revenue by owning more stages of the production process. This also means that the number of independent development studios is decreasing as they are acquired by publishers and console manufacturers. (Johns 2006, p. 166) Aoyama and Izushi (2003, p. 432) report that both Nintendo and Sony have extensive in-house publishing operations. However, Nintendo also deals with 355 third-party game publishers, whereas Sony does business with 540 external publishers worldwide. Some of these publishers develop their games in-house, while others act more as coordinators and outsource most functions to independent developers. (ibid.) Johns (2006, p. 168) adds that all console manufacturers outsource a proportion of their game development. Thus, the aim is not to have all game development done in-house. As external developers are given a chance the publishers and console manufacturers have an opportunity to screen them for purchase and thus buy only proven talent to become a part of their in-house resources.

The consolidation of the industry has been noted by the industry associations and especially in the UK this is seen as a threat. Table 16 presents the mortality rates of independent developers between 2000 and 2007 in major game development countries. In France and the United Kingdom the mortality rate is reported to have been as much as 45%. Even the smallest mortality rates noted here have been 25%.

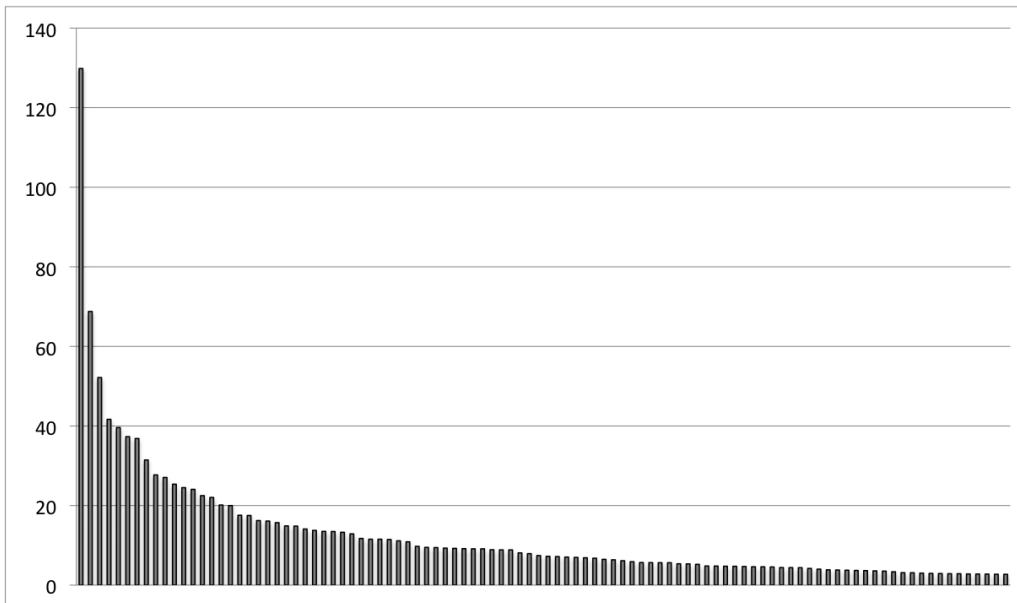
**Table 16.** Independent developer mortality rates in 2000-2007 according to Games Investor Consulting Ltd. (2007).

Country	Independent developers	Mortality rate 2000-2007
Australia	45	25 %
Canada	110	40 %
France	85	45 %
Singapore	25	40 %
South Korea	211	35 %
United Kingdom	160	45 %
United States	650	25 %

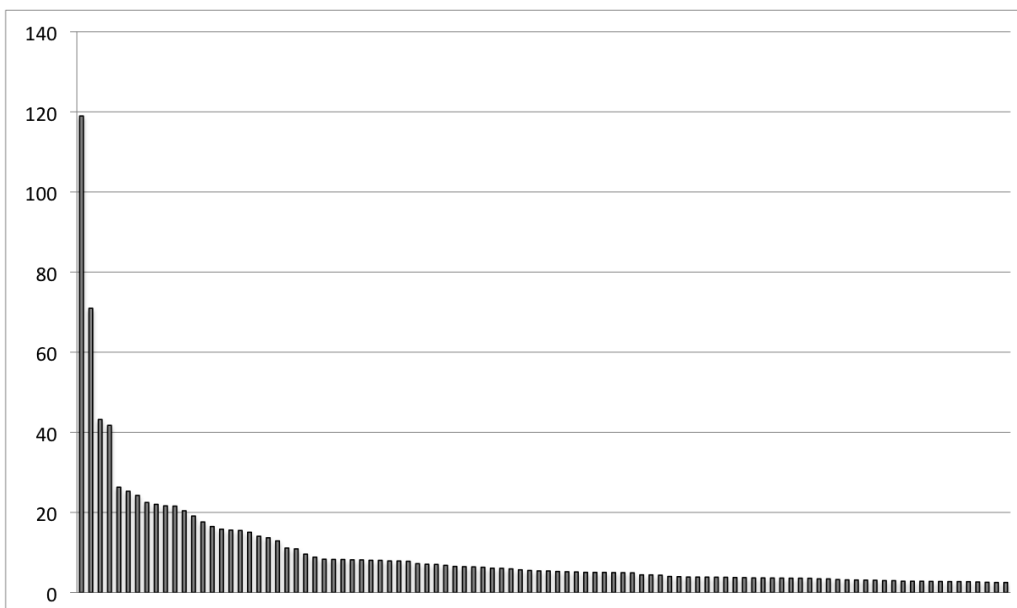
After such decreases in the numbers of independent developers the consolidation should also be visible in the indexes of industry concentration. To find out whether this is the case Develop 100 rankings on the UK sales for 2006 and 2007 are used to calculate the values of the Herfindahl index, reciprocal Herfindahl index and four-firm concentration.

Figures 19 and 20 respectively plot the sales of the top 100 development studios for 2007 and 2006, respectively to provide a picture of the game development industry structure. The data covers sales

in the UK, thus GBP is used as the currency. However, the data includes sales by studios located all over the world and not only UK-based firms.

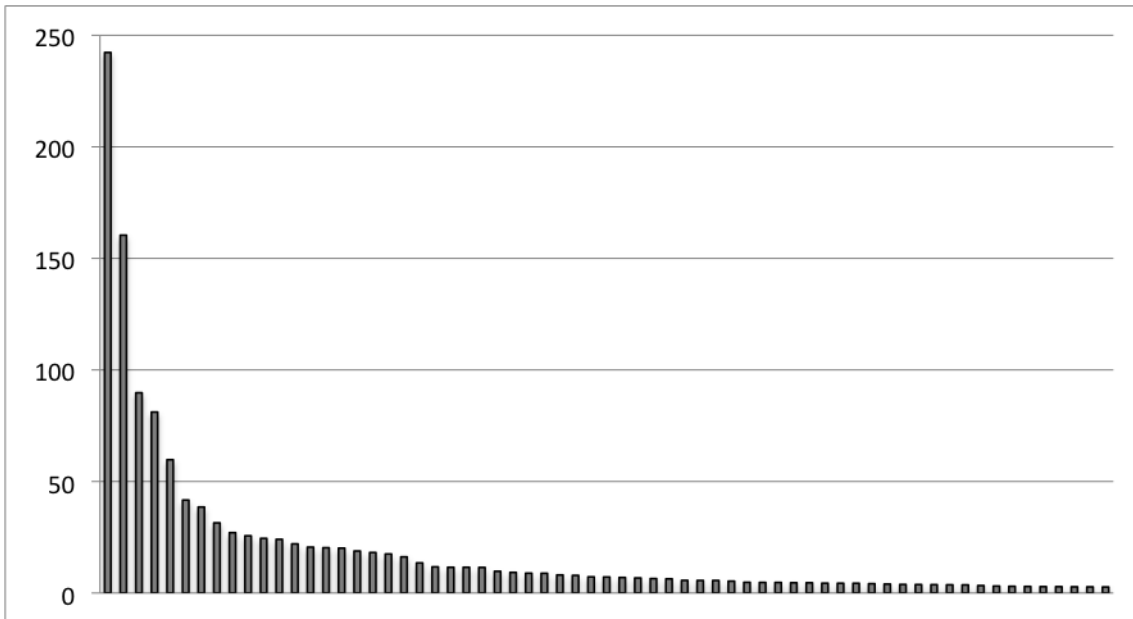


**Figure 19.** Sales per studio in the UK in million GBP in 2007.

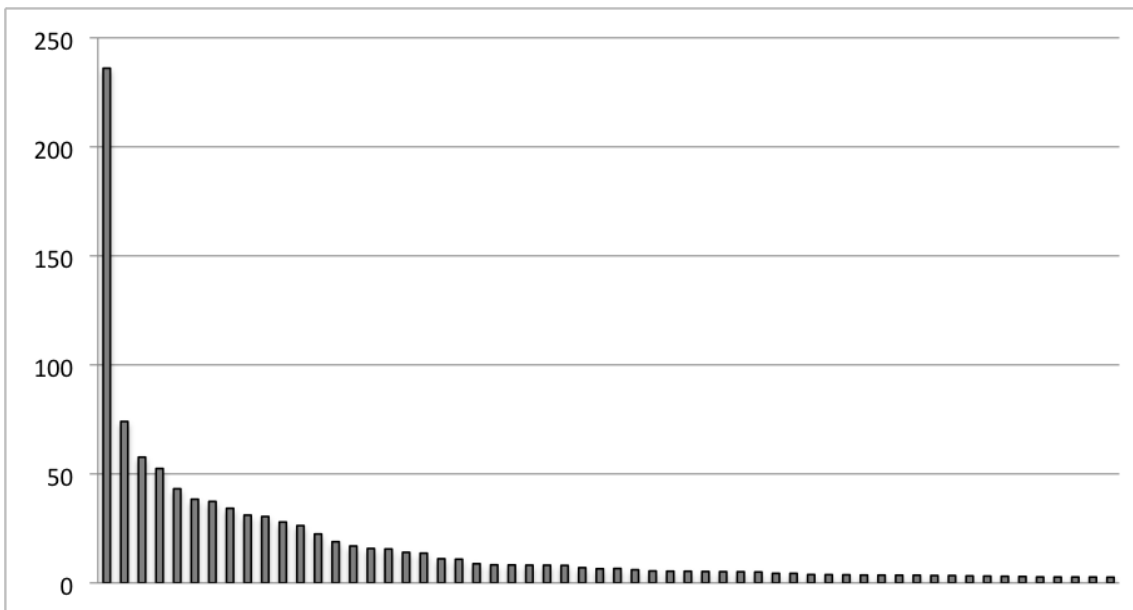


**Figure 20.** Sales per studio in the UK in million GBP in 2006.

The sales of the studios appear to follow the power law with few dominant sellers and a long tail of lesser sellers. However, it should be noted that many of the studios are owned by a larger firm. As the sales of each studio are allocated to their owners we are left with 65 firms in 2007 and 58 in 2006. Figures 21 and 22 plot the sales per firm. They exhibit a similar power law even though the curve for 2007 appears to be slightly less steep than that for 2006.



**Figure 21.** Sales per firm in the UK in million GBP in 2007.



**Figure 22.** Sales per firm in the UK in million GBP in 2006.

In addition to allocating the sales to each firm the data should be modified to cover the entire market. The sales of the top 100 studios account for a major portion of the market, i.e. 72% in 2007 and 74% in 2006. This was calculated by summing the sales of the top 100 studios and comparing them to total UK sales. For 2006 the UK market size of 2,650 million dollars is retrieved from the Games Investor Consulting Ltd. (2007, p. 45) report. For 2007 the UK market size is approximated based on the US sales for 2007 and the relationship of US and UK sales in the 2000s. The US sales figures come from the ESA (2008). This gives a figure of 3,420 million dollars. To get the GBP figures a conversion rate of 1.95 was used as this was also used in the Games Investor Consulting Ltd. (2007) report to obtain comparable figures for different countries. To take into account the



entire market, the difference between total sales and sales by the top 100 studios, 28% for 2007 and 26% for 2006, is ‘filled’ with firms smaller than the smallest ones in the top 100 ranking list.

These modifications allow us to calculate four different versions of the Herfindahl index, the reciprocal Herfindahl index and the four-firm concentration index for both years. Table 17 presents the results. In the Studios column the index values are calculated by treating the studios as independent market actors. In the Top 100 column only the studios appearing on the ranking list are included whereas in the Entire market column the residual market is filled with small studios. In the Firms column the sales of each studio are allocated to its owner and these firms are treated as market actors. Again, calculations are made for both Top 100 including only the top 100 studios and their sales and Entire market including the residual small firms. The column farthest to the right contains the most realistic values, meaning that the assumptions made in them follow most closely the facts that are known about the industry. The column that fills the entire market with independent studios (third from the right) functions as the lowest limit of concentration indexes whereas the column including only the owner firms that appear on the ranking functions (second from the right) as the highest limit of concentration indexes. Thus even though the ultimate truth is not revealed here, the upper and lower limit values accurately pinpoint the area where the ultimate truth lies.

**Table 17.** Concentration indexes and benchmarks for comparison.

	Studios		Firms	
	Top 100	Entire market	Top 100	Entire market
<b>2007</b>				
<b>Herfindahl index</b>	0.0265	0.0141	0.0714	0.0375
<b>Reciprocal Herfindahl index</b>	37.8	70.9	14.0	26.7
<b>Four-firm concentration</b>	23 %	17 %	45 %	33 %
<hr/>				
	Studios		Firms	
	Top 100	Entire market	Top 100	Entire market
<b>2006</b>				
<b>Herfindahl index</b>	0.0313	0.0176	0.0784	0.0436
<b>Reciprocal Herfindahl index</b>	32.0	56.7	12.8	22.9
<b>Four-firm concentration</b>	27 %	20 %	42 %	31 %
<hr/>				
<b>Comparisons</b>				
<b>Herfindahl index</b>	US Department of Justice			
<b>Reciprocal Herfindahl index</b>	Early automobile industry			
<b>Four-firm concentration</b>	Monopolistic competition			

The comparison values are identified at the bottom of Table 17. The Herfindahl index values are compared to the US Department of Justice criteria according to which an unconcentrated market has an index value lower than 0.1. A moderately concentrated market has an index value between 0.1 and 0.18. High concentration is indicated by a value higher than 0.18. The reciprocal Herfindahl index is calculated to be able to compare it to the figures reported by Abernathy (1978, p. 30) concerning the maturation process of the early US car manufacturing industry. In the very early

1900s the car industry showed a reciprocal Herfindahl index value of around 11 which stabilised to around three and four as mass production emerged with the Ford model T. The four-firm concentration is compared to the definition of monopolistic competition. A very low value indicates perfect competition and a value under 40% indicates monopolistic competition. A value over 60% indicates oligopoly.

The Herfindahl index values shown in Table 17 all indicate an unconcentrated market. Even when the 65 (for 2007) and 58 (for 2006) firms owning the top 100 studios are treated as making up the whole market, the index values still stay in the unconcentrated area (0.0714 and 0.0784 are below 0.1).

The reciprocal Herfindahl index values are all above the value 11, which was characteristic for the unconcentrated early automobile industry. The most realistic values, 26.7 and 22.9, are more than double that. Thus even during its era of ferment the car manufacturing industry showed a higher level of concentration than game development nowadays.

The four-firm concentration results in 33% and 31% calculated with the most realistic assumptions. The values are well below the 40% limit and thus indicate monopolistic competition. The upper limit values go above that to 45% and 42%. They are the only calculations made here that indicate anything but an unconcentrated industry.

In light of these calculations it is safe to say that the game development industry is unconcentrated. There may have been mortalities among independent developers but it would still be an exaggeration to call this industry consolidated. In many industry accounts and also academic papers (e.g. Tschang 2007; Grantham and Kaplinsky 2005) the game developers reporting difficulties in getting a publishing deal is treated as evidence of increasing consolidation. This logic begs the question: Has it ever been particularly easy?

## **5.5 Industry evolution in Finland**

The previous section offered a picture of the current structure of the games industry. To complement it we next consider entries, exits and firm numbers between 1990 and 2007. As there is no international data available we use Finnish data. Finnish firms form a very small part of the international game development community, but changes in firm numbers in Finland can indicate changes in the international market's ability to absorb new entrants. First the Finnish context is introduced followed by an analysis of entries, exits and firm numbers, after which some of the opportunities and challenges faced by the Finnish firms are discussed.

### *5.5.1 Entries, exits and firm numbers in the Finnish games industry*

A game called *Sanxion* is often mentioned as the first Finnish game success (see Koivunen 2004, p. 85). It was programmed by Stavros Fasoulas in 1986 and released for Commodore 64 and

Sinclair ZX Spectrum (Mobygames 2007). Jukka Tapanimäki is another pioneer of game programming in Finland; he developed several games for Commodore 64 in the late 1980s (Saarikoski 2001). During the 1980s the first Finnish game publishers, including Amersoft and Triosoft, emerged (ibid.). Amersoft published several games for Commodore 64 as a subsidiary of Amer Sports, a well-known Finnish sports equipment manufacturer (Fantasiaseikkailut 2007). Triosoft is better known as an importer of computer accessories and software and has not been involved in game publishing since early 1990s (Triosoft 2007). The pioneering firms also included Mediatyhtiö Sansibar and Teknopiste.

It should be noted that the roots of many of the pioneering as well as today's firms are in demoscene. Demoscene is a subculture that centres around yearly meetings, demoparties, where demogroups compete in the production of audiovisual works. The Finnish demoparty Assembly has been in operation since 1992. Many of the active participants have gone on to found one or more game development firms. Many groups have also achieved some sort of fame with their productions. For example, a Finnish demo group tAAAt (also known as tArzAn tuotanto) is a demo group famous for the 2002 web game Stair Dismount (also known as Porrasturvat) (see Newman and Simons 2007, p. 156-158).

Even though there were several firms in Finland making games in the 1980s the shift from home computers to consoles as the mainstream game platform changed the situation. During the early 1990s the games industry in Finland lived a quiet life. The first console game developers emerged in the mid-1990s. Here some of the Finnish firms are introduced as examples of a larger population.

In 1995 two of the early firms, Terramarque and Bloodhouse, merged to form Housemarque. The two previous firms had a background in developing games for Amiga, but as the PC games market gathered momentum Housemarque decided to concentrate on PC games. During the late 1990s Housemarque developed three PC CD-ROM titles, namely *Super Stardust* (1996), *Alien Incident* (1996) and *The Reap* (1997). Housemarque also signed a deal with Infogrames to develop *Supreme Snowboarding* for both PC and Microsoft Xbox. Since then Housemarque has invested heavily in console specific capabilities but revenue has come mostly from mobile games, such as *The Chronicles of Narnia*. (Housemarque 2007) Housemarque ultimately marketized a console game title, *Super Stardust HD*, which came out in the summer of 2007 for PlayStation 3 (Karvonen 2007a).

Remedy Entertainment is among the oldest and probably the most successful Finnish game developer to date. Remedy Entertainment was founded in 1995 and currently employs over 30 people. Their first game was *Death Rally*, published in 1996 by Apogee Software and GT Interactive. (Remedy Entertainment 2007) Major success followed, however, from their next game, *Max Payne*. It was published in 2001, also by Apogee Interactive, and has sold over four million copies. (Lehtoranta and Uusikylä 2005, pp. 40-41) In 2002 the rights to the Max Payne character were sold to Take-Two Interactive Software and the sequel was to be developed by Rockstar Games, a subsidiary of Take-Two, in cooperation with Remedy (Lehtinen 2002). This transaction created the basis for the long-term plans of the firm (Lehtoranta and Uusikylä 2005, pp. 40-41).

In 2005 Remedy Entertainment announced a publishing deal on their new title *Alan Wake* with Microsoft Game Studios. The game was to be published on Xbox 360 and PC. This is the first and so far the only Finnish title to be published by Microsoft. Remedy reported that other publishers were also interested in this title. (Karhu 2005) For Remedy the deal was favourable as they gained access to Microsoft's resources but at the same time they got to be in control of the game development process and to own the rights to the content (Kurkijärvi 2006). In September 2007 Remedy commented on the progress of their eagerly anticipated game project saying that the publishing schedule had not been finalised as they were not willing launch the game until it was good enough. This was allegedly also the stance of Microsoft as the game was strategically important for them. The development team consisted of only 34 people as some software modules could be purchased from other parties and the aim was to concentrate on the more innovative aspects in-house. (Aro 2007)

An example of a younger Finnish console game developer is Bugbear Entertainment. Bugbear was founded in 2000 and employs around 40 people. They develop games for consoles, handhelds and PC and they report to have sold over 2.2 million game copies to date. Bugbear specialises in racing games and their early games include *Rally Trophy*, published by JoWood Productions Software in 2001 for PC, and *Tough Trucks*, published by Activision Value Publishing, Inc. in 2004 also for PC. (Bugbear Entertainment 2007) Bugbear is best known for its *FlatOut* game series. The first *FlatOut*, a racing game, was released in 2004 for Xbox, PlayStation 2 and PC by Empire Interactive, a global game developer and publisher. (Karvonen 2004) The sequel, *FlatOut 2*, came out in 2006. It was also published by Empire Interactive for Xbox, PlayStation 2 and PC. Challenges were to be expected as other firms were publishing their games on the next generation consoles. (Kurkijärvi 2006) In 2007 the third game of the *FlatOut* franchise came out for Xbox 360 (Karvonen 2007b).

Recoil Games is one of the industry newcomers founded in 2007. Despite the very short history of the firm the founders all have background within the games industry in Finland. The firm employs around 20 people and aims to develop games with epic stories for consoles and PC. (Poropudas 2007a) US based 3D Realms is funding the development of Recoil Games' first title *Earth No More*. (Hatvala 2007)

In addition to the console and PC sector there are many firms in Finland developing and publishing games for mobile phones. Mr. Goodliving is a mobile game developer founded in 1999 and whose strength is their own EMERGE development platform. (Mäntylä 2005b) Mr. Goodliving was bought by RealNetworks in May 2005 with 12 million euros. All of their 40 employees continued working at the Helsinki office. (Karvonen 2005) According to Mäntylä (2005b) the motivation for the acquisition was RealNetworks' plan to enter the mobile game sector through buying the required competence. Mr. Goodliving develops both original titles and well-known franchises, such as *Trivial Pursuit* and the *PlaymanSports* series (Mr. Goodliving 2007).

Universomo is a mobile game developer founded in 2002 and now a subsidiary of THQ Wireless. They have developed over 25 games for mobile platforms. In October 2005 Universomo acquired

DiCode, a software developer, to acquire skilled employees. (Universomo 2007) In 2006 Universomo acquired Aukio Group game studio specialising in 3D graphics. The motivation for the purchase was again reported to be the difficulties in recruiting skilled employees. Afterwards Universomo employed a total of 35 people. (Karvonen 2006) In early 2007 Universomo reported a deal made with Sega of America for developing mobile games based on Sega's licences. In addition, Universomo had made a deal with Lego for developing mobile games for them. (Karppinen 2007) In May 2007 Universomo, employing 40 people, was acquired by THQ Wireless. The motivation for the purchase was reported to be the unique capabilities of Universomo in cross platform development. (Poropudas 2007b)

The games industry in Finland has not been under intensive study from the economic perspective, thus knowledge of its evolutionary path is limited. In 2002 it was estimated that the average age of Finnish game companies was 3.5 years and that each had around 10-30 employees (Koivunen 2004, p. 85). Altogether 400-420 people were employed by the games industry. According to Koivunen (ibid.) the Finnish games industry has been growing fast since 2000 and up to 90 percent of the sales are exports.

There have been some, mainly descriptive, attempts to research the Finnish games industry. Kalhama (2003) surveyed Finnish game firms on several topics, such as perceived risk, profitability, project portfolio and future potential in game development. However, the results are merely illustrative as the size of the sample is 10 and the analysis of the gathered data is left to the reader. The findings are not linked to any theory or to other wider contexts.

In May 2004 Neogames<sup>11</sup> had around 40 members including investment firms and educational institutions (Korteila 2004). The aim was to have 60 members that autumn. At that time Neogames was struggling to move game related news from the culture section to the business section in newspapers. (ibid.) In 2006 Neogames published a brochure describing the Finnish game companies. The "Finnish Game Companies 06" report introduces 39 firms. This is, however, an underestimation of the total number as it does not even include all of the well-known firms, such as Remedy Entertainment and Fathammer, not to mention the newer and smaller firms, such as Rocket Science and Ninai Games. The reason for this is probably the unwillingness of the firms to respond to the survey.

