Network externality and competitive advantage:

Case study of Microsoft's success in home video game industry

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Abstract

The purpose of this paper is to analyze the success factors of newcomers in industries where network externality functions strongly through case analysis of game industries. In the home video game industry, in spite of the fact that strong network externalities function in this industry, the winner, a firm with the highest marketing share, has changed one after another. We analyze the reasons why ATARI become conspicuous, and took over its market winnership by Nintendo, Nintendo by Sony Computer Entertainment (SCE). In addition, we clarify the factor that Microsoft increase its market share from SCE by interview, statistical analysis and questionnaire survey, and analyze them from viewpoint of network externality.

Keyword

Network externality、Home video game industry 、winner-takes-all market, Microsoft, Xbox360

7200 words

Chapter1: Introduction

The purpose of this paper is to analyze the success factors of newcomers in industries where network externality functions strongly through case analysis of game industries. The characteristic of a network externality is defined as the increasing utility that a user derives from consumption of a product as the number of other users who consume the product increases from consumption of a product (Rohlfs, 1974). The market with network externalities tends to become monopolized (e.g., an Operating system of PC and an Internet auction site). In this manner, it is commonly accepted that it is difficult for newcomers to succeed in the market with strong network externality. However, by observing the market with network externalities over a long period of time, we discovered that there are quite a few successful newcomers in this field. Mobile phone market and the web browser market are the examples. In this paper, using researches on video game industry in global market as a reference, we derive the key factors for newcomers to gain competitive advantage in an industry where network externality is functioning.

The reason why we adopt video game industry as a reference is because even though this industry is strongly influenced by the features of network externality, transition of firms gaining competitive advantage occurs one after another. We explain this in detail next chapter, and in this chapter, we explain how video game industry has a characteristic of network externality and how winners change in global competition.

First of all, network externality functions in video game industry. This originates from the separation of hardware and software. Since the software developers wish to provide new products for hardware with larger demand, this leads the enrichment in number of software corresponding to well-selling hardware. As the number of software increases, well-selling hardware becomes more attractive to consumers and extends its sales, therefore the software developers concentrate more on producing software of that hardware. Thereby, they are able to exert a positive cycle of network externality. This is the mechanism of how network externality functions in video game industry (figure 1).

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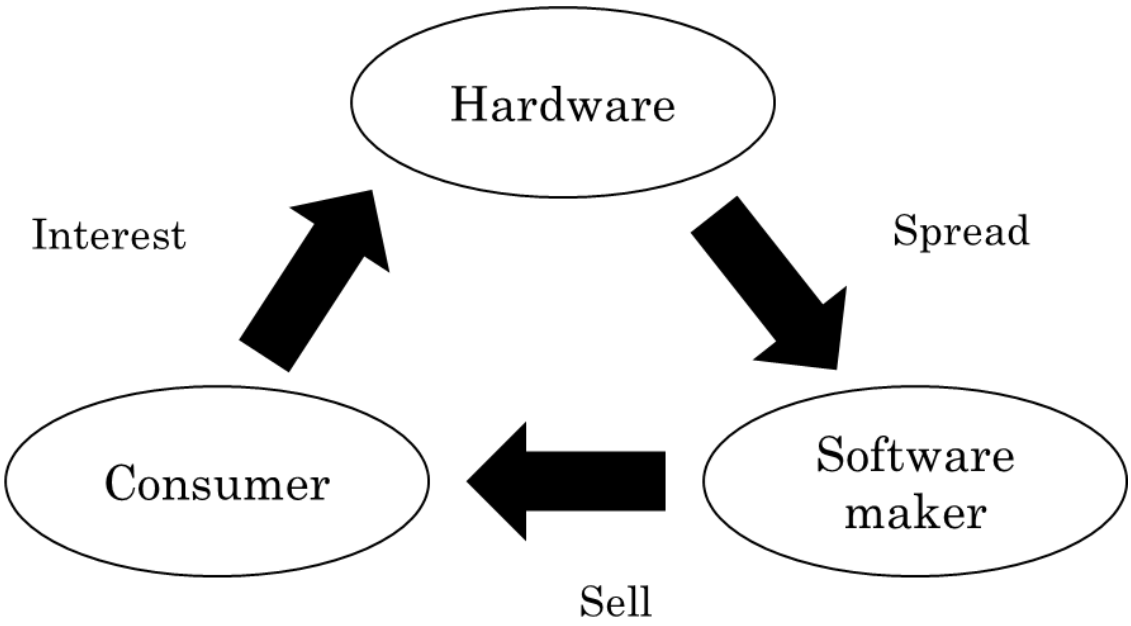
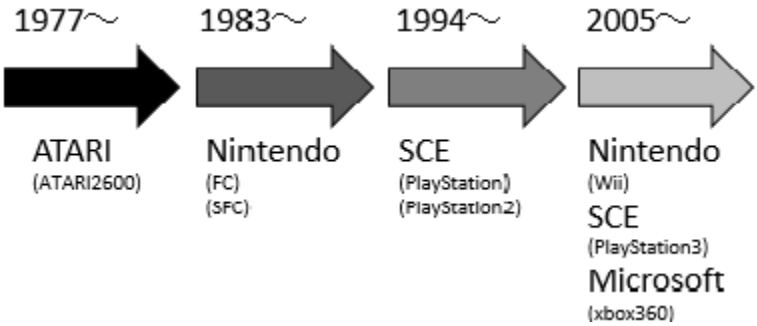


(Figure 1) network externalities in home video game industry

Source: Authors

However, in spite of the fact that strong network externalities function in this industry, the winner, a firm with the highest marketing share, has changed one after another. First winner was ATARI who sold ATARI2600 in 1977. This was the case where many software developers concentrate and could take advantage of network externality for the first time, but in 1983 a worldwide big hit marked by the Family Computer sold by Nintendo wrested supremacy from ATARI. Since then, Nintendo continued to be a winner, but in 1994, Sony Computer Entertainment (SCE) sold Play Station (PS) and SCE wrested supremacy from Nintendo. And in 2005, SCE was overthrown by a newcomer, Microsoft. In this way, winner has changed three times in spite of the fact that network externality functions in this industry.

