Down Many Times, but Still Playing the Game: Creative Destruction and Industry Crashes in the Early Video Game Industry 1971-1986[1]

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The early, formative years of many industries are often shrouded in mystery, with a paucity of information and highly exaggerated stories providing the basis for historically grounded accounts of industry dynamics. This has been the case with the video game industry as well, where many - often contradictory - factors have been suggested as explanations for what many regard as the most extraordinary event in the history of video games, namely the 1983 crash. The event forced a majority of the US video game companies out of business and was accompanied by a subsequent change in industrial leadership from the U.S. to Japan. In the U.S. and Europe, the event is usually referred to as "the 1983 video game crash", or simply "the video game crash", while in Japan it is referred to as "the Atari shock" (a name that emphasizes the unexpectedness of the event and the downfall of the dominant video game company at that time).

In general, seven explanations for the crash have been put forward. Early explanations of the 1983 video game crash suggested that it was the result of: (1) the end of a teenage fad (Friedrich 1983); (2) the mismanagement of a single firm, Atari (Cohen 1984); (3) the public criticism that video games received (Williams 2004); (4) overproduction in terms of the number of games produced together with price competition (Cambell-Kelly 2003); (5) the market failure of some notable major games (Kent 2001); (6) saturation of the market for home console systems (Cambell-Kelly 2003); and (7) the introduction of a new platform for playing games - the home computer (Cambell-Kelly 2003, Herman 2001).

Some of these explanations are not mutually exclusive, and they are referred to in the literature without any more detailed discussion and with little empirical research of the events that led to the crash.

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Despite the familiarity of the 1983 crash, no study has elaborated on the fact that crashes and shake-outs were a recurrent structural phenomenon of the video game industry during its first 15 years, with a number of severe crashes or major firm shakeouts occurring in every game platform after short periods of high growth. Subsequently, from the end of the 1980s and onwards, the video game industry entered a relatively more stable period without the same turbulence on an aggregated level as before.

This chapter reassesses existing explanations of the 1983 crash and then provides a coherent structural explanation of the turbulence that characterized the first 15 years of the video game industry, arguing that all of the early crashes and shake-outs shared similar structural characteristics. Without such an explanation, unrelated and limited explanations of these dynamics (such as the seven mentioned above) will remain nothing more than icing on the cake.

Method

This chapter presents a long-term historical account of the video game industry in which all of the early crashes and shake-outs during the period 1972-1985 are compared and contrasted, using the entire population of firms active in the market for various game platforms when possible. Two crashes and two major shake-outs are covered: the arcade shake-out of 1975, the dedicated console crash of 1977, the 1982 shake-out of arcades and the programmable console crash of 1983.

In this chapter, the term 'video games' refers to all forms of electronic games on various platforms (arcade, console, PC, handheld, etc.), unless otherwise stated. The term 'industry crash' refers to an event in which the majority of the firms in an industry exit within a short period of time (one or a few years) and the overall market for the industry is greatly reduced or eliminated during that period. The term 'shake-out' refers to a less dramatic event than an industry crash in which a large number of firms in an industry exit an industry within a period of a number of years and the decline in the industry (if any) is less rapid and less steep than in a crash.

Research Questions

This chapter addresses the following main question:

> Was there a structural dynamic behind the turbulent period of crashes and shake-outs in the video game industry during 1972-1986?

This question is then related to two other questions:

> If so, which factors were the primary driving forces behind this structural dynamic of crashes and shake-outs?
>
> Were firm exits a necessary structural adjustment to new market conditions and a prerequisite for further growth in the industry?

Video game industry and firm failures

Firm failures can be depicted in many ways. This chapter will concentrate on a firm exiting an industry, which in the video game industry led in many cases to firms terminating business activities and, in some cases, to insolvency and/or bankruptcy. It could be argued that firm exit is not a good indicator of a failure, since there may be other motives behind firm exits than that of a perceived failure in the market (e.g., ventures into other more profitable industries). However, the detrimental and severe effects of the crashes in the video game industry make such claims less relevant in this context. Moreover, it could be argued that in a high-tech industry (such as video games), with highly demanding manufacturing and development practices, the reorientation of a firm towards other types of products would involve such a major transformation that it would be impossible to call it the same firm.

Other problems emerge for studies connecting firm failures with other types of measures, such as bankruptcy and insolvency. Each measure represents a different sub-process and is related in different ways in terms of both time and meaning to the concept of firm failure and, thus, varies in explanatory stringency, depending on what kind of failure related process we are interested in studying (Carroll and Hannan 1995; Hannan and Carroll 1992).

One of the benefits of using firm exit statistics as a measure of firm failure is that it is closer in time to the actual process that led to the failure of the firm in a certain industry than, e.g., bankruptcy, which may occur a long time after the firm has actually been involved in the market. By using firm exits statistics rather than bankruptcy statistics, there are better opportunities for studying how the changing structural conditions in a certain industry impact the population of firms that are active. This increases the opportunity for studying the impact of industry-wide structural events, such as "creative destruction', which in some studies have been difficult to relate to the occurrence of bankruptcies (e.g., Grazer and Sjögren 1999).

In the literature that attempts to explain firm failures, two major perspectives dominate: firm-internal and firm-external perspectives. Firm-internal perspectives often emphasize the crucial role of management inefficiency, whereas firm-external perspectives point to the role of a number of changes in political, technological, social or economic factors beyond the control of the firm. Both perspectives take opposite positions on the old, but still disputed question of the extent to which managers have the capacity to affect the success or failure of a firm in periods of changing market conditions. Organizational ecology and many strands of strategic management are two examples of schools of research that represent opposite poles along this spectrum. However, as has been pointed out (Lindgren 1999), the two perspectives do not exclude each other, and studies that combine industry-wide dynamics with qualitative studies of the firms involved have the potential of

shedding some light on the interaction of selection due to structural factors external to the firm and the ability of a firm to dynamically change its capabilities (Dosi et al. 2001).

To understand the factors behind industry crashes and firm failures in the video game industry, the specific growth dynamics of industry must first be elaborated on.

Entertainment Industries and Video Games

Innovations in the form of new experiences are the backbone of most entertainment. Entertainment that is more traditional (e.g., music, movies, television, gambling, comic books, pinball and theme parks) has always been highly dependent on the constant introduction of new experiences (Vogel 2004). Video games as an entertainment form is characterized in particular by this constant urge for new variation in player experiences, where this is more closely connected to the exponential progress in digital technologies than most other entertainment industries. Throughout history, video games have always been able to make use of what new hardware has offered in terms of storage, processing and network capacity and to transform it into new player innovations.

This exponential trend in digital technologies had brought with it increased complexity of video games and of the development process.

Similar to other entertainment, video games compete for the consumer's free time. This creates opportunities for growth in that every moment of a consumer's life outside actual work involves a potential market for entertainment consumption. However, this free time is highly competitive and, to a certain degree, video games do not only compete with other video games but also with every other type of entertainment that is available. If one entertainment form stagnates for any reason, there is a risk that another form of entertainment will step in and take its place among consumers.

The uncertainties over demand that characterize a number of entertainment industries (Vogel 2004) are also characteristic of the video game industry, in which past successes can, to a limited degree, explain or be the key to future success.

Literally born out of the transistor logic and digital technology both in the production and exhibition stage, video games have had a unique ability to evolve and diversify in conjunction with the rapid evolution of new disruptive technologies that have characterized digital technology (Jörnmark et. al. 2005). Since its inception, digital technologies have been subject to rapid, exponential trends of increased capacity. The most famous of these trends is Moore's law, which, in its most common form, stipulates that there will be a doubling of the processing capacity (for the same price) every 18-24 months, also implying the halving of price for integrated circuits with a certain capacity during the same period (Moore 1965, Jörnmark et al 2005). Similar rapid

exponential trends have historically been common in many other digital technologies, including memory, storage and network technology.