In the above-mentioned report figures are given for the years 2004 and 2005. The total number of employees in the 39 respondent firms was slightly over 600. There were 21 firms with fewer than six people, two firms with more than 50 people and rest of them were somewhere in between. At the end of 2005 the number of employees in these 39 firms was estimated to be close to one thousand, the number of firms employing less than six people dropping to 12 and the number of firms employing more than 50 people growing to three. Similar pattern can also be seen in turnover, as of the 14 firms in the less than 100 000 € category of 2004 decreased to six firms in 2005. However, only nine of the 39 firms report a turnover of more than one million euros. On the other

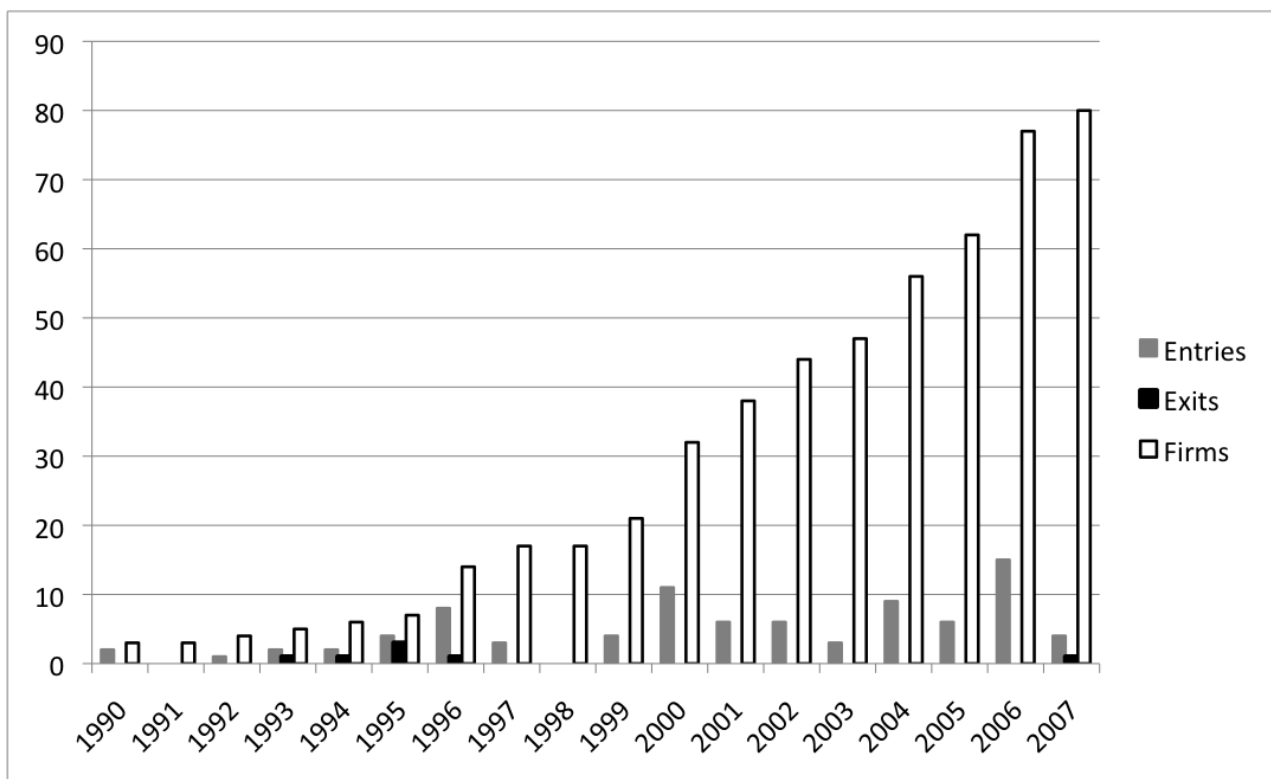
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<sup>11</sup> Neogames is a Finnish publicly funded organisation that specialises in promoting game business, research and development. See [www.neogames.fi](http://www.neogames.fi).

hand, it is estimated that the games industry turnover in Finland for 2005 is around 65 million euros. (Neogames 2006, pp. 11-12) In a newspaper article from September 2007 it was claimed that the Finnish games industry may grow 50% per year during the next few years. In this article the number of firms with games as their main business is estimated to be around 70. (Hatvala 2007)

The games industry does not appear in any official statistics and the game firms are usually classified under the heading “72220 other software development, production and consulting”. This makes it very challenging to form an accurate picture of the evolution of the industry. For this reason the data had to be gathered one firm at a time from the Business Register of Statistics Finland. The list of firms was constructed on the basis of the listing of members at the Neogames website, newspaper and magazine articles, Tekes project participant listings and trade show participant listings. The goal was to include all firms that have existed at some point since 1990. The firms were included in the data set if they claimed to be publishing and/or developing games or technology specifically for games. Thus, whether each of the firms had already shipped products was not verified. The data was gathered from the Statistics Finland database based on each firm’s identification number.

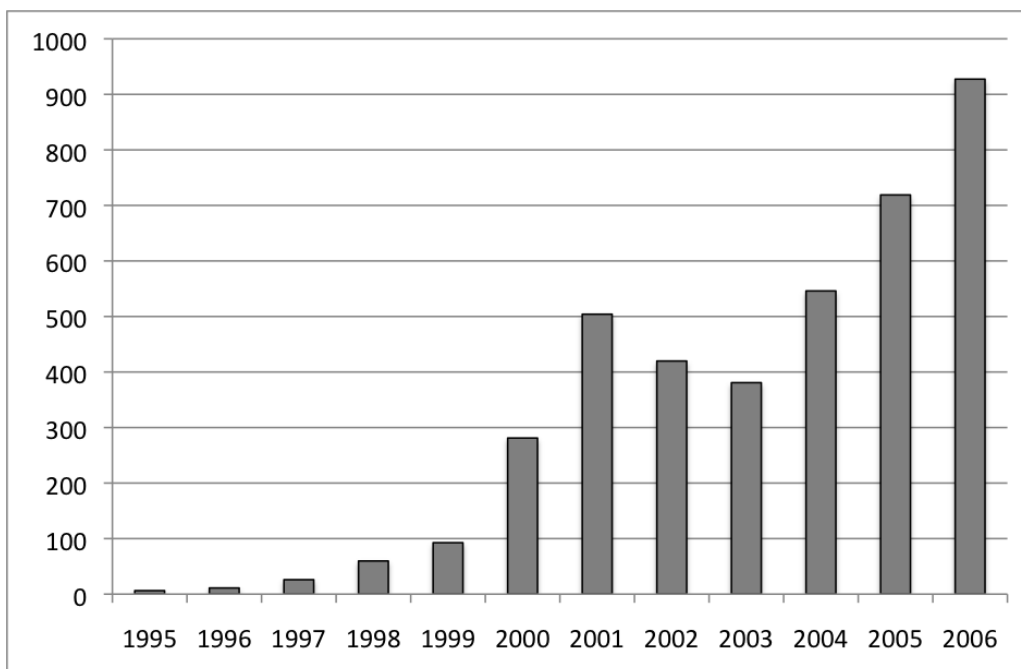
The first graph (Figure 23) presents entries, exits and firm numbers. In addition to these numbers, the data set includes one firm that was founded as early as in 1969. Probably the firm has started producing games later than that and the early founding date is a legacy of earlier business undertaken with the same business identification number.



**Figure 23.** Entries, exits and firm numbers in Finland each year 1990-2007.

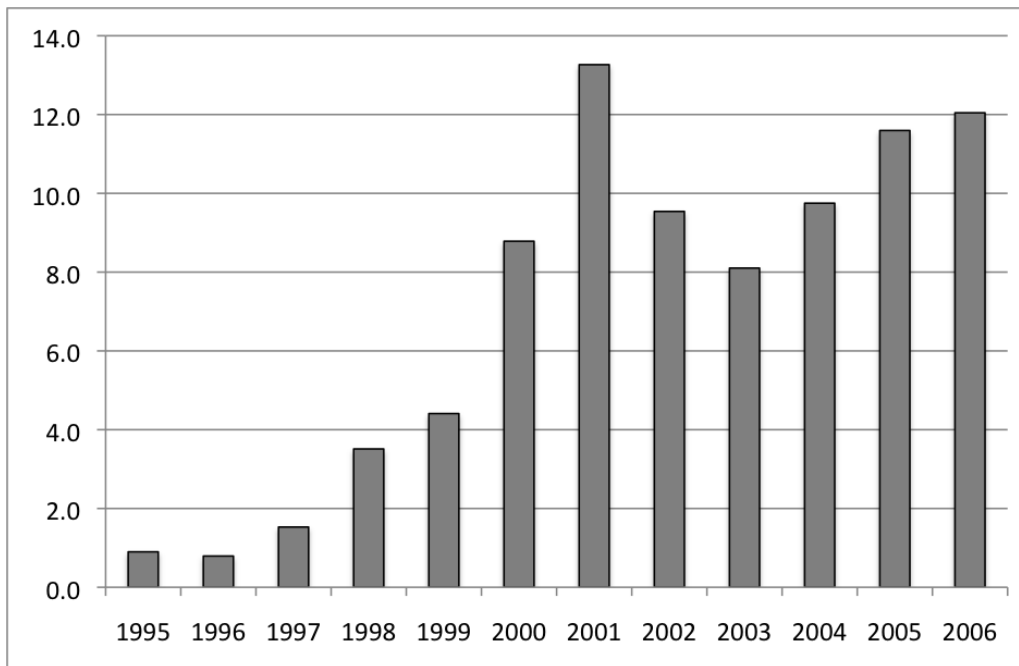
The majority of the firms were founded after 2000. The technology bubble of 2000 can be seen as a peak in firm founding that year. However, recently many new firms have emerged and the slump of 2003 has been temporary. In addition to the firms in the graph, there are five firms in the data set that were legally in existence but had not yet had any transactions and were thus not included in the graph. During the period covered in the data set five firms ceased to exist. It is noteworthy that the rise in the number of firms is not affected by the technology bubble of 2000.

The growth in the number of firms has been steady since the mid-1990s. The same cannot be said of the number of people employed by the game firms. In Figure 24 the number of people employed by the game firms each year is presented. There is a visible slump in 2002 and 2003. However, the numbers rose significantly during the period 2004-2006.



**Figure 24.** Number of people employed by game firms in Finland each year 1995-2006.

Often in young firms not all people who contribute to the firm are officially employed by the firm. There are several firms that do not officially have any employees. This means that when the firm is developing its first demo it does not pay salary to the owners. In addition, game firms in general often have part-time employees that appear in the statistics as less than one employee. For example, two half-time employees show as one employee. This means that more people are working in these firms than the statistics indicate. Figure 25 depicts the average number of employees per firm each year.



**Figure 25.** Average number of employees per game firm in Finland each year 1995-2006.

This shows that the repercussions of the technology bubble of 2000 mainly affected larger firms and forced them to downsize or exit. However, in recent years the average firm size has grown even though the level of the record year 2001 had not been reached by 2006. The distribution of firm size is presented in Table 18. As expected, there are many small firms and not so many larger firms.

**Table 18.** Finnish game firms by number of employees each year 1995-2006.

Employees / Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Not available	2	7	6	2	5	7	9	14	9	3	10	18
1-5	5	7	9	12	11	12	9	11	18	30	25	29
6-10			2		1	5	3	2	3	6	11	14
10-15				3		2	5	4	7	4	3	
16-20					2	2	2	2	2	1		1
21-30					1	4	5	6	6	3	6	5
31-40							2	3	2	5	2	2
41-50							2			1	1	3
50-						1	1	1			4	3

The bursting of the 2000 bubble is visible in the firm sizes based on the number of employees. In 2002 and 2003 the large firms were smaller. However, since then larger firms have re-emerged and the large end of the spectrum looks stronger now than it was during the bubble. There is also a population of micro-firms that is stronger than ever. Table 19 presents the magnitudes of the firms' revenues each year.



**Table 19.** Finnish game firms sorted by their revenue each year 1995-2006.

Revenue EUR / Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Not available	2	7	6	2	5	7	9	14	9	3	10	18
Non-existent	2	4	3	5	5	6	6	4	6	14	9	6
0 - 199 999	3	2	7	5	7	8	6	11	13	13	17	23
200 000 - 399 999		1	1	3	1	6	5	2	2	7	6	5
400 000 - 999 999				2	3	5	6	4	9	7	8	10
1 000 000 - 2 000 000							2	5	4	5	3	7
2 000 000 - 9 999 999							3	3	4	6	9	7
10 000 000 - 99 999 999												1

A similar trend can be seen in the revenue as in the number of employees. Firms are becoming larger and there are also several small firms. The available data presented in the above graphs and tables is not absolutely inclusive of all the firms and their information. Thus, this presentation is an underestimation of reality. However, the available data does show that the games industry in Finland is growing and has recovered from the technology bubble of 2000. There are more and more large firms and also an active population of small firms. This indicates that the ability of the international games industry to absorb new entrants and their products has not decreased.

### 5.5.2 Opportunities and challenges for the games industry in Finland

In general great success is expected from the games industry in economic terms but very little value is seen in games as cultural products. This translates into a structure where game technology development is subsidised by the state but it is rationalised through enabling the development of other more serious ICT products and technologies. For example, even though in a Tekes<sup>12</sup> report by Oesch et al. (2003, p. 17) it is admitted that games are the fastest growing form of entertainment, the games industry is seen more as a source of technology competence for the development of other consumer services and new application fields. Furthermore, Oesch et al. (2003) suggest that the future is bright for educational games and this is where the investments should be made. This claim illustrates the common attitude that games are not a legitimate form of business and that the investments should be targeted at a marginal and not very lucrative group of games (educational) because their legitimacy can be argued for. Eskelinen (2005, p. 19) forecasts that as games become more and more popular as means of education, communication, marketing and political discourse their low cultural and social status will be enhanced.

Leikola and Leroux's (2006) report on Finnish cultural export leaves electronic games on the margin by equating them with radio and dance production. They identify the key cultural industries to be TV, film and music (p. 21). However, there are four game companies on their top-30 list of Finnish cultural exporters in 2005 and these game companies represent about 40% of the exports by the top-30 firms (p. 46). For comparison, TV, film and music represent less than 2%, around 2.5%

<sup>12</sup> Tekes, The Finnish Funding Agency for Technology and Innovation, is the main government financing and expert organisation for research and technological development in Finland. [www.tekes.fi](http://www.tekes.fi)

and around 8% respectively, of the cultural exports by the top-30 firms. This exemplifies the attitude that games are not worthy to be acknowledged as cultural products even when the attention is on realised exports. However, there are also views more favourable to the games industry. Himanen (2004, p. 11) states that the Finnish strategy should include the promotion of the cultural industries (including games) to be the spearheads in the creative economy in addition to the IT industries.

Perhaps the rejection of games as cultural products has to do with the primacy of financial realities in game production. Games are produced to make money and not as art for art's sake. In his book on creative economy in the Finnish context Wilenius (2004, p. 18) sees culture as something that may co-operate with businesses, but is not a business in itself. He sees potential in (1) building brands and company image with the help of "cultural actors", (2) doing marketing by offering cultural experiences to key customers and subsidising culture production in order to create goodwill and (3) using culture to motivate the employees. Thus, in his view culture and business are completely different undertakings. Furthermore, Wilenius (2004, p. 34) defines cultural export as the exchange of cultural meanings between different cultural spheres. Again, this way of thinking excludes profitable business because there is no selling involved.

There are also other challenges for the games industry to face. One of them is industry related education. On the one hand, Koivunen (2004, p. 85) argues that the strength of the games industry in Finland is the ability of the Finnish education system to produce up-to-date competence. On the other hand, Bugbear's development manager Jussi Laaksonen states that the foundation of the Finnish games industry is a lively demoscene, which means that a large part of the game programmers and graphics artists have been trained through the competitions in Assembly events. (Hatvala 2007) Games industry related education has emerged in recent years<sup>13</sup> but it cannot be credited for the growth of the games industry as most of the skills are still developed through active participation in communities with similar interests and hobbies.

One challenge that the Finnish game firms have to face is the absence of domestic funding. Eskelinen (2005, p. 9) states that the worst case scenario is that the development costs of console and PC games will be beyond the Finnish potential while the mobile games sector remains unable to fulfil the excessively optimistic forecasts. He adds that as the games industry is associated with large amounts of capital, high risks, fierce competition and global markets the emergence of super developers makes it increasingly hard for Finnish firms to enter the market (p. 52). The emergence of international 'super developers' is mentioned as a trend and a threat in Koivunen (2004, p. 85).

In the Finnish Game Companies 06 report it is stated that the rise of the games industry in Finland is not a coincidence but a result of continuous investment in the sector (Neogames 2006, p. 8). From 2005 to 2007 game firms based in Oulu have been able to get both funding and consultations from the ELVI project funded by European Regional Development Fund and the City of Oulu (Åman et al. 2007). Another example is the Fenix Interactive Computing Programme financed by Tekes. In the final report it is noted that contrary to expectations 'game and entertainment applications' turned

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<sup>13</sup> See Akimo 2007 on the plans of the launch of a games related Master's programme at the University of Oulu.

out to be the largest application area in the Programme measured by both financing and the number of projects (Tekes 2007). The Fenix Programme funded games industry related activities, such as international networking trips, research projects and enterprise projects. (ibid.) From 2007 onwards game developers have been able to obtain partial funding for demo development from the Vertical Software Solutions Programme of Tekes (Bonnici 2007).

In recent years several Finnish game companies have been bought by international firms. In August 2006 Lukkari reported that around one mobile game company per month is sold abroad (Table 21). One of these was the mobile game developer Fathammer based in Helsinki that became a subsidiary of the London based Telcogames in June 2006. The motivation of this acquisition was the rights to 24 new 3D games and the expected growth in the penetration of more developed mobile phones that will create the market for high-end games. (Myllylahti 2006) The most recent event at the time of writing was the acquisition of Universomo by THQ Wireless in May 2007. THQ reported the motivation for the acquisition to be, in addition to the mobile game development skills, the technological efficiencies that Universomo's porting solution can offer (Green 2007). These events raise the question as to whether the purpose of the Finnish games industry is only to produce promising firms for international heavy-league players to buy.

**Table 20.** Finnish mobile game firms acquired by international companies (based on Lukkari 2006 and Green 2007).

<b>Firm</b>	<b>Time</b>	<b>Buyer</b>	<b>Specialty</b>
Universomo	5 / 2007	THQ Wireless	Mobile game development
Fathammer	6 / 2006	Telcogames	Mobile game development
Bitboys	5 / 2006	Ati	Graphics processors
Oplayo	4 / 2006	Slice Wireless	Video technology and mobile devices
Hybrid Graphics	3 / 2006	Nvidia	Graphics software
Mr. Goodliving	5 / 2005	Real Networks	Mobile game development
Sumea	6 / 2004	Digital Chocolate	Mobile game development

A further challenge for the Finnish games industry is its dependence on mobility. This issue is raised in the Neogames (2006) report but it is concluded that an ample number of PC and console games have also been developed in Finland. Mobile know-how is seen as a strength for the multiplatform games of the future. Of the 39 firms that responded to the Neogames (2006) survey 28 work on mobile, eight work on PC and/or console and four on other platforms. However, it is stated that the mobile platform is not as dominant as this would indicate because (1) some firms work on several platforms but at the moment mobile games account for the majority of their income, (2) the developers of TV SMS games are included in the mobile platform sector and (3) many of the firms in the mobile sector are about to move to other platforms as well. (Neogames 2006, p. 8, 13-14) Another important reason for the apparent domination of the mobile sector is the bias produced by the relatively low response rate to this Neogames survey. It is safe to say that a significant portion of the potential respondents did not respond. The response rate is not mentioned in the report.

## 5.6 Summary of findings

The international game software market is still growing in terms of both dollars and units. In addition, unit prices have not decreased. This means that the levelling off in sales and decrease in price posited in the industry life-cycle theory have not taken place. It may be that these phenomena are still to come or it may be that they will not appear in a cultural industry similarly to previously studied traditional manufacturing industries.

The international game market has crashed twice. The first crash in 1977 followed the introduction of first generation home game devices. The second crash of 1983 followed the second generation. The crashes were driven by overshooting. There were too many firms and too many products for the market to absorb. However, the problem was primarily in quality, and exacerbated by quantity. Consumers refused to buy low quality games and the market disappeared. The quantity of products in the production pipeline forced firms to dump their inventories. These incidents differed from the shakeout pattern of the industry life-cycle theory. The size of the market decreased considerably and thus the pre-crash sales were not reallocated among survivors, but to a significant extent just disappeared. Secondly, the crashes were not caused by an advance in the price-performance frontier or the emergence of a dominant design. They were caused by the lack of innovation, and superior products from Japan were required both times to reinstate the market.

In hardware there have been well-defined performance metrics from the beginning. As the natural upper limit has been achieved in one, new metrics have emerged. The metric of current interest, rendering capability in polygons per second, is experiencing exponential growth. Thus the advance in performance has not levelled off. New storage media have been introduced every few years and almost every console generation has had a dominant storage medium different from that of the previous generation. New game device types have also been constantly introduced, including online and mobile gaming. The most notable candidate for dominant design is the business model of slim profits from hardware enabled by more generous profits from software.

Technological innovations in software are found here to take place predominantly simultaneously with the emergence of new device generation. This is natural, as software is technologically tied to the requirements and opportunities specified by hardware. The notable issue here is that technology in both hardware and software is developed continuously and this imposes demands on the learning capability of game development firms. Guérin (2006) points out that as console generations last around five to six years and a console game project can take several years to complete, a development team can be involved in only two or three projects per each console generation. Thus the ability of a development firm to benefit from cumulative learning and economies of scale is curtailed by the frequent technology reforms. Perhaps the old skills do not become obsolete, but the firms are frequently forced to adopt new additional technologies.

Stylistic innovations defined as new genre introductions have taken place every two or so years without much change in frequency. Stylistic innovations tend to follow new device generation introductions. The steady stream of new genre introductions begins approximately simultaneously

with the introduction of first generation home consoles. Many of the genre-introducing games were, however, first released in the arcades. The first genre-refining innovation is from 1985, when the third hardware generation had been launched. It appears that advances in the technological frontier were required to activate the stylistic innovations. Mäyrä (2008, p. 79) points out that the diversity in hardware in the early games industry forced game developers to create different versions of their products for a multitude of platforms. Contemporary games are usually ported to a maximum of three platforms (ibid.). This means that the decreased diversity in hardware has allowed the game developers to concentrate on the stylistic issues in software. Perhaps homogeneity in hardware induces heterogeneity in software.

Next we summarise the answers to the research questions *Q1a*, *Q1b*, *Q2a* and *Q2b*.

*Q1a. What kinds of patterns of innovation in hardware (technological) and software (technological and stylistic) can be detected in the history of the games industry?*

In hardware technological development has not levelled off as new device generations are introduced continuously and performance advances in key metrics have continued to be exponential until the present day. In software technological innovations have taken place continuously and no clear pattern can be detected. Stylistic innovations defined as introductions of genres have taken place every two years on average and no levelling off in the frequency can be detected.

*Q1b. What kinds of interconnections are there between the patterns of different kinds of innovations?*

Technological innovations in software occur to a considerable degree apace with those in hardware. An average of 2.7 innovations has taken place on console generation introduction years and an average of 0.75 per year at other times. Thus technological innovations in software coincide to a considerable extent with the emergence of new hardware generations. For stylistic innovations the interconnection with other types of innovation is also clear. Genre innovations are most likely to occur during the first three years after device generation introductions. When the first two device generations, during which many genre innovations first appeared in the arcades, are excluded the link is even clearer; genre innovations are most likely to occur simultaneously with the introductions of new hardware generations. During the following five years the likelihood decreases. Thus innovations, both technological and stylistic, cluster to a considerable extent into cycles governed by device generations.

*Q2a. What is the level of concentration in the games industry?*

In light of data on UK sales it appears that game development is an unconcentrated industry. Even though the competitive process has had more than three decades to shape the industry, competition is still monopolistic.

*Q2b. How has the ability of the game market to absorb new entrants changed in 1990-2007?*

In Finland the entry rate still far exceeds the exit rate. The number of firms doubled between 2001 and 2007 and exit rate remained modest. There is no sign of shakeout or stagnation. This is only the case of Finland but it indicates that the ability of the international game market to absorb new entrants and new products has not decreased.

Many of the findings reported here deviate from the propositions of the industry life-cycle literature. Thus the next task is to determine what characteristics and actions at the micro level cause such distinct dynamics. This is done by constructing a qualitative systems dynamics model on the micromechanisms of the game development sector based on interview data from game development executives.



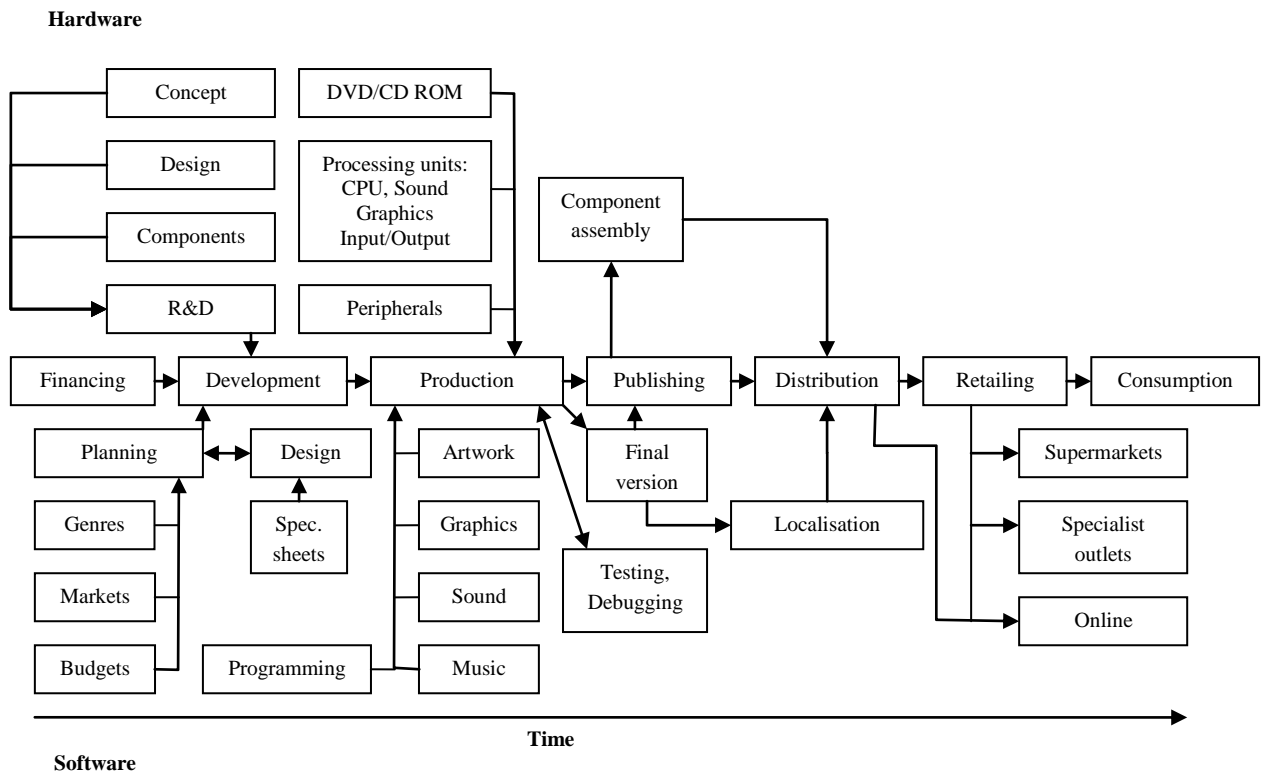
## **6 Micromechanisms of the game development sector**

Before the systems dynamics model of the micromechanisms of the game development sector is built, prior models describing the games industry are reviewed. The scope of the model here is very different from earlier ones as most prior models either describe project-level activities or are static descriptions of the order of different functions required to produce games and game devices. The goal here is to build a model that extends to cover the workings of a firm beyond a particular project and that also takes into account the firm's links with other actors. Furthermore, the model incorporates the effects of decisions on strategic alternatives on the firm's future.