According to Figure 2, in order to discuss about newcomers and competitive advantage in industries where network externality functions strongly, video game industry seems to be perfectly suitable.



(Figure 2) changing winners in home video game industry

Source: Authors

This paper is constructed as follows. The next chapter, in chapter 2, by organizing the existing research related to network externality, we clarify research questions and positioning of this paper. Chapter 2 consists of three contents. First, we organize the arguments and definitions related to network externality and, moreover, summarize the cases studied previously. Secondly, we overview competitive situation in the industry where network externality is functioning, excluding the video game industry, and analyze how competitive advantage has changed in the industry. Finally, we organize the existing research and confirm positioning of the present study. Chapter 3 consists of two contents and we mainly analyze transition of competitive advantage in video game industry. First, we trace the history of video game industry winners, such as ATARI, Nintendo and SCE, and analyze the factors for transition of firms gaining competitive advantage. Moreover, we frame three hypotheses why Microsoft was able to take away market share based on chapter 2 and clarify factors with statistical analysis, questionnaire and documentary search. In chapter 4, we verify whether the features of network externality in video game industry we reveal in chapter 3 are applicable to another industries or not. And in chapter 5, we make conclusion and discuss about implications and limitations of this study.

Chapter2: Literature reviews

Firstly, we confirm about definitions and features of network externality reviewing the existing researches. After that, we introduce some examples about industries affected by

network externality and survey how they have been competed. Finally, we confirm our research questions.

Chapter2.1: Network externality

Network externality is a concept proposed by Rohlfs (1974) and was theorized by Katz&Shapiro (1985). Network externality is defined as the increasing utility that a user derives from consumption of a product as the number of other users who consume the product increases from consumption of a product, as it was mentioned in chapter 1. Network externality is sorted to two types. One is direct network externality. We explain this by giving an example of the FAX. When the number of users is few, users only get few chances to deliver message through FAX, however, as the number of users increase, the chance for delivering message increases, then FAX becomes more beneficial for each user. Therefore, as the number of users increases, there is a higher chance to use the specific product or service they get, hence network externality offers higher utility to each user. This is known as the direct network externality. Another is indirect network externality. This can be explained by an example of operating systems of PC as well. As the number of users increases, depending on its scale, the number of software as a complementary product, which increases the value of that OS, increases. Therefore, each user's utility also increases. In this manner, a product, that complements products or service is considered as an important value for consumers, allowing the utility each and every user earn to increase indirectly. That is indirect network externality. Indirect network externality is believed to be one of the factors causing solo winner (W.B. Arthur:

Increasing returns and the new world of business. Harvard Business Review, July-Aug (1996)), and this phenomenon is called lock-in situation (Arhur, 1989).

In a market where network externality functions, industry standard is determined by three conditions (Besen & Saloner, 1989). First condition, when each of the companies competes by developing a product with incompatible standards, only one of the products tends to win the market. When the winner is determined like this, we call this Industry standard determined as De facto standard. Specific examples include VHS and operation system of the computer. The second case is a case when this condition is determined by administrative agency or the like. Standard of industrial field is developed internationally by International Organization for Standardization; like this, there is a case when industrial standard is chosen by place different from market competition. Lastly the third condition is when typical firms bring each of their own technologies to evaluate each other before they introduce their products to the market. At this time, industrial standard is determined by making an agreement between the firms. This is the so-called voluntary standard（Competition Policy Research center, Tanaka, Yazaki, Shimotsu 2005）. A CD is a concrete example.

As mentioned above, we confirmed the determination of industrial standard. Although, since this paper handles the case in market competition, we result in ascertaining de facto standard. In the next chapter, by introducing industries with direct network externality and indirect network externality function at the same time, we confirm what kind of feature functions network externality and competition held in those industries.

Chapter2.2: Example of industries where network externality functions

We described that there are two types of network externality. First, we examine the case of the industry where direct network externality functions.

(1) **The direct effect of network externality allows the number of users and market share directly to become users merit or may be seen in the enhancement of the quality of the products or service.**

Mobile phones, SNS and online game in their early stages can be mentioned as examples. When mobile phones appeared on the market, the purpose of the consumers who were willing to purchase mobile phones was to receive call service. But in the mobile phone market, the utility is too small if there is only single subscriber. That is because the utility derived from the usage of a mobile phone is strongly influenced by the number of users enjoying the same call service. Also meaning that the bigger the network of the subscriber is, the bigger the utility becomes in that network. Thus, the size of the market will lead to benefits as a user, it is said that the effect of network externality functions directly.

Next, we will consider the case of industries that network externality functions indirectly.

(2) Case of reversal of share in the mobile phone market

Not only the direct network externality, there is a case when indirect network externality functions in the mobile phone market. At the time when Internet browsing feature in the mobile phone has been developed, there were almost no compatibility between DoCoMo, AU and

Vodafone. Also at that time, most of the mobile phone websites were corresponding to i-mode, operated by DoCoMo. Since most websites were compatible with i-mode, many users willing to purchase mobile phone to browse internet, desiring higher utility deriving from the number of browsable websites, preferred purchasing DoCoMo, which had allowed DoCoMo to broaden the market in the early stage. However, then, AU and Softbank (Vodafone) took a share of DoCoMo. Both companies made compatibility in the Internet browsing and i-mode, so the effect of network externality of DoCoMo was almost gone.

We confirm the case of the industry functioning direct network externality and indirect network externality. In the next chapter, we organize the existing research concerning network externality and clarify our research questions.

Capter2.3: Summary of existing research and introduction of problem consciousness.

Network externality has direct and indirect effect, so it has a tendency to form winner-takes-all market. However, as we said above, there are some cases where we can find transition of winners in such markets. In the case of "i-mode", other companies took in network of i-mode by made product which is compatible with i-mode. Hence, i-mode loses its indirect network effect and this shows how winner changes place in the market. Is this factor peculiar to the cell-phone market, or can this be applied to other markets as well? Thus, we analyze the factors of transition of winner in the video game industry, representative of the market with indirect network effect, in order to explain the success factors to gain competitive advantage in such markets.

Chapter3: Analysis of video game industry from the viewpoint of network externality.

