Intergenerational Competitive Strategies for Industry Standards

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Abstract: This paper first presents the following as obstacles to the generational switch of industry standards: (1) magnitude of installed base, (2) ample scope for technological progress based on existing standards, (3) limited applicability of accumulated technology to new standards, and (4) lack of investment capability. Next, we examine strategies to overcome such obstacles and migrate to new standards. Finally, we analyze the cooperation between a company that advocates new standards and one that produces complementary products when implementing those standards through the case study of the family console game industry. The results of analysis demonstrate that Nintendo has a traditional self-reliance strategy, whereas new entrant Sony has a collaborative one.

Keywords: de facto standard, intergenerational competitive strategy, network externality, console game, Nintendo

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1. Introduction

As is well known, securing the industry standard is critical in corporate strategy, particularly for products affected by network externality. Companies have fiercely competed over formats for music records and VTRs in the past and, more recently, for third-generation mobile phones. In these lines of business, the system that is set as the industry standard greatly influences a company’s subsequent competitive edge.

Where network externality is involved, supply-demand behavior and anticipation thereof (e.g., knowing the supplier and consumers behavior) become more important for a product to be the industry standard than the extent of the product’s functional superiority. To influence prediction and establish a favorable industry standard, a company may delay the launch of a product and move in step with or disclose its technology to other companies and actively encourage imitation. Such practices are frequently observed in these types of industry (Asaba, 1995).

Once established, an industry standard tends to steer the industry over a long period. However, control based on a specific industry standard does not persist indefinitely. Setting standards for a given product entails reducing the freedom to choose technology. When very detailed and rigorous technical specifications are adopted, the range of technological choice will be greatly reduced, and the scope for product differentiation and product improvement will possibly disappear in extreme cases. Consequently, when facing newly developed technologies that could not be anticipated when the existing standards were set and cannot be integrated into existing standards, companies must change the current industry standard to utilize the new technologies.1

1 For research on the relationship between standardization and corporate
Users can maximize their benefit from the effects of network externality by preserving the existing industry standard. However, by doing so, they will face a dilemma as the products and services with even better functionality that incorporate new technologies cannot be used indefinitely. Moreover, companies that have been defeated in the standardization race are likely to promptly advocate a new standard on the basis of new technology and endeavor to make it the new industry standard.

This paper analyzes the main factors that hamper the generational switch of industry standards and illustrates competitive strategies necessary for this switch. Strategies designed to develop next-generation industry standards can be called intergenerational competitive strategies whereas strategies to establish industry standards are defined as intragenerational competitive strategies. Generational switch is a phenomenon observed in nearly all industries, but it is particularly prominent in industries that face rapid technological progress, such as the ICT industry. This paper discusses the family console game industry, which exemplifies this phenomenon.²

2. Obstacles for Changing to New Standards

During the generational switch of an industry standard, if companies suffer defeat in the standardization race, they obtain the opportunity to reverse their fortunes if leading companies are unable to maintain compatibility with existing standards. However, it does not necessarily follow that a new product incompatible with the industry standard will fulfill the expectations of the company strategy in Japan, see Asaba (1995), Shintaku and Eto (2008), Shintaku, Konomi, and Shibata (2000), and Yamada (1993, 1997).

² Shintaku, Tanaka, and Yanagawa (2003) provide a detailed analysis of hardware and software in relation to the console game industry.
launching it and that the generational switch from the industry standard will progress smoothly. Excess inertia comes into play when users continue to opt for an older product, although they all welcome the new product. Conversely, the effects of excess momentum can result in a complete switch to a new product, notwithstanding the social desirability of preserving the older product (Farrell & Saloner, 1987).

The reason for such situations arising is the uncertain success of a new product. As a result, a user’s options change depending on his or her predictions of other users’ purchasing behavior. A new product will not gain popularity if the majority of users are pessimistic about its prospects. This self-fulfilling prophecy results in excess inertia. Conversely, excess momentum arises if the majority of users are optimistic and the product gains widespread acceptance.

