Wherever Hardware, There'll be Games: The Evolution of Hardware and Shifting Industrial Leadership in the Gaming Industry

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ABSTRACT

The paper concerns the role of hardware in the evolution of the video game industry. The paper argues that it is necessary to understand the hardware side of the industry in several senses. Hardware has a key role with regard to innovation and industrial leadership. Fundamentally, the process can be understood as a function of Moore's law. Because of the constantly evolving technological frontier, platform migration has become necessary. Industrial success has become dependent upon the ability to avoid technological lock-ins. Moreover, different gaming platforms has had a key role in the process of market widening. Innovatory platforms has opened up previously untouched customer segments. It is argued that today's market situation seems to be ideal to the emergence of new innovatory industrial combinations.

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Keywords
Innovation, market widening, hardware, arcades, pinball, consoles, proprietary business models, Moore's law, ubiquity, player interaction

Introduction

This paper concerns the development and importance of hardware in the evolution of the video game industry. In a theoretical sense, the evolution of the video game industry was described by Josef Schumpeter in 1911 [14] and Allyn Young in 1928 [18]. This paper builds on the insights that were provided by these social scientists.

Schumpeter's typology of innovation describes the evolutionary path that the video game industry has followed. In a strict sense, video games were the first truly digital entertainment medium, requiring processing power both in the production and consumption stage. Born out of the transistor, it has always been intimately connected with the logic that is inherent in Moore's famous law: the doubling of the processor capacity every 18th month or the halving of the price for the same processing capacity in the same time.

The evolutionary process has one very basic prerequisite, which is described by Young. If markets did not grow; the evolutionary path would stop dead in its own tracks. Moore's law makes this dynamic even more visible: without dynamic market growth, the only remaining feature of the industry would be devastating price wars.

Following Young, we contend that it is the widening of the market that has led to the constant growth of new video game related industries. The development of new markets and the removal of borders to other industries have been characteristic and necessary features of the growth of the video game industry. The question then arises how markets have been widened. In this paper, we argue that growth has mostly been characterized by the more or less constant evolution and penetration of new kinds of hardware.

The video game industry has demonstrated a large ability to conquer new platforms and incorporate new technologies. In this regard it is the foremost example that growth of a medium succeeds not by digital convergence but digital divergence. What started out on a mainframe has later moved to the arcade, the home console, handhelds, the personal computer, and the mobile phone. The development of new platforms has made gaming experience possible through a more diversified market that incorporates a larger part of our life as well as economic segments. Today, games are available on five different platforms, in some cases these different platforms have been non-competitive in the sense that they have complemented each other, such as the handheld and the console. In other cases they have been competitive, such as the console and the PC. The game mediums' unique ability to utilize and adapt to different platform makes it metaphorical to its nature. When one platform for various reasons has stagnated, another platform has been able to continue to innovate.

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For every gaming platform, games have developed new expressions and forms. Indeed, platform diversification may be seen as the most important reason behind the long-term viability and growth of the game industry. The coevolution between games, computer technology and networked solutions that is a main feature of the contemporary situation seems to be able to create a very large number of new game related industries. In today's situation, the room for new innovations seems almost limitless. The video game industry seems to be characterized by a tendency towards ubiquity.

In this paper, we are going to focus on the evolution of different platforms. Our main argument is that it is evolutionary diversity that explains the quite remarkable growth that characterizes the video game industry.

Transformation of the pinball industry

Incremental innovations characterized the electromechanical arcade industry during the 1950s and 60s. All this changed with the advent of the transistor technology. Chicago's traditional pinball manufacturers were confronted by Silicon Valley's new transistor based companies. As a result, the pinball industry went through the most innovative period in its history.

As often described, Atari pioneered new and innovative video games in the stagnant arcade industry. The company was successful with Pong and several other games around 1973-76. In order to strengthen its competitive edge in the arcade sector, Atari decided to enter the larger market for pinball. Indeed, it was decided to diversify into a large number of different platforms.[1] Somewhat paradoxically, the pinball division was a remarkably successful failure. It also illustrates the problems that Atari was to suffer in almost all of its new divisions. Hence, the example seems to exemplify the potentialities and risks inherent in the choice of multi-platform strategy.