This chapter is made up of two parts. Through both part, we trace the history of competitive advantage in video game industry. First, we analyze the major factor of transition of the winners in video game industry from a viewpoint of network externality based on existing researches. Secondly, based on the above result, we explain the reason why Microsoft was able to increase its market share in the industry with three hypotheses. And in this chapter, we reference ASB case NO.2 (2011, magi) and official web site of each company, newspaper articles, *CESA game hakusyo,* and so on, as a previous research.

Chapter3.1: transition of video game industry.

In this part, we explain about history and evolution of the video game industry. In 1972, the world's first video game machine "Odyssey" was sold by American company "Magnavox". It is said that Fairshil (U.S.) have a success in unbundling video game architecture "Channel F" for the first time in 1976. Unbundling video architecture is separated in main unit and game cassette. After that, unbundling architecture became mainstream of this industry.

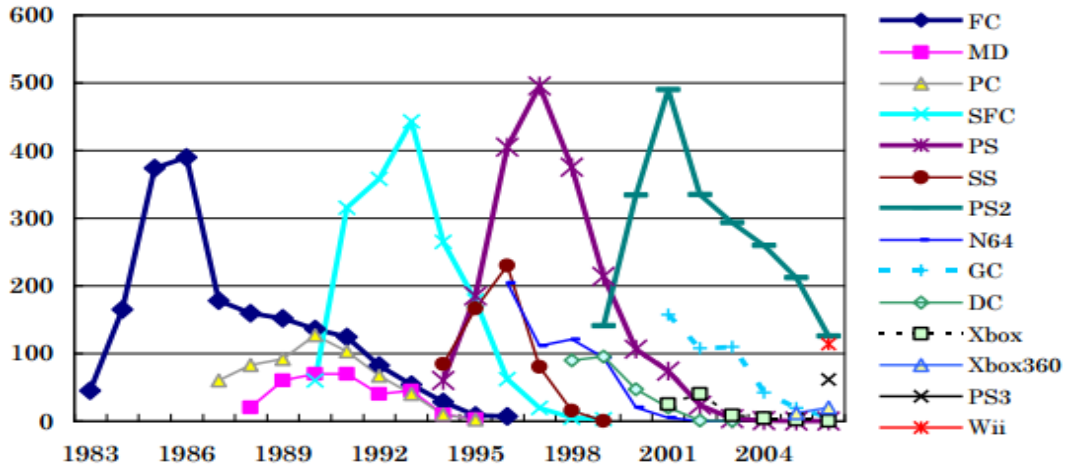
Unbundling video architecture "ATRARI2600" sold by ATARI (U.S.) made waves across the world for the first time in 1977. ATARI2600 and cheaper version ATARI2600Jr sold thirty million units and found a new market for home video game. In Japan, home video game became widespread after the arrival of "Family Computer (FC)" by Nintendo in 1983. Figure3 shows

each machine's trend in the volume of shipments in Japan after 1983. According to that, in the 1980s, cumulative shipments of FC are nineteen million units. Consequently FC won a considerable share of the market. Nintendo launched “Super Family Computer (SFC)” after FC and it made success as well. In this period, many other companies flocked into the video game market. However, no one could threaten Nintendo’s hegemony (Table1).

	Entry	Withdraw	The number of hardware
Magna Vox	1972	1978	2
Atari	1975	1993	6
Epoc	1975	1984	7
Coleco	1976	1982	2
Nintendo	1977		11
Bandai	1977	1996	5
Tomy Industry	1977	1977	1
FairChild SemiConductor	1976	1976	1
Takatoku	1977	1977	1
Inter Ton	1978	1978	1
Toshiba	1978	1978	1
Mattel	1980	1980	1
GCE	1982	1982	1
SEGA	1983	1998	5
Casio	1983	1995	3
Comodoll	1982	1993	4
Sinclear	1982	1982	1
Tomy	1977	1982	2
SORD	1982	1982	1
Sharp	1982	1987	3
NEC	1981	1994	5
SNK	1990	1994	2
Fujitsu	1989	1993	2
Pioneer	1993	1993	1
3DO	1994	1994	1
SCE	1994		4
Microsoft	2001		3

(Table 1) a period of entry and withdrawn of a home video game machine manufacturer, and the number of sale hardware

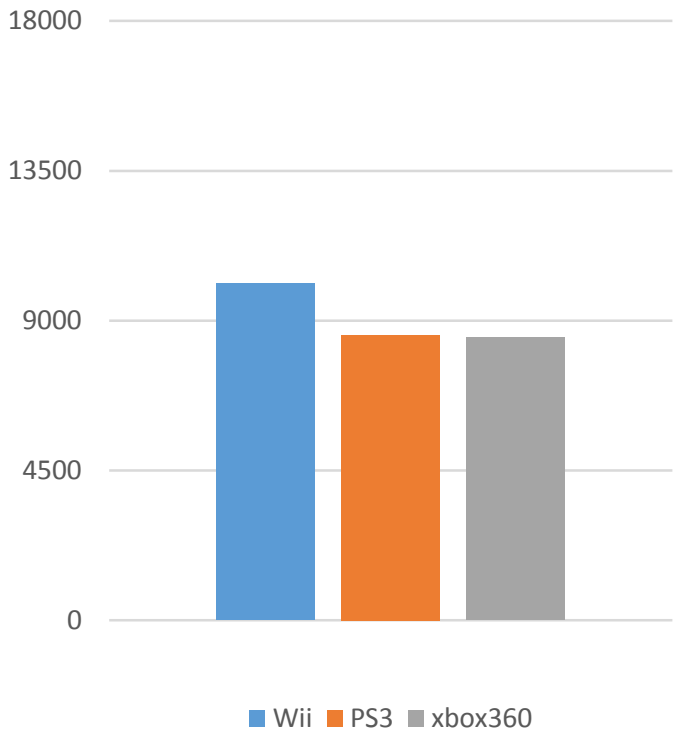
Source: VGchartz



(Figure3) transition sales of hardware in japan

Source: The network externality effect at home video game market

(2007,Ishibashi Study Group)