### **6.1 Prior models of games industry micromechanisms**

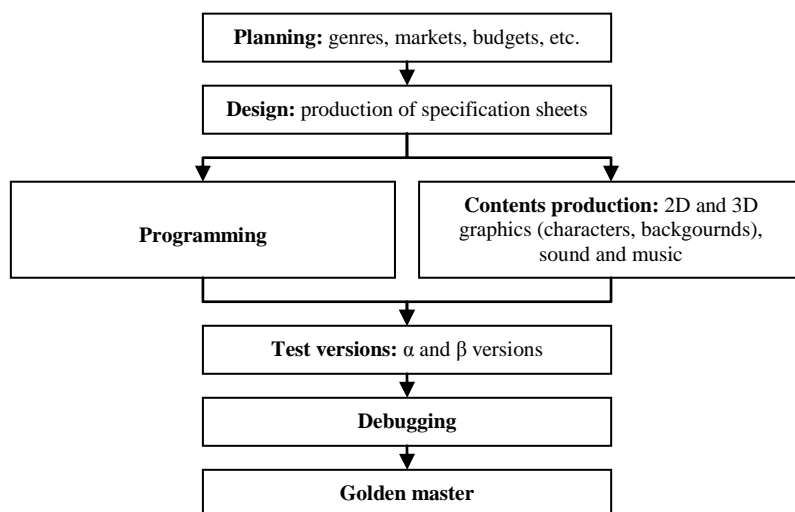
Modelling efforts concerning the games industry have so far been limited to linear expressions of the value chain type. A prime example of such is Johns' (2006) presentation (Figure 26) of the actors and activities needed to produce video games. This model presents the activities as taking place consecutively. First both consoles and games are developed, then produced and published followed by distribution, retailing and consumption. The model fails to explicate that for each console, hundreds or even thousands of games are developed and thus the product development projects in the hardware and software sides of the business are very different in magnitude and time-frame. Furthermore, the model fails to account for the very different industry dynamics, i.e. oligopoly in hardware and fragmented market structure in software. An additional shortcoming is the use of the terms development and production as separate functions, as production is usually thought to be a part of game development.





**Figure 26.** Video games production network by Johns (2006).

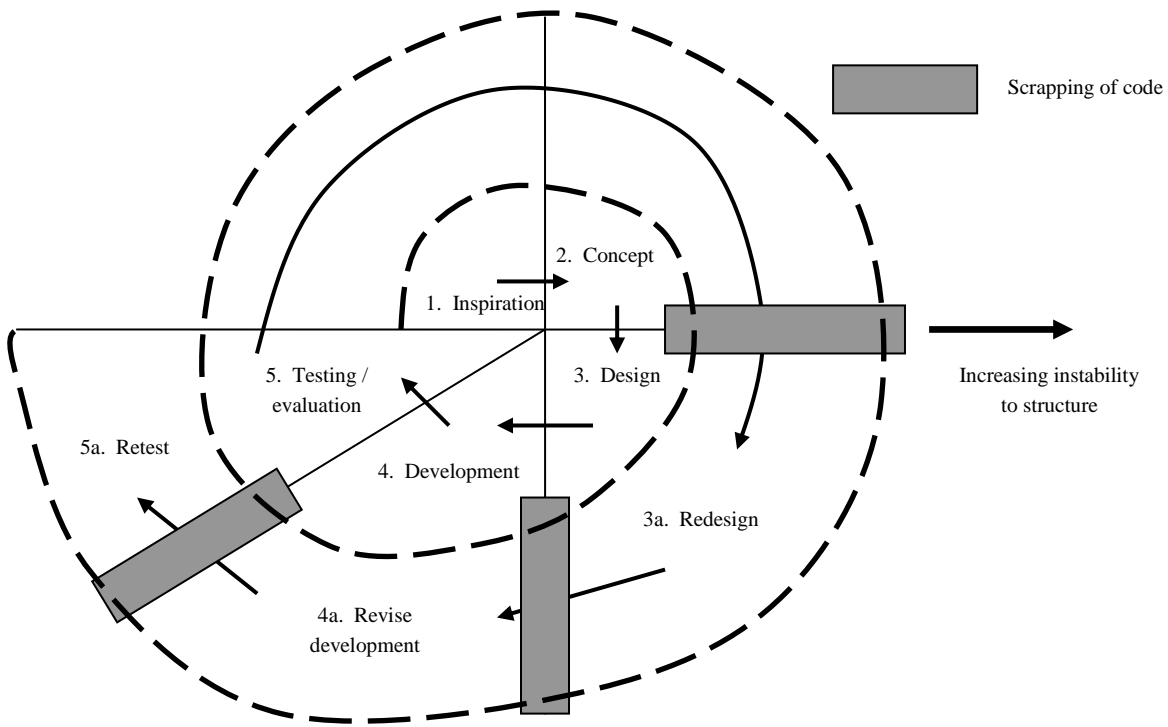
The game development process has also been modelled in greater detail. A good example of this is Aoyama and Izushi's (2003) model (Figure 27) that traces the steps of the game development process from planning and designing to debugging. This model is also linear and gives a rather simplistic view of the very complex process of creating a game.



**Figure 27.** Linear model of game development by Aoyama and Izushi (2003).

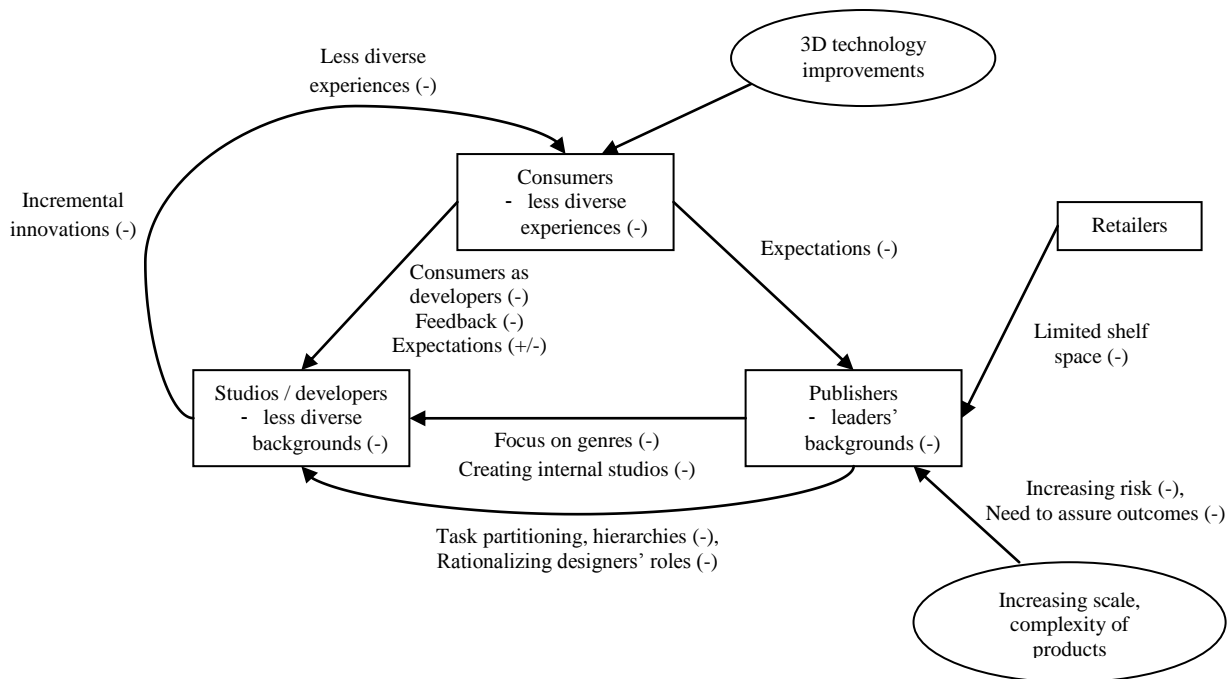
An interesting attempt at depicting the iterative nature of game development is Baba and Tschang's (2001) outward spiral model of game development (Figure 28). This model succeeds in capturing the interactions between different tasks and revisions needed to make the whole work. In addition,

the growing costs and risks are noted. However, this model is limited in the sense that interactions among people within the development firm and with other actors, such as publishers, are neglected.



**Figure 28.** Outward spiral model of game development by Baba and Tschang (2001).

The only systems dynamics model so far depicting the dynamics of the games industry is that by Tschang (2007) presented in Figure 29. This model concentrates on the interactions of developers, publishers, consumers and technological developments in determining the level of innovation in new games. Most of the effects are dampening, thus directing the developers towards incremental innovation. However, this model does not take into account the dynamics inside the developer firm or interactions among developer firms.



**Figure 29.** Qualitative systems model of creativity in the games industry by Tschang (2007).

The objective of the model building exercise here is to include the interactions between developers and publishers as well as between developers themselves. These are both tied to the innovation processes of the developer firms as well as to the way in which the market for games takes shape. Thus all these factors are included in the qualitative systems model built on the basis of interview data on game development firms. The following sections build partial models of the effect of gatekeepers, the emergence of demand, the entry and innovation processes and the effects of information and knowledge exchange among the firms. In the final section the partial models are brought together to construct the complete model.

## 6.2 Gatekeepers in action

In Table 21 some basic information on the firms and the views of the interviewees on various aspects of competition are presented. The firms in the console/PC sector usually perceived competition to be for publisher attention whereas the firms in the mobile sector saw competition to be for the placement in the operator's deck<sup>14</sup>. Firms also experienced competition over skilled labour. Some of the firms claimed that they had no competitors. Others were able to name a few international companies that they compete with. Furthermore, producers of other forms of entertainment were named as competitors.

<sup>14</sup> Deck placement refers to the visual location of the game in the operator's portal. If the games are presented on a list, those at the top get more attention than those at the bottom. Attention can also be drawn to particular game by highlighting it as "game of the week".

**Table 21.** Summary of empirical data on competition.

Firm	Founded	Employees	Platform	Subcontractor	Developer	Publisher	Competes for	Competes with	View on competition	Success factors	Project selection based on
Alpha	2004	35	Mobile		•	•	Deck placement	Two international companies	Competition against low quality developers	Small size, Risk taking ability, Originality	Market potential, Competitive situation, Feasibility, Perceived risk, Available resources
Beta	2002	27	Mobile	•	•		Skilled labour, Publishers developing their own games	No one	Sets upper limit on price	Quality, Total service package	Feeling, Budget, Legal matters
Gamma	2000	24	Mobile		•	•	The souls of the end-users, Deck placement, Funding	No one	Group effort against international big companies	Timing	Market potential at that moment, Technology constraints
Delta	1999	100	Mobile		•	•	Deck placement, Skilled labour	Several international companies	Neck to neck with international heavy league players	Quality, Brand, Reputation	Competitive situation, Size of the niche, More art than science
Epsilon	2000	170	Online, mobile, handheld, console		•	•	Race with competitors to new countries and applications	Few global and several local entertainment and media providers	We do our thing and we are not that interested in what others do	Timing	Commercial potential, Good will
Zeta	2002	9	PC, online	•	•		Publisher attention	Not specified	Imposed by international publishers	Originality	Available resources, Originality of content and story
Eta	1995	25	Console, PC		•		Consumer mind share, Skilled labour	Other forms of entertainment	It is about owning a segment that is large enough	Business competence, Quality	Interesting characters, Usability
Theta	1995	13	Console, PC		•		Skilled labour, Publisher attention	Not specified	International publishers are very picky	To do something different, but not too different	Resources, Funding, Team excitement

Competition was often seen as imposed by international publishers. On the other hand, competitiveness was measured against international established companies, either as an individual firm or as a group effort by Finnish firms. Competition affected the firms differently. At one extreme competition was seen as setting the upper limit on price, i.e. the project budget, whereas at the other extreme competitors were seen as irrelevant as the interest was in the firm's own

operations and not in what others do. Quality, originality and timing were named as the dominant success factors.

We begin by approaching competition from the viewpoint of game titles, i.e. products. Selection of game titles entails three rounds. The first is the phase in which potential game ideas and concepts compete with each other within a game developer firm. Only a fraction of game ideas is developed to the stage where they can be sold to game publishers. The second round is that of game concepts and demos competing for publishing deals. Here, too, only a fraction will survive. The third round is selection imposed by the consumer market. As most published games are financial disasters, the bulk of the game titles will make losses and only a small number will end up as hits with large sales. The interest here is in how some game ideas progress to be developed to the concept stage, some of them to the demo stage, a fraction of those to a finished game and finally a minority of the finished games end up as hits.

### 6.2.1 Selection imposed by developers

The criteria for game concept selection by the developer firms are often described as more of an art than a science. The interviewees used words like feeling, excitement, intuition and consensus to describe the decision process. This is well described in the following quote.

*“We do not have any scientific method or scoring system. Somehow consensus arises if consensus is required. The founders are more equal than others, but we have also developed ideas put forward by others. And if the team gets excited then we start doing it.” (Theta)*

However, besides such soft things a necessary condition for the game concept to be developed further is the faith in its ability to generate sufficient revenue. In addition to low market potential, game concepts may be discarded because of encountered or anticipated technical problems as well as due to lack of funding to cover the estimated budget. These reasons override any greatness that the content might otherwise have.

*“We have killed projects if we have felt that even though the idea has been good but for some reason these kinds of games do not sell at the moment or that the developer cannot do it or there are technical problems for which the game will not run properly. So we have killed quite many projects after starting them and even after we have spent money on them. There is no sense in doing a game if you don't believe that there is business. That is a raw fact. If you don't believe that it will bring you money then it will die no matter how great a work of art it is.” (Gamma)*

The creation and selection of new game concepts is very much guided by games currently on the shop shelves. It is of prime importance for the developers to create game concepts that differ from established brands in strictly defined genres.

*“The typical reason is that if there is a lot of competition. If there are big competitors then it will not pay off to do it. For example, it is not a good idea to do a football game because there are big licences and brands like EA Fifa against which it is quite impossible to compete.” (Delta)*

It seems to be quite a paradox to come up with an idea that would be internationally appealing to the masses but not yet implemented by anyone. As such international appeal of a new idea cannot be determined prior to the actual launch it is a matter of faith and intuition. Thus, a popular strategy is to be original enough to differ from existing brands but similar enough to justify market potential.

*”Q: Do you try to avoid such strictly defined genres?”*

*A: Actually yes, but it feels like even the slightest innovative twist that we offer seems to be too much, unfortunately. We have tried some new approaches lately so that the high concepts would not be totally alienating.” (Theta)*

The balancing of originality and familiarity is a common strategy in cultural production in general. The replication of familiar elements in games has received criticism: “If we are to see games accepted as a contemporary art form, game designers are going to have to stop using “market pressures” as an excuse for their lack of experimentation” (Jenkins 2005, p. 321). This, however, is an unfair assessment as there are countless aspiring game development firms working on innovative ideas, but they cannot get their products to market as publishers are unwilling to take the risk. In addition, a fundamental difference between games and most art forms is that game development is extremely expensive. Game development entails more than one artist and mere material costs.

#### *6.2.2 Selection imposed by publishers*

Game development firms do not encounter a faceless market. Instead, they form and manage relationships with publishers, and also with operators within the mobile sector. Such relationships require a lot of work to create and maintain and this is a very conscious effort.

*“The product has to be in good trim. If it has been for some time and then you have some history, a certain reputation and brand that we absolutely have. It is very important that you have long experience in working with the same channels and you can show that it has been profitable for both sides.” (Delta)*

When publishers are making the decisions on which game concepts to finance they have limited knowledge of each potential product. Deals are made without the ability to make an objective assessment of the merits of a particular product. This is because often the product does not exist prior to the deal and the publishing deal is made in order to turn a demo into a game. There may be a minute of the game, some animation, some documents describing the game concept and the enthusiasm and track record of the people pitching the game. This means that the reputation and trust that enable the creation of such contracts are a valuable asset for the firm. This also means that the publishers are inclined towards making deals with people they know and with firms of whom they have prior experience of successful projects. This is illustrated in the following quote.

*“At the end of the day we are selling intangible stuff and when we are talking of a product that cannot be seen then it is a matter of credibility. The product has to be credible and the firm has to be credible so that you can deliver. One way is not to promise too much and deliver faster or better and then you get a good reputation. Image is important, also how you present things. We have*

*always paid attention to how we present the product and how we talk about ourselves and how we take care of our network. We have been building PR with the press and relations with publishers and device manufacturers and that has been very deliberate.” (Eta)*

Such relations do not emerge as a result of demand in the market turning into a favoured position. After all, there is no real demand for games in the sense that they are not essential to life, as are food, housing and clothing. On the contrary, the market is created through the continuous development of relations with publishers or mobile operators.

The demo is usually presented to several publishers, in order to find one to finance the rest of the project and to make a contract on how potential profits are to be shared. As royalties are paid only after the publisher has earned back its investments, it is fairly rare that the developer will actually get any. Most games are financial disasters and the publisher ends up losing money on them. However, the first challenge for a developer is to get a publishing deal.

*“You go with the package to the publisher and if the developer has been able to finance the project that far that they have some material to present to the publisher, then that is where it usually ends. Like you can show the idea and how it runs on a screen and you have one minute of the game done. Then they say yes or no. At that point the publisher comes to finance the project. In some cases the developer can develop the game further but the risks increase all the time. Even if you have a completed game it is possible that no one will want to publish it.” (Theta)*

This applies mostly to the PC/console sector, whereas in the mobile sector the operators have a gatekeeper role. In the mobile sector the publisher makes a contract with the operator and this usually entails sharing the revenue by certain percentages from the first sale onwards. The main differences are that operators do not invest in the development of the game and mobile publishers negotiate deals with several operators to reach a larger customer base.

According to Jenkins (2005, p. 322) the power of the gatekeepers within the games industry has had an impact different from that of the film industry. Filmmakers around the world have been able to experiment and to create the language of cinema through an emergent process whereas within the games industry the number of platforms has been limited and thus all the games have had to pass corporate scrutiny. Jenkins (ibid.), however, reports the lowering of this barrier because of the proliferation of open-source game engines, for example, which makes it easier for independent game companies to reach the market. This, however, is a somewhat idealistic view as there are no signs of the struggle of the independent developers getting easier. Some of the interviewees stated that in recent years the publishers have increased their demands on what the demos have to include before any discussions can begin. Thus, the cost of demo development is rising and the barrier to entry may actually be getting stronger.

The publishers can afford to impose such demands on developers because there are so many aspiring firms willing to make great sacrifices to get a publishing deal. As long as there is a permanent oversupply of enthusiastic game development firms, the publishers can make them compete fiercely and select their favourites. In the games industry the oversupply of cultural labour

thus manifests as the oversupply of development firms. The publishers have a strong position in moulding the selection environment for the developers. This is well presented in the following quote on negotiating a contract with a publisher.

*“Usually the first draft is the worst possible, like you have to give them your daughter and sign the paper in blood. Our own experience is that there is some room for negotiation and you can get reasonable things. The project is scheduled with some milestones and the publisher pays as each milestone is completed. The developer has the pressure and they are hanging on the publisher who can have quite tight strings. And if we are talking about a console game then it is quite a large part of the income of the developer and the publisher can dictate the artistic direction and whatnot.”*  
(Theta)

However, just as developers are dependent on publishers to get their game onto the market, the publishers are constantly looking for new games to publish. This means that a developer with a good track record may have several publishers to choose from.

*“Before our first success it was very hard, as it is for everyone. But it is not that hard now. You are as good as the last game you have sold. At the moment the situation for us is good and we want to hold on to that and that is done by doing good games. And also by doing everything professionally. Firm reputation consists of so many things. There are the games but there is also the way in which you do business. Competition is tough and although some old firms die darwinistically, new good firms are born every year. You cannot rest at any point. It is very rough and the four or five large publishers only want to work with four or five external developers so you have to work hard to stay on that list once you get there.”* (Eta)

Within the games industry the publishing decisions are not based solely on the characteristics of the potential product. A crucial element is whether the publisher believes that the developer can actually finish the product, provide acceptable technical quality and stick to a schedule and a budget. This is because the technical side of a game development project is far more demanding than that of a film, for example. Elsbach and Kramer (2003) analysed Hollywood pitch meetings where studio executives make decisions on which screenwriters to hire. They conclude that the executives try to identify creative people by looking for certain characteristics and matching the people with stereotypes indicating differential creativity. This process is quite different from developers pitching to publishers within the games industry as in such pitch meetings the capability of the whole team is estimated and not just the creativity of an individual.

As the publishers have such power in deciding which game concepts are taken forward and which are not, there is some tension between the developers and publishers. A common criticism of the publishers' decision making logic is that they are willing to finance only the kinds of games that repeat things that have sold well in the past and would thus be appealing to the mass market. This means that novelty would not be appreciated. But seen from the viewpoint of the publishers the picture is very different. All publishers want to be the one to publish the next big innovative game.



In order to find it, the publishers are forced to bring to the market more games than can generate positive cash flow.

### 6.2.3 Selection imposed by consumers

Selection imposed by consumers is a multi-faceted issue as they make their decisions to buy based on many factors of which some are more and some less conscious. However, these decisions are affected by the marketing budget allocated to each game by the publisher within the PC/console sector and placement in the operator's deck within the mobile sector.

From the viewpoint of the developers, a publisher can condemn some games to poor sales by cutting their marketing budgets. However, even huge marketing efforts cannot turn a very bad game into a big hit. Moreover, investments in marketing push up the sales required to break even. Thus, it is acknowledged that both good game and good marketing are necessary but not sufficient conditions for good sales.

*“The success of a game is determined six months before it is published. It starts with how the publisher believes that the game will succeed. They make projections based on how these kinds of games have sold previously and that is the first problem if your game is of a new type. There is no evidence of good sales for its type and the publishers do not want to invest in marketing. And when there is no marketing then it becomes a self-fulfilling prophecy. Perhaps some types of games never get a chance. Big games that are advertised on the sides of buses and on TV have for some reason been believed in. So often success has been guaranteed through previous success. However, there are games that despite huge marketing budgets have not succeeded. So there has to be both good game and good marketing.” (Theta)*

Within the mobile sector deck placement is said to be the factor with apparent influence on selection induced by consumers. This means that games that get good placement in the operator deck are sold more than those with a poorer placement.

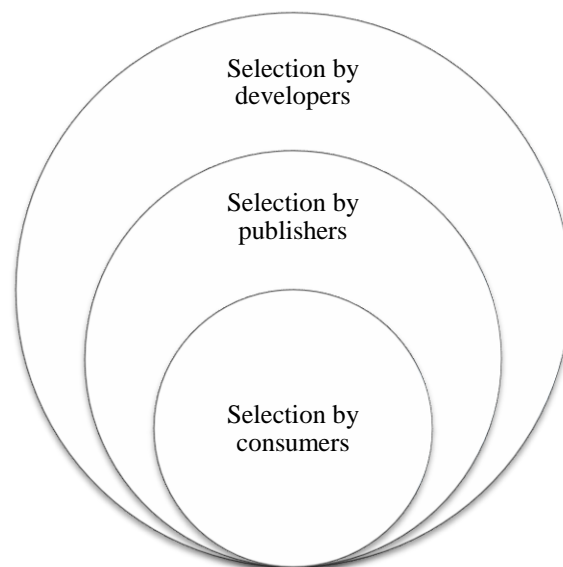
*“It is not really rocket science if you look at how the end user makes the decision to buy. In the end it is dependent on one thing; it is the deck placement when you go to Vodafone Live or T-Mobile operator portal. On average 90 percent of European consumers do not have flat rate but pay time-based for browsing. They buy games with good deck placement, such as top ten or game of the week or something. And to get a good deck placement for a new game you arrange a campaign with the operator and that is why we put a lot of ammo into marketing and do co-marketing with operators. Of course quality helps but we do original IP that competes with Star Wars, for example, and no one has heard of our stuff so we really have to have higher quality than others.” (Alpha)*

Marketing investments by the publishers or operators undeniably have an effect on sales, but in itself it does not determine the end result. Games are not played in a vacuum where the only message comes from paid advertisements. Inducing positive word-of-mouth before release is very important and this can be done, for example, by posting a link to some graphics shots of the game on web discussion boards and encouraging gamers to evaluate them. This is not a particularly

expensive effort and can be done by developers. Later on the opinions of the actual game experience will be circulated in the social network of gamers. Marketing decisions do not simply doom games to bad sales. An exceptional game may find its way to success regardless of the resource allocation of the publisher.

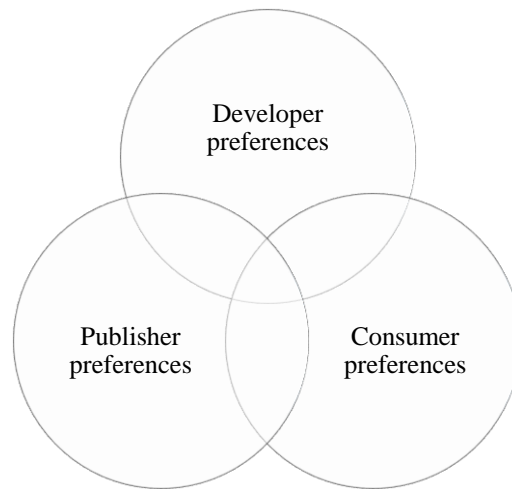
#### 6.2.4 *Three rounds of selection*

The logic of the three selection rounds – selection imposed by developers, publishers and consumers – is that in this way the concepts that are likely to be unprofitable are weeded out before they reach the consumer market and thus investments can be directed towards game concepts that are likely to be profitable. However, this is based on the assumption that the concepts that do not survive developer selection are actually of the kind that would not be appealing to the publishers and the ones not surviving publisher selection would not be appealing to the consumers. Thus, this approach includes the assumption that the two first selection rounds consistently cut variation from the areas that would not succeed in the consumer market. This is presented in Figure 30.