For companies in the video game industry, this dynamic has meant that they have had to operate in an environment of constant innovations in which new hardware and software have inexorably driven previous versions out of the market in a process of creative destruction (Schumpeter 1943). New disruptive S-curves have constantly emerged (Christensen 2003), making industrial leadership in the video game industry difficult to sustain. New firms and firms from outside the industry have constantly built disruptive business models around new disruptive technologies that have had an advantage over inertia-plagued incumbents (Jörnmark et al 2005). The fast technological development has created numerous opportunities for firms to reap Schumpeterian quasi-rents through innovation, but the periods of time during which these have been able to be used as a competitive advantage has decreased. There are many examples of firms in the video game industry that have made huge profits in one year, only to have them turned into major losses the following year. As a result, the rise and fall of firms has been extensive.

Video game crashes and 3D: (1) Disruptive technologies; (2) Delimited differentiation; and (3) Decreased entry barriers and destructive liabilities of newness and smallness

While this chapter argues that *disruptive technology* has been a major source of restructuring and firm failure in the video game industry, disruptive technology by itself was a necessary though not sufficient structural condition for the more widespread crashes in the industry that within a short time forced a majority of the firms out of the market. Only when disruptive technologies were accompanied by delimited abilities for firms to differentiate themselves from other firms, a decrease in entry barriers and liabilities of newness and smallness that were destructive for the industry did such extraordinary and widespread events as industry crashes occur (Figure 1). When some of these factors were less prominent, lengthy shake-outs and restructuring efforts among video game companies made the connection between creative destruction and firm failure less direct. However, this does not mean that the process of creative destruction was not present in those cases; they could be instances of the less dramatic, normal case in which the process "takes considerable time in revealing its true features and ultimate effects" (Schumpeter 1943, p 83). Industrial crashes are those rare cases in which the effect of creative destruction becomes compressed in time, competition becomes cutthroat, restructuring efforts are critical and losses for firms are of a magnitude that make it impossible to wait for better times by relying on strong financial resources.

In the following sections, the impact of these 3D factors and their relation to the video game industry will be described in detail.

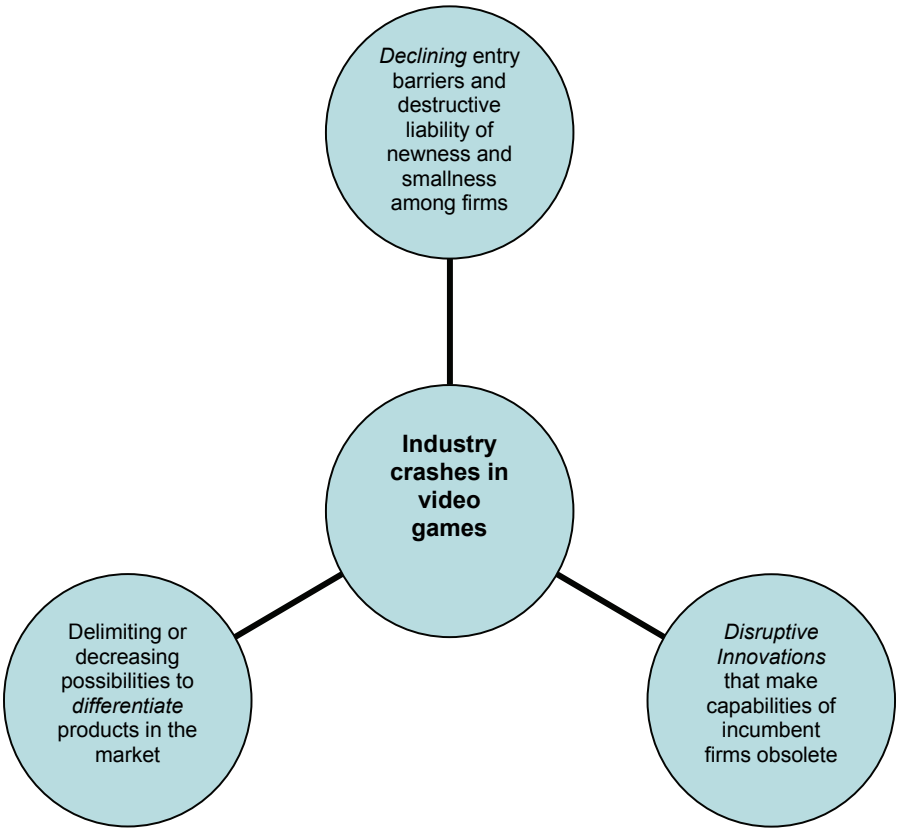


Figure 1. 3D factors that in combination caused the video game crashe, and that were factors underlying industry shake-out when not all were present to the same degree.

Disruptive technologies

For Schumpeter, the relation between firm failure and creative destruction through innovation was explicit and straightforward of competition. Although plausible, there are a number of problems in conducting empirical studies on the basis of this assumption. One is that the innovation process itself is so varied: there are numerous types of innovation in Schumpeter's definition of the term, all of which are very different in nature. When multiple forms of innovation are at work at the same time, the combined effects are far from straightforward. Another problem is that the entrepreneurial function in Schumpeter's later view was a function that could appear on multiple levels (the individual entrepreneur, firms, etc.), necessitating consideration of combined effects of multiple levels of analysis.

One single type of innovation -- technological innovation -- has dominated the evolution of video games, and it is mainly through new opportunities created by technology that new disruptive business models have been made possible (Jörnmark et al 2005). The simultaneous rapid obsolescence of established business models has made it difficult for many firms to adapt to the new circumstances.

In their study of the dynamics of technological innovations, Anderson and Tushman (1990) showed that in a number of industries radical innovation was often followed by a longer period of incremental innovation. They argued that these radical innovations, which they labeled technological discontinuities, could be either competence enhancing or competence destroying in relation to existing competencies and capabilities in the industry. Through struggles between rival designs, a dominant design often emerges (Anderson and Tushman 1990).

Clayton Christensen (2003) continued to study the effects of competence-destroying innovations on business models. He showed how common it is for established leading firms to fail when new technological innovations are disruptive in the sense that they (1) create new growth opportunities, (2) attract customers away from the core of the mainstream market and (3) make it difficult for incumbent firms to respond by developing a different value chain (Christiansen 2001). In the video game industry, disruptive technological innovations were experienced so frequently in the period under study that longer periods of incremental innovations were an exception rather than the rule.

Delimited differentiation

One of the most remarkable features of the video game industry is how increasingly differentiated it has become in the past 30 years. This increased differentiation has not only affected products but the distribution, marketing and service surrounding the products as well. Despite this, few have studied how this remarkable increase in differentiation relates to the growth dynamic

of the video game industry. In this regard, the video game industry is far from the perfect market of homogenous products characterized by equilibrium that Schumpeter criticized as being only a special case, but rather a market in which firms through differentiation constantly create special markets for themselves:

> Each firm in any sector of the system in which monopolistic competition prevails offer products that differ in some way from the products of other firms in the sector, and thus supplies a special market on its own. This product differentiation must be interpreted with reference to its rationale, the creation of such a special market, hence very broadly: it comprises not only 'real' but also 'putative' differences, not only differences in the product itself, but also differences in the services incident to supplying it (atmosphere and location of shops included) and every device that enables the buyer to associate the things he buys with the name of a particular firm Schumpeter (1939, p 63).

