

Intra-system competition and innovation in the international videogame industry

SUMMARY

This paper analyses the international videogame industry, focusing on the efficiency and effectiveness of different forms of value chain organization chosen by video console manufacturers. Customer signalling necessities and innovation requirements of the product's system architecture are investigated in this context. To undertake this analysis, the historical development of the international videogame industry, the competitors in this industry as well as competitive forces within it are first described and evaluated. Indirect network effects characterize competition in the videogame industry. Game developers, publishers and console manufacturers invest in system-specific assets of the product. From a transaction cost perspective it is efficient to minimise the resulting coordination and hold-up problems within a vertically integrated value chain organization. However, from a strategic perspective selecting an inefficient value chain organization can be advantageous, because in certain markets coordination disadvantages are smaller than the strategic competitive advantages achieved. Competition inside a product system can increase innovation activities inside the system and thus increase the attractiveness of the whole system by leading to better components and thus competitive advantage over other product systems.

KEY WORDS

intra-system competition; innovation; system architecture; value chain organization; indirect networks; competitive advantage; videogame; customer signals

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1 PRODUCT SYSTEMS, CUSTOMER SIGNALLING AND INNOVATION

Experts predict substantial growth for the international videogame industry. While industry sales in 2000 amounted to about US\$10 billion, for 2003 annual sales of about US\$22 billion are expected. The videogame industry is seen as one of the most attractive investments in the entertainment business. A new generation of technologically sophisticated video consoles dominates the market. In 2003 Sony with its PlayStation 2, Nintendo with the GameCube and Microsoft with the Xbox compete for customers. With such competition, the videogame industry is developing vertically disintegrated value chains; a development which is comparable to the development of the PC industry over the last decade.

One crucial feature of the PC industry as well as the videogame industry is the relevance of compatibility. Both industries offer product systems that can only succeed if a sufficient range of compatible components is available. In industries with component compatibilities indirect network effects exist. In such industries, it is crucial for success that in an early stage a sufficient number of customers is convinced to invest in the product system, so that the offering firm survives in the market. Customers are willing to invest in the system only if they expect that a product system will survive in the market. Thus the expectations of the customers play an essential role. Firms have to find possibilities to send out credible signals to customers that the own product system is the one that will succeed. Customer signalling possibilities already well investigated in this context are the reputation of a firm, early product announcements or particular pricing strategies (e.g., Shapiro & Varian, 1999).

What, however, is not analysed to a great extent up to now is, whether the form in which a firm organizes their own value adding processes also influences customer expecta-

tions (Dietl & Royer, 2003). Next to customer signalling effects, the form of value chain organization in product-system industries influences innovation processes. The questions posited in this paper deal with exactly these issues. Answers to the following two questions are to be given:

- (1) Which customer signals go along with chosen forms of value chain organization in product-system industries, i.e. industries with indirect network effects?
- (2) Which conclusions can be drawn with regard to the forms of value chain organization selected by video game console manufacturers with regard to signalling necessities as well as innovation requirements?

In a first step, the specific features and the development of the videogame industry are outlined (Section 2). In a next step, indirect network effects are the centre of attention (Section 3). Their impact is described in general and analysed for the videogame industry in particular. The selected forms of value chain organization of the videogame console manufacturers Sony, Nintendo and Microsoft are described in the following Section 4. They are further analysed with regard to their efficiency and effectiveness in Section 5, before organizational and strategic conclusions are drawn in Section 6.

2 THE VIDEOGAME INDUSTRY

Atari was the pioneer of the videogame industry. In 1975, Atari introduced the first television compatible videogame 'Home Pong'. In 1977, Atari developed the so-called video cartridge system (later renamed Atari 2600). This system consisted of a console and compatible game cartridges. The former arcade game producer Atari offered a great variety of games. This formed the basis for Atari's success, even though the consoles of competitors were regarded as technically superior (e.g. Phillips

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G700, Mattel Intellivision and CBS Coleco Vision). In addition to game variety, a set of hardware complements for the Atari 2600 system existed (e.g. copying stations or controllers). This complement variety not only prevented the penetration of competitive consoles, but Atari's own successors Atari 5200 and 7800 also did not survive in the market. Atari's descent began when the firm engaged increasingly in the (then) developing market for home computers. Innovations regarding the console and games were delayed and many games with inferior quality were thrown on the market. Sharp drops in prices were the result. In 1990, Atari finally stopped manufacturing the 2600 console. In 1993, Atari tried to re-enter the market with the Jaguar 64 console, but could not establish a sufficient customer base. In 1996, Atari completely withdraw from the console market. Today, Atari is one unit of the French game publisher Infogrames SA that recently changed its name to Atari Entertainment.