**Figure 30.** Three rounds of selection.

However, there is no way of knowing whether the games that are developed and published at the moment cover any more than a fraction in the variety of all possible games that the consumers would be willing to buy. It is not reasonable to assume that the preferences of developers, publishers and consumers coincide in a consistent manner. In Figure 31 the situation is sketched where the preferences intersect only to a small degree leaving a very small number of games surviving all three selection rounds.



**Figure 31.** Three kinds of preferences behind selection rounds.

Based on this it is possible that there are game titles that the publisher would like that do not survive in the selection by the developers. Also, there may be game titles accepted by the developers that the publishers discard in spite of substantial consumer appeal. But to conclude, it is quite certain that there are possible games that the consumers would buy but no one has so far come up with the original ideas for them. This is also the reason why novelty is created by developers and expected by publishers in order to find and make good use of such consumer potential.

#### 6.2.5 *Scarce resources*

So far we have concentrated on the factors that limit the sales of games in both publisher and consumer markets. However, there is also scarcity in other factors limiting the ability of a developer to get any products done in the first place. The main scarce resources identified in this study are skilled employees, capital and both technological and business competence. Game developer firms are usually small and young. This is because the industry is growing and new firms are being founded. However, the other reason is that the industry is quite volatile and firms also die, which means that the number of old firms is small. These scarce resources partly explain the volatility of the industry.

The availability of skilled employees was often mentioned in the interviews as a factor limiting the growth of the firm. Within the games industry a varied combination of skills from different fields is required, such as coding, artificial intelligence, physics modelling, graphics and art, game design, sales and marketing, project management and contract law. As there is very little games related education available, especially in Finland, the firms have to invest heavily in training their staff. However, having such education is not the ultimate answer as it is not possible to go into the required depth in each field in a two or four-year programme. This means that university education in software engineering, for example, is complemented with experience through personal interests, hobbies and finally working in game firms. This way the people entering the firms have in a way had to beat the odds and show a lot of determination as there is no such straight route from university to work as there is in many well-established professions. As the productivity of an

employee is dependent on such training, the firms are keen to retain their employees and avoid losing them to other game firms. Many of the interviewees stated that having the right people is the most important condition for success. The following quote is an example of this.

*“Thinking back you have to have the right team. You have to have a vision and some kind of a business plan. Even though the plan will surely be changed a hundred times but you still have to have a clear vision. But the team is the most important. You have to have different kinds of people so that there is experience of different things.” (Delta)*

The second important scarce resource is investment capital. Within the PC/console sector the developer needs capital to finance the development of the demo. New firms are dependent on investment capital whereas more experienced firms may be able to finance the development of a new demo with the profit from previous projects. Within the mobile sector the publisher needs capital to cover the expenses of game development before it starts to receive revenue from games in the operator portal.

*“If we think about competition in Finland then it is about funding because there is very little capital moving at the moment. It is a zero sum game. If someone gets the money then no one else gets anything.” (Gamma)*

But this is not just about the scarcity of money. It is also a matter of competence that some investors may bring to the board of the firm. Such ‘smart money’ is very much appreciated by the firms but not many investors can provide such expertise.

*“Q: What keeps you from getting to your dream situation?”*

*A: Funding and the understanding of the business. There are no people in Finland who understand about marketing games like who would have been launching an international game project. There is a lack of capital and lack of marketing and advertising competence.” (Gamma)*

The third scarce resource is business and technology competence. The challenge in the technology department is that every time a new generation of devices is introduced it becomes technologically more complicated for the developers. This means that they have to continuously invest in training their staff, but it also entails the growing complexity of the development projects from a managerial perspective. The infrastructure of the firm has to be kept up to date.

*“Basically no matter what the business is it takes a certain competence to set a firm up and it takes a certain competence to handle the growth and if you don’t get the competence from outside and change your procedures you will die in that environment. Quite traditionally game developers have had a great game designer or a great programmer ordered to be a project manager or CEO. Not surprisingly he has not been that interested in building the business processes or infrastructure. People have had a garage way of working and perhaps they have accidentally sold IPs or they have become a subcontracting company that will be the victim of cost-cutting and will eventually die out. But behind it all is the lack of business competence.” (Eta)*

6.2.6 Model of the selection process

In Figure 32 the qualitative systems dynamics model on the way in which game titles are selected at various stages is presented. Inside the developer firms ideation produces alternatives among which concept selection is done. The publisher then determines which demo is to be developed into a game, what kind of advance and royalty rates will be applied and how much is invested in marketing.

The cash stock of the developer firm is boosted by the advance payments as well by the royalties that are determined by sales. These are dependent on finishing the game as advance payments are made based on milestones achieved and royalties can follow only from a finished product. Funding also boosts the cash stock. The cash stock finally determines whether the firm stays in business or is forced to file for bankruptcy. The cycle of ideation, getting a publishing deal, finishing the game, gaining reputation and going back to ideation fundamentally keeps the firm alive. From the perspective of a new entrant the complication is that the cycle cannot be entered on a small scale as one game is the smallest unit of business. In addition, to cover the costs it is not sufficient to sell the game on the home market. This means that entrants have to jump in at the deep end and do business on an international level from the start.

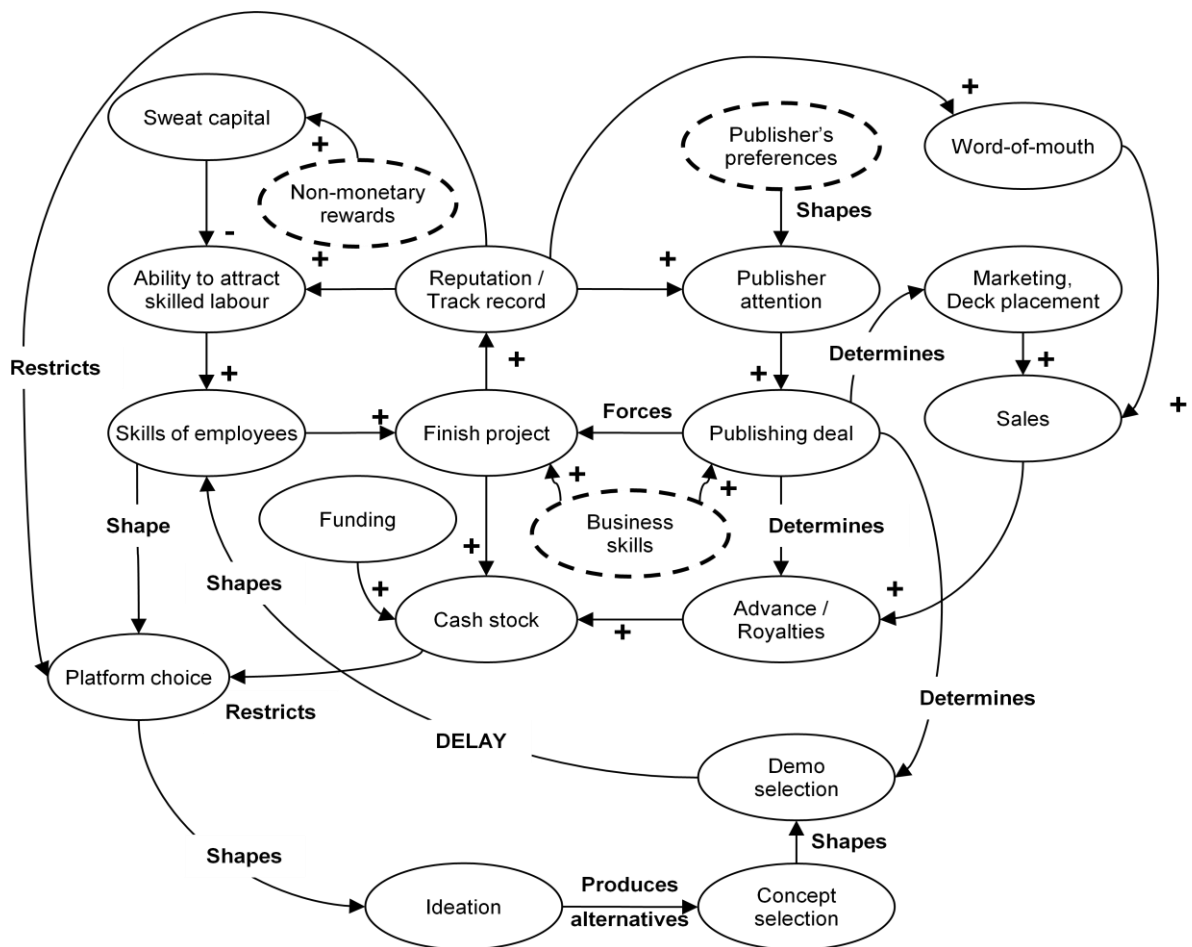


Figure 32. Selection operating on titles.

The reputation of the firm allows it to gain publisher attention which is also shaped by the publisher's interests, which are shaped by the perceptions of which kinds of products the consumers might like. Reputation also induces word-of-mouth on ongoing projects which translates into a sales boost when the game reaches the market. Such reputation and track record are accumulated by finishing projects and shipping products. The ability to get a project done is boosted by skilled labour and business skills, whereas the incentive structure of the publishing deals has the effect of forcing the developer to finish the game.

The reputation of the developer firm is a determinant of the ability of the firm to attract skilled labour. Developers often use sweat capital, i.e. working without pay, which is encouraged by the non-monetary rewards that this line of work entails. However, game designers, programmers and so on are also people with families and mortgages and thus the use of sweat capital decreases the firm's ability to attract labour.

The platform choice is restricted by cash stock, reputation and technological skills. Console game demos require significant investments from the developer, whereas mobile games can be launched with less cash. The reputation of the firm restricts its ability to attain a console game development deal and thus a firm with modest achievements is less likely to go for a console project. The skills of the employees have been accumulated in previous projects and thus firms that have concentrated on a particular platform are likely to stick to that.

### **6.3 Emergence of demand**

The above analysis mapped the selection rounds imposed by the gatekeepers and the way in which resources like skilled labour, reputation and cash enable or restrict the choices that the developer firms can make. Next we consider how demand for a game emerges. In the interviews the diversity of the game firms came across strongly. Some basic information on the firms and their differences is given in Table 22.

The firms vary first of all by age and the number of employees. Secondly, the firms develop and/or publish games for different devices. Thus, there are differences in the position within the value chain and in the platform choice. Thirdly, there are differences in the strategy relating to content and immaterial property rights. Even though developing content that differs from everyone else's constitutes a competitive edge for many firms, most interviewees mentioned less specific sources of differentiation, such as good quality or flexibility.

**Table 22.** Basic information of the firms and their differences.

Firm	Founded	Employees	Platform	Subcontractor	Developer	Publisher	Content strategy	IPR strategy	Competitive edge
Alpha	2004	35	Mobile		•	•	Content includes a statement	Original IP	Games for gamers, Good quality
Beta	2002	27	Mobile	•	•		Anything goes	Licensed IP	Total service, Good quality
Gamma	2000	24	Mobile		•	•	Anything goes	Both original and licensed IP	High end, Technological sophistication
Delta	1999	100	Mobile		•	•	Social and casual	Mainly original IP	Creation of game experience specific for mobile phone
Epsilon	2000	170	Online, mobile, handheld, console		•	•	Social	Original IP	Social media and entertainment
Zeta	2002	9	PC, online	•	•		Based on Finnish culture	Original IP and subcontracted projects	Content differs from everyone else's, Capability to change
Eta	1995	25	Console, PC		•		Action-adventure	Original IP	Content differs from everyone else's, Doing business smartly
Theta	1995	13	Console, PC		•		Creative but not too creative	Both original and licensed IP	Flexibility

### 6.3.1 Allocation of market shares

Industry life-cycle theory sees competition as something that arises with the entry of firms into a new industry and the subsequent development of performance criteria, on the basis of which competition operates and which become more and more well-defined as the market ages. This leads to the allocation of market shares among a decreasing population of firms according to how well their offerings perform in relation to the criteria and how well the firm is able to benefit from economies of scale and cumulative learning leading to decreasing prices.

The problem is that this line of thinking assumes demand to be there in any case, well-defined performance criteria to emerge and standardisation to induce economies of scale. The market crashes of 1977 and 1983 illustrate that demand for games does not exist without good quality supply. Changes in market size are primarily caused by changes in supply, which are followed by changes in demand. After all, the market is created by the game titles rather than by consumer needs. This means that the growth of the market is not a matter of suddenly having more consumers among the shop shelves trying to decide which game to buy. The consumers come there attracted by some particular game. The market growth is not there for anyone to grab, but is created by a limited number of games. A big hit may increase the size of the market both temporarily and permanently.

The temporary increase follows from a substantial share of that year's sales coming from this particular game. The permanent increase will follow from the power of a hit game to attract new consumers to buy the first game of their lives, and more importantly, to invest in the hardware necessary to play it.

This also means that if a particular highly successful game had not come onto the market, then consumers would not necessarily have bought some other game as a substitute. Perhaps some of them would have and some would have bought a DVD film instead. Furthermore, as the criteria for choosing a game vary from consumer to consumer, the consumers buying some other game instead of the hit game would have ended up with different substitutes. Games are not perfect substitutes, actually far from it. The interesting thing is that the more diverse the games are, the larger the market can be as many consumers buy several different games a year and new kinds of games can bring new consumers to the market. There is also a temporal dimension as games are, in a sense, perishable. The market for a new release will disappear in a matter of weeks or months.

Most of the interviewees stated that they do not have any direct rivals because the products are so different from each other. Indeed, in a business programme organised for Finnish game development start-ups it was emphasised that in order to succeed convincing answers are needed to the following questions: "What differentiates you on the games market? What is your message to the industry? What is your message to the paying customer?" (Koivisto 2005, p. 15). The traditional definition of competition would suggest that competition is a matter of "us" or "them", but this is not how the interviewees saw it. Almost all of them said that some other firm developing a good game does not take anything away from them.

*"We sell orange juice and the others sell beer. These are different kinds of brands and we all compete for free time. Of course we have competitors but you can't say that we would compete with some other game." (Eta)*

*"I think that in Finland within the games industry there is no competition. Like if they do a game then that doesn't harm us in any way. In that sense there are no competitors, only potential collaborators." (Zeta)*

However, games are not just a mass of differentiated products situated randomly everywhere in the product space; there are subgroups that have higher degrees of similarity. Both developers and publishers think of games in terms of genres. As mentioned in the previous section, many firms aim at developing games that are original but not too different from existing games. In terms of genres this means that games can usually be classified to some genre but there is also something in them, especially among successful games, that differentiates them from other games of that genre.

*"If we can own a mind share in the minds of the gamers like when you say cinematic action game then we hope that our game comes to their minds. And that competes in the action-adventure category. It owns a small segment and we hope that it is large enough to be financially sustainable. But in any other genre, let's say strategy games, which is a large one, then you have to have some innovations related to either technology or gameplay so that it differs from all the rest. If there is a*



*genre with Coke and Pepsi and you try to bring in another cola drink then you are not likely to win that battle.” (Eta)*

Competition occurs both within and between genres. There are consumers who choose a maximum of one game per genre as are also consumers who choose several games but from only one genre. For example, a consumer may choose one shooting game to fill her line-up of different kinds of games. On the other hand, a consumer may buy all possible shooting games published on a particular device because these are the only kinds of games he likes. Naturally, most consumers are somewhere between these extremes. This adds to the complexity of the variability of the market size. Genres compete with each other, thus these submarkets change in size in relation to each other. Games within a genre compete with each other based on originality, thereby continuously redefining the genre. Competition is primarily based on originality and not on price, and thus the market is created by the products and not by demand. Competition cannot be understood as gaining market share from some other firm.

### *6.3.2 Efficiency and quality as competitive weapons*

Efficiency relates to competition in two ways; it is a success factor for a competing firm and it is a population level result of the competitive process. Basically efficiency is understood as producing the same output with less input. The industry life-cycle theory assumes that efficiency increases with market age as economies of scale and cumulative learning make the manufacturing process cheaper and faster.

However, within the games industry succeeding in competition is not about making the same product cheaper and faster, but about making new, original and better products at a reasonable cost. The development costs, especially of console games, have been rising exponentially in recent years and this implies that efficiency in terms of low development cost is not a key success factor. This raises the issue of increasing returns that dominate within the games industry. The cost of the development of a game title is constant as the number of physical game copies rises. Even though there are costs associated with manufacturing the discs, cases and printed materials, as well as retail costs, the next game copy sold will yield more profit than the one before<sup>15</sup>. The more units sold, the more profit per unit and thus the sales of a hit game can absorb quite extensive development costs.

Within the games industry price per unit efficiency loses its meaning. Even though console games tend to sell for a certain price as also do mobile games, the price per game copy<sup>16</sup> is not a relevant measure of value to the consumer. Hayes and Dinsey's (1995, p. 65) analysis of the early 1990s game market concludes that a good title sells almost as many units at £49.99 as it would at £39.99. For them the main decision-making criterion is the overall appeal of the game including graphics, licence and gameplay. The consumer is interested in the amount and quality of entertainment the game will provide. These are very hard to measure and to make things worse, they vary from

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<sup>15</sup> According to Schoback (2005) the cost of the physical good is about 3USD for a 50 USD console game.

<sup>16</sup> In November 2007 the prices of latest generation console games (Xbox 360, Playstation 3, Nintendo Wii) ranged from 40 to 80 USD at amazon.com. For mobile phone games the prices at the Vodafone Live UK portal ranged from 1 to 5 GBP and at the Finnish operator Sonera's portal from 3 to 5 EUR.

consumer to consumer. Different people appreciate different attributes and what some consider exciting may be boring to someone else just as one's humour may be pathetic to another. Thus, "price per unit of fun" defined per each potential consumer would be the correct measure of efficiency.

The ability to produce a game at a very low price matters little as long as the content is not what the consumers want. It does not matter how cheap a game is if it is of the wrong kind. To buy nothing is a strong option for the consumer who is not particularly impressed by the supply. If there are no good enough games available at a given time the potential buyer will buy nothing. If there are several good enough games the buyer ends up buying some of them. But in the game market there are no guarantees that a winner will emerge. The consumer may choose to go home empty-handed. This means that within the games industry competition is essentially innovation-based. Also, the very high development costs associated with a hit game can be absorbed with the help of increasing returns.

*"If we think of the project triangle then the most critical is the quality aspect and in the broad meaning of the term. Not quality in terms of 'we provide good quality but no one cares' but the game has to be desirable and fun. Time and money can be more flexible until we reach a certain point in the project where you have to lock the schedule and budget and go with that. But because this is a hit-driven business we have to do it this way." (Eta)*

It appears from the interview data that efficiency is more a discrete hurdle than an incremental avenue of development. There has to be a certain level of efficiency to ensure that the firm can go through the complicated development process and deliver what they have promised. This is not a matter of successful firms being more efficient than the less successful ones. It is more of a level of efficiency that the firms have to reach in order to exist and compete by creating original content. Such a level of efficiency can also be defined as quality; it contains the ability to deliver acceptable technical quality by a deadline which is dependent on the business competence of project management and the management of stakeholder relations.

The key selling point of the game, its originality and appeal, do not conform to the idea of economies of scale. Adding raw manpower to the development process does not make it any more original or appealing. What matters greatly is who the people in the team are and their number is of less importance. This quantity versus quality issue also came up in the interviews.

*"The world is full of people who work harder than us. If the solution would be that we just worked harder then there is always some firm in India where people work 80 hours a week for half the pay. We have to be smarter in deciding what we do." (Eta)*

It appears that rather than striving for economies of scale the firms concentrate on product characteristics, such as characters, story, style and the technologies required to create it. Apparently the way in which things are done is often a secondary problem after what things are done. This is illustrated in the following quote.

*“We concentrate on doing a few things well and hopefully some of those are the kind that no one else does and they are relevant and so we put our resources into them. The biggest problem has always been whether we do the right things. Not so much whether we do things in the right way. We can find enough talent to do things well but we just have to aim that at the right things.” (Eta)*

Within the games industry the primary problem is to develop a game concept that is original and appealing and hence can create a market for itself. This is not a matter of choosing among known alternatives. Technology imposes limitations but technology can also be developed to suit the game in question. Cumulative learning can open up new avenues of exploration, but it does not give a decisive competitive edge as the originality of the game concept is the fundamental determinant of who succeeds and who does not. As a firm accumulates a track record and a reputation there is learning involved. However, the cumulative reputation is more decisive in attracting publisher attention and being able getting to choose the platform than in determining sales. The cumulative firm characteristics enhance the chances of obtaining a publishing deal and thus a chance to make a game. This is an ‘on or off’ decision by the publisher. Cumulative learning itself does not induce incremental increases in sales.

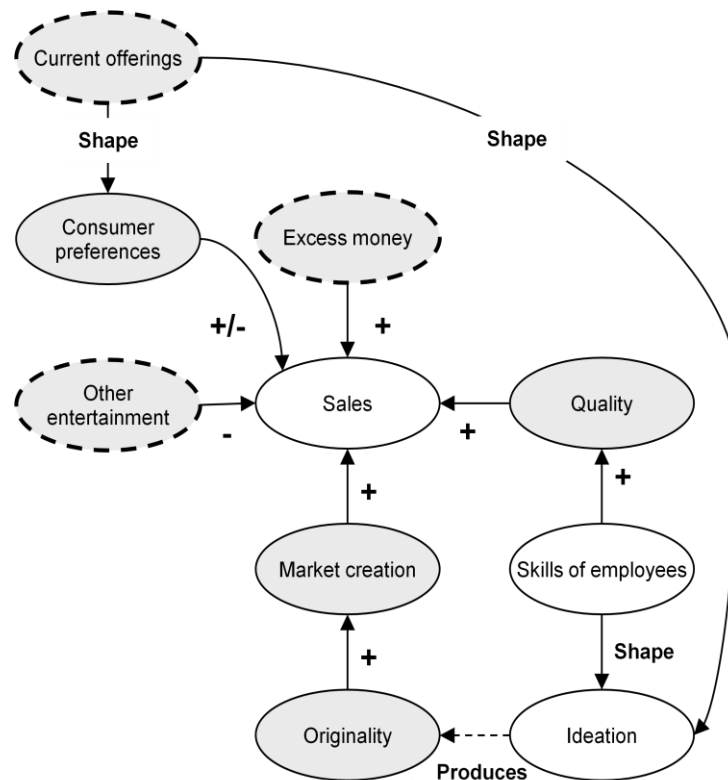
### 6.3.3 *Model of the emergence of demand*

The model describing the emergence of demand is presented in Figure 33. The white ovals have already appeared in the previous section whereas the light grey ovals are new.

Demand cannot emerge unless the game reaches the consumer market. The previous section described how a game needs to pass selection by developer and publisher before it can appear on the shop shelves or operator deck. Marketing, deck placement and the reputation of the firm were identified as factors directing sales to a particular game.

The sales of games in general are affected by other entertainment products. The money that is directed to entertainment may just as well go on film tickets, music recordings or board games. The potential entertainment budget is determined by how much excess income consumers have after paying for essential goods, such as food, housing and clothing.

Consumer preferences determine which games are bought. Some game concepts are more fashionable and appealing than others. However, consumer preferences are not given but to a significant degree are formed based on the offerings currently on the market. This point has both a technological and a content component. Technologically the games of the 1980s were crude and unsophisticated compared to the games currently on the market. Such early games could not attract sales at the moment as they would immediately be perceived as obviously inferior. Similarly, the content of early games could not compete with today’s equivalents. For example, the four screens in *Donkey Kong* were sufficient to turn into a hit in 1981, but today it would not be able to compete against *Super Mario Galaxy*. The more advanced games are offered, the more advanced consumers expect them to be.



**Figure 33.** The emergence of demand.

Whether a particular game can create a market for itself depends on the originality of the game concept. A game creates a market for itself; it does not respond to pre-existing demand. With established game series the consumers may be anxiously waiting for the next release, but this kind of demand is created by the previous products in that series. The game has to create an appearance of itself as fun and appealing. It does not respond to an inherent need for a game about a secret government agency saving people in need by tapping the correct rhythm, as would be the case with *Elite Beat Agents*. After the game is brought to market, it is seen whether it is able to create a market for itself. The current offerings also shape the ideation process. For a game to be original, it needs to differ from games currently in the market and thus its creators must be knowledgeable about current offerings.

The recurring product introductions constantly redefine the industry. New genres are created, but each game of a given genre also adjusts the definition of that genre by a small increment. Furthermore, new generations of devices are brought onto the market affecting competition among games. Games of a given genre on different devices compete with each other and determine which device a consumer will purchase. If the consumer already owns the device, such games do not compete with each other. Furthermore, games in the same genre for the same device can be seen as competing alternatives or as creators of critical mass making that device more desirable.

The quality of the game is the final determinant of sales. Good technical quality is required to satisfy expectations. This means that the game should run smoothly, be logical to use and be thoroughly debugged. The skills of the employees help the firm to deliver good quality. This is a

budget and deadline issue as such resources are needed for the finishing touches. The skills of the employees are also vital in determining the originality of the game. Even though the game ideas of the employees are filtered in many stages, the originality of the end result depends on the originality produced in the initial ideation phase.

## **6.4 Entrants and innovations**

The previous sections have dealt with the ways in which products are selected out and how demand for products emerges. Next we take a look at how new firms enter the market and how firms conceive new products and ideas for them.

### *6.4.1 The birth of new firms*

Table 23 synthesises the early phases of the firms. The table includes information on who founded the firm, their motivation, the first stages in the process and the main challenges initially perceived.

The founders of the firms can roughly be divided into three different groups. We call the first group ‘kids’ and it includes firms Delta, Zeta and Eta. The common denominator is that the founders were very young, mostly teenagers or university students. The driving force seems to have been that they had nothing to lose. The founders had a vision of what they wanted to do and how that would generate revenue. However, that vision was quite vague and was iterated several times before the business started to pick up. And not all of these firms have succeeded. The following comment by the firm Delta shows that the main motivation in the beginning was to do something amusing and there were not too many business considerations. However, as the realities of the business emerged they were willing to do things that were less “cool”. During this process they were able to formulate their strategy, namely to make products instead of subcontracting.