The typewriter keyboard is a frequently cited example that illustrates adherence to an older product due to pessimism about the prospects for a new product (David, 1985). The Dvorak keyboard was designed to accelerate typing speed and vie with the QWERTY keyboard. The functionality of the new layout was clearly superior. However, retraining typists who use the existing QWERTY layout and switching them to the Dvorak layout required considerable costs to society. It also entailed the obsolescence of acquired skills to seasoned typists. Therefore, typists did not expect the Dvorak layout to gain mainstream popularity and typewriters adopting this layout were not put on the market. Thus, the QWERTY layout is still the standard keyboard layout today.3

As the example illustrates, the success of launching a new standard that incorporates new technology is uncertain. Under such conditions, a company may hesitate in migrating to a new standard that may not make its appearance on the market at all. There are four

3 However, some argue that the Dvorak layout was not functionally superior (Liebowitz & Margolis, 1990).
main causes that hamper companies’ migration to new standards. The first two relate to the specificities of the existing industry standard, while the remaining two concern the capabilities of individual companies.

The first is the number of users of products based on the existing industry standard, that is, the installed base. The larger the installed base, the higher the value of the existing industry standard, which makes it difficult to promote the widespread adoption of an incompatible new standard. For example, it is rarely possible to adopt a new standard in the personal computer (PC) industry on the basis of modest technical superiority due to the huge installed base of IBM PCs. The possibility of conducting business in a vast market by observing existing standards is very attractive to both hardware and software manufacturers. The second is the ample scope for technological progress based on existing standards. In the 1990s, in the PC industry, it was possible to enhance hardware performance and software user-friendliness without fundamentally altering IBM PC standards. The third is the limited applicability of hitherto accumulated technology to new standards. The greater the degree of obsolescence of existing technology through adoption of a new standard, the greater the orientation is likely to be toward refining the existing technology rather than migrating to a new standard. The fourth is the lack of investment capability. Although there are differences in degree, migration to a new standard is in essence a discontinuous change and requires a considerable amount of investment compared to the refinement of existing technology. Moreover, technological success alone does not guarantee the successful adoption of a new standard. A company’s scale and decision-making structure are likely to determine its capability to approve and implement large investments carrying such risks.
3. Strategies for New Generation

The previous section identified four obstacles. The first was the installed base—an obstacle that is inextricably linked to industry standards. This section examines strategies for migrating to a new industry norm, focusing on the magnitude of the installed base. Figure 1 illustrates the relationship between the size of the installed base and the amount of utility that users derive from the product in question for the existing industry standard and the new standard, respectively. For products affected by network externality, the larger the installed base, the greater the utility derived from the product. This is illustrated by the rising lines. Furthermore, assuming that the installed base is of equal magnitude, the line representing the new standard lies above that representing the existing industry standard. This is because the product based on the new standard provides greater utility.

When a new standard is introduced, the installed base of the existing industry standard (point C) far exceeds the number of users in the early stages of the new standard (point A). Consequently, utility of the existing standard exceeds that of the new standard at inception. The new standard can equal the existing industry standard in terms of utility when its installed base reaches point B, assuming that their respective physical functionalities are constant and the installed base remains static due to saturation of the existing industry in the market. The new standard lags behind to the left of point B and slowly gains ground, but gathers momentum past point B. Therefore, point B can be said to represent the point of critical mass point for adoption of the new standard. This point represents a point beyond which adoption progresses, regardless of user

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4 In Figure 1, the horizontal axis can also be presented as the ratio of the installed base to the number of users in the market as a whole, i.e., adoption rate (participation rate).
anticipation, and an installed base smaller than point B can be critical mass depending on user anticipation.\textsuperscript{5}

Under such circumstance, a company that attempts to lead a switch to a new standard must contemplate a strategy to allow the installed base to reach point B critical mass as early as possible. To re-express this on the figure, this strategy should aim at positioning the line representing the new standard as far up and to the left as possible. There are three conceivable approaches.

(1) Companies can expand the performance differential between the new standard and the existing norm. They can achieve a

\textsuperscript{5} Rofles (1974) demonstrates in relation to a specific standard that there are multiple equilibrium points in models that take user anticipation into consideration and that one of these equilibrium points becomes unstable. This unstable equilibrium point shares commonalities with the critical mass noted here.
performance level that is not feasible using the existing industry standard or add completely new functionalities by incorporating innovative new technologies. For example, the CD player that made its appearance in 1982 not only produced better sound quality than the analogue LP record player, but was also a standard that added a new functionality known as random access. Furthermore, two years later the “Discman” was commercialized—a portable device that was inconceivable for using LPs. As a result, the number of CD player deliveries matched that of LP record players within just five years of its launch (Shibata, 1996).