Nintendo rose to be the new star of the console market in the 1980s. After the firm was also very successful in arcade games, it decided in 1982 to enter the market for videogames with an 8-bit technology. Competing with the large installed base of the Atari 2600 system, Nintendo had to direct all forces on convincing a sufficient number of users for the Nintendo Entertainment System. By using game characters, which the target group of young boys already knew from cartoons, Nintendo created a high reputation on the US market and in 1990 reached a market share of 90%.

In the mid 1980s Sega, a new competitor, tried to enter the market with its Master System. However, the market entry failed due to an insufficient game variety. Game developers could not support the Sega console due to a clause in their licence agreements with Nintendo. Internal game development, and the removal of the clause from the contracts by a

court, could not stop the fall of the console. With the 16-bit console Genesis Sega tried again to enter the market some years later. A large marketing campaign and a variety of high-quality games in combination with progressive technology made it possible for Genesis to become generally accepted in the market. Nintendo did not want to cannibalise its own 8-bit system, so it took until 1991 to market the 16-bit Super Nintendo Entertainment System. Meanwhile Sega lacked innovations. The Sega consoles Mega-CD (1993) and 32X (1994) were flops, because hardware was too expensive and not enough high-quality games were available – as they lacked support by game developers.

In 1995 Sega marketed the 32-bit console Saturn. However, this initiative failed because the CD-ROM based, technically superior PlayStation was already introduced a year earlier by Sony, another new competitor in the market. Sony ensured a large game variety for the PlayStation, targeting particularly young men between 16 and 24. Sony had further advantages because its hardware was developer-friendly resulting in a quickly growing game variety. After another Sega console (Dreamcast) could not convince enough customers, Sega decided to leave the console market in 2001.

With Sony, Nintendo and Microsoft, three firms compete for customers in the console market in 2003, where a new console generation succeeds with technical data resembling PCs. Sony established a dominant position over the last years. In 2000, Sony had a market share of about 50%, while Nintendo's and Sega's market shares amounted to 26% and 18%, respectively. When Sega left the market in 2001, Microsoft entered with massive financial efforts. In 2003 Sony reached a market share of 66%, while Nintendo and Microsoft hold approximately equal parts of the rest of the market. Nintendo and Sony, compared to Microsoft, can at least partly

build on their former successes. Nintendo's GameBoy Advance for example has been on the market since June 2001 and can be used as a controller for the GameCube. 40% of all US families already own a Nintendo Game System. Sony already sold 80 million PlayStation; the videogames that could be used on PlayStation, can also be used on PlayStation 2 that in addition has had a market lead of more than a year compared to the GameCube and Xbox.

3 THE IMPACT OF INDIRECT NETWORK EFFECTS IN THE VIDEOGAME INDUSTRY

Network effects (Katz & Shapiro, 1985) characterize the videogame. There is a direct linkage between system members if direct network effects exist (e.g. in e-mail systems). If indirect network effects are present (such as in the videogame industry) the users are linked logically. Each additional system member (e.g. owner of a game console) indirectly increases the benefits of the other system members by increasing the market for complements (e.g. videogames). These indirect network effects are typical for product-system industries. If network effects are present, the average willingness to pay grows with an increasing number of customers. In such a market, a product can only succeed with a sufficient number of users. In the age of information and communication technology, network effects characterize many industries (e.g. Arthur, 1996). The presence of complements is crucial for firms' success when network effects are present.