The new division proved innovative. Atari introduced a number of innovations in pinball: the first solid-state wide-body pinball, inductive under-playfield sensors, electronic sound etc. However, Atari lacked the manufacturing capabilities and experience of the traditional pinball manufacturers in Chicago and as a result they where plagued by technical problems. The managerial competence and determination needed in the new sector was almost entirely lacking. Nolan Bushnell, founder of Atari, commented on the problems:

> … We had a cost of manufacturing disadvantage to Chicago. Whereas we had a significant advantage on things that had to do with computers…When it comes to stamping out the little parts, winding coils and basically doing wood board train which is basically what pinball is all about, we had a 150 dollar cost disadvantage. Pinball was an amusement device that had pricing that where pretty commodity... They where viewed that way and if you try to break that price structure you have a real problem. So what you try to when you have a cost disadvantage, the real answer is that you innovate and you do something that breaks you away from the commodity pricing... When Warner came along they said 'You have to get into the commodity side'. I said 'we will loose money if we do that'... They kept saying that we are going to figure out ways to cut costs, but there are things that were intrinsic in terms of what labour was and various other things that were frozen in California. [16]

[1] Beside Pinball Atari entered programmable home consoles, handheld games and home computers.

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The result was disastrous. In the end it was incompetence and nepotism that led to two of the most talented and important game designers of what was to become known as “the Golden age of the Video Games” to leave the Atari’s pinball division in 1978.

Eugene Jarvis and Steve Ritchie are often named among the most influential game and pinball designers. The traditional manufacturer Williams/Midway in 1978-79 lured both of these young Californians to Chicago. During the next few years, Ritchie created innovative and successful pinball machines that used solid-state technology to the fullest, while Jarvis migrated into the video game industry. Working for Williams/Midway, he created Defender and Robotron, games that still rank among the best selling video games of all time. The other innovative center that emerged during the late 1970s was Japan, where several industrial actors that were to become future leaders made their first appearances during 1978-79.

Hence, due to Atari’s inability to keep and nurture its own talents, the more traditional producers were able to catch up on the innovative advantage that had opened up in California. The traditional pinball manufacturers managed to adopt their business to the new technology. Threatened by new competitors and new technologies, they became highly innovative in the late 1970s’and the early 80s’. The new infusion of life gave the electromechanical pinball machines makers a lease of life that lasted into the 1990s. Interestingly enough, it was the new hybrid technologies that were introduced during this period that finally killed off pinball during the late 1990s.

The phenomenon is interesting, as it demonstrates how digital technology initially revitalizes an old industry, only to kill it a short while later. What happened was that the new competition and the new technology made the old producers willing and able to innovate and create entirely new pinball machines that sold in record numbers around 1979-80. New features, such as multiple balls and multiple playing fields, were added to an increasing extent. Designers got more influential and free. Steve Ritchie commented on the phase:

> ... That's the beginning of the process when things were still simple and we were always pushing the envelope about things we wanted to add on.
>
> Interviewer: What years are we talking about here?
>
> I'm talking between 1978 through to the end of pinball. It was a progression that led games to being extremely complicated. I'm one of the most responsible and I am telling you as I sit here that this progression is what it took to make pinball machines sell. That is absolutely the truth: you had to have everything you had on the last machine as well as five or six brand new interesting cool things. Pretty soon they began to accumulate and you'd have Star Trek TNG in its complicated, endlessly mechanical glory. [13]

Pinball’s’ market share in the arcade industry had been 80% in 1975. The low point was reached

at 5% in 1984. Thereafter it rebounded to 34% in 1992. The problem was that the comeback happened at a large price, as production and maintenance costs rose.

In a rather strange sequence of events, the Chicago-based companies capitulated to video games by relinquishing the one great advantage they had: production economy. Soon they found themselves to be in a commodified market, where production costs were set by the development of Moore's law. Few people proved willing to pay for the excessive costs involved in pinball development and production.

In an arcade industry that grew at a slow pace or stagnated after the mid 1980s', these developments proved disastrous. By the turn of the millennium there was only one pinball producer left in the once thriving business.