(2) Companies can reduce switching costs. This should be an effective approach because switching costs associated with migration to a new standard reduce the utility of the new standard. Examples of switching costs are the retraining costs associated with a revised *modus operandi*, such as the typewriter keyboard layout, as well as those to replace complementary products, as is the case with computer software. With respect to software, switching costs can be reduced by ensuring compatibility between the existing and new standards.6

(3) Companies can lower the price to accelerate adoption and increase the relative utility of a product with a new standard by lowering its price. Products based on a new standard are generally high priced due to the technological development costs; nevertheless, reducing the launch price is an effective means of reaching critical mass as early as possible.

However, it is difficult to simultaneously pursue all of these approaches. For instance, as mentioned, it is necessary to forgo switching costs reduction by ensuring compatibility (Approach 2) to enhance performance (Approach 1). In the PC industry, when Microsoft commercialized its next-generation operating system

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6 See, for example, Farrell and Saloner (1992) for a discussion on converters and adapters regarding this point.
Windows 95, it decided to postpone full-scale 32-bit compatibility to ensure compatibility with existing software, although initially it had been aiming for complete 32-bit compatibility. Moreover, ensuring compatibility requires additional development and manufacturing costs, which are an impediment to product price reduction.

This type of problem was one reason for Nintendo abandoning compatibility with Nintendo Entertainment System (NES; Famicom) in developing Super Nintendo Entertainment System (SNES; Super Famicom) for the Japan market. Nintendo controlled the family video game console industry through the success of Famicom and enjoyed a large user base, having shipped over ten million consoles. To leverage its strengths, Nintendo should have maintained compatibility with Famicom and its software in developing the new-generation game console. However, in 1990, Nintendo released Super Famicom, which was completely incompatible with the previous Famicom. Instead of maintaining compatibility, Nintendo adopted a new 16-bit CPU and introduced a new product that was able to fully exploit its image and sound processing functions.

Furthermore, there is room for choice regarding the timing of introducing a new standard. It is better to delay introduction if the aim is to introduce a new standard that can achieve a much higher performance than the prevailing industry standard. This allows a company to advance a standard that incorporates the latest internal and external technological achievements. However, delaying the timing can hamper adoption, regardless of how technically groundbreaking a standard is, if the installed base of the existing industry standard further expands or a competitor creates an installed base by being the first to introduce a new standard. Companies should decide the timing of introduction by considering factors such as projected technological progress, trends of the existing industry standard, and efforts by competitors to introduce a new standard.
4. Self-reliance Strategy of Nintendo and Collaborative Strategy of Sony

When companies simultaneously advance heterogeneous new standards, users may refrain from purchasing them until it becomes clear which standard will prevail. As a result, no standard gains ground. This phenomenon can arise in the initial standardization race of a particular product, such as in the case of VHS and Betamax systems for home video recorders. When such a phenomenon arises in a generational switch, however, the refrain from purchasing can be even more common as many users already own a product based on the existing standard. Setting a unified standard in advance through cooperation within the industry as a whole can be an effective means of promoting the new standard to avoid this situation. Users are more likely to take an optimistic view if competitors cooperate to produce a unified new standard, which then drives adoption of the new standard.

Furthermore, in the case of products in which the existence of complementary products generates the benefits of network externality, it is essential to expand the range of complementary products. For example, hardware adoption based on a new standard requires an expansion of the compatible software base. If a company promoting a new standard does not develop and manufacture complementary products, or is unable to independently supply sufficient complementary products, it requires the cooperation of suppliers of complementary products to promote the new standard.

As illustrated, a valuable means of promoting a new standard is cooperation between companies (e.g., between competitors) or between the company advancing the standard and suppliers of complementary products. Cooperation between companies requires coordination to reach an agreement on issues such as the type of standard and the timing of market introduction. However, this
coordination can be an arduous task as each company may have a different view on the new standard and the timing of its introduction, depending on individual circumstances. Taking mainly the home video game industry as an example, the discussion below identifies the issues of cooperation between competitors and that between a company advancing a standard and suppliers of complementary products.7

First, one of the main barriers to cooperation between competitors is the difference in magnitude of the installed base of the standard hitherto held by each company. A company that secures the industry standard and has an overwhelming installed base is reluctant toward a switch to a new standard and has little incentive to promote a new standard through industry cooperation.

If such a dominant company were to consider converting to a new standard, it would consider a different strategy to that of the lower-ranked companies. For example, Nintendo, which had gained a dominant market share in the past and had a large installed base, launched its new product later than other companies, i.e., when there was a generational switch of video game consoles. When its competitor Sega launched the Mega Drive as a second-generation video game console in October 1988, Nintendo also announced plans to develop Super Famicom. Specifications were announced in October 1989 and the actual launch followed in November 1990. The same sequence of events occurred several years later for third-generation video game consoles, when Sega and Sony launched new products in 1994. By contrast, Nintendo announced that it would launch its new NINTENDO64 in December 1995, but then deferred the planned launch date to April 1996, and finally, launched the product still later in June 1996.