It is the ability of the video game industry to constantly break down barriers to increased differentiation, both in terms of hardware (Jörnmark et. al. 2005) and software (Jörnmark and Ernkvist 2004), that has been one of the major driving forces for growth in the video game industry and that has allowed it to avoid innovative lock-ins. However, this process of increased differentiation has not been smooth throughout history. In the early video game industry, there were fewer opportunities for firms to differentiate themselves from each other and, thus, technological lock-ins were common. The result was a turbulent period with rapidly changing opportunities for differentiation in which commoditization and crashes followed brief periods of rapid growth. Some platforms for games were better able to continue differentiation, and this - along with the fast pace of technological innovation - made them the focus of a continuous process of creative destruction.

Contemporary video games could be differentiated along a large number of dimensions, real as well as putative. In terms of product features, there is differentiation in both game hardware and game software. More putative differentiation exists in terms of brands, licenses, distribution channels and marketing. With such diversity, contemporary video games have been able to adapt to a large number of different tastes, and the diversity has increased the stability of the industry. However, this was not always the case (as argued later in this chapter).

Decreased entry barriers and destructive liabilities of newness and smallness

Barriers to entry have shifted considerably in the early video game industry. The erratic pattern of entry barriers has been the result of the combined effects of two tendencies: (1) increasing development costs and complexity; and (2) degree of modularity of production.

Increasing development costs and complexity. One side effect of Moore's law is a stead increase in development costs. As the processing capacity and the performance of other components have increased exponentially, the complexity of the production and development has resulted in increasing costs as well. This has been evident in both the hardware and software elements of the industry. Integrated circuit components are the most expensive material parts in game consoles, accounting for over half of the material costs (iSuppli 2005); For these parts, R&D costs, testing, factory and equipment costs have increased considerably, which has only been possible to manage through increasing economies of scale (Jones 2004). The same is true for game software, for which the increased complexity has resulted in a four-fold increase in game development costs for each new generation of consoles. Simultaneously, the number of persons involved in AAA game development projects has increased from one or a few people at the end of the 1970s to today's teams of >50 persons. Although the increasing development costs and complexity in hardware and software have increased entry barriers for new firms in the industry over the long term, sudden changes in the degree of modularity have rapidly decreased entry barriers in certain parts of the value chain in the short run, making it possible for new firms to enter the industry.

Degree of modularity. One common way to manage increased complexity is by breaking down a complex process into a number of interacting subsystems, which has been labeled the decomposability principle (Garud et. al. 2003). The basic problems with the degree of decomposability of a system are the problems and costs associated with coordination (Garud et al 2003). The costs and advantages of different degrees of modularity did have an overwhelming impact on a number of video game firms, since it created possibilities for a number of firms to enter the market in a previously closed part of the value chain. Subsequently, the increasing development costs and complexity that followed Moore's law put pressure on a number of these new, small firms in the market.

From the beginning, video games involved a system in which the complete design of hardware and software was so closely related that both operations were performed by the same video game firm (e.g., Magnavox and Atari), but then a number of changes in the degree of modularity made it possible for firms to enter certain parts of the value chain. The 'pong in a chip', the programmable console and the home computer are all examples (described in more detail later) of changes in the degree of modularity that affected entrance barriers in the industry.

Apart from development costs and degree of modularity of the system, the financial market and the expectations surrounding video games as a phenomenon have affected entry barriers as well. The financial market and its growth projections for the video game industry fuelled the

creation and growth of video game firms during certain periods, while it inhibited them during other periods. As argued later, the venture capital market in the U.S. was important for the number of U.S. game software firms entering the industry in the beginning of the 1980s and was also indirectly one important factor that contributed to the effects of the video game crash of 1983 being more severe in the U.S. than in Europe and Japan.

Destructive liabilities of newness and smallness. Organizational researchers have studied the lower survival rate of new (Stinchcombe 1965) and small firms (Aldrich et al. 1986) in many industries. The liabilities of newness have been explained by several factors, including lack of consumer trust in a new firm and the ability to support planning given the experiences, routines, fame, relationship, interaction and history of a new firm. For the liability of smallness, limited financial resources, human resources, skills, market presence and power have been suggested as factors of vulnerability.

When entry barriers rapidly decrease through the opening of a previously closed part of the industry (e.g., by increased modularity), the demographic of new and small companies increases, and many new entrants initially tend to be generalist firms rather than specialist firms (Aldrich 1999). A situation in which a large part of the industry contains firms that are both small and new is indeed a very fragile one that could be at high risk for firm failure in times of harsh business conditions. The effect could be even more damaging if the withdrawal of firms does not lessen the competition for those firms left in the industry but instead is destructive and makes conditions even more difficult by, e.g., firms dumping prices in an effort to sell out their entire remaining stocks of products at discount rates. This is what happened during both video game crashes (1977, 1983) and, as a result, market conditions became even harsher in the short term for the remaining firms in the industry.

Industrial crashes and shake-outs in the early video game industry

The 1975 arcade shake-out

Initially, many of the large established companies that made electromechanical pinballs and other amusement machines were reluctant to enter the electronic arcade market. Instead, two small California based companies, Nutting Associates and Computer Recreations, were the first to enter the market in 1971. However, due to premature technology, poor understanding of the market and unsuccessful game concepts, both endeavors failed. One year later a former Nutting Associates engineer, Nolan Bushnell, co-founded

Atari and took the simple Pong concept to the arcade. With its simple but enticing game play, it became an immediate success in the end of 1972. Pong was a true disruptive technology in relation to pinball and other electromechanical games. It earned more money, required less service and involved a different development process. At the time of its breakthrough, the electromechanical arcade business had been dominated by five Chicago-based companies (Gottlieb, Williams, Bally/Midway and Chicago Coin). They conducted business in a relatively stable environment with many incremental but few radical innovations. With the disruption of Pong, the whole market structure changed. A number of new companies started to develop Pong games and were soon followed by the older electromechanical game companies that tried to adapt their organizations to the new market. The arcade industry that involved one region, one technology and five companies in 1970 became a tale of two major regions (Illinois, Chicago and California, Silicon Valley), two technologies and twenty-seven companies in 1974 (Table 1 and Figure 3).

Initially, all of companies that entered the market made more or less similar imitations of the original Pong. Technologically, it was easy to make these imitations, and Atari itself even increased the incentive for the creation of such a market when its production capacities were far below the demand. Atari had the Pong market to itself in only a few weeks, and in 1973 seventeen imitators produced Pong games (Table 1 and Figure 3). When the traditional pinball manufacturers Williams and Midway/Bally entered the market, it became apparent that their superior manufacturing capabilities and developed distribution networks were a major advantage in the homogenous market. At the end of 1973, they had each sold as many Pong games as Atari (around 10.000 each, Baer 2005, p 95). The limited manufacturing capabilities and distribution network among many of the new Pong imitator companies constrained most of them from selling more than a few hundred Pong games. Interestingly, intellectual property protection did little to hinder a large number of companies from entering the market (see Baer 2005, p 130).

A study of the majority of the arcade games sold in 1972-1975 shows that the dominance of tennis-type Pong games in percentage of units sold was 87% in 1973, 38% in 1974 and 21% in 1975 (derived from Baer 2005, pp 10-13).

The reliance on a single concept was the result of a lack of innovative capabilities among the firms in the market combined with technological constraints. Many firms had no capacity to do other than imitate and manufacture games and at the same time technology placed such constraints on what was achievable that it was difficult to diversify into new game concepts that could compete with Pong. Atari and its fully owned company Kee Games was the first company to try to introduce new games in the arcade environment at the end of 1973. However, they initially failed to compete with the success of Pong (Cohen 1984, Kent 2001).