(figure 4) Sales of Wii,PS3,Xbox360 （2015）

Source: VGchartz

Chapter3.2: Analysis of a transition of winner, from ATARI to Nintendo

First, we will analyze what kind of strategy game companies took so far and how they got power in the game market in terms of network externality. ATARI2600 sold by Atari Co. was a home video game machine hit worldwide for the first time by architecture with its shape that software was separated. There were two main factors in which ATARI2600 succeeded. The first was a success to take in network externality for the first time. The second can be mentioned that it succeeded in exerting a positive cycle of network externality. Analysis of the cause of the

first one is that they widely published program specification for software developments to software developers. Because of this, many software developers entered into the market, and consumers began to play a wide variety of software. ATARI Co. made the program specifications public, by which software development companies got easy to develop software for ATARI2600, to make a market environment with network externality. Next when the second factor is analyzed, it's mentioned that the space invader and Pac-Man popular as an arcade game then were transplanted to ATARI2600. The company made a success to increase the number of users of ATARI2600 by taking the software popular already in it and to give incentives of developing software for ATARI2600 to the third party. Thereby, they were able to exert a positive cycle of network externality. From the above, it is assumed that it is ATARI Co. that succeeded firstly in taking software development companies in network externality in the game industry. Due to this, ATARI2600 pioneered a home video game industry with a smash hit making sales 30 million in conjunction with a low-cost version ATARI2600Jr.

However, a home game industry had been declined significantly from1983. This is because it had backfired as ATARI Co. over-focused on indirect network externalities effects. It is caused by getting open program specifications for developing software. Although a variety of software has been released by a number of third-party who has entered the market, inferior software began to increase gradually. It was difficult to grasp whether the software was interesting until a consumer played actually after software was bought, because the media to confirm the quality of the software beforehand weren't complete then. The amount of the software was increasing. On the other hand, the quality was falling, and a consumer hesitated to buy them. As a result,

ATARI Co. lost reliance of consumers, and it leaded to the decline in the industry. It was called ATARI Shock later. The system of exerting network externality doesn't work properly as time goes by. In figure3, it is shown that distortion of netwaork externality of ATARI2600.

Instead of ATARI2600 losing power by the distortion of network externality, Family Computer released by Nintendo obtained power in the industry. The hardware had two features. First is that Nintendo checked software qualities by themselves to provide only high quality software for the industry. They learned from ATARI Shock, and Yamauchi (Nintendo) said as below.

"We lost consumers because of making lots of low quality software."

It is assumed that Nintendo revised the distortion of network externality by this. And distortion of network of externality revised by Family Computer by Nintendo is shown at Figure3.

The second is the system and distribution of software. It can be said that this is a refined strategy giving motives of entering the market to software developers. Not producing by themselves, software developers entrusted Nintendo with the development after some discussion and they purchase and sell it. Surplus production and price break were restrained by the know-how built in a toy business by Nintendo. It seems that this improved a stock cost which was an entry risk for the third party, allowed them to enter more easily. Through these factors, the video game recorded the smash hit which made sales of 19 million copies in Japan and made a home video game permeate through Japan. After that, Nintendo had been a winner

in the market with network externality built by them, although some companies attempted to enter the market.

Chapter3.3: winner change from Nintendo to SCE

Next, the factor from which SCE could take the share of Nintendo away in the game market is being analyzed. It's when SCE released PS in 1994 that a movement of Nintendo's power state came out. SCE considered that they could take the share of Nintendo away by focusing on reinforcements of the scale of the network and an indirect network.

The first thing SCE did was to make the scale of network bigger in order to increase software related to products directly. This was an offer of an open software development environment, which disclosed program specifications to software developers by different way of Nintendo. Distrust to software by ATARI Shock was already swept by Nintendo, and also the media reviewing software had begun to be complete at this time. Therefore SCE called software developers by rules which were not strict to offer a wide variety of software to the market. Concretely, the companies kept the low expenses by means of offering applications which can develop game software on PC basis.

The second was to stop surplus order and shortage of products to strengthen the software developers' motives in the network externality. Nintendo also tried the same strategy, but SCE worked superior one. Because of this, software developers could develop a variety of software more easily than before. It is said that consumers tend to choose a hardware having much software and SCE made the strategy in the hope of effects of the indirect network externality.

In more detail of the strategy, SCE did business, by using a distribution of Sony Music Entertainment, with major consumer electronics retailers directly without wholesalers. SCE succeeded to establish more efficient distribution chains than Nintendo because it was possible to exchange information on sales of software and additional productions efficiently. Moreover, it was the CD-ROM adopted by PS that supported SCE. It became possible to produce flexibly because the additional production of CD-ROM could be performed much earlier than the ROM cartridge adopted by Nintendo.

This was an effective innovation in the home video game market where an expectation of demand was difficult. Because of attaching the importance, many software development companies entered as the third party of PS in the market, and PS made sales of 20 million units in Japan and made Nintendo ended as a result.

To summarize the strategy of the SCE, they were able to take the network externality from Nintendo by mainly strengthening the motivation in the network externality to the third party in the background of changes of image and information media about games to consumers.

Chapter3.4: Competition of Nintendo, SCE, and Microsoft

It is release of Wii that Nintendo got a chance to have regained force from SFC. A development concept of Wii is to be accepted by family. Unlike superior performance of the former simple hardware, Nintendo pursued a compact design and a power-saving design sacrificing performances and an easy operation. In addition, regarding software, they were dedicated to developing what everyone can enjoy playing. As a consequence, WiiFit, software of

Wii, was released. Family could do their health management, and WiiFit provided a different game experience from the usual. Thereby, Nintendo made a success to sell Wii to lots of families and expand the scale of gamers. Then, Iwata, a former president of Nintendo, said as below.

What is important is the game experience of the next generation rather than the next predecessor technology. Power is not important. As indicated by this, the development concept of Nintendo was absolutely different from before, and their target was consumers who stopped playing games and never played them.