Steve Ritchie has summed up how the stagnation of the arcade industry led to the demise of the pinball industry:

> Hardly anyone wants to operate [pinballs]... You can only operate them if you have a service man go out and repair them every week… Every week… you will find bulbs out, either that or a broken rubber or something wrong. That's the first problem. The second problem is, who is going to do the work and how much is it going to cost? Are techs still sharp on how to fix what's wrong? Is he well paid and diligent? I doubt that many operators are paying great money for special techs who actually care about pinball anymore. From a marketing standpoint the return on investment is hopeless. Its pathetic… why would they even bother operating a pinball machine when you had a great video game that you don't ever have to fix... [13]

Gaming in the home: the evolution of Nintendo's capabilities

In 1976 the American Toy manufacturer Mattel created the first completely dedicated electronic hand held game. The handheld market experienced rapid growth and its success has been described as a contributing factor to the 1977 video game crash. The new innovative platform that provided gaming anytime and anywhere posed a threat to the stagnating and imitative console market.

Initially the market was dominated by US companies, but in the end of the 70s Japanese companies became increasingly successful. Toy manufacturers with established sales channels and manufacturing capabilities had a considerable comparative advantage and became industry leaders.

As a result of Nintendo's original line of business – playing cards – and its diversification into the electronic toy business in the end of the 60s, the company had a favorable position to enter the handheld market. Nintendo already had established sales channels to Japanese toy- and department stores and had built up a business model that was well adapted to the market for electronic entertainment products.[2] Nintendo hired young and innovative engineers that were given freedom to innovate in a large number of small projects. Furthermore, Nintendo's business

[2] Hiroyuki Yoshida argues that this model of production had a long history in the Kyoto areas craft based industries, where Nintendo originated [17].

model was based around a flexible production in which it was able to utilize a vast and changing network of suppliers. When Japanese companies became market leaders in some segments of the semiconductor industry, Nintendo had a great opportunity to utilize this.

Having already established a line of dedicated home consoles in the end of the 70s, Nintendo diversified into the dedicated hand held electronic game market and introduced its first internationally successful line of "Game and Watch" in 1980.

Nintendo's involvement in the amusement industry evolved in a similar way. By using light sensor technology that Nintendo licensed from Sharp for their gun toys on a larger scale, Nintendo successfully built up shooting arcades in old bowling alleys [10]. During the late 1970s they released a number of moderately successful arcade games before they scored a huge success with Donkey Kong in 1981.

The rise of the proprietary hand, Nintendo entering the programmable console market

After the video game crash of 1983, the majority of the U.S. video game companies left the market. The only U.S. companies that survived were those that had the dynamic capabilities to successfully move into other adjacent, still thriving, gaming platforms.

For the Japanese companies that were less affected by the 1983 crash, the situation looked brighter. Many Japanese companies had showed a remarkable ability of evolutionary growth by building up capabilities in one platform, moving up the value chain and then entering a new platform. From the beginning they where successful second movers in the less resource demanding platforms, but by 1983 they had become innovators in the arcade and handheld business.

Nintendo, strengthened by its success and capabilities in both the hand held market and the arcade market were in a particularly favorable position to penetrate the programmable console platform. When Nintendo decided to enter the console market, it skillfully used the capabilities it had already built up in other platforms. While knowledge of the arcade platforms was important in finding the suitable components for the console [15], knowledge of the handheld business was important for the manufacturing capabilities and the marketing knowledge that were necessary when entering the programmable home console market.

To be able to deliver a fast but yet inexpensive 8-bit system, Nintendo guaranteed to buy 3 million chips from the semiconductor manufacturer Ricoh. Nintendo came to build up a huge network of cooperating partners and subcontractors, eventually it used around 30, predominately Japanese, subcontractors. When the Nintendo Famicom were released in Japan 1983 its price, hardware capacity and innovative game library rapidly made it market leader. The competitors' consoles were expensive hybrids of home computer and game machines that many manufacturers thought was the future after the 1983 crash.

Nintendo was the only company at the time that had the strategy to develop a cheap console for kids that where designed completely focused on playing advanced games. This strategy permeated the entire development process of the Famicom. Masayuki Uemura who was responsible for R&D at Nintendo, commented upon the strategy:

> Personal computers where claiming that they could do anything, but actually they did nothing. With Famicon, we were the first ones to admit that our computer cannot do anything but play games. [12]

It would not last long before Moore's law would make possible the revitalization of gaming for the handheld market and create a similar market for handheld games with cartridges that had appeared when Atari had released its programmable console in 1977. By 1989 the hardware had evolved to the stage where it was possible to build programmable and cartridge based handheld units with advanced games and graphics. Nintendo was one of the first companies to release these new types of handhelds with its Game Boy in 1989.