Table 1. *First electronic arcade game manufacturers 1972-1974*

Manufacturer	**Year of entering the market for electronic arcade games**	**Place of origin**
Computer Recreations	1971	California
Nutting Associates	1971	California, Mountain view
Atari	1972	California, Los Gatos
For-Play	1972	N/A
Allied Leisure	1973	Florida, Hialea
Amutronics (c/o PMC 1974)	1973	N/A
BAC Electronics	1973	New Jersey, Cherry Hill
Brunswick	1973	Illinois, Stokie
Chicago Coin/Chicago Dyn.	1973	Illinois, Chicago
Kee Games	1973	California, Santa Clara
Meadow games	1973	California, Sunnyvale
Midway MFG	1973	Illinois, Shiller Park
Mirco games	1973	Arizona, Phoenix
PMC	1973	Pennsylvania, Sothampton
RAMTEK	1973	California, Sunnyvale
See-Fun	1973	N/A
SEGA	1973	Japan
Taito	1973	Japan
US Billiards	1973	New York, Amityville
Williams (Seeburg)	1973	Illinois, Chicago
Bailey International Inc.	1974	N/A
Computer games	1974	Massachusetts, Hingham
Digital Games Incorporated	1974	California, Corina
Electra games (division of universal research lab)	1974	Illinois, Elk Grove Village
Electromotion Inc.	1974	N/A
Exidy	1974	California, Palo Alto
HID/Visco Games	1974	N/A
JRW	1974	California, Sunnyvale
UBI	1974	New Jersey, Union
Volley Industries	1974	Canada, Montreal

Sources: International Arcade Museum, Arcade History Database, Ralph Baer etc.

As long as there was a homogenous product market, consumers' appetite for new entertainment experiences could not be quelled. By the end of 1973, the first signs of harder times in the industry appeared. In a memorandum from the November 1973 MOA (Music Operators of America) expo, the "father of

video games', Ralph Baer (2005, p 96), described the lack of differentiation in the market:

> Right about time of show, business takes nose dive – Why ? – General panic in industry – little guys starving – Midway Mfg only making about 50 units/week – ATARI "struggling', I'm told…– Best guess as to cause: Everybody copies each others game – basically ATARI's design – creative engineering practically non-existent – public suddenly fed-up with 28 x same damn thing! Moral: Nobody knows for sure; but best guess is GAMES WILL SELL BIG, IF they're different, challenging – must provide "hand-to-hand combat' between players, lots of action, noise, not readily "learnable' games.

During the following years, a shake-out occurred in the arcade industry in which a large number of small manufacturers were forced out of the market. The number of firms entering the industry declined during the 1974-1977 period; at the same time, the number of firms exiting increased (Figure 3).

When the capability to develop new innovative games became crucial in the competition, none of the smaller imitator companies that had entered the market survived in the business. Although statistics over the early arcade industry are unreliable, marketing data from the major industry magazine of the time indicate that the arcade industry decreased by more than 50% between 1974 and 1975 in terms of units sold (Baer 2005, p 10-13). As a result, in 1977 the number of competing firms actually decreased in the industry (Figure 3). It was a clear case of the structural inertia of companies and their inability to adapt to changing market conditions

Of the 3D factors, low entry barriers and a lack of differentiation were present in the market. The liability of newness and smallness made many of the smaller companies vulnerable when market conditions became more competitive. Being small, generalist companies could not adapt to the change from a homogenous to a diversified market that required innovative specialist companies. The exits that followed were not destructive but rather increased the possibilities for the innovative companies that were left in the market to regain growth and profit margins. The absence of a disruptive technology meant that not all of the elements necessary for a crash to occur were present, but enough for a major shake-out of firms with an organizational form ill-suited for adapting to the new capabilities that were required. In the new diversified market reliant on a larger number of game concepts, the capability to constantly innovate new games became a competitive advantage.

The shake-out in the arcade industry was a necessary adjustment to the changing requirements in the industry. The exit of the imitators from the market did not only increase the pressure to innovate, but it also opened up a resource space that could support companies with innovation capabilities (such as Atari and Midway) as their main competence in the market. The

result was a new wave of firm entrances from 1978 to 1980 in which a larger number of firms with a combination of manufacturing and innovative capabilities entered the market (Figure 3). At the same time, the number of firm exits in relation to firm entrances was considerably lower during the same period. Most of the innovative firms in this new entrance wave were Japanese firms (Konami, Namco, Nichibutsu, Irem, Data East [DECO], SNK and Banpresto all entered the industry during 1978-1980). Whereas many of those innovative Japanese companies would have considerable success in years to come and produce a large number of arcade titles, most of the new U.S. companies that entered during this period were less competitive and were, thus, forced out of the market during the arcade shake-out in 1982. The constant diversification into new game concepts from 1978 to 1981 by numerous Japanese companies together with Atari, Williams and Midway intensified the process of creative destruction that facilitated the highest growth period in the history of the arcade industry, depicted as "the golden years of the arcade".

Figure 3. Entrants, exits and number of competitors in electronic arcade games from 1971-2000

Source: Author's analysis of Arcade History database, KLOV database, PlayMeter, Baer 2005.

The 1977 console crash

> …the appearance of General Instrument's AY-3-8500 game chip in March of 1975 changed everything – forever. Suddenly anybody would soon be able to produce a high quality Pong-like video game for home use.
>
> Ralph H. Baer, inventor of the video game console, (Baer 2005, p 92)

The early console industry had a similar dynamic of delimited differentiation and decreased entry barriers that characterized the early arcade industry. However, the subsequent introduction of disruptive technologies in the form of programmable consoles and handheld games was a decisive change that contributed to a full-scale industry crash in 1977.

Magnavox Odyssey (1972), with a simple Pong-type game as its major game, was the first video game console. The technology that was used (a large number of analogue discreet components) constrained it in several ways: it contained no sound and no scoring, had blurry graphics and involved a costly, labor-intensive manufacturing process. As a result, it never became a profitable business for Magnavox (see Baer 2005, p 91). Subsequently, the rapid progress in digital technology made it possible for the whole Pong game concept to be incorporated into a single integrated circuit chip with the benefit of considerably lower manufacturing costs and increased game quality. In a market effect similar to that with the introduction of single chips in the personal calculator market (Braun and Macdonald 1982), sales skyrocketed when Atari entered the market and released the first single chip Pong in 1975. As with Pong, Atari's manufacturing capacity was limited, and demand far surpassed supply by Christmas of 1975. A large number of the available U.S. chip manufacturers at that time swiftly developed their own Pong chip, which they introduced during 1976 and 1977 and sold on the open market for 5-10 USD. With the help of the chip, basic assembling capabilities were the only thing necessary for firms that wanted to enter the lucrative market for Pong consoles. Throughout 1976 and 1977, established and newly started companies rushed into the market to manufacture Pong consoles. As a result, the Pong console market went from a market of 7 companies introducing pong consoles in 1975 to 34 in 1976 and 82 in 1977 (Table 2)[2]. The growth was almost entirely based on the introduction of the 'Pong in a chip'. The number of systems introduced using Pong in a chip increased from 1 (Atari) in 1975 to 54 in 1976 and a record high 162 systems in 1977 (Table 2).

[2] These numbers only include those Pong systems with identifiable manufacturers and introduction year; the actual number of manufacturers in 1976 and 1977 was probably higher. One source estimates the total Pong market to over 500 models from 300 manufacturers (see Winter 2006).