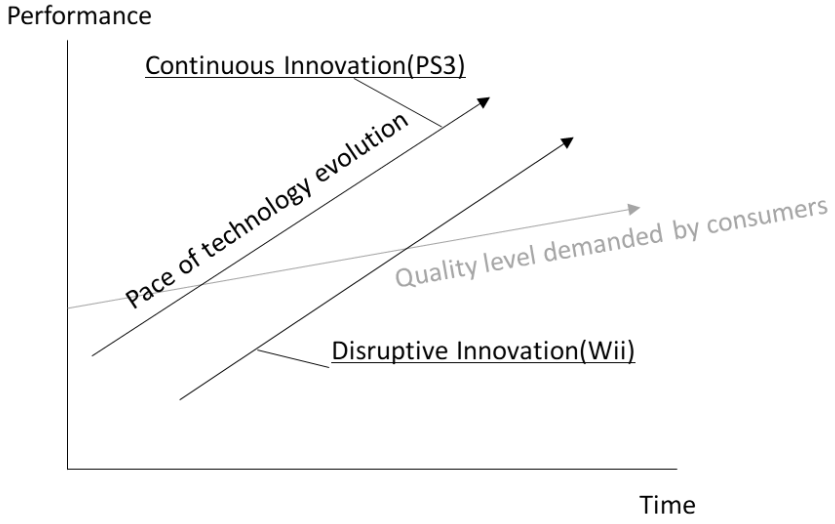
While on the other hand, SCE released PS3 as a high-performance hardware using advanced technology. With respect to CPU, a core part of performance, SCE put large amounts of money to make Cell CPU itself and adopt Blu-ray Disk, which was comparable to super computer. Kutaragi (Sony) said as below.

"What can make future is only a technology innovation. This thought is unwavering."

From above, PS3 was targeting a completely different costumer from Wii and focused those who have been playing games. That is, Wii targeted the light user, and PS3 did the heavy user. Consequently, it was not that only one company won in the market as before, because the sales of home video games were dispersed.

On analysis of Wii and PS3 in terms of innovation, Wii was a disruptive innovation, and PS3 was a continuous innovation.

Figure 5 shows PS3 and Wii by a continuous innovation and disruptive innovation. The continuous innovation is what changes a market by an improvement of continuous technology competed in the market. PS3 can be classified in the continuous innovation because SCE made efforts to improve simple performance. In contrast, the disruptive innovation is what changes the market by offering other value dimension, but sacrifices important parts of competition. Wii can be classified in this.



(Figure 5)　Deferent types of innovation between PS3 and Wii

Source: Authors

It is explained from above that Wii and PS3 were not competitive products. However, how was Xbox360? Xbox360 had high performance equal to PS3, and Microsoft regarded Sony as a rival. Therefore, both competed for the continuous innovation. A home video game industry was difficult to enter and take the share away because of network externality. Microsoft and Sony competed in it, and Microsoft succeeded to get shares although SCE had been winner until then (Figure2).

Why could Microsoft succeed to take shares in the market with network externality? We set three hypotheses to analyze their factors. The logics of them are being explained in the next section.

Chapter3.5: Derivation of hypothesis

(1) The influence that the number of software gives to unit sales of the hardware

A variety of software to be provided is considered to be the important factor for hardware to achieve increase in number of sales. As verified by the transition of video game industry, in the past, hardware had succeeded by providing variety of soft by taking in software developer maker. In fact, while the number of software for Xbox, published before Xbox360, is about 1000, the number of software for PS2, top share at that time, is 2500 more than twice the number of soft provided by Xbox. But, at the case of Xbox360 and PS3, there is 1162 softs for Xbox360 and 1026 softs for PS3, so the number of software for Xbox360 is larger than that for PS3. We suggest hypothesis 1 from the fact provided above.

Hypothesis1

Xbox360 could take market share from PS3 because Xbox360 had more software provided compared to that of PS3.

(2)The strategy of Xbox360 in expectation of gamers quitting game

There is Wii, released during the same period as Xbox360, PS3. As we mentioned before, Nintendo succeeded in acquiring light-users, or new customers, by releasing Wii. Nintendo understood that there is a phenomenon occurring among game users where gamers quit playing games since the game industry has become so complicated through development of sustainable innovation. While Xbox360 and PS3 competed on sustained innovation, it seems that Xbox360 succeeded in getting market share by adopting the strategy for heavy-users, by functioning network externality. Heavy-users prefer not only RPG or Action games, being sold regularly, but also shooting games and sports games. Almost all of shooting games and sport games are online-games and these games are played, not only for competition but also cooperation, with players all over the world who plays the game at the same time. In short, as the number of players increases the number of friends to play games with increases as well, more attractive the hardware becomes. Now we suggest hypothesis 2 from the fact provided above.

Hypothesis2

Xbox 360 could take share from PS3 by taking in network externality from narrowing its target to heavy-users and successfully obtained support of heavy-users.

Chapter3.6: Investigation of hypothesis and Analysis

Hypothesis1

Xbox could take share from PS3 because Xbox360 had more soft provided compared to that of PS3.

We conducted a regression analysis to make sure the relationships of software released for Xbox360 and PS3 and hardware sales. In order to count the number of monthly released software to handle, we checked the official site of Microsoft for Xbox360 and the official site of SCE for PS3. For the data of monthly sales of hardware, we referred it from the website: VGChartz. We can clarify how the numbers of released software influence sales of the hardware by conducting regression analysis using these dates.

In this analysis, we made a regression analysis on each market (Japan and America) for each hardware (PS3 and Xbox360), by using the data of monthly sales of hardware and monthly released software. Since it seems that the number of the game titles[1] influence not only that month but also several months ahead, we used game titles two months ago for regression analysis.

$$Yt=\alpha+aXt+bXt\text{-}1+cXt\text{-}2$$

We made a regression analysis based on above equation. In this equation, **Yt** is objective variable, to express game hardware sales on t month, and **Xt, Xt-1,Xt-2** is explanatory variable, to express the number of game titles on **t** month, and **t-1** month , **t-2** month. We use the data

[1] Game title means game software.

from December, 2006 to December, 2012 for PS3, and from November, 2005 to December, 2012 for Xbox360. The results are shown on Sheet1.