*“Our story is that two friends, one of whom was a graphics designer and the other a coder, wanted to start doing cool things. They did quite a lot for the web environment, some small games and all kinds of subcontracting, for example ad games for ad agencies and some things for other game firms. Mostly subcontracting and for the thrill of doing it. That was the starting point and later we wanted to change the focus to making products. We made the decision that mobile phone games would be the next big thing and we would concentrate on them. For a long time there was no market for those. Some phones came out in the summer 2001 that supported Java with which we wanted to do our games. It was very difficult to raise money in the product business so we had to generate revenue by all kinds of subcontracting for a long time and it was near the end of 2002 that we managed to get rid of subcontracting and could concentrate on the product business. As the product business started growing it went up quite fast.” (Delta)*

**Table 23.** Information on the firms and their early phases.

Firm	Founded	Employees	Platform	Subcontractor	Developer	Publisher	Founders	Motivation	Process	Main challenges for young firms
Alpha	2004	35	Mobile		•	•	Two colleagues from an existing games firm	We can do it better than others. There is money to be made.	1. Business plan 2. Recruiting 3. External financing	Lack of business know-how and contacts.
Beta	2002	27	Mobile	•	•		Three young men working in ICT	We want to make games.	1. Technology 2. Content 3. Customers	Lack of motivation and daring.
Gamma	2000	24	Mobile		•	•	One man with a vision	More advanced mobile phones need more advanced games. Exit. Passion.	1. Technology 2. Games to verify technology	Lack of financing.
Delta	1999	100	Mobile		•	•	Two friends	We want to do cool things.	1. Subcontracting 2. Original games	The wrong team. Lack of vision.
Epsilon	2000	170	Online, mobile, handheld, console		•	•	Two friends with an idea	We want to explore the applicability of our idea.	1. Demo 2. Founding of the firm as business potential was discovered	Content with no consumer appeal.
Zeta	2002	9	PC, online	•	•		Six friends with common interests	It is possible to make a living out of this.	1. Game engine 2. Founding of the firm 3. Complementing fields of expertise to get revenue	Lack of contacts and original ideas.
Eta	1995	25	Console, PC		•		Six guys with games, animation and coding as hobbies	Boyish ambition to show off.	1. Garage 2. First project 3. Founding of the firm	Lack of motivation.
Theta	1995	13	Console, PC		•		Combination of two existing teams	It is our dream to do games.	1. Idea development 2. Publishing deal 3. Founding of the firm	Lag in consumer adoption of new technology. Lack of passion.

The firm Zeta started from a different position, namely from the game engine. They had quite a bold vision at an early stage, but they did not really have an understanding of all the challenges. This led to a significant change in strategy to subcontracting in the hope of financing the development of original titles through income generated that way.

*“We had been doing our game engine since 2000 and in late 2002 we noticed that we could make a living out of it. We founded a firm around it with people with common interests. There were six partners and later we noticed it was not that easy after all. Because there are no [console] publishers in Finland and you need one to get the game to the store. And that means that you have to travel abroad. Publishers want to see you in person and have ten meetings in the US. Then we*

*started to concentrate on our other fields of know-how to generate revenue and finance the development of the game engine with that.” (Zeta)*

The third firm of this group, Eta, is perhaps the most typical entrepreneurial story as a garage is the scene of the main events. There were several people with common interests and they were developing ideas in a self-organising fashion as no one had a clear vision of what this group should head towards. As they tried out several things they were able to formulate a direction based on the feedback from those trials.

*“There were six guys who had known each other from the demoscene and Assembly events. They had been doing audio and visual things and kinds of compositions and gotten to know each other from there. At one Assembly event they had an idea that it would be cool to do games. I don’t know exactly how that took shape but eventually they dragged their computers to the garage of the parents of one of the guys. This is quite a classic garage story. There were also other people hanging around and perhaps also did some graphics but mostly they were just wondering whether anything will come out of it. It was very much informal and no one was paid. In the beginning they had several projects of which many died. Either the publisher had backed off or they had not had a publisher for it. There has been a large mass of people. You can think of it as a network of friends and friends of friends. Those who have been able to do something better than others have taken certain roles.” (Eta)*

The second group is called ‘insiders’ and includes the firms Alpha, Beta and Theta. The founders of these firms had experience within the games industry or within related industries and they had quite a good grasp of the nature of the business from the beginning. Within this group quitting the previous job marked the point in time when they became entrepreneurs. They wanted to do the same things as they had been doing previously, but in a different and better way.

Alpha can be defined as a spin-off of an older firm and the main motivation was to do things better. This is quite a contrast to the firm Beta, which was founded as three young men working in ICT, and thus having knowledge and understanding of the underlying technologies and their potential, wanted to start earning a living by making games. Alpha had a business vision and Beta a technological vision that they could not follow in their previous jobs. On the other hand, Theta was born as a result of combining two existing teams. There the motivation was to join the forces to be stronger and to have the capability to undertake larger projects.

*“It started so that we came up with the idea with a colleague while we were drunk. We worked in a game company at that time and in October 2004 we started to think that we could do it ourselves and better. We started to create a business plan in the evenings and resigned in December and started to build this enthusiastically. In February we got our first financing round. Within ten weeks we had recruited six or seven people even though we did not have financing yet. But we were looking forward and trusted that things would work out.” (Alpha)*

*“We had some things left of our old projects like a demo for PC and some ideas and plans and we tried to sell those. We got off to a flying start. We signed a deal for one game and got the first*

*money in during summer 1995. With that money we rented an office. An additional story is that at that time there were the counter trades with the United States related to the Hornet fighters and we got a game project and that way got things really going some months later in the autumn. So we had income financing as we got the signing money.” (Theta)*

The third group is called “visionaries” and includes the firms Gamma and Epsilon. Within both of these firms there was a clear vision from the start, either a product or a service, that the business has concentrated on. This also means that as attention is solely on the product or service, other parts of the firm may be neglected. In the firm Epsilon the vision of the online service was strong enough to carry them through the initial difficulties. Gamma was not as lucky as it has had to revise its focus to survive. The initial strategy was to produce technology for mobile game developers, but as there was not a sufficient market for it, they resorted to making games themselves to generate revenue and also to prove the technology.

Many interviewees stated that the typical way to start a game firm is to build on a specific idea for a game and that their firm was a rare exception in that sense. However, only one of these firms claims to have done it this way. It seems that the mainstream way to start a game firm is first to have or to gain some kind of an understanding or experience of what they are trying to do and then start probing for what could generate revenue. As the firm finds a short-term revenue strategy, they start to think about a long-term one. However, the long-term strategy is something that requires investments and some kind of an ability to bear the risks involved. For this reason the short-term strategy has to be kept alive until a sufficient basis in terms of money, contacts and employees is acquired.

Such a decisive period is discernible in the histories of all the firms. However, the length and nature of the period varies between the firms. It can be months, but after several years some firms are still struggling. It is typical to do subcontracting and to simultaneously develop original projects to the demo stage. However, if the demo does not sell the firm is back at square one. It seems that the main difficulty for these entrepreneurs has been finding a match between their goals and what they can persuade consumers or publishers to buy. The business conception has been quite broad and flexible and there have been constant search efforts to find a profitable area on which to focus and which could enable the firm to overcome the critical period.

When asked which factors were essential to get the firm going, the most common answers were having the right people, having contacts and having the passion and courage to do it. Luck was also mentioned. The right people and passion are closely linked because it is not only one person in charge of whom passion is needed. In most firms the founding of the firm has essentially been a social process. There have been several people giving their input and some ideas have been eliminated and some have been implemented although they may have been iterated several times. Thus the entrepreneurial team has been a more common actor than the heroic entrepreneur.



#### 6.4.2 *The innovation process*

The innovation process starting from an idea and ending with the finished game varies to some extent between different platforms. One significant difference is the length of the time period from idea to shop shelf. The extremes are console games with a development period of two to four years and mobile phone games with a development period of one to twelve months. Another difference is that often console games are developed one at a time, which entails considerable risk whereas multiple mobile phone games are developed simultaneously creating a portfolio. However, the innovation process, regardless of the platform, comprises certain common stages, such as idea generation, concept development, character and field design, technology development, graphics and sound design. For mobile games these are done on a smaller scale and for console games on a larger scale.

In the beginning there has to be an idea of what the game is to be like and what it will consist of. Most firms stressed that they want everyone to produce such ideas and present them informally. The expectation of ideas from everyone working in the firm was essentially taken for granted. It seemed to be a standard practice of the industry. Some interviewees stated that this is the reason why people work in the industry. If they had no such desire and ability to come up with new things, they would be doing some other kind of software.

*“We of course have a process on how an individual can give ideas. Quite many people have such job descriptions that they’d better come up with ideas if they want to keep on working here.” (Epsilon)*

However, this generation of ideas is not completely free of boundaries as most firms have either a stricter or a looser focus on what kinds of games they produce. This may concern the content; some firms only make racing games or only action games, for example. Another limiting factor is technology. This means that those kinds of ideas are preferred that can be supported by the existing technology base of the firm. For example, technology used to create downhill motion in a snowboarding game can be utilised, to some extent, in a game about downhill biking.

*“We want everyone to produce ideas. Then we have some main checkpoints. We have a standardised model for describing the kinds of ideas we want. We have quite a limited product strategy regarding what kinds of games we develop. In that strategy we have two full-time game designers who have two tasks; to come up with new concepts and do field design. Like what the field is like and are there enemies.” (Alpha)*

Another interesting aspect of the idea production process is that the ideas of some people are appreciated more than those of others. The main responsibility for idea development usually rests with the game designer or producer. The assumption is that these people have a more advanced ability to estimate customer response or assess the feasibility of the idea. Basically, those ideas are given more attention in the decision-making process and it is thus more probable that they will be developed further.

*“Basically ideas come from everyone but mainly from the game designer. When an idea emerges then someone just throws it in the air or writes it down. It is very difficult to say where an idea comes from. But I can say that the ideas of the game designer generally carry weight and he creates a proper document on it and presents it at a meeting with the reasons for why it should be done. It is good if we get excited and even better if we get a customer to like it.” (Gamma)*

*“Everyone gives ideas but only a few people give good ideas. Those are the people who can see the product development cycle all the way to the end or at least some part of it so that they can see where it is going and where it could go.” (Eta)*

*“You can build it in many different ways. It is possible that one person has quite an advanced vision of what the game is to be like. Small things and influences come from others. But, for example, our producer has quite a strong personality and you can’t turn him around without good grounds.” (Beta)*

In addition to the master idea there is room and need for many smaller ideas, especially in larger console and PC games. Such a game may include hundreds of details that complement the general idea of the game. The high concept of the game defines the general direction and the small ideas bring flesh to the bones.

*“The high concept defines it so that it goes approximately west and then there is a lot of room for different kinds of flowers to flourish as long as the general direction is correct. Individual ideas come from anyone and some of them are accepted and may even as such become a part of the finished game and then a part of the ideas are changed and iterated first. If you have an idea related to gameplay, for example, like what could happen in the game, then usually those are presented informally in the office corridor or somewhere. That’s how they usually emerge and then they are integrated into the whole thing. The game time is usually ten or twelve hours or more depending on how fast you want to play it then in the end there are hundreds of ideas that are put in as details. Regarding the whole game, the main decision power is on a few people but at certain point ideas are taken up and some of them become a part of the game and others are eliminated.” (Eta)*

The decision regarding high concepts to take for development is usually taken by the board of the firm or by some other combination of people from different departments of the firm, such as marketing, technology, art and production. Some smaller firms mentioned weekly meetings of all employees where such decisions are made. In any case, it is a group decision and several aspects are taken into account. Also, some firms consult the opinions of their publishers or operators before making a decision on their own.

*“Publishing decisions are made by the publishing board and I believe that other firms have something like that, too. We have sales, technology and production present there. In practice the business decisions are influenced by market potential, competitive situation, whether it is feasible, what are the risks and do we have the resources. That is the final gate. If it goes through then we give resources for the project and guys will start with preproduction.” (Alpha)*

*“We have weekly meetings where we go through what has happened during the week and what is coming during the next. And if some ideas have come up we will discuss them. We start refining rough ideas and assess whether they have potential and look from different standpoints and then if it feels like something could come out of it we start developing a production manuscript. But at first it is just a very short synopsis of the idea and we start moving it forward little by little.” (Zeta)*

Producing ideas and deciding whether to implement them is a continuous process of a game firm. However, it is not just a straightforward string of decisions followed by implementations, since during the process new information concerning the feasibility, business potential and the fit between the idea and firm strategy is received and earlier decisions are adjusted. This is well expressed in the following comment.

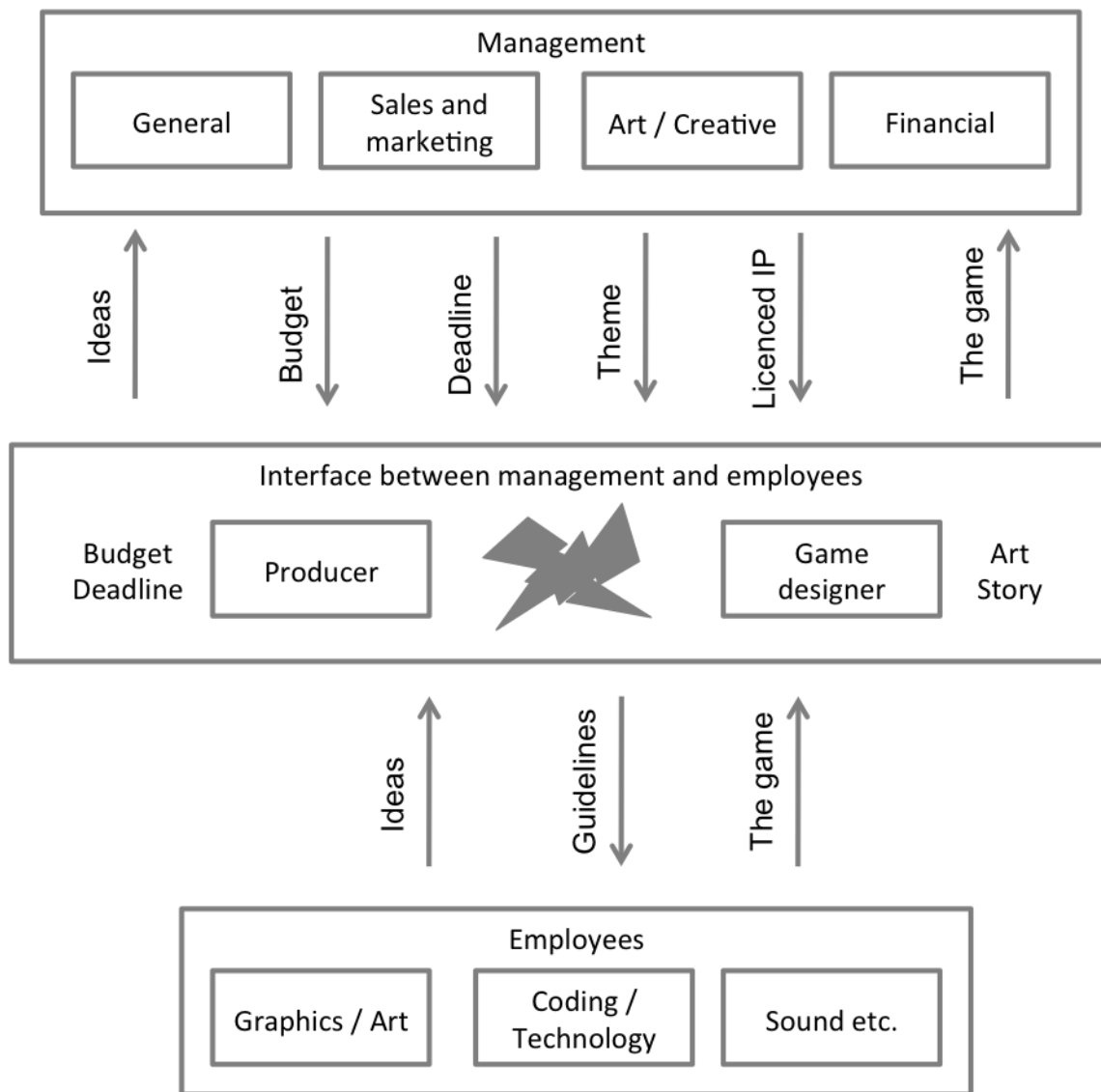
*“Game projects are quite inexplicable and irrational because as we start doing a game it is never strictly specified and in any case some mechanisms of the game will change on the fly as the game designer says that this idea was good on paper but it doesn’t work. And as the process goes through the milestones then the customer might come up with requests for additional features. So game projects are lively things and it is interesting to balance it all. Specifications change but the deadline and the budget must hold.” (Gamma)*

This phenomenon is called ‘feature creep’ by Tschang (2005, p. 123). He describes it as a tendency of many firms to add more and more of features to the game in the course of development because it is fairly easy to bring new modules to the whole. He sees it as a discipline problem and as a somewhat juvenile ambition to add ‘cool’ features. However, according to the interviews features are added either because there is no choice or because an additional feature is deemed valuable enough to risk the schedule. In the first case, the publisher may demand changes to the original specifications in order to continue funding the project or redesign is needed because something does not work. In the latter case the developer firm weighs up the benefits and risks of adding features and delaying the project. If the game is not showing hit potential and there is a wonderful idea that could make the game significantly better, the changes may be financially worth it.

Even though the innovation process appears somewhat chaotic, there are routines that the firms follow. There are standard ways of communicating game ideas and concepts, coding conventions that enable the employees to understand each other’s code and processes that are followed in order to do the projects efficiently. These are very similar in every firm. The main difference is in whether or not a firm adequately has them. Larger firms also may need more routinised procedures than smaller ones. Such routines form the infrastructure that is a necessary, but never sufficient, condition for success. Such routine procedures appear to be conceptually close to the idea of dominant design. In most firms the production process conforms to these routines.

#### *6.4.3 The roles of management and employees*

There is no universal organisation structure followed by each game firm, but a tentative general construction is presented in Figure 34.



**Figure 34.** Roles and tasks in game development.

Basically, each firm has at least one person that is responsible for the management of the firm. Depending on the size of the firm different management areas are assigned for different people. Generally, sales and marketing are the first such areas for which managers are hired as a start-up grows. Larger firms also usually have financial managers and art or creative managers. However, these vary from firm to firm and many kinds of structures are in use. The management level is in charge of many tasks from day-to-day housekeeping to the long-term strategy of the firm. They take part in making decisions on which games to start developing and how much can be invested in each project, but not in decisions on any details inside the game.

*“Q: Whose vision is followed?”*

*A: The vision towards which the firm is directed is that of the producers. When it comes to content it is theirs and I don’t meddle in that much. If I really think that something is not feasible or market data doesn’t support its success like those kinds of games will never sell then I say something. But in terms of business like how we build it and how we internationalise and what are the steps then I*

*have a great impact. What business we are in. And what is our position in the value chain.”*  
(Gamma)

Between the management and the employees are the producer and the game designer. Usually, the producer is in charge of project management including budget and deadline. The game designer is in charge of content. Aoyama and Izushi (2003, p. 436) define the task of the game designer as that of writing the blueprint of the game. This usually translates into some kind of tension between the two as the game designer wants to include many good ideas into the game while the producer has limited resources and time for their implementation. On the other hand, in smaller firms these may be the same person and in larger game projects there may be several of both.

*“The role of the producer is quite complex in the sense that his responsibility is to keep the game project on schedule but also that it is of good quality. If games are developed in-house and there is a game designer and producer in the team then they are in a battle of wills. Game designer says that I want this and this and this and the producer says that you can’t have them. Then there is arm wrestling over what is so important that it is included even though it entails risking the deadline.”*  
(Gamma)

*“This is not a hierarchical organisation but in certain departments like let’s take art, so we have built a directing function which is the AD. The Art Director gives the direction towards which certain things should go in the audiovisual experience of the game and then we have the Art Manager who is in charge of schedule and resources. We have separated these so that one sees to it that the certain let’s say car comes out of the tube and the other sees to that the car is either red or blue.”* (Eta)

Aoyama and Izushi (2003, p. 436) divide workers into artists, sound designers, programmers and testers. This is roughly the same division of tasks as was encountered in the interviews. Based on post-mortem data of 32 projects Tschang (2005, p. 127) reports that an average team has about 21 members, ranging from six to 31. Of these 49% are content specialists meaning mainly art and sound, 30% are programmers and 21% are designers. According to the interviews, the workers each have a specific area to focus on. However, they may have quite a large area of discretion as specifications may be vague. Also, they usually make a lot of suggestions and alert the producer or game designer if they think that something is not going to work. Even though the workers are expected to be creative and have problem-solving skills, they still have boundaries within which to work. This is a matter of productivity as well as of limiting the stress put on each employee. However, it is a two-edged sword as there is a fine line between too many and too few boundaries when it comes to creative employees.

*“We have to focus their thinking so that we say that these kinds of things, concentrate on these. But there is quite a lot of room to manoeuvre. For a creative person you have to allow that. If you don’t then there is no output and they will leave to work somewhere else.”* (Gamma)

*“These crazy artists don’t do anything if you haven’t set boundaries and schedules and say: “Do this!” That is why we have two producers in such a small firm and they do sales as well. They drive*

*the people in the right direction. When people don't know what they should do we have someone who says: "You don't know what to do? Do this!" The guys have said that they need someone to do that." (Zeta)*

*"No matter what people say in the end they are a lot happier if they have a clear direction in which to go and then inside that space they can decide how or in which order and make suggestions. People want that kind of certainty and quite rarely want to have total freedom. People are least happy in situations when there is uncertainty for a long time and we can't give them a clear direction. Security gives you confidence in what you do. And isn't it the task of management to make decisions and set the direction? When people have ideas they have to be filtered and there has to be ongoing dialogue and that is a vital part of the whole business." (Eta)*

No matter what kind of hierarchy is described on the organisational chart, there is usually an ongoing debate inside the firm on what kinds of things they could and should do. In smaller firms some decisions may be made by voting. As firms grow they may move on to votes where some are more equal than others. After that the next step is defining who is responsible for what and has the power to decide on those matters.

*"Q: If we think of two extremes of doing the kind of stuff that sells at the moment or doing something new so what is the strategy in this firm?*

*A: We fight three rounds on that every week. The opinions vary from person to person. Of course management has to look at the numbers and if Solitaire sells well in Paraguay then we do one of those. And the game designer might think that something else is the greatest idea ever and we should do it no matter what. To be honest we haven't really had a clear strategy on that." (Gamma)*

*"We have very strong personalities and they have opinions independent of expertise. Consensus is prevalent but it isn't automatic. To get the people to accept the direction of the firm or the project requires discussions. In a perfect world everyone would have the same goals but in reality you have to create the will to go to that direction and to allocate efforts to the right things. People who have come to work here and stayed have had the preference to do these kinds of things and in this environment. There is a lot of that but there is no stereotypic or one shared vision even about the game project if everyone could make the decision." (Eta)*

Most employees take part in the process of introducing new ideas and accepting them. Ideas are introduced by basically everyone and they are expected to do this. Formal decisions on what to do are confined to the territory of a limited set of people from management, production and design functions. On the one hand, the decision-making bodies limit idea production by focusing the employees' efforts on certain areas and on the other hand, the employees producing ideas limit the set of alternatives with their personal preferences and talents. Thus it appears that Tschang's (2005, p. 129) metaphor of game development as a series of conversations that the manager needs to orchestrate, is valid.

People with different tasks have different kinds of roles in innovation. The space where they search for alternatives has different dimensions. The task of management is to narrow down the space for

each employee. The purpose of control mechanisms, such as budgeting and definition of responsibilities, is to keep people within acceptable alternatives. The latitude of each person in the firm depends on his position, seniority and personal characteristics. This latitude is defined by management but it is also a matter of taking the space. This means both the direction of the search and the size of the area of discretion. Some people have more decision-making power even though there are no strict hierarchies. It seems that the fundamental condition for the success of a game firm is to allocate the search space appropriately giving, on the one hand, sufficient freedom for creative people and, on the other hand, sufficient guidance to focus the efforts. This is not a matter of dictation but of dialogue.

In order for novelty to be created, there has to be both divergence and convergence within the firm. Even though managers and workers take different roles in this process, they both contribute to each of these. Managers create convergence by limiting the space where each employee may practice searching. The firms usually have some kind of a focus in terms of content and technology. Managers create divergence by directing the search efforts to new areas, such as targeting different demographic groups. Employees create divergence by introducing ideas and convergence by offering a limited set of alternatives, and limited information on each, for the managers to choose from.

This leads to the conclusion that in the context of game development innovation is a social process and entails both bargaining and learning. Decisions are made on the basis of arguments that may be somewhat objective but are often subjective views. Those decisions are adjusted and iterated as more such arguments become available. Even though the decisions on which game concepts to develop are usually made by a limited number of people from the management functions, the decisions are very much influenced by information from workers regarding the feasibility, originality and market potential of the game. Managers determine the focus of the firm, but that decision is influenced by what the workers are capable of doing. Furthermore, the workers develop their expertise through projects that the firm undertakes and that creates path-dependent behaviour as some directions become more favourable for the firm depending on expertise acquired. The accumulation of technical and other expertise interacts with perceived market potential. This way expertise is developed in areas with good market potential and, on the other hand, market potential is sought predominantly in areas that can be supported by the workers' expertise. Over time this process constructs the future of the firm.

#### *6.4.4 Model of new firm formation and the innovation process*

The games industry in general is an interesting one from the viewpoint of entrants and innovations. This is because its existence is heavily dependent on firms creating new products. If we compare it to the car manufacturing industry, for example, this dependence is evident. Even if all research and development activities were to cease, cars could still be sold to consumers. However, a consumer will buy only one copy of a certain game and wear and tear very seldom justifies buying a new copy. In addition, buying a game is only considered if it differs to a sufficient extent from games owned by the consumer at that time. This means that in order to survive the firms are obliged to

produce novelty at a constant rate. Such novelties have to face competition from other firms. Hence novelty is an indispensable precondition for taking part in competition.