Indirect network effects always characterize markets in which compatibility is a relevant feature. In such product-system industries, the buying process is divided into two separate phases: In the first phase the customer has to decide for the product-system architecture. In the second phase (s)he then has to invest in the necessary components that fit with the system architecture, i.e. are compatible. If the

customer once invested in such a product system (s)he usually is in a lock-in situation, i.e. switching cost in the form of specific investment in the product system as well as learning costs are relevant when deciding for an alternative product system.

The videogame industry is a typical product-system industry. The individual system components (i.e. videogames and consoles) are only of joint use. These system interdependencies shape the competitive forces within the industry. Console manufacturers are dependent on the availability of compatible games, while the success of game developers and publishers depends on the installed base of compatible consoles. The console manufacturers at present are dominant within the industry. They are relatively well protected by high market entry barriers. For example, Microsoft had to invest approximately US\$500 million to enter the market. In order to build an installed customer base as fast as possible, the console manufacturers tend to sell the consoles at a loss. They earn profits via licence royalties and with the games they develop in-house. As soon as a manufacturer has installed a large customer base, its licence profits are protected by high switching costs, since new competitors have to induce consumers, game publishers as well as developers to switch to a new system.

Game publishers act as intermediaries between game developers and console manufacturers as well as between game developers and distribution channels. Publishers acquire licences from console manufacturers for the development, production and sale of videogames. Publishers usually do not develop new games, but assign that task to independent, usually small, creative and flexible game developers. These firms, due to major technical differences of the consoles, are usually only able to develop games for one platform. Publishers manage the game production and distribution. Developers lack the necessary production facilities, knowledge and access to

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distribution channels (such as wholesalers, retailers and Internet platforms). In the past boys between 6 and 14 were the main customer group. Today young adults up to the mid thirties are also seen as potential customers. Substitutes for videogames are PC games. Video console manufacturers try to cope with this threat by massive technical improvements of their consoles and additional functionalities such as DVD players or online gaming.

Deciding for a console indirectly means deciding for a compatible set of games. The production decision of software producers for or against a technology influences the market share of different hardware technologies and thus the size of the respective system. In the videogame market the existence of comple-

ment manufacturers is crucial. As a consequence coordination problems arise. The following example illustrates these coordination problems:

In the beginning of the 1990s the US software firm 3DO developed a 32-bit technology for a new videogame generation (e.g. Brandenburger, 1999). In order to achieve software variety, 3DO did not only develop videogames in-house but also issued software licences for a fee of three US dollars (therefore the name: '3DO'). Since 3DO games did not run on conventional consoles, many software firms hesitated to acquire a licence. As long as no sufficient software variety was available, many customers hesitated to buy the hardware. 3DO tried to solve this chicken-and-egg problem by assigning free hardware licences to