	α	a	b	c	Adj.R2
PS3japan	***74351.04***	***2553.04***	***254.41***	***434.54***	***0.02***
	(3.184)⋆⋆⋆	***(1.559)***	***(0.158)***	***(0.251)***	
PS3North America	***11152.41***	***560.89***	***17655.29***	***12651.28***	***0.42***
	(0.185)	***(0.146)***	***(4.555)⋆⋆⋆***	***(3.724)⋆⋆⋆***	
Xbox360Japan	***15570.24***	***121.74***	***235.69***	***-32.80***	***-0.02***
	(3.241)⋆⋆⋆	***(0.321)***	***(0.594)***	***(-0.084)***	
Xbox360North America	***-59381.10***	***-3132.24***	***35593.82***	***18405.36***	***0.45***
	(-0.659)	***(-0.566)***	***(6.520)⋆⋆⋆***	***(3.394)⋆⋆⋆***	
※⋆=the significance level of 10%,⋆⋆=the significance level of 5%、⋆⋆⋆=the significance level of 1% ***term ：2006～2012***					

Sheet1

Taking a look at the sheet above, in Xbox360 japan and PS3 japan, numerical value of **Adj.R2** is very small, so this regression formula can't describe the relationship between game hardware sales and the number of game titles. And, although in Xbox360 North America and PS3 North America, this regression analysis describe that the number of game software a month ago and the number of it two months ago have positive influence for game hardware sales, and this figure is statistically significant level at the 1%. But in this data, it is difficult to explain all relation since numerical value of **adj.R2** is slightly small.

From the analysis mentioned above, it is revealed that the number of game software don't affect hardware sales. Since it is confirmed in previous research that the number of game

software has positive influence on hardware sales at the game console before Xbox360 and PS3, we get a different result from what we expected. So, we made a new hypothesis, is as follows, and analyzed it: number of killer title affect hardware sales. As a reason for that, we thought that the quality of video game is to be emphasized, whether the game is fun or not, rather than number of software.

Hypothesis 1-2

Xbox360 could take market share from PS3 because Xbox360 had more killer title software compared to that of PS3

In this paper, we defined killer title as software with sales over 3million[2] copies. We used VGChartz's data as a reference and analyze it with same method performed in hypothesis1. In this regression analysis, game hardware sales are an objective variable and the number of killer application is an explanatory variable.

$$Yt=\alpha+aZt+bZt\text{-}2+cZt\text{-}2$$

Yt indicates hardware sales in t month, **Zt, Zt-1, Zt-2** indicate the number of killer application released. Same as before, we use the date from December, 2006 to December, 2012 for PS3, and from November, 2005 to December, 2012 for Xbox360. The results are shown in Sheet2.

[2] Generally, software sales well is million title, sales million softs. But we judge that there are too many parameters since the number of million title is over 200. So we defined killer title as software that sell over 3million to reduce a parameter.

	α	a	b	c	Adj.R2
PS3	***262728.0 (2.062)⋆⋆***	***322978.3 (5.922)⋆⋆⋆***	***240881.3 (4.562)⋆⋆⋆***	***-574.4 (-0.010)***	***0.614***
xbox360	***372094.3 (2.417)⋆⋆***	***227026.1 (3.641)⋆⋆⋆***	***401813.7 (6.612)⋆⋆⋆***	***-138646.0 (-2.195)⋆⋆***	***0.645***
※⋆=the significance level of 10%,⋆⋆=the significance level of 5%、⋆⋆⋆=the significance level of 1% ***term：2006～2012***					

Sheet2

The numerical value of **adj.R2** is rather high. When we take a look at the data derived from PS3 market, coefficient of both **Zt** and **Zt-1** met the significance level of 1%, and it is identified that **Zt, Zt-1** has positive influence on **Yt**. Looking at Xbox360, coefficients of **Zt** and **Zt-1** also met the significance level of 1%, so **Zt** and **Zt-1** affect **Yt** positive.

The result shows that there is positive influence in the relationship between the number of killer title and hardware sales. And we get the result that what affect hardware sales is not the number of software but the number of killer titles in the competition between Xbox360 and PS3. One of the reasons why such result is indicated that many same software game are released by both Xbox360 and PS3. 805 softs among 1026 software released for PS3 are released on a multi-platform. Similarly, 959 softs among 1162 software released for Xbox360 are released on a multi-platform. It is thought that the software developer released same software for several hardware, not only one hardware, and this action is different from the hardware that released before Xbox360 and PS3.

We consider that software developers release for multi-platform since there are few differences to develop software in Xbox360 and PS3. So we interviewed[3] an engineer in a software developer that release for both Xbox360 and PS3 about whether or not there are difference in difficulties of development when develop software of Xbox360 and PS3. The answer of this interviewee is "there is no difference in difficulty of development."

Thereby, we can say that one of the reasons why soft developer started releasing soft on multi-platform is because there is no difference in difficulty creating soft for Xbox360 and PS3.

The important point here is that if there is no difference in difficulty creating soft for PS3 and Xbox360, developed in-house soft is the factor to establish a leadership in the industry. 17 out of 57 killer titles of Xbox360 were sold by Microsoft and 12 out of 52 killer titles were sold by SCE. From this, we guess that the number of developed in-house killer titles is the important factor in order to compete against PS3.

So, while we proved that killer title is an important factor in game console competition, we also made a research to find out which factor makes consumer want to purchase Xbox360 or PS3. The purposes of this research are to provide evidence to the fact we proved by regression analysis, to check the network effect (ex, whether consumers purchase hardware in order to play software), and other factors that raise the purchasing willingness of consumers.

[3] We interviewed some software developers, and developer of Company A by e-mail at 17, August.

Q1	Which do you have PS3/Xbox360?
Q2	Why did you decide to buy PS3?
Q3	Why Did you decide to buy Xbox360?
Q4	How can you give priorities on your answer?

Figure6 Contents of questionnaire

1	Price
2	Friends already playing it
3	Many software you want to play
4	Brand of the company
5	Controller
6	Processing speed (responses,image quolity)
7	Other

Figure7

In this research, we chose American game players who have Xbox360 or PS3 as the main target for survey. It is because the majority of home-use game console market is in America. The contents of the questionnaire are shown in figure 6. Moreover, Q2 and Q4 give choices, shown in figure7. We spread the questionnaire by directly asking consumers who own either of the hardwares through Facebook and other SNSs. We requested 131, and get 131 answers. Figure below shows the questionnaire contents.