The Nintendo Entertainment System (NES) that by many initially was seen as a toy fad continued to sell well year after year after its introduction in the US market in 1985. At the end of the 80s, Nintendo dominated the console business to an unprecedented degree. With Game Boy, they dominated the hand held business.

Nintendo's dominance was built on its strong proprietary hand by which it had a firm grip on all parts of the value chain. By making it necessary for every cartridge to include a security chip, Nintendo manufactured all cartridges by themselves and could take full control over the development and production phase of videogames for their system. Nintendo decided which game genres that third party developers were allowed to produce, how many different games they were allowed to produce every year, the quantity of new games they had to produce, what type of content that they could include and restraints that hindered third party producers to make Nintendo games on other consoles within a period of two years. Before a game was released, it had to go through a rigorous quality control by Nintendo in which changes where implemented before it was released. However, Nintendo's proprietary arm also had a firm grip of the marketing and distribution of games. These firm grips were upheld by many different methods. Nintendo's monopoly in game distribution was particularly important. Nintendo could set all the prices for its products and retailers were not allowed to give any discounts. There were also many accusations of various other methods, e.g. obnoxious retailers receiving worse financial conditions and threats of limited stocks of popular games.

Tom Kalinske, former CEO, Sega of America has commented upon Nintendo's success:

> Nintendo was a tough competitor. I admire them for it. They went to all the third-party developers and said, 'If you support Sega, we won't get you your gamechips on time.' Or they told retailers, 'If you put Sega games on your shelf, you're not gonna get your new *Mario* games for a while. [5]

Through *Nintendo Power*, which was by far the largest video game magazine in the U.S. with 1 million subscribers, Nintendo also controlled a large part of the game previews and game

reviews that reached their consumers. Development, production, distribution and marketing in video games were all permeated by the strong proprietary hand of Nintendo. The strategy of strong vertical integration, that tended toward monopolization, is markedly similar to business models that were the developed in traditional industries such as steel during the first decades of the 20th century. In the span of a few years, the strategy would expose Nintendo to the same weaknessess that it took US Steel half a century to develop. Hence, by the early 1990s Nintendo suffered from problems related to technological inertia and path dependence, as well as problems that related to anti trust litigation.

The rise of the digital hand, Nintendo's decline

The fall of Nintendo's leadership would be a gradual decline as the digital hand gradually changed the fitness of its business model. The legal actions against Nintendo clearly had some effect in loosening Nintendo as it tied up managerial and other resources in litigation issues. But the main drivers that caused Nintendo's decline was that a number of disruptive innovations (primarily in hardware) changed the structure of the market and in the process of that transformation also made Nintendo's model less fit. By the beginning of the 90s, Nintendo's proprietary business model had become vulnerable to attack from many types of innovations in hardware. The fungible nature of games meant that in many cases when a platform by some reason stagnated, another could continue to innovate. When Nintendo developed their proprietary business model in the handheld and console business, there where still two major platforms (the arcade and the PC market), which Nintendo did not control and which continued to develop. Hence, game platforms outside Nintendo's control became innovative again in the beginning of the 90s.

When Sega introduced its 16-bit Sega Genesis in 1989 in the U.S., it had the opportunity to utilize these weaknesses in Nintendo's model. Through its position of one of the biggest arcade manufacturer, Sega could utilize coevolutionary opportunities between this platform and its new console. This was also evident in Sega's marketing campaign for its Genesis as "arcade entertainment for the home". Sega's less restrictive policy towards third party developers of games where also attractive for many third part developers. As a result, a large number of third part developers started making games for the Genesis despite the fact that Nintendo prohibited game developers to make NES games for other platforms within a period of 2 years.[3] Sega also had a strategy of developing and marketing its system as a consumer product for teenagers and young adults compared with Nintendo who still developed and marketed its hardware and software towards kids. Nintendo's proprietary business model was ill suited in an increasingly diversified game market. As a result, Sega's market share in the U.S. 1993 was as big as Nintendo's by 1993.