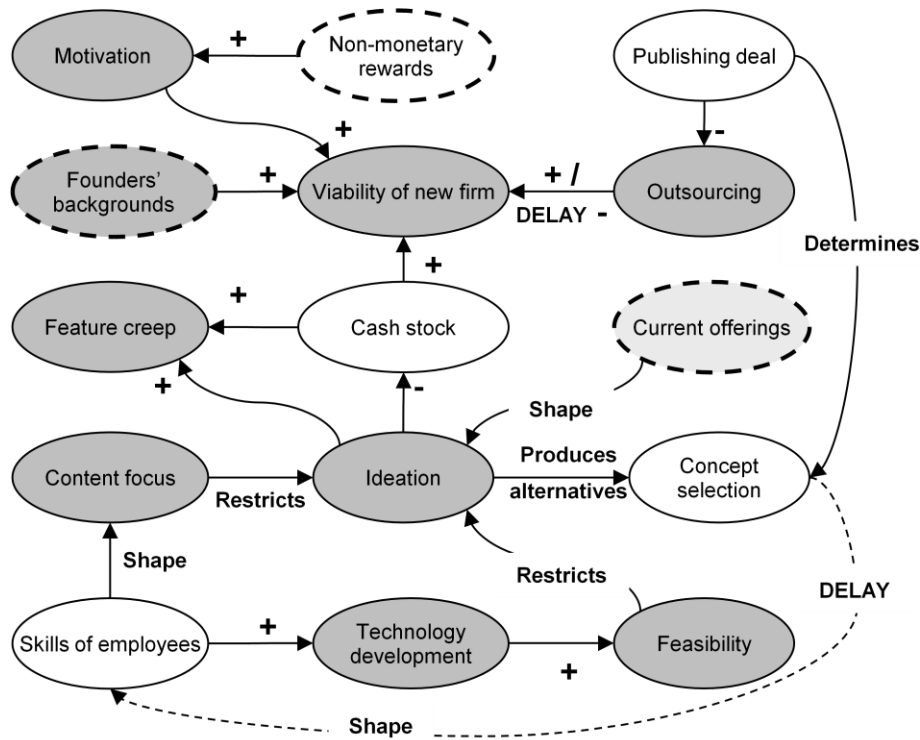
Succeeding in the innovation process depends on several factors. Consumer appeal cannot be known prior to game launch. Another issue is the gap between specification and implementation. The specification for a game may have several features that would make it a big hit. However, implementing these may be an overwhelming challenge. For example, the specification may describe the game as funny, appealing or exciting. Translating such requirements into a game experience is not achieved simply by telling someone to do it. Another factor adding to the challenge is that a major part of the investments is in labour. This means that if a game concept turns out to be a failure, the firm is left with virtually nothing. For this reason the firms start developing new concepts step by step ready to abandon them in case such reasons emerge.

The model on new firm formation and innovation is presented in Figure 35. The medium grey ovals represent the newly added variables. The beginning of the innovation process, i.e. ideation, is restricted by the content focus of the firm. The firm may specialise in games of a particular genre or in multiplayer games, for example. This guides the ideation as employees know beforehand that certain criteria must be filled for an idea to be considered. Thus the game concept is selected from ideas satisfying such criteria. As the employees work on the game they accumulate skills specific to the game's genre, technology and gameplay. This shapes the skills of the employees with a delay. These skills in turn shape the content focus and ideation. There is a reinforcing dynamic at work where what the firm does directs what it is capable of.

In addition, the technology capabilities of the firm have an effect on the feasibility of particular game ideas. Ideation is restricted by technological feasibility. However, technology can be developed to suit the needs of the game idea. The extent to which this can be done depends on the skills of the employees. However, just to keep up with new hardware generations the developers have to constantly concentrate on adopting new technologies.

The skill accumulation related to content and technology makes it unattractive to follow whatever is in demand in the global games market at a particular moment. Especially in the PC and console sector the development period for a game may be as long as four years and responding to current demand would make the firm hopelessly late. Learning the skills associated with a fashionable game genre, such as cinematic action games, takes time in itself. The winning strategy is to go with a game concept that the key people in the firm believe in and to play with high stakes. Current offerings shape the ideation process, but the aim is not to imitate but to create a product that is original compared to other products in the market.





**Figure 35.** New firm formation and innovation.

Some of the interviewees mentioned feature creep as a managerial challenge. Either the game designers would like to add features to the game or the publisher orders them to do so. The endogenous feature creep is boosted by active ideation and the cash stock. However, ideation incurs expenses which reduces the cash stock and curtails the possibilities of tolerating feature creep. Also, the requirement by the publisher to have the game finished by a particular date discourages feature creep.

For new entrants the main challenge is to achieve a publishing deal. As this takes time, the firm is forced to do subcontracting and other temporary assignments to maintain cash flow while striving for a publishing deal. In the short term the subcontracting business increases the viability of the entrant, but in the long term it reduces the viability as there are only short term projects and no royalties. Getting a publishing deal decreases the need for doing odd jobs.

The viability of an entrant is also affected by the motivation and the backgrounds of the founders. Often they have backgrounds related to the game business, which appears logical. Such experience can help the entrant to survive. Motivation is obviously needed to get a start-up going. This translates into the willingness to use and supply sweat capital, i.e. working without pay. Thus game development is often seen as a value in itself and a source of non-monetary rewards which substitute for monetary rewards.

## 6.5 Information and knowledge exchange among developers

During the interviews it became apparent that there is a lot of information and knowledge exchange going on between the firms. Table 24 presents a summary of their views on information and knowledge exchange.

**Table 24.** Firms' views on information and knowledge exchange.

Firm	Founded	Employees	Platform	Subcontractor	Developer	Publisher	Attitude towards information exchange	Main reasons for exchanging information
Alpha	2004	35	Mobile		•	•	We want to help others.	Critical mass to improve the recruitment situation. To gain knowledge about the market.
Beta	2002	27	Mobile	•	•		Everything is easier when you have a network of contacts.	To do marketing. To get inputs for our creative process.
Gamma	2000	24	Mobile		•	•	Together we can find new profitable opportunities.	To find subcontractors. To understand the global games market.
Delta	1999	100	Mobile		•	•	I can learn from you and you can learn from me.	To find subcontractors. To find employees. To see what others are doing.
Epsilon	2000	170	Online, mobile, handheld, console		•	•	We all help each other.	To find out about the development of the industry. To ponder what is going to happen next.
Zeta	2002	9	PC, online	•	•		We can benefit each other and have fun together.	To enhance the growth of the industry.
Eta	1995	25	Console, PC		•		We want to help others.	To find out what is going on. It is in our interest to see other firms in Finland succeed.
Theta	1995	13	Console, PC		•		We want to exchange views with others.	To discuss what the publishers want. To get concrete leads on sales opportunities.

A prevalent feature of the information and knowledge exchange between these firms is that it is done in an informal manner and thus published information, such as press releases, are not regarded as useful. This is well exemplified in the following two quotes.

*“Ninety percent of press releases are nonsense. I have been in this business for 15 years and there is real substance in only every fifth or tenth press release.” (Gamma)*

*“From our point of view the most important information is what our competitors are doing and we always know that before the press releases come out because word gets around.” (Alpha)*

The interviewees reported that they call each other and talk about what they have been doing lately and what they are thinking of doing. There are also meetings where the people from one firm can get feedback from the people from other firms regarding their game project. The social aspect is

also very important. The following quotes represent what the communication is like and how it happens.

*“I call other CEOs and ask what is going on. What have you been doing lately? We have been doing this. Sometimes people from other firms come here and we also go to other firms. Basically we just socialise and that is quite nice.” (Zeta)*

*“Our seller engages in informal cooperation as he meets others. He tells them that we have entered some market and it seems quite good and it is worthwhile to go there. That doesn’t take anything away from us. It is based heavily on the personal relationships between people.” (Alpha)*

*“Some of our managers go to lunch with people from other firms every month or two. It’s more about personal relations like if you are friends then why wouldn’t you do that? There are more official things as well once or twice a year when we invite some people from other firms to see our game and we have like a private demonstration. Or then the other way around we get to play someone else’s game. And then there are IGDA<sup>17</sup> meetings which are another form of unofficial interaction. The industry is very small in Finland so almost everyone knows each other.” (Eta)*

Some interviewees also reported meeting other Finns at international trade fairs. However, some reported that they tried to avoid wasting precious time abroad on meeting other Finns as it is more economical to meet foreign firms there and organise meetings with Finns at home.

Most of the interviewees emphasised that such information and knowledge exchange benefits everyone and this is well illustrated in the following quote. Most of the firms reported that it is a reciprocal activity where the firms help each other. Two firms claimed that they engage in such activities to help others, suggesting that they do not get anything out of it.

*“Information exchange is clearly a case of win-win because you can always learn from others and it does not take anything away from you. And a large part of it is simply about having fun.” (Delta)*

The view of not deriving benefit from information and knowledge exchange was held by some firms. However, they felt that it was a way of keeping up with developments, what is going on within the industry in terms of what kinds of games others are developing or publishing, what kinds of games the publishers want and what kinds of games the consumers want. On the other hand, many firms felt that they derived definite benefit from such communication. They found it to be a way of finding subcontractors, doing marketing, identifying sales opportunities, finding new employees and getting new ideas to feed their creative process.

Information and knowledge exchange seems to be heavily based on personal relationships. People within the industry know each other and enjoy discussing industry-related matters. The underlying assumption is that it is not harmful for anyone to engage in such interactions. When asked why they participate in active communication, most of the interviewees responded that there is no reason or that they do it for altruistic reasons. Helping others is seen as a norm within the industry and its

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<sup>17</sup> IGDA is the International Game Developers Association. [www.igda.org](http://www.igda.org).

benefits to oneself are not considered. However, this cannot be the full explanation since, after all, it is a demanding branch of business. When the interviewer persisted in asking about the motivation for information exchange some other reasons were also mentioned as shown in Table 24. In the following three sections such reasons are developed further through the effects of information and knowledge exchange on the dynamics of the industry.

#### *6.5.1 Creation of critical mass on a national scale*

There is quite a good consensus on the benefits of a critical mass of firms in the Finnish games industry. The firms do not see each other as threats but as vital creators of critical mass on a national scale. Critical mass has several aspects here. Since skilled personnel are scarce, it is in every game firm's best interests to have other potential employers for their staff. This makes the industry attractive to prospective employees and lowers their personal risks in investing their time, effort and money in industry-specific training and career. This is obvious in the following two comments.

*“We take the view that the more entrepreneurs there are within the industry and the firms, in the long run it will help us. One thing is that we will be able to recruit employees who have worked within the industry. If they want to work in a larger firm then we are an option.” (Alpha)*

*“Some of the other firms here have had to scale down and the first thing that the HR managers do is to call us and say that these kinds of skilled employees are available. The overall goal is to keep the people within the industry.” (Alpha)*

The more firms there are, the more job opportunities the employees will also have. This means that there is more demand for skilled workers and they can be persuaded to change jobs. This may cause some tension between the firms, but at least some of the interviewees also saw positive potential in such circulation.

*“I think it's good that they get to see new things and develop their skills. Perhaps one day they will come back here to a higher position. I don't see that as a bad thing, but is it punished? I guess some people would like to do some arm-twisting at some cocktail party.” (Epsilon)*

A critical mass of game firms can also make the industry attractive to prospective investors. The mass will increase the general credibility of the industry and success stories can serve as best case scenarios. From the viewpoint of a firm seeking finance it is very important to be able to show that other firms in Finland have managed to grow and succeed in the international market.

A critical mass of Finnish game firms can also serve as a collective track record for international publishers and operators. In their minds game developers from different countries may have group characteristics. For example, Japanese game developers are sometimes thought to have some similarities. Thus the first challenge is to create the perception that such a group as Finnish game developers exists. The second challenge is to develop association between positive features and the group.

The objective of creating critical mass is clearly shown in the treatment of newcomers. The older firms are willing to give advice to aspiring entrepreneurs. This is shown in the following two quotes.

*“Within the last six months we have had lunches with six start-ups.” (Eta)*

*“We have always talked with people if they have asked something or they have invited us or something else. And over the years quite a lot of people have visited us. Many aspiring entrepreneurs have just stayed at the wannabe level. But people have come here and asked for advice and we have tried to do our share in accumulating knowledge. All the time new entrepreneurs take contact and we interact with them.” (Theta)*

Although the firms stated that they do this mostly for altruistic reasons it seems that it is quite a rational thing to do to create such critical mass in the industry. If the new firms can avoid making all the same mistakes that others have made then they can contribute to the group sooner.

#### *6.5.2 Group selection enforced by the institutional setting and competing industries*

Group selection as a mechanism is closely related to critical mass. Basically, group selection means that besides competition between the firms within the industry there is also competition between different industries. In the case of the Finnish games industry the meaning of group selection is twofold. Firstly, the firms belong to the group of international games industry that competes for consumer attention with many other industries producing entertainment products and services. Secondly, the firms belong to the group of Finnish game firms that compete with the games industries of many other countries and who also strive to change the national institutional setting within which they have to operate. The lack of games industry related education in Finland and business subsidies available mainly for the development of technology and not for the development of content are good examples of the national institutional setting.

For the games industry competition between industries means that it competes against other industries providing different forms of entertainment. This was noted by many of the interviewees and they identified the need for a united front for the purpose, for example, of affecting regulations concerning games and encouraging the launch of education related to the games industry. Thus, the firms try to mould the selection environment, not in order to influence who will succeed, but in order to increase the odds that at least someone will. Furthermore, a consumer with prior game purchases is more likely to buy another game than those with no previous contact with games. This means that every game sold by any firm is a victory for the games industry in general as this makes the consumer more inclined towards spending his entertainment budget on games rather than on films, for example.

*“We compete with the Olympic Games for people’s spare time. Like how they spend their spare time and excess money is what we compete for. I guess with other forms of passive entertainment like watching TV and surfing on the web. Like whatever passes the time. Nowadays people may play a couple of hours in an evening and we compete against anything else that could happen during*

*that time. And if we do a game for younger people then we compete over whatever else they would do when they come home from school.” (Eta)*

Most of the firms reported that they do not have direct rivals in Finland or anywhere else in the world, either. This is because each firm has highly specialised products and exact substitutes are not produced by anyone else. The firms find niches where they can protect themselves from fierce rivalry. This is evident in the following comment.

*“We just operate in a niche within the ecosystem that is different from those of many other firms.” (Beta)*

By finding these niches they create variety, which enables them to continue to specialise. This means that the sphere in the space of potential content and technology covered by the population is continuously expanding. However, this does not mean that there is no competition. Game developers compete with each other for the attention of the game publishers and they in turn compete with each other for consumer attention. The main competitive weapon is innovation and originality. But in order to have such potential consumers, the game firms must stimulate demand as a group.

If information and knowledge exchange can help the firms to form a stronger group to succeed in rigorous group selection, then it is a rational strategy. Furthermore, this line of thought has both a short-run and a long-run aspect. In the short run the firms are indifferent to the survival of other firms, but concentrate solely on immediate necessities, such as finding the money to pay the monthly wages. In the long run the firms see the benefits of group thinking. They take the view that there is selection pressure at the group level as the industry has to compete with other ways of spending free time.

The success of a firm depends on the growth of the games industry in general in relation to other industries producing entertainment products or services. Also, the growth of the industry results from the successes of individual firms. This is a self-reinforcing cycle where the firms have to find a balance between group efforts in relation to other industries and individual efforts in relation to the games industry. Most of the interviewees recognised the need to have the market grow because that will increase the chances for their own growth. Some interviewees saw a need for the improvement of the overall quality of games in order to be able to sell their own products.

*“Of course there is direct rivalry because in Europe there are about 700 mobile developers and if there is an operator that launches ten games a month then there is quite a hustle and bustle. However, at the moment the industry is developing in such a way that first and foremost competition is against firms developing bad quality games. Because they slow down the growth of the market and the problem is that unless the market grows we won’t have business after two years.” (Alpha)*

Besides identifying themselves with the firms, the people within this industry identify themselves to a certain degree with the industry as a whole. This can be explained by two factors. One is that

many of the people managing and working in these firms already knew each other before entering their profession. They have been associated through similar interests, hobbies and dreams. Another explanation is that loyalty to the industry is of greater importance than that to the firms as tackling the selection pressure at the group level is a necessary but not sufficient condition for the success of a firm.

### 6.5.3 *Collective search*

Each firm has a search function according to which it explores new opportunities and alternatives to be applied in the future. Ideation is an everyday activity because failing to find novelty for inclusion in the products inevitably leads to problems. New games must differ from the old ones either by technology or by content. In an ideal case the difference is significant in both. The same product cannot be sold again to the same consumers. This means that every firm aims at innovation with each and every product.

In terms of information and knowledge exchange this means that the search activity has a collective feature. The firms are not compelled to execute a purely trial-and-error type of search function. Communication allows the firms first of all to avoid the mistakes that have already been made, but also to find potential directions in which to move. It also enables efficient exploitation of existing niches and the avoidance of fierce rivalry. Communication among the firms enables the evaluation of more alternatives since more of these are known. Also, communication may allow attributes and aspects to be found that might have been overlooked if they had not been discussed with others with different backgrounds and experiences. The following three comments illustrate the nature of information exchange that leads to collective search.

*“It is really about everyone telling what has happened. Sharing the news and sharing understanding of the global market. Many good ideas have emerged in such discussions. Like has anyone done something like this? We met the guys of this firm and they are doing something like that. We all travel abroad but we go to different things and we meet different people so we share those experiences. Of course within the limits of confidentiality agreements. There are some things that you cannot tell.” (Gamma)*

*“We gossip, in quotes, and usually about the latest developments of the firm. We go through that and also some plans and if there is something bigger going on then usually we hear that quite early.” (Eta)*

*“Do you have new projects? How are the old ones progressing? Can we come and take a look some time? And then we usually go and take a look. Like how nice that you have been coding this and that. It can also get technical. And if you have closed a new deal then of course you have to brag about it. It is very much small talk and nothing serious.” (Zeta)*

Even though information and knowledge exchange is not perfect, i.e. not everything is divulged, the interviewees reported that they can be quite open about what they know and tell. This is because the firms are not likely to compete for the same deals as their products differ from each other.

Furthermore, copying exactly what another firm is doing would lead to a considerable delay in time-to-market, making it impossible to beat the original firm. The following two quotes represent thoughts on why such communication is not risky.

*“You can usually talk with people quite freely and you don’t need to contemplate whether you shouldn’t tell this to someone. Development cycles are so long that a potential competitor cannot react by making a competitive product just like that. Perhaps with specific details of great new stuff you have to keep quiet. But if there is a chance for collaboration then we do that. It doesn’t take anything away from us.” (Zeta)*

*“With certain CEOs of other firms I am a lot more open than here in this interview. Information really is shared. In Finland we have this cooperating spirit that we help each other if we can. It is related to industry development and there are things happening that are very interesting when they are shared. And a large part is contemplating. We puzzle over what is going to happen next.” (Epsilon)*

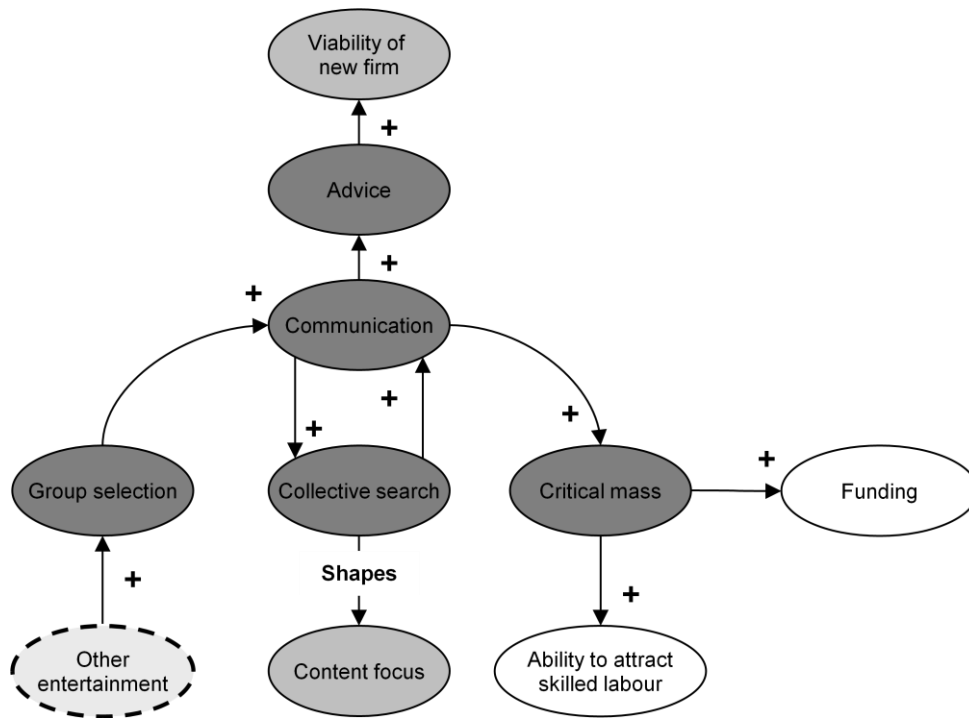
Although it is often thought that such active information and knowledge exchange would lead to homogeneity, this is not the case here. Naturally, there are also such imitative decisions, but the overall picture is characterised more by finding out what the others are doing in order to avoid doing the same thing. Knowing what the others are doing is the only way to achieve this. Learning indeed does not equal imitation in this case.

#### *6.5.4 Model of the exchange of information and knowledge*

Figure 36 presents the model on the exchange of information and knowledge. The dark grey ovals are new additions whereas the others represent variables introduced in previous sections.

Aiming at enabling collective search motivates communication, which makes collective search possible. Collective search shapes the content focus of the participating firms. The firms have complementary knowledge about the market because they attend different conferences and meetings. This way they can acquire knowledge about the preferences of publishers and operators and also on forthcoming products developed by other firms. On the other hand, in the firms new knowledge is created by trying out different technologies and game ideas. Thus, each firm constructs a unique knowledge stock concerning the development of the market. This way there is division of labour in knowledge production. Information and knowledge exchange is a mutually advantageous process. As the information and knowledge is reallocated it benefits the recipients in their decision-making processes without damaging the source. It seems that the dynamics of the industry protect the firms from exploitation in such cooperation. By sharing information and knowledge a firm can gain from reciprocity, but if the others do not reciprocate then the firm does not lose anything apart from time spent. Such defectors will not gain a competitive advantage over those that cooperate as the goal for everyone is to make sure that they are making a unique product. By revealing what it is doing a firm can give other firms the chance to avoid doing the same.



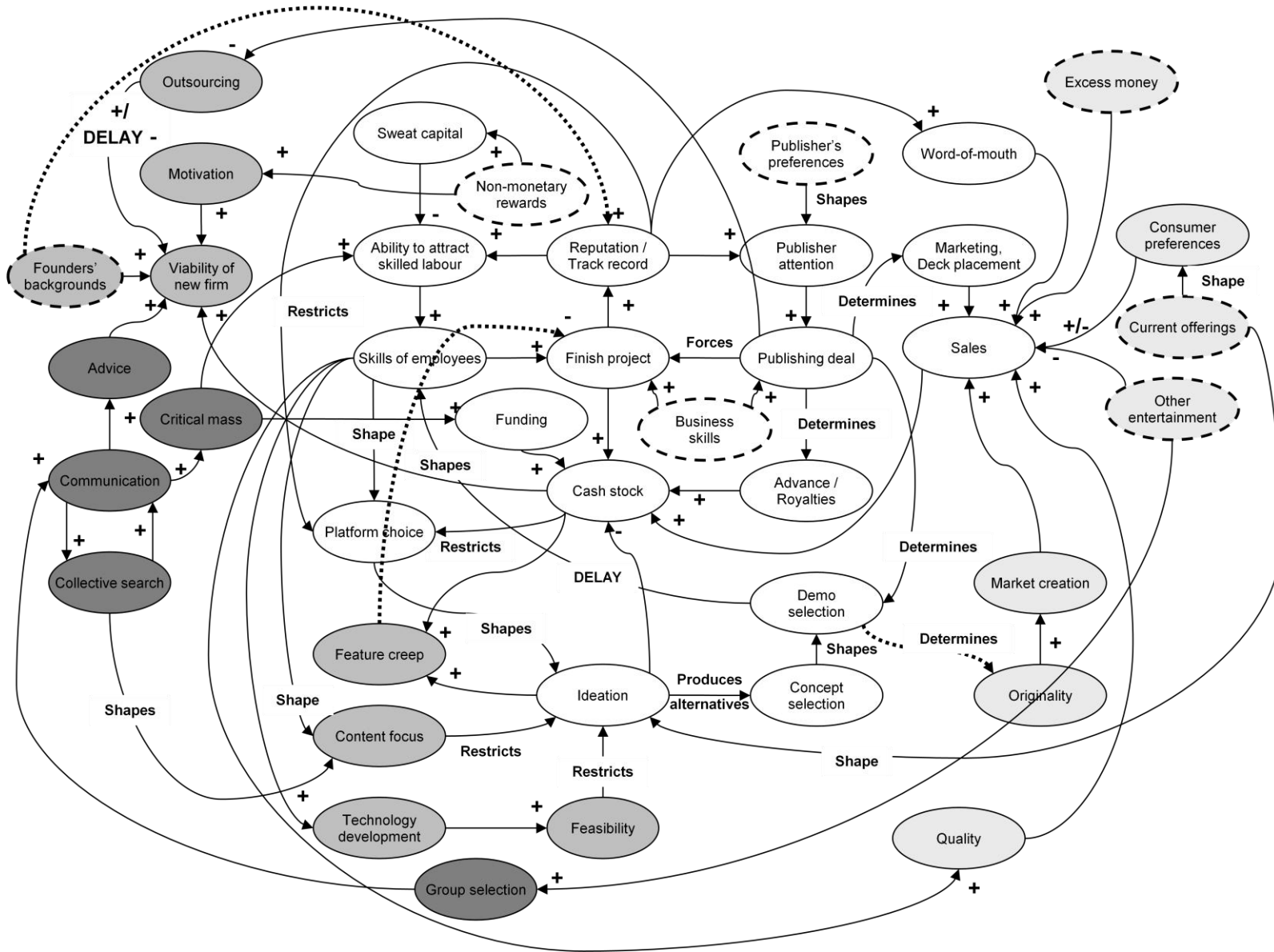


**Figure 36.** Motivations and effects of communication.

Group selection is another motivator of communication. The group selection effect comes from other forms of entertainment competing for the consumers' entertainment budgets with games. Critical mass, on the other hand, is enabled by communication. Critical mass increases the chances of obtaining funding for the firm and the ability to attract skilled labour. Finally, entrants get advice through communication with seasoned firms, thereby increasing their chances of survival.