Table 2. *The rise and fall of the Pong console market*

Year	Manufacturers releasing a Pong console	Pong models released	Systems introduced using analogue technology or a large number of digital components	Systems introduced using dedicated Pong chips	System released in North America	System released in Europe
1972	1	4	4	0	4	0
1973	0	0	0	0	0	0
1974	3	5	5	0	2	3
1975	7	10	9	1	5	5
1976	34	62	8	54	50	12
1977	82	162	0	162	60	101
1978	29	36	0	36	8	27
1979	6	8	0	8	0	8
1980	0	0	0	0	0	0
1981	3	3	0	3	1	2
1982	4	4	0	4	0	4
1983	2	2	0	2	1	1

Source: Derived from Pong Story Rarity Database (Winter 2006).

Despite the success of dedicated consoles in 1976, the market crashed in 1977 when all 3D factors were present and together led to the dedicated Pong console crash. In terms of differentiation, it was a highly homogenous market in which every company relied on the same Pong game concept and few product features distinguished the companies. In 1977, an increasing number of consumers in the U.S. had grown tired of Pong consoles. At the same time, the programmable console (introduced in 1976) and handheld games (introduced in 1977) were two disruptive technologies that both had distinctive advantages over the dedicated Pong consoles. Whereas handheld games offered the opportunity for cheap, simple games at a lower cost and ubiquitous playing possibilities, programmable consoles offered a diversity of new types of game. When these new disruptive technologies started to make their impact on the market in 1977, production and stocks among the manufacturers of dedicated pong consoles were record high. At Christmas of 1977, supply far exceeded demand. The market crashed, and during the course of a few months, the market for Pong consoles completely disappeared (Table 2). A cutthroat price war followed in which Pong manufacturers sold off their stocks far below manufacturing costs (Herman 2001, Cohen 1984). With few exceptions (Atari, Coleco and Magnavox), almost all of the U.S. manufacturers of dedicated consoles left the video game market in 1978 and never reappeared. The same pattern was repeated almost identically in the European market, with the exception that the market became saturated a few months later in some European countries. The large number of firm failures in the 1977 crash was closely connected to the decreasing entry barriers in the industry and the liability of smallness and newness among the firms.

There was a mismatch between the capability endowments among the companies in the population of firms in the dedicated home console market and the innovative capabilities needed for long-term growth in the console industry through further innovations. Most of the Pong manufacturers had only basic assembly capabilities, while the semiconductor manufacturers that made 'Pong in a chip' had neither the knowledge of the game market nor the capabilities to develop new game concepts. In the short-term free riding on the success of the Pong concept and production increases gave firms competitive advantages, but for long-term growth new innovative concepts had to be developed. Driven by the introduction of the programmable consoles, there was a shift of this kind in the market from the imitators to the innovators, with accompanying advantages, but most companies could not make the transition. In statements that were similar to those that would later be made in conjunction with the 1983 crash, many contemporary analysts claimed that the 1977 crash was the end of a short video game fad, similar to the problem that other digital consumer industries experienced at that time (Braun and Macdonald 1982). Initially, the price war had a negative impact on the market for programmable consoles as well, and only two (Atari and Coleco) of the five companies that released programmable consoles in 1976-1977 were able to stay in the business (Table 3). Atari could remain in the video game market despite heavy losses due to the financial stability of Warner, which had bought the company in 1976 and continued to believe in a future for the disruptive programmable VCS console that Atari had released in 1977.

The combined effect of various disruptive aspects of the programmable console and the handheld game made the crash even more severe. Whereas the cheap but simple handheld games provided considerable advantages in terms of cost and ubiquitous gaming in the short run, programmable consoles provided considerable quality advantages through differentiated gaming opportunities in the long run.

Handheld games were made possible because of the opportunities created by the rapidly declining costs of integrated circuits and LED display technology. By showing that it was possible to play electronic games on other screens than television and by providing cheap game playing opportunities anytime and anywhere, handhelds created new markets for digital games and showed the adaptability of the game medium to new technologies originally developed for other purposes[3]. Toy companies from the U.S. (Mattel, MB) and later Japan (Nintendo, Bandai, Tomy) dominated the market (Gielens 2000). Although handheld games were able to capture new market segments, the inseparability of hardware and software stifled innovation in software and created a rather homogenous product market. That did not change until

[3] The first handheld games were greatly influenced by the handheld calculator technology. Both the LED display and the chip used in Mattels first handheld games had those effects.

the Nintendo Game boy was released in 1989. Instead, new possibilities for creative destruction in hardware and software were made possible with the development of programmable consoles that brought video games back on a path of growth that lasted for five years.

Table 3. *Programmable console systems released from 1976-1982*

Company	Name	Nationality	Year introduced	Number of games produced	Games developed until	Number of units sold (million)	Companies other divisions
Fairchild	Channel F	USA	1976	26	1979		Integrated circuits
Bally	Astrocade	USA	1976	50	1983		Amusement machines, gambling machines
Atari	VCS/2600	USA	1977	500	1992	30	arcade games, home computers
Coleco	Telstar Arcade	USA	1977	4	N/A		Plastic products, leather articles
RCA	Studio II	USA	1977	N/A	N/A		Radio, TV
Interton	VC 4000	Germany	1978	40	1982		Family business making hearing aids
Magnavox (US subsidiary of Philips)	G7000	USA/ Holland	1978	50	1984	2	TV manufacturer
APF	M1000	USA	1978	12	1978		stereos, calculators
Mattel	Intellivision	USA	1980	125	1990	3	Toys
GCE/Milton Bradly	Vectrex	USA	1982	25	1985		MB:Toys
Coleco (CBS)	Colecovision	USA	1982	100	1985	4	Plastic products, leather articles
Entex	Adveture Vision	USA	1982	4	1982	0.05	
Emerson Radio corp	Arcadia 2001	USA	1982	35	N/A		Radio, TV
Hanimex	HMG 2650	Asia	1982	30	1983		
Atari	5200	USA	1982	70	1986		arcade games, home computers

Source: Forster 2005, Herman 2001.

Although programmable consoles were released in 1976-1977, it took a few years for their true innovative potential to reveal itself, i.e. not until a large number of diversified innovative software products had emerged and created a positive upward spiral, most visible for the Atari VCS/2600 (Table 3). The programmable consoles separation of hardware and software into two separate modules (console and cartridges) spurred the creation of the differenti-

ated software market and provided a way out of the destructive 3D factors behind the Pong console crash.

The new business model for the programmable console has often been compared to that of Gillette razor blades, in which the razors themselves (the console hardware) provide the less profitable (or even loss generating) but more long-lived part of the business while the razor blades (the software) provide the profitable but more short-lived part of the business. One of the results of the business model was that it involved considerable network externalities for the hardware, and sales tended to be increasingly concentrated to one or a few console systems on the market. The R&D costs, marketing efforts and software capabilities required comprised some of the entrance barriers to the programmable console hardware market of the late 1970s, distinguishing it from dedicated consoles. As a result, in 1976-1982 only 15 programmable systems were released, a major difference as compared to the many hundreds of dedicated console systems (Tables 2 and 3). Of those 15, Atari's unit sales were more than seven times that of its closest competitor Mattel.