7 This discussion limits itself to issues between companies. Similar cooperation and coordination issues can also arise between divisions within a company, e.g., between the hardware and software divisions.
Although there is no conclusive evidence whether Nintendo’s delayed launch was intentional from the outset, companies that plan a late launch are known to try to obstruct software companies from switching and discourage users from making purchases by providing advance notice of new hardware (Brandenburger & Nalebuff, 1995). By doing so, Nintendo blocked the adoption of other companies’ new standards and released new products with a superior hardware standard compared to those of other companies through late participation. The image and sound processing capabilities of Super Famicom surpassed Sega’s Mega Drive and NEC Home Electronics’ PC Engine, and NINTENDO64 adopted a 64-bit CPU, which was superior to the 32-bit CPU used by other companies.

Next, we examine the cooperative relationship between a company promoting a standard and a supplier of a complementary product. Video game consoles cannot function, obviously, as a standalone product, as they require complementary game software. There are hardware producers such as Nintendo and Sega that advance standards and develop and sell game software themselves, but even so, supplies of software from third parties are indispensible in these cases. When Famicom was launched in 1983, only Nintendo-produced game software was available. However, spurred by Nintendo’s success, Hudson Soft released game software for use with Famicom in July 1984, followed by Namco in November of that year. These products quickly became million sellers. At the time, even successful PC software sold only 10,000 copies at best, therefore, Famicom game software market was extremely attractive to software producers. Thus, 17 companies entered the market as third parties in 1985. Subsequently, successful software products such as Dragon Quest released by Enix and Final Fantasy released from Square entered the market, and since then, the use of third parties became common business practice in the video game industry.

Third parties could expect larger sales volumes by developing
software for a game console with a huge installed base such as Nintendo. This is the reason for the virtuous circle in motion for Famicom and Super Famicom, whereby more widespread hardware ownership led to greater software variety, which in turn led to even more widespread hardware ownership. Once set in motion, the virtuous circle further reinforced Nintendo’s dominance.

A generational switch, however, can create an opportunity to break this virtuous circle. When deciding on the next-generation standard, the best technology to adopt differs between hardware and software producers, and even among software producers, depending on which software is the main product for the software company. Such differences may break the dominance of Nintendo that has been established. For example, in third-generation game consoles, other companies adopted the CD-ROM as a medium of software storage, whereas Nintendo was the sole manufacturer opting for a conventional ROM cartridge. Nintendo deemed the ROM cartridge better suited to fast moving games, given its far shorter access time compared to the CD-ROM. In fact, the software that Nintendo released exploited this advantage.

Nevertheless, the CD-ROM with its larger capacity was more attractive than the ROM cartridge with high-speed access for Square, which developed role-playing games that did not require rapid movement. Square had been developing software for Nintendo hardware for many years, but opted for Sony’s PlayStation as the hardware for Final Fantasy VII. It did so because it decided to orient itself toward realistic image projection through the heavy use of computer graphics to enhance the expressive power of the images.8 The fact that the choice of technology when deciding on a new standard can give rise to the departure of such a third party is a very serious issue for companies such as Nintendo that advance new

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8 Square’s internet site, http://www.square.co.jp
Sony was a newcomer to the game console market. It did not have a strong software division, so it deliberately chose a strategy of enhancing incentives for third party software producers to develop software for Sony. First, Sony reduced the contract commission that third parties pay to the hardware producer. The contract commission to Nintendo, including the factory cost and royalty, was 2,500 yen per unit of software sold. By comparison, Sony’s contract commission was the higher of 900 yen and 10% of the retail price, that is, 900 yen in most cases, based on retail prices. Second, Sony set the minimum order quantity to 1,000 units, compared to Nintendo’s 5,000 units. Third, it reduced the lead time from order to delivery to approximately one week. Software producers for Nintendo were exposed to opportunity losses and inventory risks because the lead time was two months for ROM cartridge, not to mention the minimum order quantity that was much larger. Fourth, development tools for software development apparently cost over 10 million yen per set for Nintendo. Sony offered this at 2–3 million yen, which enabled low-cost development.