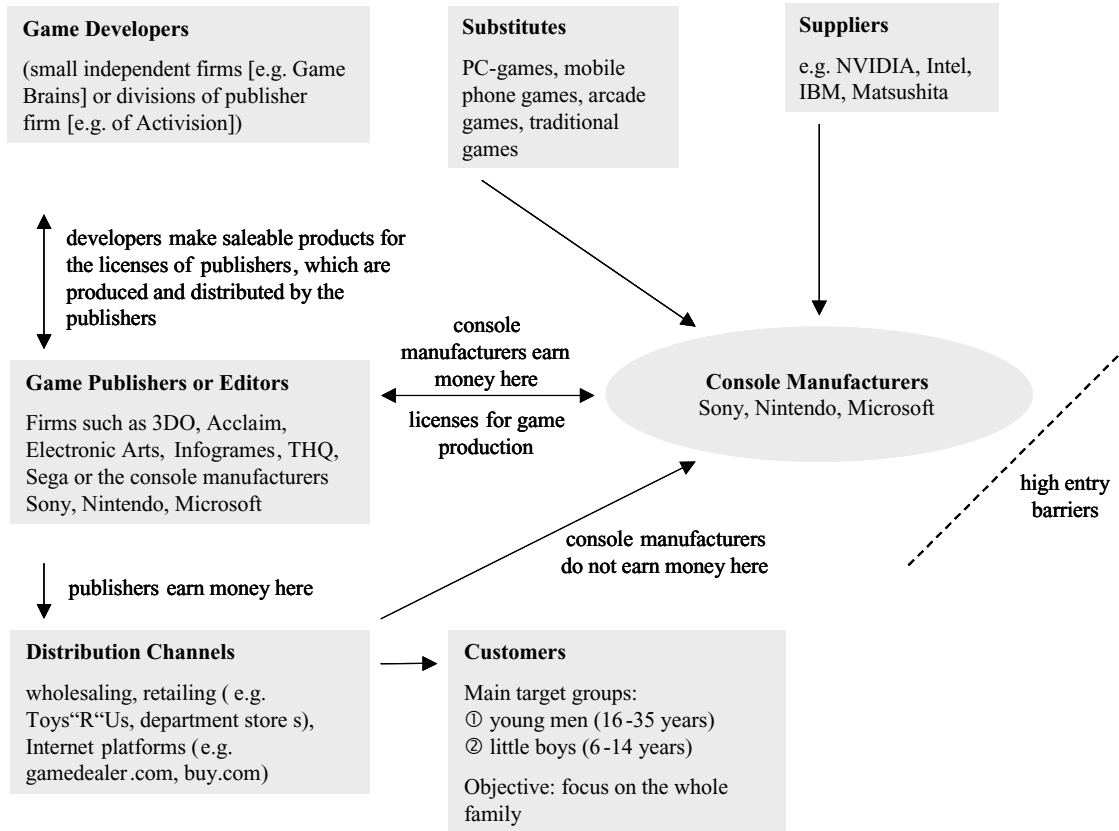


FIGURE 1: Competitive Forces in the Videogame Industry
Source: Dietl & Royer, 2003: 416.

Matsushita (Panasonic), AT&T, GoldStar, Sanyo, Samsung and Toshiba. When sales figures still remained low, 3DO decided to subsidize the hardware sales by rewarding the hardware manufacturers for each console sold. At the same time the costs of the software licences were doubled. All these strategic manoeuvres, however, could not solve the existing problems and in 1995 3DO withdrew from the console market.

Incumbents are not only protected against new entrants by high investments and indirect network effects. High switching costs are also a relevant entry barrier. Customers as well as game publishers and developers undertake product-system-specific investments that are devalued when switching to another system. Publishers and developers mainly invest in product-system-specific business relations, developing tools and programming capabilities. In addition, there are system-specific learning effects and contractual commitments. Customers mainly invest in product-system-specific complements such as compatible games. Figure 1 summarises the relevant competitive forces in the videogame industry.

4 VALUE CHAIN ORGANIZATION IN THE VIDEOGAME INDUSTRY

Three systems compete in the videogame industry: Sony's PlayStation 2, Nintendo's GameCube and Microsoft's Xbox. There are basically two different kinds of value chain organization to be identified with regard to video console manufacturers. Compared to Sony and Microsoft, Nintendo's value chain organization shows a higher extent of integration. Nintendo develops a major part of GameCube games in-house (e.g. Luigi's Mansion or Pikmin) and issues a strictly limited number of licences. Each licensee is only allowed to develop a fixed number of Nintendo games and usually has to agree that developed games are not immediately available for other consoles. Nintendo controls the sales price for these videogames (e.g. Madden 2002 by Electronic Arts or All-Star Baseball 2002 by Acclaim Entertainment) indirectly via the licence fees. In addition, Nintendo controls the production of the specific game CDs. Nintendo thus limits market power of independent publishers. Figure 2 shows Nintendo's value chain organization.