The PC market also grew to an important game platform at the same time when Doom (1993) became the first real breakthrough of a genre that would come to dominate the gaming scenes in years to come.

[3] Due to litigation issues, Nintendo had to give up the exclusivity requirement in 1990 [9].

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By the middle of the 90s Nintendo's business model became evermore vulnerable for disruptive technologies. The most important example were the CD-ROM, a technology that were cheaper and had larger storage capacity than cartridges. It had the potential to transform a large part of the business model for video games. With PlayStation in 1995, Sony was the first company to build an organization that was well adapted to this new CD-ROM business model.

The combined effect of these different guises of the digital hand broke Nintendo's leadership in the 90s. By only concentrating on its proprietary business model, Nintendo had not seen the threat that new technologies and expanding markets posed. The evolution is very similar to the model used by Christensen in order to demonstrate how market leaders often listen too much to its current base of users [4]. What was even worse for Nintendo, in the process it lost much of its ability of successful platform management that had characterized its history since the 70s. The late release of Nintendo 64 in 1996 and the unsuccessful release of a new gaming platform, Virtual Boy, in 1995 (arguably the most unsuccessful large scale introduction of a platform in the history of video games) was all signs of that Nintendo had lost contact with the constantly changing video game market.

The victory of the digital hand, Sony's road to Leadership

When Sony released their PlayStation in 1995, Nintendo definitely lost its market dominance. The PlayStation was not the first console equipped with CD-ROM, but unlike earlier console manufacturer, Sony was the first company to fully adopt its business in accordance with the possibilities of the CD-ROM medium. It was three things that made the CD-ROM stand out from cartridges. *Firstly*, as a disruptive technology, the CD-ROM was much cheaper than cartridges. *Secondly*, the CD-ROM could deliver games continuously to stores. If there where a shortage of a certain game, new ones could be produced and shipped almost immediately. This was in stark contrast to cartridges that was characterized by batch production, three months before they hit the store. This put great demands on Nintendo's ability to forecast the demand of its games, something that became increasingly difficult in a more diversified market. *Thirdly*, the huge storage capacity of the CD-ROM meant among other things that they could include a large amount of high quality audio and movie clips which contributed to games becoming more of a life style product with relationship to other types of cultural expressions in society.

When Sony built up its market share, it could take into account all these differences with the new storage medium and build up a flexible organization that resembled and took advantage of its music business. Through its marketing as lifestyle product, its looser censorship of games and a larger part of freedom of choice for increasingly diverse players, Sony gradually came to dominate the console business and successfully captured increasingly large segments of the market.

When Nintendo released its Nintendo 64 in 1996 they defended their choice of sticking with cartridges instead of CDs with the argument that "what's the advantage if those discs hinder, rather than improve the quality of game play?" [11]. Nintendo also warned that an overflow of

games on the market could lead to a new video game crash.[4] However, the technological development itself had diminished the risks, as CD-games were produced in a continuous process. Hence, technology eliminated the risk that large stocks constituted. The high production costs of games and the subsequent shakeout of game publishers had also led to a diminished risk for price wars in the game industry. Further, CD-ROM game demos, a large game review press, online game magazines and forums, game rental services, older gamers etc. where all changes that meant that the consumer had a better chance to choose the best games. In this sense the game industry became more similar to the diversified music industry [8].

Changing hardware and widening markets – changing consumer behaviours

The evolution of the computer game hardware industry in recent years has also brought about a noticeable development in relation to consumers and consumer behaviors. Hence, the evolution of hardware is not only important in a technical sense. It may even be more important in its implications for market widening.

The most obvious change occurred as the old arcade games were slowly replaced with video games in the mid 1970s and 1980s and the PC games in the 1990s. What happened then were mainly two things: (1) the consumer group became more diverse and (2) the game play became more complex.

The arcade games in the 1970s mainly attracted male consumers, most likely because both game content and the context in which the arcade games were placed and used had a greater appeal on males than females, as has been pointed out elsewhere [6]. The content of the early arcade games was for example action-based and in some cases even aggressive to its nature, something that might have prevented females from playing the games. Looking at it from a hardware perspective though, the context explanation to why arcade games attracted mainly male players seems more plausible. The arcade can be considered a male urban region which women, especially in the 1970s, had little access to and whatever activities take place there can be seen as intended for men rather than for women. A broadening of the consumer group took place, as mentioned by Haddon [6], when the computer games moved from the arcades into places such as lounges and restaurants, areas which were not male and youth dominated as the arcades. Women and also older users/consumers could now become acquainted with computer games.