With the separation of softwar from hardware, the successful operation of a software development project was not dependent on the performance of hardware development. The modular system of the programmable console enjoyed all the potential benefits that research has provided to modular systems (Garud 2003), such as increasing speed, scoop and reach of innovations, the continuous reuse of system parts and a higher degree of stability (Table 4). The programmable console could also reap the benefits of the prolonged learning process involved in game development. As the hardware became more complex, learning what the hardware was capable of in terms of games increasingly became a discovery process for game developers, a process that unfolded over time. Many new innovative game concepts were discovered several years after the first programmable consoles were introduced. Nonetheless, the variety and innovative games that were possible on these first, technologically very constrained systems, were remarkable and an important source of growth for the industry. Such a differentiation in games had not been possible if it had not been for the malleability of software in relation to hardware, accurately described by the legendary game developer John Carmack:

> Software is so wonderful in a unique way. The people who set up for a physics experiment spend a year of preparation time, tooling around doing things. And then you spend another year analyzing it. With software you can have an epiphany and just sit down and hash it out. You can make it happen right there. It's the most malleable media to be working in for any kind of intellectual pursuit.
>
> John Carmack (Colayco 2000)

Table 4. *Different systems of innovation: dedicated consoles, programmable consoles and home computers*

	Dedicated consoles (1972-1978)	**Programmable console (1976-)**	**Home computer (1977-)**
Degree of modularity	One module consisting of both hardware and software. Initially many discreet components, but in 1975 Atari introduced the first 'pong in a chip'.	Two freestanding, compatible modules: console hardware and software (cartridges)	Two freestanding, compatible modules: console hardware and software (magnetic cassettes and disks).
Business model	Profits from the sales of the console. Market concentrated to Christmas sales.	Razor and Blade 'Gillette model', low or no profit margins on the hardware (console), high on the software (cartridges). Market increasingly year round.	Profits on both the sales of hardware and software, but no Gillette model. Year round market.
Market characteristics	No network externalities. Homogenous market characterized by price competition. Decreasing entry barriers spurred firm entries.	Considerable network externalities. Positive feedback loops between hardware and software favored the creation of one dominant hardware company (Atari). Subsequently (1979-), many software companies entered the market.	Network externalities in hardware. A large number of i firms initially, but only a few were left after a few years. Homogenous hardware market, but heterogeneous and diversified software market.
Reuse of system parts	No reuse of system parts	Reuse of the hardware (console) for several games. No possibilities to reuse the software (cartridges)	Reuse of hardware for several games and other programs. Possibilities to reuse software medium (disks and tapes) as well.
Stability and risks	Reliance on single concept increases the risk. Innovation in new software is risky: if a new game concept fails the total production of the game console suffers.	Lower risk of innovation. If a new game concept fails, only the cartridges fail. Diversity in software decreased the risks involved in reliance on a single game concept.	Production risk of game disks and game tapes lower than for game cartridges (they do not have to be produced in batches, but on demand). The large number of incompatible systems initially involved the risk of supporting the wrong system.
Innovations (speed, scoop, reach)	Imitation of successful game concepts. Reliance on single game concepts makes for a less risk-taking market where it is more difficult for differ-	Enhanced speed, scope and reach of innovations. Innovations occurring continuously in software. Game software development becomes a profes-	High speed and scoop, moderate reach of innovations. User-created software makes possible a huge variety of tastes close to actual demand.

	entiated tastes and niche concepts. Single game concepts limit the adaptability to different tastes.	sion. Heterogeneous software market reaches more differentiated tastes.	Heterogeneous software market, but the home computer had less market reach because of its high price and relatively complicated use.
Development Process	Only a few companies did any software development; successful concept was imitated by chip manufacturers and sold to a large number of assemblers.	Initially software development in-house by the hardware manufacturers. Subsequently (1979-), a large number of independent software developers joined the market. Programming knowledge difficult to acquire.	Software development by users possible and common, a number of hackers started their own game software development companies.
Entrance Barriers	Low entry barriers in 1976 when the core component (Pong in a chip) containing the game became available on the open market. No need for any substantial capabilities in either hardware or software for manufacturing.	Initially, high entry barriers because of a more complicated development process and the need to initially have capabilities in both software and hardware development. At the end of the console cycle, entry barriers decrease in both hardware and software.	Initially low in software. A skilled user could develop and distribute self-made games as the home computer was programmable. Later on, marketing capabilities and financial strength became more important. Higher and increasing entry barriers in hardware.
Differentiation	Homogenous market. The only differentiation appears in marketing and appearance of the products.	High differentiation in software, less in hardware.	Very high differentiation in software. Initially, the market consisted of both console games and new adventure games.

The Video Game Crash of 1983

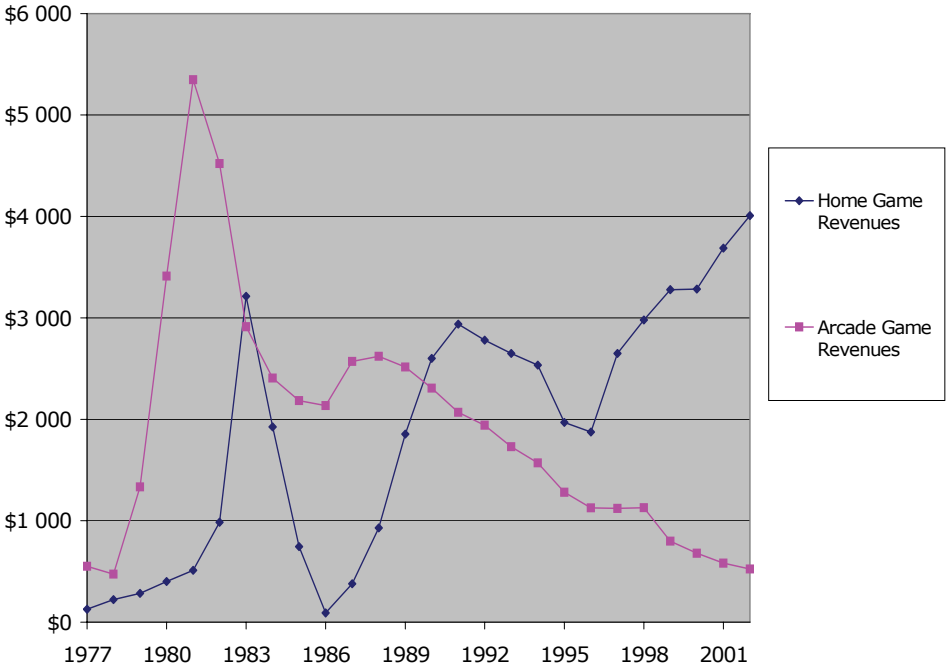
> This most visible aspect of the computer revolution, the video game, is its least significant. But even if the buzz and clang of the arcades is largely a teen-age fad, doomed to go the way of Rubik's Cube and the Hula Hoop, it is nonetheless a remarkable phenomenon.
>
> Otto Friedrich, TIME, January 3, 1983.

Among video game historians, 1983 has been synonymous with the video game crash. For many, the crash was viewed as an exceptional event requiring equally exceptional explanations. However, the same 3D dynamics of disruptive technologies, delimited differentiation possibilities, decreased entry barriers and destructive liabilities of newness and smallness of the industry that characterized the 1977 crash were the main driving forces behind the

1983 crash in video game consoles. The US arcade market also decreased around the same time that the programmable console market crashed, but the decline of the arcade market took longer, was less deep and was not as rapid. It is, therefore, better depicted as a shake-out than a crash (Figure 2).

In the course of the two last months of 1982, the general perception of video games in the U.S. changed from being the future of entertainment to a teenage fad (Marbach 1982, Friedrich 1983).

Figure 2. U.S. home game vs. arcade sales (millions of dollars, inflation adjusted to 1983 year's value)



Source: Williams, D (2005). *Note*: the accuracy of some of these figures can be questioned, especially for the home game market in the U.S. However, the general trend is most probably accurate.

The fall of the arcade market

Of the 3D factors, declining entrance barriers, delimited differentiation and destructive liabilities of newness and smallness characterized the arcade industry in the beginning of the 1980s.

By 1980, the arcade market had grown bigger than the pinball industry. It was a process of creative destruction in which the old electromechanical pinball market in the arcade halls was destroyed and new markets for arcade video games were constantly being created. As arcade games promised high

returns and easy maintenance, they soon became attractive for far more venues than the original pinball venues (penny halls and bars) and invaded restaurants, liquor stores, gas stations, shopping malls, motels, convenience stores and various other locations.