## 6.6 A qualitative model of games industry micromechanisms

The complete model in Figure 37 may initially appear somewhat daunting. It contains a lot of detail that may be easier to approach through the partial models presented in previous sections. The full model includes three additional arrows. Firstly, the founders' backgrounds contribute to building the firm's reputation. Secondly, feature creep has a negative effect on finishing the project. Thirdly, demo selection determines the originality of the game. These three arrows are marked with dotted lines. In the remainder of the chapter the most important micromechanisms are summarised and their effects on the industry life-cycle dynamics are analysed.



**Figure 37.** Micromechanisms of the game development industry.

Game development firms are going through the cycle of ideation, sales pitch, publishing deal, finishing the game and starting with ideation all over again. This is the cycle that keeps them alive. At first entrants usually have to do subcontracting and all kinds of odd jobs to finance the ideation phase. They are forced to do this until they have a publishing deal. This strategy is not sustainable in the long run and it is also not why the founders started the firm. As the developer finishes a game it gains reputation and track record, which help in getting publishing deals in the future. However, after finishing a game the developer may be forced to go back to odd jobs if it does not have a new project lined up. It is thus a constant struggle to keep this cycle going. The cash stock is the final determinant of the survival of the firm. Reaching milestones, receiving royalties and obtaining external funding boost the cash stock whereas spending time and resources on ideation makes it disappear. However, investing in ideation is the only route to sustainable business through publishing deals and original IPs.

The cyclical nature of business discourages growth. One team without an immediate new project can be sustained by subcontracting in the interim, but the challenges of this business model grow steeply with size as additional teams are formed in the firm. The firms in the sample with more than 100 employees are in the mobile and online game business, where the revenue flow is often steadier than in console and PC games. In mobile games the developer can benefit from having a wide-ranging portfolio where revenue streams from different games complement each other. With online games the revenue stream may be continuous as flat rate subscriptions, micro payments and advertising revenue spread across time. The cultural industries literature often mentions the strategy of managing the risks of uncertain sales through a portfolio. However, that kind of scale increase is beyond the reach of most game developers as the amount of capital required is considerable.

Some firms have not grown due to lack of capital and the workload or demand have not forced it to take place. Some firms have not grown because the negative effects of growth have outweighed the positive ones. In addition to the growing challenges to finding work for a larger team in cyclical business, the firms have experienced lack of skilled employees as a barrier to growth. As training consumes resources, the firms would rather direct those resources to the actual work and manage with what personnel they have. Also, firms that have gone through PC or console projects reported using subcontracting themselves to get chunks of coding or art done. Even though such a project may take several years to complete, the heavy workload is there for only a part of that time. Thus adding people to the payroll may not be wise when their input is only needed for a few months.

Development firms learn cumulatively through game projects. What the firm does directs what it is capable of doing in the future. However, this learning is more qualitative than quantitative. It directs firms towards particular genres, content types and technologies. It does not make them generally more efficient at making games. Certainly experience helps in going through a complex game development project, but it does not become a decisive competitive advantage making production significantly cheaper. Experience in particular genres, content types and technologies directs the focus of the firm. The focus is also directed by the founders' backgrounds, current offerings in the market and the information that the firm can acquire from other developers on the evolution of the game market.

Games need to create a market for themselves. They are non-utilitarian products and thus the consumer may refrain from buying any in case she deems none of the alternatives sufficiently appealing. She can also satisfy any entertainment needs with films and music, for example. Thus a game needs to create a market for itself instead of responding to pre-existing demand. In order to do this the game must be original, interesting and appealing. This is the starting point in the ideation process. In addition, technical quality must equal that of other games.

In the previous chapter it was noted that the innovation patterns in neither hardware and nor software have experienced a notable shift from radical to incremental. In hardware new performance metrics have emerged once development avenues in previous ones have been exhausted. Growth in performance is still exponential. In software technological innovations have taken place apace with the evolution in hardware. Stylistic innovations defined as introductions of new genres have taken place every few years since the early 1970s and this development has not levelled off. Furthermore, game development has remained an unconcentrated industry and the ability of the international game market to absorb entrants and their products has not decreased. The findings presented in this chapter provide explanations for these observations, which are not in line with the industry life-cycle theory.

First of all, it appears that economies of scale and cumulative learning do not play the kind of role in the games industry as posited in the industry life-cycle theory. The lesser extent of economies of scale follow from the cyclical nature of the business as well as from the complexity of the management task in game development, which makes the advance and royalty deals more favourable compared to large in-house teams. Thus more efficiency gains follow from using contracting with milestones than would from a larger scale in game development. Pushing entrepreneurs to finish a game based on tight contract terms may be easier than getting an internal organisation to do it. Cumulative learning helps in going through the very complex game development project, having the ability to use certain technologies and creating a particular type of content. However, it does not give a decisive cost advantage.

There are also large game development companies as well as first party studios owned by device manufacturers. It appears that the division of labour between them is that the large firms stick to proven concepts while independent developers go for more uncertain concepts. Nintendo, an example of a device manufacturer, has the *Mario* and *Legend of Zelda* series that they develop in-house. Activision Blizzard, an example of a large scale developer and publisher, has the *Warcraft*, *Crash Bandicoot* and *Call of Duty* series. The benefit of having external studios pitch new game ideas to publishers is that this makes the ideation process free. The publisher can choose the most promising concepts and start financing these while the ideation and demo making costs of less compelling concepts remain the developer's problem and must be covered either through sweat capital, odd jobs or profits from previous projects. As there is an abundance of developers willing to go through this kind of selection process there must be non-monetary rewards associated with making games.

The innovation pattern where new console generations with exponentially better performance appear every few years and new game genres continue to emerge every few years is due to the non-utilitarian nature of the products. Console manufacturers need to bring more advanced devices to the market as the sales of the previous ones decrease sharply with time through saturation in the gamer population. People who have PlayStation 2 buy for the next time only when PlayStation 3 becomes available. Thus the constant introduction of more advanced hardware is needed to stimulate demand and to avoid market crashes like those of 1977 and 1983. New games need to be developed to demonstrate the technological potential of the hardware and to justify hardware purchases. New games need to bring something new to the market to succeed in also generating demand for the devices.

For games to be interesting and appealing they need to have a level of originality. In making a hit game the originality of the concept is more important than the ability to make it at a low cost. Many of the bestselling games are sequels, but before a sequel can be made an appealing new game concept has to be created. The originality of the game concept and the track record of the developer are decisive in determining whether a publishing deal will be offered. Thus innovation is required independent of market age. Developers gain skills in producing such innovations from past game projects. They learn about working with particular technologies and content types and they gain experience in going through a game development project. However, the originality of the game is still crucial. Hence, economies of scale do not give a decisive competitive advantage.

Next we summarise the answers to the research questions *Q1c*, *Q1d*, *Q2c* and *Q2d*.

*Q1c. What factors direct the innovation process?*

The innovation process is directed by other products on the market and the objective of making something sufficiently different and original to justify market potential. The main challenge for entrants is to find such a niche and to keep the firm alive until revenue arrives. However, such search is restricted by platform choice, employee skills, technical feasibility and the firm's content focus. The cash stock of the firm from profits on previous projects and external funding restricts platform choice. It also restricts the time and money to be used on ideation. The content focus on the other hand builds on skill accumulation from previous projects and forms a self-reinforcing cycle where what the firm is able to do directs what it does and *vice versa*.

*Q1d. What factors motivate communication among firms?*

Communication among game development firms is motivated by critical mass, group selection and collective search. The firms share information to attract new entrants and keep them alive in order to see the industry grow and become a reputable investment context and worthy of government policies favourable to the industry. Group selection effect motivates the firms to share information in order to form a strong collective in competition against other forms of entertainment. A consumer buying the first game of her life is a triumph for the industry as a whole as the likelihood of future purchases by this particular consumer increases. Thus collective stimulation of demand appears to be a reasonable action. Collective search relates to the innovation process in the sense that sharing

information on present and future projects the firms can ensure that their projects are in fact original. In this context sharing information does not necessarily lead to imitation but it is a method of ensuring a sufficient level of originality.

*Q2c. What factors govern the ability of a game development firm to create successful products?*

The ability of a game development firm to create successful products depends on the characteristics of the firm, the way they present themselves to publishers and the originality of game demos pitched to publishers. The characteristics of the firm comprise the skills of the employees in creating high quality concepts as well the business skills of management in administering complex projects. These are perceived by the publishers in the reputation or track record of the firm, which attracts publisher attention. As publishing deals are made without having the end product finished the publishers also evaluate the ability of the whole team to complete the project. The game demo is in any case a fundamental component in determining whether a publishing deal will be offered. The way in which ideation works and game ideas are filtered inside the developer firm affects their desirability in the eyes of the publishers. Competitive advantage thus follows from originality and capabilities specific to delivering a particular kind of originality. Sufficient efficiency needs to be in place, but that is only a gate towards competing on originality.

*Q2d. What factors limit the sales of a game product?*

The sales of a game product are limited by its ability to create a market for itself. This depends on its originality as well as its technical quality. The sales of games in general are limited by the consumers' excess money as well as other forms of entertainment competing for it. Marketing budget and word-of-mouth have an effect on sales, but success in these also depends on the originality of the game. Marketing cannot save a poor game just as word-of-mouth helps only when people have good things to tell about the product.



## 7 Discussion

### 7.1 Summary

Industry life-cycle theory is interested in changes in key industry variables, including entry and exit rates, firm numbers, price, output, performance, concentration and inter-firm sales variability, and in innovative activity as the industry ages. In addition, there is great interest in how such changes affect competition and the conditions for success. Industry life-cycle research has so far concentrated on traditional manufacturing industries and counterexamples to the theory have been scarce. This motivated the selection of the games industry as the empirical research object as it is a prime example of a non-manufacturing industry producing non-utilitarian goods. In addition, even though competitive forces have had more than three decades to work on the games industry, it appears that the emergence of the dominant design or the shakeout pattern have not taken place as predicted by the industry life-cycle theory. The present study was also motivated by the gap in knowledge about the long-term evolution of the game hardware and software sectors.

As prior research on the games industry is scarce, the cultural industries literature was reviewed to shed light on the conformities and deviations to be expected between the propositions of the industry life-cycle theory and an empirical analysis on the games industry. The literature on cultural industries concentrates on the ways in which such industries differ from other, mainly manufacturing, industries. The specificities of cultural industries were discussed in terms of economic characteristics, management challenges and industry dynamics. However, there is a lack of research on how these various specificities work together and affect industry evolution. In light of the literature it was concluded that (1) the constant requirement for novelty challenges the alternation of eras of radical and incremental innovations, (2) in addition to technological innovations there are stylistic innovations, (3) performance criteria remain fuzzy independent of market age and (4) economies of scale and cumulative learning play a lesser role.

The empirical research comprised two analytical steps. The first analysed the evolution of the games industry with standard industry life-cycle methods including innovation patterns, industry concentration and entries, exits and firm numbers. In the second step a qualitative systems dynamics model of the micromechanisms of the game development sector was built based on interview data. The purpose was to make a diagnosis with the first step and build explanations for the observations with the second step.

The key finding of the study is that the dynamics of the games industry differ from the propositions of the industry life-cycle theory in two respects. Firstly, innovative activity has not levelled off in either hardware or software regardless of over three decades of industry evolution. Technological innovations in software coincide with those in hardware, whereas stylistic innovations follow hardware innovations. Secondly, game development has remained an unconcentrated industry. In



Finland entries still far outnumber exits signalling no decrease in the ability of the international market to absorb new entrants and their products.

The innovation pattern is explained by the constant need for novelty common to all cultural industries and it manifests in the key role that the production of original ideas has in game development firms. Game developers communicate with each other in order to make sure that their games remain different from each other's. The innovative activity of a game development firm is also directed by its experience from previous projects. This, however, is rather qualitative learning in terms of game themes and genres than quantitative learning in terms of efficiency. Thus experience does not lead into a decisive cost advantage. For a game developer the most important gatekeeper is the publisher, who needs to be convinced of the team's abilities and the game concept's originality. Ultimately a game needs to create a market for itself in the wide space of games and other entertainment.

The low level of concentration in game development is explained by limited economies of scale as the cyclical nature of business causes financial risks to increase with increase in firm size. The benefits of cumulative learning are also limited as new technologies need continuously to be adopted and developed and the crucial feature of a successful game is originality. It appears that the lack of economies of scale and the diversity in tastes make the dynamics of the cultural industries deviate from the propositions of the industry life-cycle theory.

Next the contributions to the games industry literature are discussed followed by more detailed considerations of the contributions to the cultural industries literature and the industry life-cycle literature. Thereafter methodological implications as well as limitations and future research topics are considered. Finally, implications for policy-making and management practice are presented.

## **7.2 Contributions to the games industry literature**

In the cultural industries literature the games industry is underrepresented. It is noted in many studies as one of the cultural industries, but it seldom serves as the actual research context. Thus this study contributes to the diversity of cultural industries literature as well as to the games industry literature. The main contribution of the research presented here is that it considered the hardware and software sides of the industry together, and industry evolution was traced in the long term.

The literature on the hardware side of the games industry has so far concentrated on battles between particular products (Schilling 2003) or network externalities (Gallagher and Park 2002, Shankar and Bayus 2003). Less attention has been paid to changes in industry structure and innovative behaviour. Here it was found that even though hardware has long been a concentrated industry, albeit with a relatively high churning rate, the software side of the industry still shows a very low level of concentration. Innovative behaviour has remained active in both. Contrary to

Tschang (2007), who argues that innovative behaviour levelled off around 2000, the introduction of new genres was found to take place every couple of years until present time.

The study also contributed in discussing the effects of the unique management challenges of game development (see Tschang 2005, Grantham and Kaplinsky 2005, Cohendet and Simon 2007) on industry evolution. In addition to the management challenges growing disproportionately to firm size (Autier and Picq 2005), the growth of game development firms is discouraged by the cyclical nature of the business. As a project is completed a new assignment should be there to cover the payroll. The larger the firm is the more urgent this requirement becomes and thus the more difficult it becomes to keep the firm alive. This discourages the search for competitive advantage through growth. This means that economies of scale in game development are uncertain and thus the evolution of the industry does not necessarily lead to a clear shakeout pattern.

Two specific characteristics of the games industry were identified to differentiate it from other cultural industries. Firstly, technology and its development have a central role in the creative process of game development, but this is not the case with many other cultural industries. Secondly, game firms in general try to offer job security as much and as early as possible, while in many other cultural industries work is done mainly freelance or fixed-term. These characteristics should be considered prior to generalising the findings to other cultural industries.

### **7.3 Contributions to the cultural industries literature**

The cultural industries literature covers a wide range of research in the fields of economics, sociology and management. The main interest there has been in determining the differences between cultural and other industries. Much of the research has taken into account various moral issues ranging from the manipulation of the masses and unfair employment policies to the detrimental effect that pop culture can have on children and young people. Thus research on these industries carries some moral baggage that inhibits their analysis as mere business. In the research presented here the aim has been to combine the specificities of cultural industries in the economic characteristics, management challenges and industry dynamics identified in the literature and to study their effects on the evolution of one cultural industry.

In the present study the industry life-cycle theory was applied to a new kind of context and this also contributes to the study of cultural industries. Industry life-cycle theory provides a framework and concrete variables to monitor. This gave structure to the study. On the basis of the cultural industries literature, the sources of deviations from the standard industry life-cycle theory were classified into four groups that relate to (1) the alternation of radical and incremental innovations, (2) the incorporation of stylistic innovations, (3) economies of scale and cumulative learning and (4) performance metrics.

The alternation of radical and incremental innovations is a core assumption in the industry life-cycle theory. In the cultural industries literature this is challenged by the constant requirement for

creativity and originality (DeFillippi et al. 2007, p. 513) independent of market age and the tendency of majors to concentrate on incremental innovations and independents on radical innovations (Hesmondhalgh 2002, p. 22). Thus there is simultaneous division of labour rather than alternating eras of particular kinds of innovations. In the empirical material the innovation patterns support the idea of a constant requirement for novelty instead of temporal alternations. New console generations have been introduced every few years and advances in performance metrics are still exponential. In software, new genres have been introduced every couple of years until the present. Thus there is no discernible levelling off in the innovation frequency as the industry ages. The game developers perceive the introduction of original game concepts as the only way towards sustainable business and thus they strive towards this.

Industry life-cycle studies have so far concentrated on technological innovations. In the study of cultural industries stylistic innovations need to be incorporated as they form a major part of the innovative activity in these industries. Stylistic innovations have previously been traced by Cappetta et al. (2006) in the fashion industry, but otherwise this concept has been seldom used. Here stylistic innovations appeared mainly as introductions and refinements of game genres. Genres have been identified as innovations by Peterson and Anand (2004) in music, Perretti and Negro (2007) in film and Tschang (2007) in games. The challenges of identifying stylistic innovations have been noted in the literature on the relationship between cultural diversity and industry concentration (Peterson and Berger 1975; Lopes 1992). In studies on technological evolution innovations are apparently easily traced and the evolution appears straightforward. It may well be that in reality technological evolution is not as simple as it is made to look. However, Cappetta et al. (2006) note that the difference between stylistic and technological innovations is that stylistic designs converge to a trend whereas in technological innovations one variant dominates. Perhaps this makes the identification of stylistic innovations fundamentally more complex. Games rather conform to than duplicate genres and genres also conform to games.

Industry life-cycle theory assumes that economies of scale and cumulative learning operate in the production process and cause a shakeout where the sales are reallocated to a smaller number of firms and those failing to increase their efficiency are forced to exit. The literature on cultural industries provides three particular complications to this logic. Firstly, the combination of increasing returns on the sales of one title (e.g. Denisoff 1975, p. 203), but to a lesser extent on several titles produced simultaneously, with extreme variation in sales figures (e.g. Jeffcutt and Pratt 2002; De Vany 2004) gives rise to considerable uncertainty. Secondly, the tension between commercial and artistic goals (DeFillippi et al. 2007, p. 514; Autier and Picq 2007) makes management challenges grow disproportionately to firm size. In addition, Baumol's cost disease hampers productivity gains (Baumol and Bowen 1966). Finally, the dominant artists charge rewards disproportionately higher to any differences in capabilities (Benhamou 2003, p. 72) which goes against the cost reduction logic of adopting the dominant design. In the empirical material it was evident that the game development industry has not become concentrated despite more than three decades of industry evolution. This indicates that economies of scale and associated efficiency increases have not caused a shakeout. The requirement for the constant adoption and development of new technologies as well as the requirement for original content lessen the benefits from

cumulative learning. Economies of scale were found to be restrained by management challenges growing with firm size as well as by the increasing risk that a larger payroll brings in a cyclical business.

Finally, the industry life-cycle theory builds on performance criteria becoming increasingly well-defined with market age. This phenomenon is challenged by three characteristics discussed in the cultural industries literature. Firstly, cultural goods are non-utilitarian (e.g. Hirsch 1972a) and horizontally differentiated (Lampel et al. 2000, p. 264) making uniform performance criteria unattainable. Secondly, the plurality of the gatekeepers (e.g. Hirsch 1972a) further complicates the evaluation and selection process. Finally, cultural goods are experiential (e.g. Lampel and Shamsie 2000, p. 235) and taste for them develops through consumption (e.g. Cowen 1989) which further restrains the emergence of shared performance ideals. It was found that on the hardware side of the games industry shared performance metrics had emerged relatively early. However, on the software side the stylistic innovations were rather widening than deepening as the goal for most firms was to introduce original products sufficiently differentiated from existing ones.

#### **7.4 Contributions to the industry life-cycle literature**

Industry life-cycle studies have so far concentrated on traditional manufacturing industries. Most popular in this respect have been the car manufacturing (e.g. Abernathy 1978; Abernathy and Clark 1985; Utterback and Suárez 1993; Klepper and Simons 2005), computer (e.g. Tushman and Anderson 1986; Henderson 1999; Bayus and Agarwal 2007), television set (e.g. Willard and Cooper 1985; Suárez and Utterback 1995; Klepper and Simons 2005) and tyre (e.g. Jovanovic and MacDonald 1994; Klepper and Simons 2005) industries.

Research on non-manufacturing or non-utilitarian industries has been scarce. Fein (1998) found that in pharmaceutical wholesaling, i.e. a service industry, there was no dominant design, but a dominant business model emerged. Research on at least partly non-utilitarian products is limited to television sets, which are treated similarly to utilitarian industries. The game development sector is both non-manufacturing and non-utilitarian. The business model of cheap hardware and expensive games was identified as the most notable dominance effect. This conforms to Fein's (1998) logic. The non-utilitarian nature of the product was apparent in many of the phenomena described in the previous section and caused the evolution of the industry to deviate from the general industry life-cycle theory. Most importantly, the constant requirement for novelty and the absence of well-defined performance metrics hampered the emergence of economies of scale and efficiency increases. As the products are non-utilitarian, new device generations need to be introduced to attract consumers to replace their older model. New kinds of games need to be developed to persuade the consumers to buy the hardware.

The study traced the evolution of complementary products. It was found that (1) development in hardware accelerated prior to that in software, (2) hardware innovations coincided with technological software innovations and (3) preceded stylistic software innovations. This dynamic

indicates that hardware enables software and software sells hardware. In the study the concept of stylistic innovation was adopted, which has not so far taken place in industry life-cycle studies.

The findings of this study indicate that the dynamics of the games industry deviate from the predictions of the industry life-cycle theory in several important respects. Klepper (1997) and Bonaccorsi and Giuri (2000) have proposed systematic classifications of phenomena that can bring about such deviations. For Klepper (1997) these include (1) the emergence of specialist firms that service the manufacturers by developing process technology and supplying key inputs, (2) the outsourcing of manufacturing to other firms and (3) heterogeneous demand which enables small competitors to survive. Bonaccorsi and Giuri (2000) merge the first two cases and call them violations to appropriability stemming from the fragmentation of product and process R&D and manufacturing into separate firms. Their second source of deviations is violations to increasing returns in the firm's activities, such as manufacturing, marketing or R&D. This threatens the basis of the cumulative advantage of incumbents, but is not due solely to heterogeneous demand.

The findings from the games industry deviate from the industry life-cycle theory in four respects. Firstly, innovation activity does not level off with market age. Secondly, stylistic innovations play an important role in addition to technological ones. Thirdly, economies of scale and cumulative learning appear to play a lesser role. Finally, performance criteria in the stylistic domain remain fuzzy independent of market age.

The deviations in innovative activity are not covered in Klepper's (1997) or Bonaccorsi and Giuri's (2000) classifications. The lack of economies of scale and cumulative learning correspond to Bonaccorsi and Giuri's (2000) violations to increasing returns. The creative process encounters Baumol's cost disease, investments are made in projects with extreme uncertainty regarding sales, management challenges grow disproportionately to firm size and the risk of bankruptcy increases with firm size. The fuzzy performance metrics are best described by Klepper's (1997) proposition of heterogeneous demand. Consumers have varying tastes and change over time and the products need to please several gatekeepers before they reach the consumers. No one game can serve a population of consumers with varying tastes. Thus the performance criteria do not conform to support a single or a small number of dominant designs.

## **7.5 Methodological implications**

Several methods were used in the research project. In the first empirical step many standard industry life-cycle methods, such as tracing innovation patterns and increases in performance as well as looking at entries, exits and industry concentration, were adopted. Innovations in devices were traced through generations. This led to the decision to define entry and exit years on the basis of the generations during which a firm introduces devices. This is not a precise method as some devices have managed to compete with next-generation devices. It was, however, decided to proceed with the years identified as it is improbable that a firm which is unable to introduce new

devices apace with its competitors would have such a successful product that could compete with next-generation devices.

Additional challenges were faced in determining which products are the same and which are different. Many devices come in several models with varying features. It was decided to treat such models as one product as long as they did not have notable differences in the key performance criteria. For example, when a device came in monochrome and colour versions they were treated as different products.

The analysis of industry concentration was conducted with the Herfindahl index and the four-firm concentration index, which are standard industry life-cycle tools. The data used in the calculations was limited to the UK sales and to the top 100 studios. However, as the UK is the largest game market in Europe and a mainstream market, it was deemed a good enough proxy for global sales. In addition, the top 100 studios cover over 70% of the market, which is sufficient for assessing the market structure. Finnish data on entries and exits were used to probe into changes in the ability of the international game market to absorb entrants and their products. Finland represents a very small portion of the international games industry, but this may also be seen as an advantage; it is reasonable to assume that the Finnish firms would be especially sensitive to the international market closing its doors to entrants. Concerning the Finnish games industry entries and exits were traced using data from the Business Register of Statistics Finland. The reliability of the findings is dependent on the ability to identify the appropriate firms. Every possible effort, including discussing the list with industry experts, was made to locate the right firms. Perhaps in the future better statistics will be available as the games industry is included in industry classifications.

The incorporation of stylistic innovations was a methodological novelty in this study. The identification of introduction innovations and refinement innovations followed the logic of Jovanovic and MacDonald (1994). The game that was the first to represent a particular genre was identified as the introduction innovation and the game that popularised or created the standards for the genre was identified as the refinement innovation. The problem with the definition of introduction innovation is that it takes time for a genre to form and thus when the first game appears the genre does not yet exist. This also brings uncertainty to the definition of recently introduced genres. For them a reference indicating the birth of a new genre was included and thus it is not only at the author's discretion that such events are defined. The identification of stylistic innovations requires further development in future studies.

In the second step interview data was used to build a qualitative systems dynamics model on the micromechanisms of the game development sector. This is not a standard industry life-cycle tool. However, it is useful to examine the processes that produce the observed industry life-cycle dynamics and this method allows the analysis of the perceptions based on which the managers make the moves that build the industry's future.