The PC boom in the 1980s, the continuous hardware and software development during the 1990s, and the growth of Internet since the mid 1990s are advances that at the same time have made computer games more individual and more collective. More individual in the sense that they are not anymore played in public places but in people's homes, and collective in the sense that they are not single-user games anymore, but networked multi-user games involving thousands of simultaneous players.

[4] In 1996 Nintendo wrote in their annual report that "It has been more than 10 years since our industry first discovered the danger of flooding the market with substandard products, Now, history is repeating itself" [11].

This change of platform, from arcade to networked PC, has domesticated the computer game and not only made it accessible to new user groups, such as women and adults, but has also changed computer game play making it more complex than before. The main reasons for this is that people who play computer games in their homes have considerably more time to play and more access to people to play with, as compared to playing in public places. Arguably, the new developments should be able to widen the market to previously untouched groups. In many ways, the new markets seem almost endless.

Recent surveys of how people play Massively Multi-Player Online Games (MMOGs) show for example that people in average spend more than 20 hours per week playing the game and that the game play is highly social [1]. Highly social in the way that players have become intimate friends or even married, behavior most unlikely to be seen in relation to computer games other than on the home-based PC console.

However, it is not only the placement of the computer itself on which the computer game is played which plays a central role, but also the closeness and access in the home to other communication technologies, enhancing the sociability of the MMOG players. The most common reasons reported for using communication media are to plan and organize play outside the game, to facilitate play sessions (communicating with other players while playing the game), and to obtain advice from people outside the game while playing [1]. The use of Internet for information sharing via fan websites is another important unique aspect of PC based gaming, apparently an essential part of the game play for many players. However, it is not only the networked aspects that make PC-based computer game play unique, it also makes it possible for players not only to play while other family members are present, but facilitates play *together* with family members such as parents, children, and partners. Moreover, the social network around users of information and communication technologies (ICTs) has proven to be immensely important to users, both in the adoption phase, when the user is considering to buy a device and to start using it, as well as later when the user has become more familiar with the technology. As Bakardjieva [2] and Haddon point out, family members, friends, and co-workers play an important role as 'warm experts', as being knowledgeable about the technology and being available in the new or potential user's immediate environment, willing to share this knowledge.

To sum up: the platform on which a computer game is played is of great importance in relation to who plays the game and how the game is played, something which has critical effects also on game content, being modified to match new consumer groups and new behaviors. The example of the PC based computer game shows that the move from the arcade to the home meant that people who previously did not have access to computer games, of cultural reasons, like women, were actually enthusiastic gamers. The move into the home also meant that players could spend more time playing the game. Other ICTs available at home, such as email, telephone and also the surrounding social network consisting of family and friends are probably contributing factors to this. Problems (technical or social) that can be overwhelmingly difficult for a single player and that could even, if worse come to worst, make a player stop playing the game, is often solved by other players.

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The implications of the new possibilities are enormous. Steve Ritchie and Eugene Jarvis have commented on the new ubiquity of gaming:

> The arcade isn't a popular place to go anymore, either. Internet and platform games are so... exciting that no one needs to leave home to experience great quality games to play. [When pinball made its comeback] there was no Internet and no competitive platforms like X-Box and PS2 calling our players away. [13]

Jarvis continues Ritchies' argument:

> So the gamer today really has an amazing quality of gaming experience in the home. Then you add to that the Internet... There's any number of Internet sites where you just go and you can play games forever for free. That's going to give competition to both the arcade and the console people, who are trying to make you pay to play.
> It's amazing the quality of entertainment people have for almost no cost... I was thinking about "Everquest" and those online games and a buddy of mine said, "Yeah, they raised that to 15 bucks a month! It's outrageous!" If the average guy plays a hundred hours a month... he's paying 15 bucks for 100 hours of entertainment, which is like 15 cents an hour. You pay more than that just to turn the light bulb on your desk! [3]