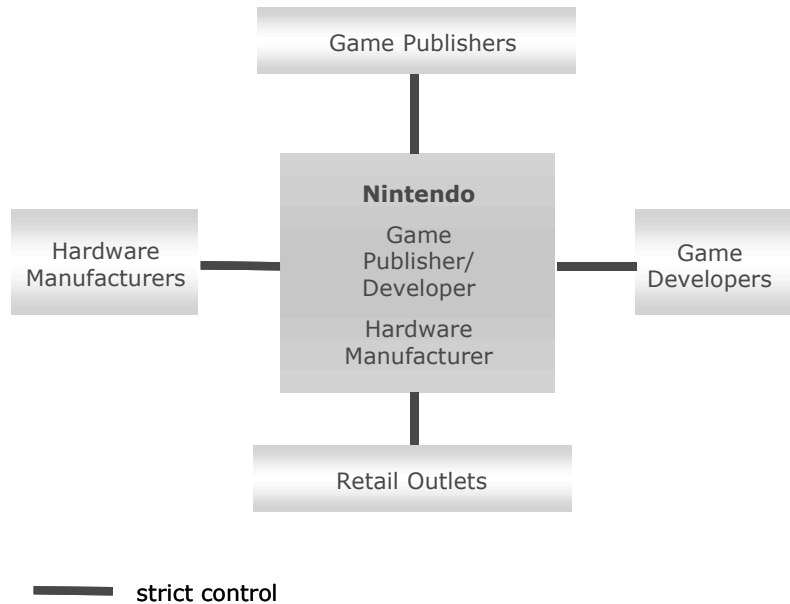
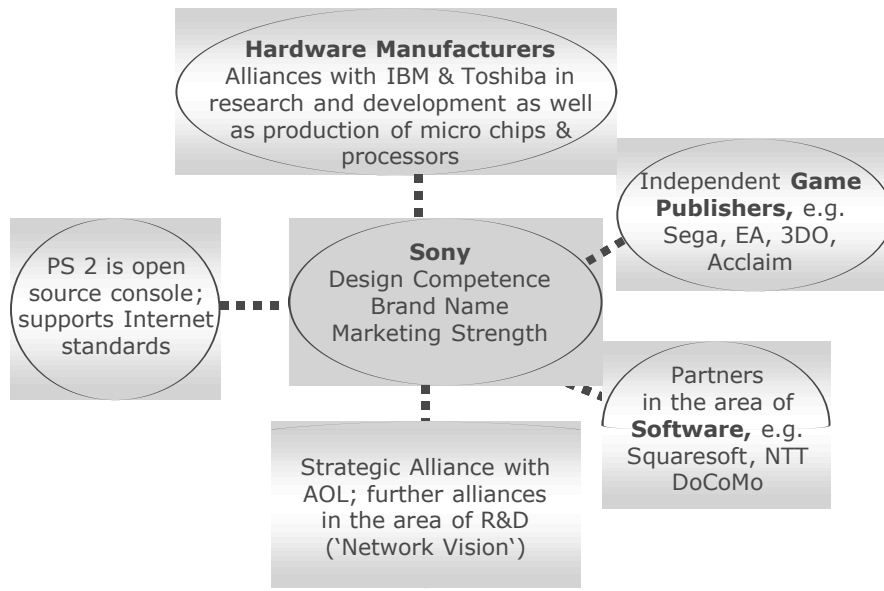


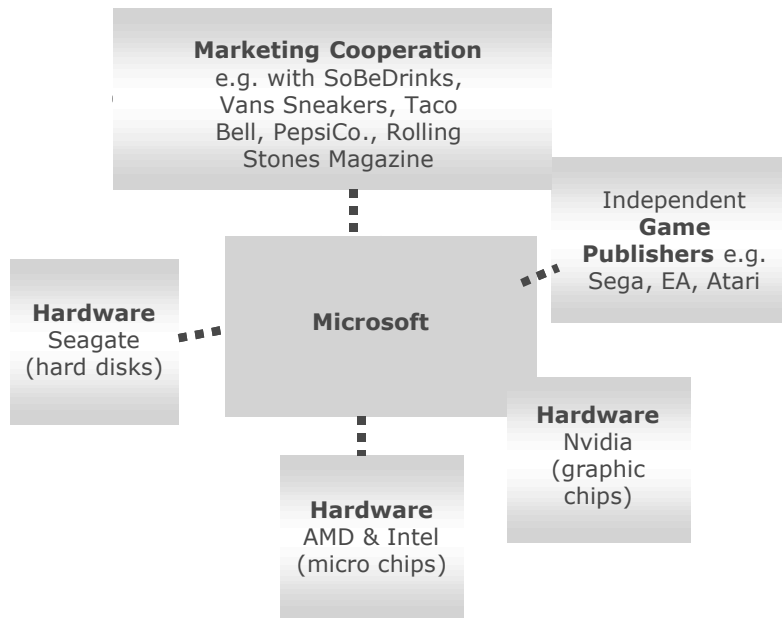
FIGURE 2: Nintendo's Value Chain Organization