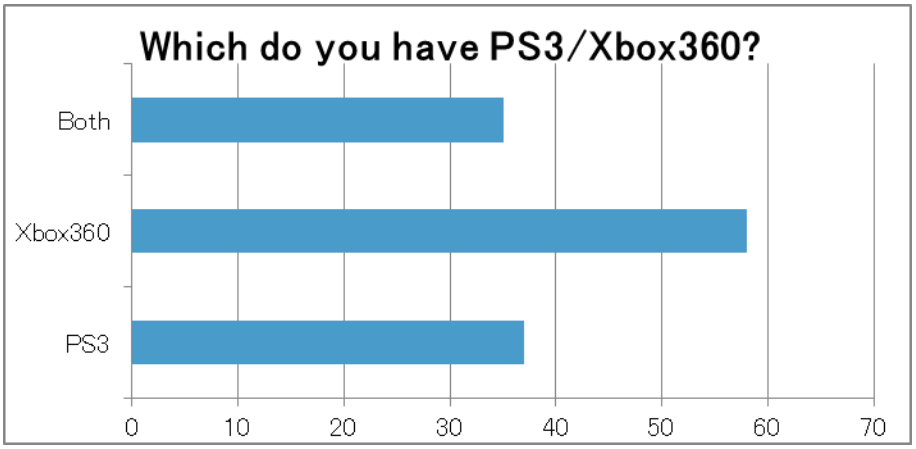


Figure8（The unit of the transverse is the number of people.）

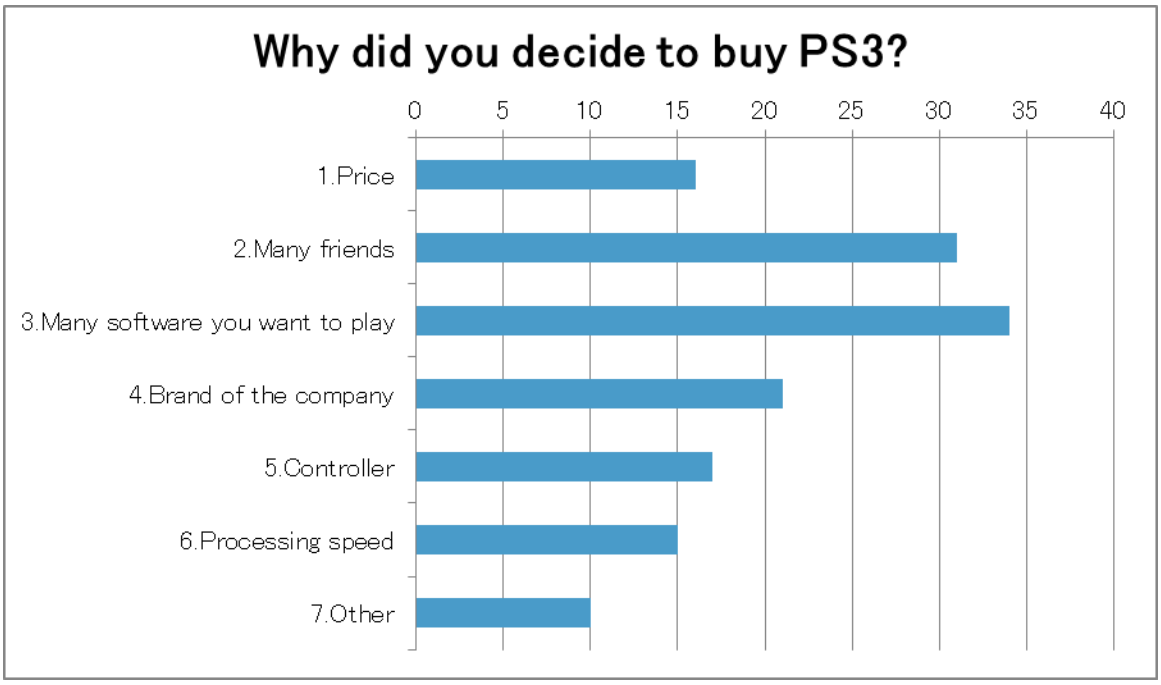


Figure9　（The unit of the transverse is the number of people.）

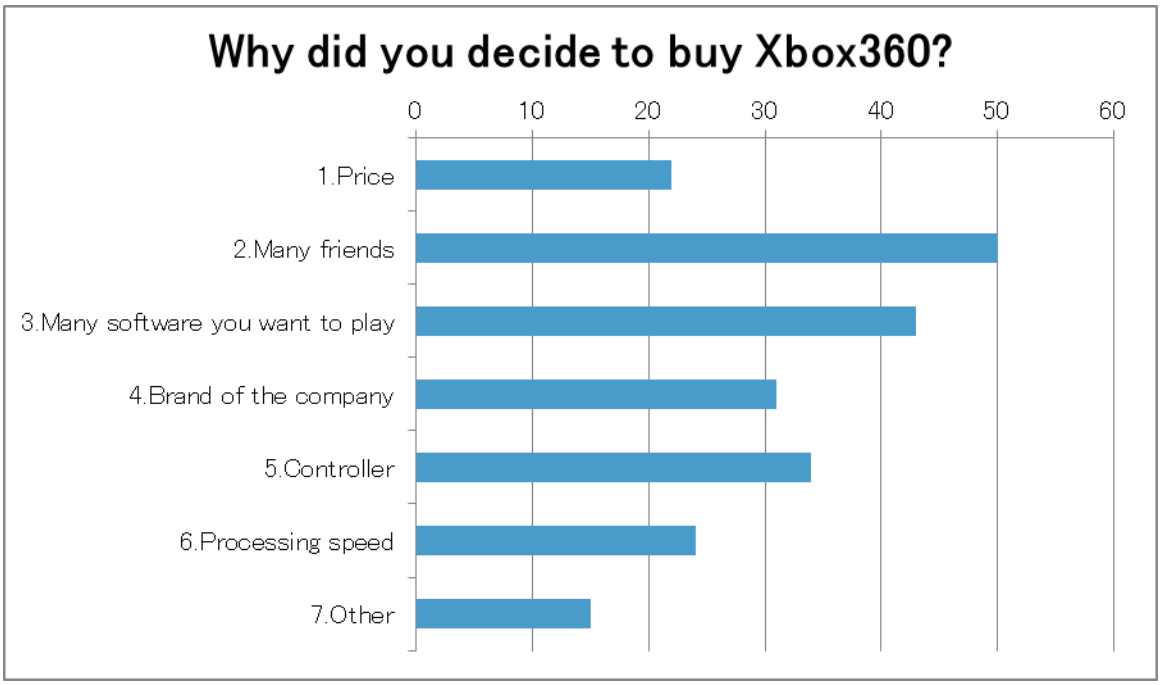


Figure10 （The unit of the transverse is the number of people.）

We analyze from the viewpoint of the network externality. Xbox360 was to arrange the performance and a development environment equal to PS3, and they succeeded to make a software development company sell software by both Xbox360 and PS3. It can be said that they succeeded to lose the situation of the previous hardware to play software and succeeded to take the network externality. We think one of the most important factors for effective competition is that developing attractive in-house software which becomes so called killer title.