The declining entrance barriers did not only attract new venue owners but ordinary people as well. A number of firms emerged in the beginning of the 1980s, offering small-scale investment opportunities to individuals to buy or lease a few arcade games at various locations. However, a number of frauds plagued the market, and when it was legal, less attractive locations and arcade games were often offered (Changing Times 1982). Among operators, the risks of liability of newness increased. In 1982, signs of over saturation emerged in the arcade market as an increasing number of operators reported decreased profits or even losses. In most parts of the U.S., arcade games had expanded into virtually all desirable public places and, thus, a further differentiation into new public places could only be achieved through less competitive venues. The number of video game arcades doubled between 1980 and 1982, but the average revenues from coin-operated games decreased from 140-150 USD/week in 1981 to 109 USD/week in 1982 (Thomas 2005).

Not only did differentiation opportunities in operation stagnate in 1982, but differentiation in relation to the essential foundations of the arcade business - the arcade machines and the entertainment experience they offered - also stagnated during this time. The 'golden age' (i.e. 1978-1981) of arcade games had been a period of increased differentiation characterized by continuous innovation of new arcade games. Some of the most successful and innovative arcade games from Japanese and U.S. companies emerged in 1980 and 1981: Space Invaders (Atari, 1980), Pac Man (Namco, 1980), Defender (Williams, 1980) Donkey Kong (Nintendo 1981) and Ms. Pac Man (Namco/Midway 1981). By 1982, the development of new innovative games had already started to decline, and growth in the arcade market was "stymied by an unexpected halt" (Business Week 1982). Operators hoped that new technologies in the form of laser disc arcade games would revitalize the market in 1983. However, for several reasons (most notably lack of interactivity, maintenance problems and the expense of the products) they turned out to be a technological dead end, and consumers lost interest in the new technology within a year.

During the 1982-1984 period, revenues in the U.S. industry dropped nearly 50% (Figure 2), and the total number of arcade manufacturing firms decreased worldwide (Figure 3). Unlike the more vigorous Japanese arcade market, the arcade industry in the U.S. had some subsequent (brief) periods of upswing but never again of growth (Figure 2). For U.S. manufacturers and distributors, the large quantity of unsold equipment in 1983 and 1984 proved fatal. Operators were squeezed out of the market by both a declining number of visitors and the price war that followed when a number of operators offered game playing at greatly reduced prices. Japanese arcade companies

with a healthy domestic market, high degree of operational efficiency and larger quantity of innovative games managed to survive and even increase their market share in the U.S. Today, there is no U.S. company manufacturing arcade games on a large scale.

The largest U.S. arcade companies at the time of the crash were Atari (mainly manufacturing) and Bally/Midway (operation and manufacturing). Their development during the shake-out shows how difficult it was, even for the largest U.S. companies, to survive during this period. Because of financial difficulties, Warner sold the arcade division of the company to Namco (Japan) in 1984. In contrast to Atari, Bally tried to stay in the business throughout the arcade shake-out, but the price was high. Staggering losses in the amusement game division of the company in 1983 and 1984 forced it to implement a 122 million USD restructuring plan in 1984, through which the division - after considerable downsizing and inventory write-offs - became profitable again in 1986 (Table 5). But the restructuring plan could only halt the financial losses and not create opportunities for growth. The revenues of Bally's amusement game division continued to decrease rapidly during the period from1983 to 1988, when the company sold the division to WMS Industries.

Table 5. *Bally Amusement games and services division*

	1983	**1984**	**1985**	**1986**	**1987**	**1988**
Revenues (million USD)	327.5	264.2	177.0	127.7	121.1	109.3
Operating income/loss before restructuring provision (million USD	-56.5'	-92.0'	-1.2'	19.7	23.4	20.5
Provisions for restructuring amusement game business (million USD)	0	-121.7'	0	0	0	0
Operating margin, percentage (excluding restructuring provision)	-17.2	-34.8'	-0.6'	15.4	19.3	18.8

Source: Bally Annual reports

The fall of the programmable console market

The events surrounding the 1983 programmable console crash displayed all of the 3D factors: disruptive technologies in the form of home computer games, delimited differentiation as more and more similar games were made for the ageing Atari VCS game machine, decreased entry barriers and devastating liabilities of newness and smallness.

The 1979-1981 period in programmable consoles was a very innovative one, with an increasing number of differentiated games of high quality appearing each year. Until 1979, Atari was the only company making games for its VCS console. There was a severe shortage of skilled game designers

in the industry, and by 1979 Atari had only twelve game developers, according to one of its game designers (Dolan 2001). When four of these left Atari in 1979, they created Activision, the first independent video game company to develop game software exclusively for the consoles of other companies. Atari threatened with litigation, but the parties settled on a (still existing) business model, according to which independent game developers had to pay a percentage of their game sales in royalties to the platform manufacturer.

One result of the litigation was a rapid increase in new independent game developers in 1981 and 1982. According to the most complete database, 158 companies released games for the Atari VCS (AtariAge 2006). Most of these companies only released a few games before the market crashed. The rapid entry of firms in the U.S. was fuelled by a vast amount of venture capitalist funding that witnessed all of the elements of a lucrative market in video game development: potentially high growth, relatively low entry barriers and an opportunity for quick, high rewards (Riley 1982). There were, however, risks with the liability of newness and smallness among the many new video game developers. Because of the lack of talented game programmers, most of them did not have the capabilities to compete on the same mass-market game genres with Atari. Their financial situation was also very fragile in that venture-capital financed companies were without a long-term commitment to the industry. When the market shifted, most of the small independent video game companies were forced to out of business and sold off their remaining stocks of game software at prices far below original prices (see, e.g., Herman 2001, Kent 2001, Cohen 1984).

In the increasingly crowded and competitive market, diversification was necessary in order to avoid commoditization. However, real as well as putative differences were increasingly difficult and costly to achieve. A number of companies tried to differentiate their products by relying on famous licenses from movies, music and other entertainment industries. Other companies tried unsuccessfully to exploit new niches, such as adult games. When manufacturers of other programmable consoles started to release games for Atari VCS as well because of its dominating market position (Table 2), the market for Atari VCS games became even more saturated. The majority of the new video game software firms released games of substandard quality, but even Atari lost much of it previous innovativeness (Cohen 1984). The increased competition and the demand for video game companies to differentiate their products increased licensing costs in the video games industry dramatically. The peak of this development was when Atari licensed a game based on the movie E.T. from 1982 for around one million USD, a game that became the single largest commercial failure for a game in Atari's history (Cohen 1984, Herman 2001, Kent 2001). Entry barriers for hardware also decreased, and it became possible for Coleco in 1982 to release the Colecovision console that could play Atari VCS as well (Herman 2001).

Because of the crash, average prices decreased for both video game hardware and video game software in 1983. (Table 6), and the market for video games continued to decline until 1986, when the market is claimed to have reached a record low of 100 million USD (according to Nintendo of America, Figure 2).

Decreased entry barriers, diminished opportunities for differentiation and liabilities of newness and smallness might not have created a full-blown crash if it had not been accompanied by disruptive technology in the form of the home computer. When programmable consoles failed to innovate, the home computer was able to continue the process of creative destruction. Initially, the introduction of the home computer in 1977 had no large influence on the video game market, but as Moore's law continued and the market grew, the home computer had more and more of an effect on the video game market. In many ways, the home computer represented a completely different business model (Table 4). One important difference was that it was possible for individual talented users to program their own games. As a result, the number of game titles released for home computer systems initially far exceeded the number of games released for video game consoles (Forster 2005). Production on magnetic tapes or disks could be made on demand and did not require large stocks of expensive cartridges. Many believed that the general-purpose home computer would completely take over the market for consoles. In fact, the market trend in the beginning of the 1980s seemed to support this view. Whereas cartridges and hardware sales for consoles declined between 1982 and 1983, sales of entertainment software for home computers more than doubled during the same period (Table 4).