Even more emphatically, Jarvis concludes:

> The network craze is about gaming with human opponents. Human opponents were what the first video games were about--e.g. "Pong"--since there was no AI in that era. The microprocessor revolution created a golden age of AI driven computer opponents, but even the best AI can eventually get stale, boring and predictable... And then there's the biggest problem with a computer opponent. They have no ego... We fantasize that a particularly crushing defeat will condemn an arch rival to years of therapy to overcome the trauma. A computer opponent is an egoless wimp that can be done away with in a flick of the power switch. Networking has brought accessibility to a whole universe of human opponents, creating an almost unlimited challenge and interactions to gamers. Networking also adds the human element of socialization to the gaming experience. We are clearly at the threshold of a new frontier here. [7]

CONCLUSION

The video game industry have not only survived several industrial crashes. It could even be described to be prospering.

In this paper, we tried to explain this remarkable perseverance by digital divergence and increased diversity. Fundamentally, the process can be understood as a function of Moore's law. Because of the constantly evolving technological frontier, platform migration has become necessary. Industrial success has become dependent upon the ability to avoid technological lock-ins.

The game industry has migrated to new platforms, which has made it able to open up new markets. Innovation, market widening and increased diversification has made the industry a showcase for how the new digital industries can grow.

The last stage that we described was the evolution of today's online gaming community. In many ways, these contemporary developments are the most fascinating. Gaming has become ubiquitous and all-encompassing. The limits to its growth seem to have eroded almost

Proceedings of DiGRA 2005 Conference: Changing Views – Worlds in Play.

completely. The new industrial possibilities will only be limited by our own imagination.

REFERENCES

1. Axelsson, AS., and Regan, T. “Playing online” in Vorderer, P., and Bryant, J. (eds.) *Playing video games – Motives, responses, and consequences*. L. Erlbaum Associates, in press.
2. Bakardjieva, M., and Andrew, F. “Involving the Virtual Subject: Conceptual, Methodological and Ethical Dimensions” in *Journal of Ethics and Information Technology,* vol. 2, no. 4 (2001), pp. 233-240.
3. Borgeson, M. “Stopping al-Qaida, a quarter at a time “. Availible at http://archive.salon.com/tech/feature/2004/03/02/eugene_jarvis/index_np.html
4. Christensen, C. M. *The Innovator's Dilemma.* HarperBusiness Essentials, New York, 2003.
5. Dolan, M. “Behind the Screens” in *WIRED*. 9.05 (2001). Available at http://wired-vig.wired.com/wired/archive/9.05/history_pr.html
6. Haddon, L. “Electronic and Computer Games, the History of an Interactive Medium” in *Screen*, vol. 29, no. 2 (1998), pp. 52-75.
7. Hague, J. *Halcyon Days*. Seattle, 1997.
8. Hirch, P. M. “Processing Fads and Fashions” in *The American Journal of Sociology*, vol. 77, issue 4 (1972), pp. 639-659.
9. Kent, S. L. *The ultimate history of video games.* Three Rivers Press, New York, 2001 (ch. 24).
10. Lieholm, M. “Toys & Arcades”, Nintendo land. Available at http://www.nintendoland.com/home2.htm?history/hist2.htm
11. Nintendo *Annual Report* 1996.
12. Rapoport, C. “How Nintendo aims to play the world” in *Financial Times UK*, November 13, 1986.
13. Schneider, M. “Steve Ritchie interview part 1”. Available at www.pinball.com.au/eshop/?MIval=art_info&grp=8&artno=STINT
14. Schumpeter, J. *Theory of Economic Development*. Cambridge, Mass, 1934.
15. Sheff, D. *Game Over*. Random House, New York, 1993 (pp. 30).
16. Stulir, M. “Episode 10: Interview with Nolan Bushnell”, 2000. Available at http://www.backntime.net/Radio/FrameRadio.html
17. Yoshida, H. “Nintendo’s Home Video Game Business” in Lynskey, M. J. and Yonekura, S. *Entrepreneurship and organization.* Oxford University Press, Oxford, 2002 (pp. 152-171).
18. Young, A. “Increasing Returns and Economic Progress” in *The Economic Journal*, vol. 38, no. 152 (1928), pp. 527-542.

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