In the collection of the interview data Finnish firms served as the sample. This poses a threat to generalisability. However, it is characteristic to game development that all firms aim at the

international market as the domestic market is seldom large enough to sustain domestic game production. The USA and Japan are exceptions to this rule, whereas Canadian, British, Australian, French, etc. firms are forced to strive for international distribution. Thus Finland is a typical country in this respect as the Finnish firms pursue publishing deals with international publishing companies just as game developers do all over the world.

The main challenge in qualitative systems dynamics modelling is to find the proper level of detail. Wikström's (2006) model of the music industry includes 26 variables, whereas the model presented in this study includes 39 variables. Adding variables increases accuracy but what is gained in accuracy is lost in clarity. Models with different levels of detail serve different purposes. Here the choice was made to include quite a lot of detail. Partial models are easier to grasp than the final complete model and thus many issues can be approached by inspecting the partial models first.

Finally, cultural industries have not been studied much from the industry life-cycle viewpoint. The adoption of industry life-cycle concepts and variables provides a useful framework for the study of such industries. In addition, as the aim of the cultural industries literature is to identify the specificities of such industries, the industry life-cycle theory can serve as the definition of what is general, so that what is specific can be determined.

## **7.6 Limitations of the study and topics for further research**

The research was limited by the availability of data. Entries, exits and firm numbers are especially difficult to obtain to cover the software side of the international games industry. In addition, changes in industry concentration were not available. This kind of data would be valuable to achieve a more rigorous picture of the life-cycle of the games industry. Furthermore, it would have been interesting to trace changes in the level of product diversity, but the lack of data and method to determine diversity pre-empted such a research direction.

The interview data was limited by what the interviewer ended up asking and what the interviewees deemed important enough to mention. However, explorative interviews with industry experts and two pilot interviews with an industry veteran helped in formulating the interview structure and questions. In addition, this way the terminology could be developed to make sure that the interviewer and the industry people understood each other. The findings went through respondent validation. This helped to clarify certain points, but it also offered insights into what is particularly interesting in the findings. Finally, the interviewees represented eight different firms, which enabled the corroboration of the findings. Thus, the observations from one interview were deemed significant only if they could be corroborated with the observations from at least one other interview. This helped to eliminate some random observations occurring in the course of the interviews.

Another limitation to reliability relates to the stability of the findings and the transversal interview data collection. The researcher is confident that the findings would be very similar if the study had

been conducted a few years earlier or later. However, there are limits to the temporal stability. This means that if the study were conducted again after a decade or two the findings might be different. The introduction of new distribution channels, for example, may have an effect on the industry dynamics during the next ten years. However, many characteristics of the industry are relatively stable and the main body of the study will not age fast. The active participation by the firms in information and knowledge exchange, for example, can be due to the immaturity of the industry and the small size of the firms. However, it is typical for the games industry to constantly have new developer firms emerging as the older ones are acquired by global publishing houses. Thus, the existence of small young firms is a stable feature of the games industry and such firms do not form a temporally specific case.

The game development sector does not form a uniform population but the firms differ according to the game platform and the position in the value chain. The differences between the platforms were taken into account and made explicit when they had a substantial effect on the phenomena of interest. Thus, it was noted in the analysis that the development process for an average mobile game is significantly shorter than for an average console/PC game. Also, it was noted that it is significantly easier in the mobile game sector to take the publisher position than in the console/PC sector and that mobile developers may have a large portfolio of games whereas console/PC game developers usually have only one game at a time in development, which makes the business far more riskier in the console/PC sector.

The different sectors within the games industry, however, are strongly interlinked. Firms developing mobile games may be aiming at the console/PC sector or they may be aiming at mobile game publishing. Thus, these differences can be seen as stable strategic choices or as steps on the way to the ultimate goal. Furthermore, the struggle to cross the barriers of entry described in the analysis is common to all firms irrespective of their position in the value chain. These observations indicate that even though the firms within the game development sector do not form a uniform population, they form an interconnected entity and the diversity is an important characteristic thereof.

The data used in the study was international, confined to the UK or confined to Finland. The industry concentration calculations based on British data, however, are internationally generalisable as the UK forms a relatively large market and has a mainstream flavour. The Finnish data on the basis of which the micromechanisms were traced also contains some threats to generalisability. The Finnish game development sector is younger and smaller than that of many other European countries, but there are also countries in Europe with even smaller and younger sectors. Thus, Finland does not differ significantly from other European countries. Because of the international nature of the games industry, the business is very similar in different countries. The United States and Japan can be seen as exceptions as their home markets are large enough to support domestic game production and this may lead to unique characteristics and processes. For most other countries the game business operates similarly as in Finland and thus the findings are not specific to Finland.



Whether the findings presented in this study are generalisable to other cultural industries is a research topic in itself. The generality of the findings can be argued for based on cross-contextual generalities (Mason 2002, pp. 295-297). The cultural industries have several similarities, such as non-utilitarian goods, monopolistic competition, horizontal differentiation, increasing returns, gatekeepers, tension between commercial and artistic objectives, group competition due to other entertainment industries and constant need for innovation and originality. The games industry dynamics and micromechanisms analysed in this study stem, to a substantial degree, from these characteristics. Thus, the generalisation of at least some of the findings of the study would be a promising research direction.

The relationship between industry concentration and product diversity has been analysed so far primarily concerning the music industry. Such an analysis of the games industry could shed further light on the evolution of cultural industries. In addition to data collection, the main challenge would be the definition of diversity. Products could be deemed diverse based on genre, developer and publisher. More complex measures based on gameplay could also be drafted. This kind of research could also contribute to the debate on the vices and virtues of flexible specialization.

The present study leaves open some research directions through which the industry life-cycle dynamics of the games industry could be studied. For example, intermediate outputs, such as development tools and graphics engines, could be examined to determine innovative activity, performance increases and the evolution in firm numbers and concentration. Game publishing also forms a sector that should be studied to determine its degree of influence on device manufacturers and game developers.

More generally, research on the dynamics of industries producing non-utilitarian, non-manufacturing or complementary goods would help in filling the gaps in the industry life-cycle theory. For example, the evolution of mobile phone technology and associated services would be a useful research object. Furthermore, there is a need for much more research on the micromechanisms that produce the changes in industry variables.

Information and knowledge exchange emerged in this study as a micromechanism that affects industry evolution. As this study is confined to the cultural industries it would be worthwhile also to study this phenomenon in other industries. On the one hand, information and knowledge exchange can have a specific role within the cultural industries as it enables horizontal differentiation vital to the industries in question. On the other hand, many other industries rely on horizontal differentiation even though the products also have vertical differentiation characteristics. Many daily consumer goods, for example, are not better or worse but they compete on the basis of consumer impression of the brand's trendiness, youthfulness or reliability. The same applies to cars as consumers make purchase decisions on the basis of both performance metrics and the image of the brand. Moreover, information and knowledge exchange can be a phenomenon confined to small firm populations. Thus it would be interesting to find out how it varies between different industries and different sizes of firm population.

Policy decisions concerning the games industry, and the cultural industries in general, require research on the effects of such public interventions. Direct subsidies, tax credits, publicly funded consultations, incubators and education relating to the games industry are not heavily based on research findings. On the national level it would be useful to find out what kind of a difference interventions, such as direct subsidies, consultations or incubators, can make for the future of a firm. This could be done by comparing the performance of a population of firms that have received such support and the performance of a population that has not. An interesting question is whether the intervention has made a difference to a firm's success potential. The alternative proposition is that those firms with the greatest potential, and thus able to succeed on their own, are chosen for public support. As the firm populations between which such comparisons could be made are small, statistical methods would probably not be appropriate. Qualitative case studies complemented with statistical analysis could provide an in-depth understanding of the issue.

On the international level it would be useful to find out what difference policies on tax incentives, incubators and education have made on industry development in particular countries. This could be done by creating metrics for the state of the industry in each country and constructing explanations for differences by comparing the respective policy settings. The metric could be composed of industry size by number of firms, number of employees, revenue and profitability as well as their volatility. In addition, the metrics could include the proportion of original IP of all games developed in that country as well as the extent to which the firms do outsourced projects for foreign firms and the extent to which the games are published by domestic publishers. Such research could include both qualitative and quantitative methods. However, it is reasonable to assume that the industry and its policy setting develop through a co-evolutionary process, which means that the causal explanations are not straightforward. An interesting question is whether economic success follows policy interventions or if policy interventions take place only after economic success.

User-driven innovation and open innovation have recently been popular topics in the innovation literature. Concerning the games industry user-driven innovation has been linked especially to massively multi-player online games (see Herz 2002; Jeppesen and Molin 2003; Arakji and Lang 2007). The claim is that by moulding the worlds in these games the players innovate. Indeed, the players are granted the freedom to create modifications and new levels. However, does the real innovation lie in these user creations or in the design of the game that allows a wide array of actions making the game more appealing and addictive? The problem of user-driven innovation logic in games is that novelty is a core factor in making a game interesting. Can you really enjoy a game you have created yourself and know inside out? When there are no surprises the game experience is unattractive. This means that research on user-driven innovation concerning games has to take into account the tendency of these user-innovators to innovate for other users and not for themselves. This starting point offers interesting research avenues concerning reciprocity and credit into the online communities of gamer-innovators. Open innovation (von Hippel 1988) is also a concept that requires further assessment within the games industry context. In the light of the findings of this study it appears that within the games industry open innovation means that game developers do free concept development for the publishers. It would be both academically and managerially interesting

to do research on what kind of an open innovation model would be acceptable to both developers and publishers.

## **7.7 Implications for policy-making and management practice**

Education and public funding have recently been topical policy issues regarding the games industry and are considered in that order. In Finland there have been some discussions on the launching of games industry related education programmes. A three-year programme on vocational level has been offered in Outokumpu since 2005 (Pelitalo Outokumpu 2007) and individual courses on game design, programming and graphics are available in several universities in Finland<sup>18</sup>. Koivunen (2004, p. 86) suggests in a report published by several ministries in Finland that a special games related study programme should be introduced and that the business emphasis of current education should be strengthened. One international example of successful games related education is Japan (Aoyama and Izushi 2003, p. 440). There are vocational schools with which the industry maintains close ties. Games industry professionals serve as instructors in these schools and the students are hired as part-time workers in the associated firms which may give them access to the industry. Some large firms also maintain their own schools. Konami, for example, has its own “Konami Computer Entertainment School” in Tokyo and Osaka.

However, education is not a simple issue and its effect on the development of the games industry is not straightforward. In the interviews some firms were eager to see the introduction of more games related education whereas others were highly sceptical. The scepticism follows from three main points. Firstly, many interviewees stated that a general two or three-year ‘game programme’ cannot achieve the level of profundity in the field that is required of their employees. If the education includes a small amount of programming, graphics, sound, design, project management and contract issues the end result will be people who are jacks-of-all-trades and not specialists with the kind of profound knowledge valued by the firms. This means that there should be specific study programmes for each special area of expertise required in game development. This would, however, result in unreasonable costs.

Relating to this the second opposition to the education is the lack of skilled and motivated teachers. There are not many people in Finland with the kind of knowledge and skills as well as the motivation to teach game development. This is not a problem that can be easily solved with money as even the international supply of such people is scarce. The third doubt relates to the employment prospects of the potential graduates. Some of the interviewees perceived unemployment as a risk with the potential launching of high volume games related education. After all, the game firms are not experiencing a shortage of people with general competence for the industry. The actual shortage is of highly skilled and experienced individuals with very specific qualifications. On the other hand, one factor behind the scepticism regarding games industry related education may be the industry’s identity as unorthodox and its history of skilled individuals emerging from cellars and bedrooms

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<sup>18</sup> See <http://www.hermia.fi/neogames/koulutus/> for a comprehensive list.

after years of voluntary practice. Perhaps this, too, is not the optimal solution, and some kind of middle-way could be adopted between formal education and hobbyism.

Education policy requires an in-depth assessment of the needs of the potential employers. The secret to the success of the Japanese system lies, at least partly, in the active participation of the firms in education through funding, teaching and by offering traineeships. This way potential employers can ensure that they get what they need. The Japanese system, however, cannot be emulated in Finland as the scale of the industry is completely different. In Finland the games industry employs around 1,000 people whereas in Japan the number of employees is measured in tens of thousands. This means that the environment for education is very different in Japan compared to Finland.

Public funding was an issue that provoked opinions and emotions in the interviews. The main complaint was that funding offerings are fragmented and considerable effort is required even to apply. Some firms had decided that the input/output ratio is not good enough to justify the investment of time in the application processes. Horror stories were told about how the firms were expected to contact the local authorities to apply for a subsidy for hiring a consultant to draft applications for funding administered by the European Union. Generally the interviewees were in favour of a simple system with only one entry point for applications. This way the application efforts could be focused and the criteria for successful applications could be known beforehand.

Internationally public funding for the games industry takes the form of tax credits. Currently, tax credits are offered for game companies in the Canadian province of Ontario (Maragos 2006) and in France (Carless 2005), for example. The benefit of this system is that everyone gets the same and the decisions are not left to someone's discretion. There is no uncertainty in the system and it is also efficient as it needs no heavy administrative organisation. The downside with tax credit is that benefits only follow when there is taxable income. Thus such schemes help established firms more than new entrants. This kind of a system, however, is democratic as all the firms are treated the same. Whether democracy and creativity are compatible is another matter.

The other option for public funding is direct subsidies for firms or for projects. An example of this is the European Union game prototype funding scheme announced in 2007 (MEDIA 2007 Programme 2007). Within the scheme a firm can apply for up to 100,000 euros for the development of on or off-line interactive works. The grant can comprise the maximum of 50% of the budget of the project. (ibid.) The programme has been planned in cooperation with the European Games Developer Foundation (EGDF 2007).

The MEDIA 2007 Programme is generally good for the games industry in Europe putting Europe on a more equal footing with USA and Asia. However, the risk is that it will bring another selection round to the filtering process that game developers need to pass to reach the consumer. Thus, the position of firms without the EU funding will deteriorate. When the international publishers are choosing which demos to start financing those on which 100,000 euros of public money have been spent will have an advantage over the demos produced with sweat capital. Furthermore, only firms

that have previously produced such interactive works are eligible for the funding (MEDIA 2007 Programme 2007). This means more obstacles for new entrepreneurs and start-ups.

A central issue with such discretionary public funding is the success criteria of the applications and the selection of the decision-makers. In the Call for Proposals for the EU scheme neither of these is made explicit. It is mentioned that projects that promote European cultural diversity will be preferred by giving them the maximum of 60% of the project budget. This raises the question whether the projects that pass the criteria are the kind that have international business potential. However, the selection of the decision-makers is more important. If the decisions are made by people appointed based on political merit the success criteria for applications may be very different from what would actually succeed in the market.

The findings of this study suggest that the tax credit model would have some important advantages over the discretionary subsidy model adopted by the European Union. Most importantly, the tax credit model would not create an additional selection round, i.e. an additional intermediary, between the content creator and the consumers. The discretionary subsidy model improves the competitiveness of some game developers over other game developers whereas the tax credit model improves the competitiveness of the games industry in general in relation to other industries. The latter seems preferable and the means to achieve it should be chosen accordingly. However, neither of the implemented models is particularly favourable to new entrants and this issue should receive more attention when new schemes for supporting the growth of the games industry are drafted.

The researcher's general impression after this study is that the people working in the game firms are hardworking, innovative, courageous and passionate about what they are doing. This is a very good basis for the firms as game development is fundamentally people business. The downside is that labour costs are high as most employees are specialised professionals. The findings of this study indicate that many of the firms could benefit from a definition of their core skills and from the outsourcing of other tasks. Some of the older firms had done exactly this to keep the payroll under control. In console and PC game development especially there are periods of planning and designing when the army of programmers, for example, does not have much to do. As the development cycle comes to the period when substantial manpower is needed new recruits are not a valid alternative and their productivity is low for a significant time period. Therefore outsourcing could be explored as the cure to the fixed cost problem caused by the payroll. On the other hand, the quality of the programming work is critical and the programmers frequently have to solve problems and update the specifications as the project proceeds. Thus, successful outsourcing requires a partnership with the subcontractor to ensure quality and flexibility. It also requires project management skills different from those of pure in-house game development.

Basically the firms have two alternatives in confronting competition in game development. The first one is to create original content, offer it to publishers and try to hold on to the intellectual property rights associated with original content. This is a high-risk approach but has the potential for high payoff. The second alternative is to develop licensed IPs in work-for-hire fashion. This approach entails less risk as the risky concept development and associated sales pitches are less important.

However, this approach also has low payoff potential. This means that the developer has to be very good in process management and cost control to make the business sustainable and profitable. Therefore this approach ultimately also entails considerable risk. This would imply that in the long term the requirement for sustainable business is original IP and the ownership thereof. The problem with original IP is that the developers have to do concept development without any certainty of revenue from a particular concept. Therefore the publishers need only pay for concept development if they decide to go ahead with a particular concept. There is a need to explore alternative methods of concept development and finalising publishing deals to ensure the sustainability of independent game developers. But the independent developers can ultimately survive only by creating content that is interesting and appealing to consumers. Furthermore, sweat capital will be required as long as people in other firms are willing to supply it. There are non-monetary rewards associated with game development and thus financial gains remain low for many firms.

Collective action in the industry has been productive internationally and also in Finland. There are industry organisations and many experts are generous in sharing their knowledge. This has contributed to the legitimacy of the games industry. However, for many members of the public games are still not a legitimate business and game entrepreneurs are seen as frivolous hobbyists. Perhaps reporting the exports and tax contributions of the games industry, as has been done in the USA (Siwek 2007) and UK (Oxford Economics 2008), could help in this respect.



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**Appendix 1: Classification of cultural industries literature**

	Cultural industries	Creative industries	Film	Music
<b>Definitions, statistics</b>	European Commission 2008 Jeffcutt et al. 2000 Power 2002	Blythe 2001 DCMS 1998 Dolfman et al. 2007 Jayne 2005 Markusen et al. 2008 Oakley 2006 Taylor 2006 Tepper 2002 The Work Foundation 2007		
<b>Economic characteristics</b>	Baumol 1996 Baumol & Bowen 1966 Baumol 2003 Blaug 2001 Breton 1982 Crossland & Smith 2002 Hesmondhalgh 2002 Hirsch 1972b Jeffcutt & Pratt 2002 Lampel et al. 2000 Peterson & Anand 2004 Pratt 2008 Throsby 1994; 2001 Wijnberg & Gemser 2000	Caves 2000 Cunningham 2003 Graham 2005 Pine & Gilmore 1998 Vogel 2001	Coe & Johns 2004 De Vany 2004 De Vany & Lee 2001 De Vany & Walls 1996; 1999; 2004 Eliashberg et al. 2006 Elsbach & Kramer 2003 Gemser et al. 2007 Ginsburgh & Weyers 1999 Holbrook & Addis 2008 Hsu 2006a Lampel & Shamsie 2000 Ravid 1999 Ravid et al. 2006 Zuckerman & Kim 2003	Burke 2003 Denisoff 1975; 1986 Favaro & Frateschi 2007 Negus 1992 Power & Hallencreutz 2007
<b>Creative cities and areas</b>	Gibson & Kong 2005 Henriques & Thiel 2000 Neff 2005 Scott 1996; 1997; 1999; 2000; 2004	Bayliss 2007a; 2007b De Berranger & Meldrum 2000 Yusuf & Nabeshima 2005	Mathieu 2006 Scott 2002 Turok 2003	
<b>Management issues</b>	Jones et al. 2005 Lawrence & Phillips 2002	Bilton & Leary 2002 DeFillippi et al. 2007 Eikhof & Haunschild 2007 Ensor et al. 2001 Powell & Dodd 2007 Thompson et al. 2007	DeFillippi & Arthur 1998 Faulkner & Anderson 1987	Denisoff 1975; 1986 Gander et al. 2007 Negus 1992 Ordanini et al. 2008 Peterson & Berger 1971
<b>Creative labour</b>	Becker 1974 Benhamou 2003 Cowen & Grier 1996 Francois 2004 Menger 1999 Wetzels 2008	Swedberg 2006	Bechky 2006 Blair et al. 2001 Hui & Png 2002	
<b>Industry dynamics</b>	Hirsch 1972a; 2000 Miège 1987		Aksoy & Robins 1992 Blair & Rainnie 2000 Gil & Spiller 2007 Hsu 2006b Jones 2001 Lampel & Shamsie 2003 Mezias & Mezias 2000 Mezias & Boyle 2005 Mezias & Kuperman 2000 Miller & Shamsie 1996; 1999; 2001 Moul 2001 Perretti & Negro 2007 Robins 1993 Sorenson & Waguespack 2006 Storper 1989	Anand & Peterson 2000 Anand & Watson 2004 Burnett 1996 Gander & Rieple 2004 Hesmondhalgh 1996 Huygens et al. 2001 Mol & Wijnberg 2007 Mol et al. 2005 Tschmuck 2003 Wikström 2006
<b>Manipulation of masses and diversity</b>	Adorno & Horkheimer 2008 Aoyama 2007 DiMaggio 1977; 1987 Gottdiener 1985 Jin 2007 UNESCO 1982		Degrazia 1989 Sedgwick 2002	Alexander 1996 Burnett 1992 Dowd 2004 Lopes 1992 Peterson & Berger 1975; 1996

Games	Fashion	Publishing	Opera, Theatre, Orchestra	Advertising	TV
Cadin & Gu�erin 2006					
Arakji & Lang 2007 Ha et al. 2007 Ip & Jacobs 2006 Jacobs & Ip 2003 Lee et al. 2004 Meagher & Teo 2005 Nair 2007 Song & Lee 2007	Santagata 2004	Beck 2007	Dempster 2006		
	Larner et al. 2007				
Autier & Picq 2005 Baba & Tschang 2001 Cohendet & Simon 2007 Grantham & Kaplinsky 2005 Kohashi & Kurokawa 2005 Readman & Grantham 2006 Sapsed et al. 2007 Tschang 2003; 2005; 2007 Tschang & Szczypula 2006	Mora 2006	Eisenmann & Bower 2000	Glynn 2000	Grabher 2002a; 2002b; 2004a; 2004b	
Cadin et al. 2006			Eikhof & Haunschild 2007 Haunschild 2003		Antcliff et al. 2007
Aoyama & Izushi 2003; 2004 Clements & Ohashi 2005 Gallagher & Park 2002 Izushi & Aoyama 2006 Johns 2006 Schilling 2003 Shankar & Bayus 2003 Tschang 2007 Venkatraman & Lee 2004 Williams 2002	Cappetta et al. 2006 Djelic & Ainamo 1999 Power & Hauge 2008 Richardson 1996	Thornton 2002 Vang 2007		Grabher 2001	Georgantzas et al. 1994 Starkey et al. 2000
		Benhamou & Peltier 2007			

## **Appendix 2: Interview questions**

### **Theme 1: How is variation created within the industry?**

#### *How are new firms born?*

How was this firm born?

Do you think it is a story typical to the games industry?

Why was this firm founded?

What kind of criteria have to be fulfilled in order to start a game firm?

What was the most important precondition for starting this firm?

What kind of an effect have other Finnish game firms had on your firm's early phases?

Have you been helped?

Have you helped others?

#### *How do game ideas emerge?*

How many people are involved in coming up with a game idea?

What is the process like?

How do you identify potential ideas?

On what grounds do you discard ideas?

#### *How are innovations created?*

Do you have a systematic strategy to create and develop ideas?

Is a game innovation more an accident than a result of conscious efforts?

At what point can you see that this game will be great?

Who sets standards on when a game is good enough?

#### *How do firms choose their strategies?*

How would you describe your strategy?

How have you ended up with that particular strategy?

How has it changed during the firm's life?

What kinds of mistakes have you made?

What is your long-term objective?

Have you specialised in some particular technology or game genre?

How is it possible to succeed in an existing genre?

#### *What is the games industry entrepreneur like?*

Whose vision is followed?

What is the role of management?

What is the role of game designers or coders?

## **Theme 2: How does selection operate?**

*What selection mechanisms exist?*

What would be the dream situation for your firm?

What keeps you from getting there?

*What is the competition like?*

Who are your competitors?

Who perceive you as a competitor?

In what kinds of situations do you face competition?

What are you competing on?

*How does revenue form?*

Who do you share game revenues with and how?

Who determines the shares?

Has this situation changed during your firm's lifetime?

*Why and how do some firms go bankrupt?*

What are the signs of bad times for a firm?

Is a bankruptcy more a sudden death or slow starvation?

Is there a typical game firm bankruptcy story?

Has it ever been close for you?

*How and why do firms merge?*

Has your firm been a part of a merger?

How did it happen?

What was the motivation?

What are typical reasons for such mergers?

## **Theme 3: How are the firms interconnected?**

*What kind of interaction takes place between the firms?*

How are you in contact with other game firms?

How often?

What is your motivation for such communication?

Do you follow the press on other game firms?

*What is the balance between competition and cooperation?*

How do you take your competitors into account in your decision-making?

Who are your collaborators?

What is the collaboration like and what are the motivations for it?

How do you take your collaborators into account in your decision-making?

*What is inter-firm co-evolution like?*

How do you react to decisions or moves made by other firms?

Which firms have the biggest impact on your decisions?

Which firms' decisions do your moves have an impact on?

Has your firm developed in parallel with some other firm?

Have some firm's moves benefited you?

Have your moves benefited some other firm?



#### **Theme 4: Games industry in Finland in general**

##### *The development of employment, turnover and profitability*

How has your firm's profitability / turnover / balance sheet developed since the founding of the firm?

How has the number of employees changed?

What does the future for your firm look like?

What does the games industry in Finland look like in the light of these numbers?

##### *What kinds of norms are there in the games industry?*

What kinds of rules of the game does everyone have to follow within this industry?

What kinds of consequences does breaking them have?

Have you tried to break them?

##### *What kinds of public sector interventions are there and what kinds of results have followed?*

Have you benefited from some public sector intervention?

What have been the goals in these?

What have been the results?

##### *What kinds of interventions would benefit individual firms or the industry as a whole?*

What kinds of interventions would you like to have?

What could be achieved by them?

Do you know of any system abroad that would benefit Finnish firms as well?

What could it achieve?