Despite the innovative lock-in, consoles had a future as a playing machine. In 1985, Nintendo introduced in the U.S. their NES/Famicom console, which could do nothing but play games. Nintendo had a strategy of comprehensive quality testing and put all their effort into a few, well developed titles (Sheff 1993). In contrast to the Atari VCS, it could play new innovative games in the form of long adventures (such as Super Mario, Final Fantasy and Zelda). NES became the most successful console system to date, with sales of almost 63 million units world wide, twice as many as Atari VCS (CESA 2005). It is worth noting that a crash never occurred in the market in Japan in 1983. In contrast to the U.S. market, the 3D factors were not present to the same extent. The population of firms was larger and more stable, differentiation was sustained by the successful introduction of Famicom in 1983 and the home computer never had the same disruptive effect.

Table 6. *Retail sales of video game consoles and home computers*

		1981	1982	1983
Video game consoles	Units	4,620,000	7,950,000	5,700,000
	Value, USD	577,000,000	1,320,000,000	540,000,000
	Value/units USD	125	166	95
Video game cartridges	Units	34,500,000	60,000,000	75,000,000
	Value, USD	800,000,000	1,500,000,000	1,350,000,000
	Value/units USD	23	25	18
Home computers	Units	360,000	2,261,000	5,027,000
	Value, USD	393,000,000	1,400,000,000	1,900,000,000
	Value/unit	1092	619	378
Entertainment software	Value	18,000,000	157,000,000	405,000,000

Source: Derived from Campbell-Kelly (2003, p 276).

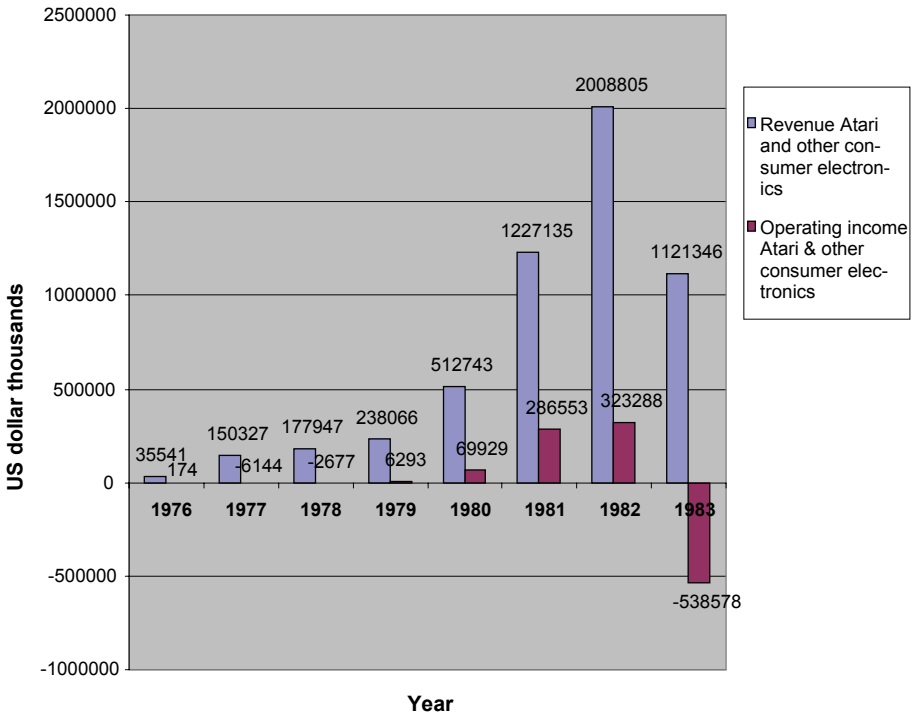
Atari's fall

As the leading video game company of the 1970s, Atari experienced such a high growth rate (Figure 4) that it was labeled the fastest growing company to that point in US history in 1980 (Herman 2001). In the crash 3 years later, Atari made several attempts to restructure its business, adapt new strategies and change ownership, but none of these attempts was able to get the company back on a path of growth. As the dominant company in the industry, Atari had enough influence not only to react to changes in the industry but also to use its dominant position to try to change the structure of the industry to its advantage. In the beginning of the 1980s, Atari began to monopolize the market, and the company came to be mismanaged both internally and externally. *Internally,* there were conflicts between management and the creative personnel of the company. As a result, many key game developers left the company and started their own business when the opportunity arose. In order to retain its talented personnel, increasingly high bonuses were paid to those that stayed, which proved to be a substantial burden once the market experienced a down turn. *Externally*, Atari had started to mismanage its distribution in a way that made it more difficult to match supply with actual demand. One result of this was that retailers had to sell stocks of lower quality games in order to receive new ones (Dolan 2001, Cohen 1985). More important, however, was Atari's decision in 1981 to force retailers to order the entire stocks of games in advance for 1982 (Cohen 1985, Kent 2001). Having experienced shortages in previous years, retailers placed huge orders for the following year. When the demand did not meet the supply at the end of 1982, distributors were faced with huge inventories of unsold cartridges.

When the price war over games software started in 1983, Atari initially tried not to follow suit. However, the >500 million USD loss of the Atari division of Warner in 1983 (Figure 4) put the entire Warner Communications into financial difficulties and forced it to sell Atari's home video game

and home computer division to Jack Tramiel in 1984. Before the transition, Warner dumped huge stocks of unsold software on the market, which exacerbated the crash (Activision 1985, p 1). For several reasons (Kent 2001, p 230), Atari also failed with the introduction of its predecessor to the Atari VCS in 1982, the Atari 5200 (Table 3). Although Atari under Jack Tramiel's ownership first tried to concentrate its efforts on the home computer market and later recapture the video console market, both of these endeavors failed, and today only the name and the physical assets of the former company remain.

Figure 4. Operational results, Atari and other consumer electronics division of Warner



Source: Warner annual reports

Concluding remarks

The history of the video game industry can be described in relation to two periods: an unstable one (1970-1986) in which industry-wide crashes occurred in an immature industry and a more stable one (1987 onward) during which a more mature industry did not experience industry-wide crashes.

Industrial crashes that force an entire population of firms to exit an industry within a short period of time are rare in most industries. In the video game industry, this was the characteristic recurrent feature during the first period (1972-1985) of the industry. This chapter has argued that all of the four crashes and shake-outs that characterized this turbulent era shared a similar structural dynamic and can be explained on the basis of the combined effect of 3D factors: disruptive technologies, delimited differentiation, decreased entry barriers and destructive liabilities of newness and smallness. When all of these factors are present, they reinforce each other in a vicious downward spiral, which, in turn, results in a crash. The decisive impact of those 3D factors on the video game industry can be explained by the permeating influence of the process of creative destruction. Driven by a rapid pace of new technological innovations in the industry, a constantly new and differentiated playing experience was necessary for growth in the industry. It was by constantly creating special markets on their own through real as well as putative differences that firms could avoid commoditization. In the early video game industry, opportunities for differentiation were limited and innovative lock-in common. However, whenever one game platform stagnated, another one often emerged and continued the process of creative destruction. There were constant discrepancies between the capabilities of the majority of the firms and the capabilities needed for further growth. When an industry crash occurred, firms had little opportunity to change their capabilities, and failure was inevitable for most of the firms in the industry. In many regards, the crashes were a necessity for the industry to return to a pattern of growth.

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