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■■■■ cooperation instead of control

FIGURE 3: Sony's Value Chain Organization



■■■■ cooperation instead of control

FIGURE 4: Microsoft's Value Chain Organization

While Nintendo controls the whole Nintendo product-system via a proprietary system structure and a restrictive licence policy, Sony selects a more open and disintegrated system structure. Sony follows a vision that bases on cooperation and competition. Sony achieved market dominance with the PlayStation and PlayStation 2. For example, Sony has cooperated with AOL since 2001 to improve the online gaming distribution channel. Further cooperative agreements with other partners aim to secure the supply of important components. Independent game publishers and game developers publish and develop the majority of the compatible games. Microsoft also chose a vertical disintegrated product-system architecture. The Xbox console is mainly based on open PC standards. A consortium of technology firms supports the development and distribution of these standards (e.g. PCI, USB, VGA). Microsoft relies on strategic partners such as Sega with regard to the development and publishing of compatible games. Microsoft does not develop many videogames in-house. Up to now with the game 'Halo', there is only one game which has been developed in-house and thus is exclusive for the Xbox that is a success. In the marketing area Microsoft also formed alliances (e.g. with SoBeDrinks, Vans Sneakers, Taco Bell, PepsiCo and the Rolling Stone Magazine). Figures 3 and 4 show the forms of value chain organization selected by Sony and Microsoft.

5 VALUE CHAIN ORGANIZATION EFFICIENCY AND EFFECTIVENESS

The efficiency of the selected forms of value chain organization is first evaluated from a transaction cost and contract theoretical perspective then later extended to the evaluation of strategic competition and innovation effects.

5.1 Analysis of transaction cost theoretic efficiency effects

Console manufacturers, game publishers and developers undertake product-system-specific investments which have a much higher value inside the specific product system than in alternative contexts. For example, the investments of game developers and console manufacturers in the 3DO technology were not valuable any more after the 3DO product-system failed. The major part of these investments is immaterial because it is mainly invested in human capital, reputation and business relations. It is often hard to verify the size of these immaterial investments. As a consequence participating firms cannot contractually protect product-system-specific immaterial investments against potential exploitation. Opportunistic contract partners can deny contractual duties by maintaining that the partner did not undertake the specific immaterial investment as agreed. The size of specific immaterial investments cannot be exactly proved so that contract partners cannot make claim for damages (Hart & Holmström, 1987). For example, it is difficult for a game developer to prove in court that all possible effort and human capital has been invested in a developed game.

The exploitation of product-system-specific investments results from the complementarity of system components. Combining the console with compatible games creates value which increases with increasing quality of the console and increasing attractiveness and variety of compatible games. The quality of the console next to many other (observable and non-observable) factors mainly depends on the size of product-system-specific immaterial investments of the console manufacturer. Similarly, attractiveness and variety of compatible games to a major part depends on the size of non-verifiable product-system-specific investments of game publishers and developers.

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Console manufacturers as well as game publishers are able to increase total gross value creation by their specific investments. However, they have to invest before knowing if and to what extent they profit from the resulting situation, because that depends on the reaction of other system members.

Because contractually arranged compensations are not realistic and for the consumers only the total system price counts, each firm is able to appropriate the created values. For example, the publishers have to take into consideration that the console manufacturer might increase the console price as soon as attractiveness and variety of compatible games increase. If participating firms have to carry the total costs of the immaterial product-system-specific investments but cannot be sure to gain the resulting total income, they will not invest enough. The basic structure of this under-investment problem is similar to the hold-up problem outlined by Klein, Crawford and Alchian (1978), Grossman and Hart (1986) and Hart and Moore (1990). Because there are not necessarily direct transaction relations in industries with indirect network effects, the existing problems can be called *indirect hold-up problems*. The theory of incomplete contracts offers a variety of 'complicated' contract solutions for the case of non-verifiable specific investments (e.g., Nöldecke & Schmidt, 1998). However, there is no individual value appropriation possible in product systems and thus product-system-specific investments always have cooperative character. As Che and Hausch (1999) show, indirect hold-up problems in the case of cooperative investments can only be solved by vertical integration as proposed by Williamson (1985).