We find out that it is important factor that the killer title as we confirmed hypothesis 1-1, and the number of the friend which can be connected on-line. We can think most people play the

hardware in off-line until before, but now people playing on-line through a net has increased by Xbox360 and PS3.

Hypothesis 2

Xbox360 is to get strategies for heavy users, and the Xbox360 took the market share of PS3 caused by succeeding to get support of a heavy user?

We think the feature of the hardware strengthened for a heavy user is a graphic expression of Xbox360 and the design of the controller are considered a general opinion. We checked this factor by doing an interview investigation to an engineer of a software development company about a graphic expression. “Xbox360 had high GPU performance, and the expressive power of the graphic. Picture degradation of PS3 is the topic of conversation on the development side," We got this answer. It's considered one of the factors which were accepted by the heavy user which wishes for continuous innovation, because the graphic was good relatively. It's possible to analyze from a result of the questionnaire survey used in inspection of hypothesis 1 about the design of the controller. A controller of Xbox360 is designed based on human engineering, and the operability is very excellent. There are differences of purchase motives in controller as a result of the questionnaire. Therefore it can be said that the design of the controller was also a big element for a heavy user.

Thus it can be said that Microsoft got a heavy user, because they designed controller and loaded graphic expression for heavy user. To get the user means increasing the number of the user's friend. We revealed viewing as important the number of friends by questionnaire, so we

found to contribute to the sales of the hardware by direct network externality caused from the number of friends.

Chapter3.7: Summary of hypothesis examination

The number of software sold caused the indirect network externality by the software developer in the past. But by making the performance and the software development difference level Xbox360 equal to PS3, software developers are selling software both PS3 and Xbox360 these days. As a result, we can regard that there are differences between software of Microsoft and SONY develops and sells. In other words, the software developers' influence doesn't have the indirect network externality, and it can be said that competition of Sony and Microsoft is getting to be in-house development capability of attractive software. In addition, the direct network externality started to function on line net, the number of friend was charm of hardware, because the user plays in the environment on the On-line. Thus Microsoft develops software for heavy users and is to take in a heavy user, Microsoft takes market share from SONY, because Microsoft made them do virtuous cycle of the direct network externality.

Chapter4: Success attribution analysis at the market where the network exteriority functions

In this chapter, we will analyze a success factor at home video game market, which is made clear at the fourth chapter and clarify whether the success factor is commonly applicable in other markets where the network externality functions, taking the example of i-mode.

Chapter4.1: Success factors in home video game industry

There were three times' changes of winners in home video game industry. The first winner was Atari Co. Next winner was Nintendo, and then, SCE became a new winner, and after that, SCE and Microsoft are competing recently. The respective factors of the successes are summarized as below.

(1) Success factor of Atari Co.

A success factor of Atari Co. is that they made a virtuous cycle of the indirect network externality for the first time.

(2) Success factor of Nintendo

A success factor of Nintendo is reinforcement of the network externality, which is taken from Atari Co, by strictly control the quality of their software.

(3) Success factor of SCE

Success factors of SCE are reinforcement of the network externality and its width, by developing efficient environment for software development and manufacturing.

(4) Success factor of Microsoft

Success factors of Microsoft are that they took in the indirect network effect, and they made a virtuous cycle of direct network effect works, caused newly by environmental change.

Chapter4.2: Application to the case of i-mode

From the chapter 2, a success factor of i - mode was that the indirect network effect was taken in. It's also possible to check this as a success factor of Microsoft in home video game industry. In case of i - mode, other companies succeeded to acquire market shares because they got compatible with i-mode and took the indirect network externality in. In case of Microsoft, It was one of the success factors that they succeeded to have the compatibility of the substantial software by selling most software sold in PS3 in even Xbox360 and took indirect network effect in.

It is said that it is the effective way for a success to take the indirect network effect in by getting compatible at the market where the indirect network effect functions.

Chapter5: Conclusion and discussions

We focused on the home video game industry with network externality and analyzed a success factor from the viewpoint of the network externality. In particular, through the case study of Microsoft, we examined success factors of firms in the industry, by a questionnaire survey, a statistical analysis and an interview investigation. As a result, there are five factors of success and one of them was also confirmed in other markets. Accordingly, it can be said that we clarified certain part of the mechanism, where winners change in `network externality functioning' markets.

But this study has four problems. First, the number of case analyzed in the market where the network exteriority functions was limited. It might increase its generalizability by comparing with other industries.

Second, we didn't do any comparative analysis with a market where direct network externality works. We studied only a comparative analysis with the other markets where the indirect network effect functions, because the network externality on a home video game market was indirect network effect. If we could do comparative analysis about a success factor at the market where the direct network effect functions, we may get more useful results.

Third, a background that many of the titles were released both in PS3 and Xbox360 is not clear enough. This is an important factor which weakened the network exteriority in home video game industry. However, if we can understand the deeper business ecosystem between hardware and software development companies in home video industry, we can further clarify the strategic dynamics, which might give helpful lessons to newcomers.

Fourth, we didn't consider the software sold by individual in regression analysis to check relationship between sales of the software and those of the hardware. Many individuals are developing and selling software in Xbox360 by using the development environment called XNA. In further study, it would be necessary and interesting to include these individual developers and analyze them.

We will study furthermore from now on about the issues. However, we were able to reveal the factor which a winner is interchanged with the feature of the home video game industry from the viewpoint of the network externality.

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