This solution of the under-investment problem can be transferred to indirect hold-up problems in the videogame industry. If the same firm develops, manufactures and distributes the console as well as compatible games,

this firm is able to appropriate the total (marginal) gross value creation. Concentrating investment costs and gross value creation in one firm leads to efficient investment incentives.

The integration of console manufacturing and game development does not only reduce the described under-investment problem. At the same time existing network externalities between console and compatible games are also internalised. Selling the console does not only increase the sales of the console manufacturer, but also increases the market for compatible games. An independent console manufacturer might not fully take this second effect into consideration with regard to its price and investment decisions and thus may set a price too high for a too low console quality. A contractually agreed compensation by game publishers does not work because of interest conflicts and prohibitive uncertainty. If the same firm develops and distributes the console and compatible games, no interest conflicts with regard to an efficient cross subsidization arise. Uncertainties which remain, however, do not imply contractual problems, because inside the firm no contracts concerning the division of subsidy profits and costs are necessary.

From an efficiency point of view, Nintendo's value chain organization is thus superior to the value chain organizations of Sony and Microsoft. Nintendo develops the console and the majority of games in-house. Value creation activities are only outsourced if Nintendo does not lose system coordination control. Nintendo holds the property rights for the relevant system specifications. Development licences for videogames are only issued to a limited degree and with many restrictions. Nintendo controls the price for videogames indirectly via licence fees. Manufacturing orders are only issued after clear specifications and with fixed conditions. Nintendo copes with the under-investment problem and internalises existing

externalities between console manufacturing and game development.

5.2 Analysis of strategic competitive advantages

Do Sony and Microsoft have an efficiency disadvantage compared to Nintendo because of their disintegrated value chain organizations? Will Sega's strategy to concentrate on game development and publishing fail because of indirect hold-up problems and network effects? From the perspective of the outlined efficiency analysis both questions have to be answered with 'Yes'.

However, up to now one relevant aspect has not been taken into consideration. In product systems *customers* also invest in product-system-specific assets and thus are exposed to hold-up dangers. Console and compatible videogames lose their value when switching to another system. In addition, consumers often gain system specific human capital over the time (e.g. user knowledge) which also loses value when switching. Component manufacturers with market power can exploit this dependency of the customers and are able to appropriate the major part of the producer and consumer rent by a monopolistic pricing policy. 3DO for example, indirectly increased the price for compatible videogames by doubling developer licences after selling the first 3DO consoles.

If consumers invest in product-system-specific assets but are not able to appropriate total consumer rent, they are not willing to invest sufficiently. Again, there is an under-investment problem because of a hold-up situation. Because of the presence of network effects these under-investments are disadvantageous for the whole system. In the 3DO example, most consumers anticipated the hold-up problem and, in spite of massive price reductions, did not invest in a 3DO console. This bore negative implications on the investment willingness of game developers and thus on the

attractiveness and variety of 3DO compatible games. This vicious circle finally resulted in the failure of the 3DO system. Consumers compared to firms, however, are not able to solve the resulting problems by integration. Other safeguards have to be established to solve this under-investment problem thereby convincing consumers to invest in product-system-specific assets. Video console manufacturers, game publishers and developers have a strategic interest to offer effective safeguards against the exploitation of the hold-up situation to be able to be successful in an industry characterized by indirect network effects. As the 3DO example shows, subsidization of the console is not sufficient because consumers have to fear that the other players deduct the consumer rent in the form of more expensive compatible games once the customers have invested in the console.

This problem does exist in all product-system industries where the system consists of a long living system-specific hardware and compatible short living software. After buying the hardware, consumers are locked in. Firms can exploit this situation by increasing the price for software. Because of different life spans selling hard- and software in a bundle is no solution. Long-term contracts do not work because of high quality uncertainty. Farrell and Gallini (1988), however, show that this problem does only exist if the hardware manufacturer also has the software monopoly. As soon as the hardware manufacturer gives up the software monopoly by issuing free or cheap software licences, consumers are effectively protected against hold-up. Competition on the software market prevents monopolistic pricing.

Transferred to the videogame industry, console manufacturers should create competition on the market for compatible videogames by a liberal licence policy. Intra-system competition in the game market, next to customer signalling effects, implies strategic competition

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effects. The more compatible games are offered by competitors, the more attractive and various the game supplies become. Thus, the whole system becomes more attractive. Increasing intra-system competition improves the particular videogame system chances to succeed in competition with other systems. From this perspective, an integrated or quasi-integrated value chain organization is dysfunctional. It does not only send wrong signals to potential customers. It also switches off the strategic competition effect and thus innovation with regard to the system.

Now it has to be questioned why Nintendo, in spite of its quasi-integrated value chain organization, was able to be so successful up to now. The reason can be seen in the focused customer group of 6- to 15-years old boys. Customer lock-in thus was limited because new customers entered and older customers exited the market all the time. Thus, efficiency advantages were more relevant than the described strategy and innovation effects.

However, meanwhile the situation has changed; even though Nintendo still focuses on the same customer group, more and more adults are interested in consoles. Therefore customer lock-in and as a consequence, strategic customer signalling and competitive effects of value chain organization, gain relevance. The console manufacturers have to induce competition in the game market to be able to send out credible signals to the customers that they are not exposed to hold-up dangers. For potential customers it is (for example) obvious that Microsoft is imposing more credible competitive restrictions with regard to the future price of the Xbox by cooperating with Sega, compared to working together with smaller firms. However, because of technological dynamics in the videogame industry it is not sufficient just to open the market for compatible videogames. As long as the console manufacturer owns a monopoly with regard to the hardware, the danger arises that not enough

research and development investments are undertaken due to the fear of cannibalising the existing console. Such behaviour prevents established firms from entering the market for compatible videogames. Sega, for example, is easily able to develop Xbox compatible games because Microsoft selected an open architecture for the console and thus created an innovation inducing competitive effect.

The disintegrated forms of value chain organization increase intra-system competition. This competition inside the product system acts as a credible signal for customers that the hold-up danger is low, and further leads to a competition for innovative hardware and software components compatible with the system. This intra-system competition therefore improves the entire system and makes it more competitive with regard to rivalling product systems. In this context, it is understandable that Nintendo recently announced to open up the Nintendo product system to a higher degree and thus create more intra-system competition in the future.

6 ORGANIZATIONAL AND STRATEGIC CONCLUSIONS

As soon as several hardware and software component manufacturers directly compete with each other in one product system, they are able to earn over-average profits if they achieve innovation advantages in intra-system competition. This dynamic competitive process does not only send credible signals to (potential) customers to invest in the system, but further improves the position of all participating firms in inter-system competition. It becomes obvious that the design of value chain organization in the videogame industry does imply strategic relevance. From a strategic perspective it can be sensible to accept efficiency disadvantages in intra-system competition to gain competitive advantages in inter-system competition. Competitive positions in a product system depend on the competitive position of the

product system in competition with other systems. Therefore, each strategic firm decision has to consider implications of the selected form of value chain organization on total value creation of the product system, as well as of strategic decisions of other product-system members and its own strategic decisions on customer expectations.

The videogame industry in this context has been analysed with respect to its history, competitors, competitive forces, and forms of value chain organization. Indirect network effects have been found to influence competition within the industry in a crucial way. Developers, publishers, and producers invest heavily in product-system-specific assets. From a transaction cost perspective, the resulting hold-up problems can be reduced within a vertically integrated value chain. From a strategic perspective, however, it is better to disintegrate the value chain. The resulting inefficiencies will be more than offset by competitive advantages. Vertical disintegration credibly signals to potential customers that they will not be exploited after purchasing a product-system-specific video console. Moreover, vertical disintegration enhances intra-system competition which, in turn, increases the probability that the whole system will be more innovative than others and therefore successful in inter-system competition.

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