Although Sony was a newcomer, it successfully offered incentives for third parties to develop many software products with the help of these strategies, which contributed to the adoption of the hardware. The widespread ownership of the hardware has generated a further increase in software. Enix, which produces the popular Dragon Quest series, announced in January 1997 that the next release of Dragon Quest would be from PlayStation. One of the reasons why the company switched from Nintendo to Sony was that PlayStation had the largest user base of the next-generation video game consoles.

As illustrated, building a cooperative relationship with third parties and increasing the supply of complementary software in a systematic fashion are a very effective means of promoting hardware adoption itself. Figure 2 illustrates the relationship between hardware and standards.
software for console games and demonstrates the positive correlation between software variety and the magnitude of the hardware installed base.

The figure illustrates another intriguing issue. For hardware other than Nintendo, the positive correlation between software variety and the magnitude of the installed base of hardware is in a similar relationship regardless of company or generation. By contrast, Nintendo’s Famicom and Super Famicom—both past successes—draw lines in the upper part of the figure. According to

![Figure 2. Correlation between hardware and software in Japanese console game market](image)

*Sources:* For hardware, *Toy Journal* (each year), Yano Research Institute (1993), p. 84, Dentsu Innovation Institute (1993), p. 90. For software, *Kou-gi-en* (2000).
this, the PlayStation and the Sega Saturn, which then demonstrated favorable prevalence results, only have a pattern of prevalence similar to that of the Mega Drive which lost out to Super Famicom in the past.

The lines representing Famicom and Super Famicom illustrate that these products have gained an installed base of the same magnitude as the products of other companies with fewer software titles. Why then was Nintendo’s hardware able to gain a larger installed base with a small number of software titles?

Nintendo has pursued a strategy that focuses on quality rather than software variety ever since Famicom. The development and sale of high-quality (i.e., genuinely entertaining) game software is vital in this approach, which is based on the premise that low-quality game software will destroy the market regardless of software variety. Nintendo has a strong internal software division so that it can consistently implement this policy. It was in-house software titles, such as the Super Mario series, that triggered the initial demand for Famicom, Super Famicom, and NINTENDO64. In the case of Nintendo game consoles, the development and sales of in-house games that fully exploit the benefits of a new standard has propelled the prevalence of new hardware. This policy manifests itself in the form of control over third parties, which went as far as interfering in the content of games developed by these companies. This is clear in the case of the third generation NINTENDO64, in which licensed third parties were deliberately squeezed out, in contrast to Sony, which actively expanded its third party base.

However, there is no guarantee that NINTENDO64 will continue to gain further ground with a limited variety of software because Nintendo has narrowed down the third parties, as has hitherto been the case. The adoption of NINTENDO64 depends also on how other types of consoles are being adopted. The PlayStation and the Sega Saturn differ from the Mega Drive in that they rise along their lines
more rapidly, that is, gaining ground more quickly than in the past. Therefore, it cannot be concluded from this figure that neither of the two consoles will become the new industry standard.

However, there seems to be two options for a company that advances industry standards and attempts to increase the supply of complementary products. The first option is to build a cooperative relationship with suppliers of complementary products in advance, increase the variety of complementary products, and thus make the hardware more appealing. By contrast, the other strategy is to adopt a strategy to reinforce its own complementary product division, prioritize the adoption of its hardware, and then attract third parties with a large installed base.

5. Conclusion

In this paper, we have discussed competition and cooperation among companies regarding industry standards. Network externality comes into play in markets for products in which industry standards play a key role, so business practices that are not observable in ordinary markets become apparent. The fundamental reason why such business practices occur lies in the significance of expectations. Product manufacturers, those of complementary products, distributors, and users all form expectations: which company will introduce which product, how many consumers will purchase a particular product, the diversity of complementary products, pricing, and technological trends and speed. Companies attempt to influence expectations because these expectations can at times be more important than the pricing or performance of a product in determining the outcome of the competition between the companies. This is what generates behavior characteristic of these markets.

There are two noteworthy points in relation to influencing expectations. The first is the importance of commitment.
Commitment toward product development and production, the complementary product business, and the levels of distribution fosters trust in a company’s product. It also adds momentum to product adoption and dispels the market apprehension that exists during the market launch and generational switch of standards.

The other point is building a cooperative relationship with other companies. Strategic theories to date have discussed how to eliminate competitors and ease competitive pressure. Porter’s (1980) theory on competitive strategy is a typical example of this. In contrast, a vital issue in the competition for an industry standard is how best to draw competitors into the ring.

The importance of industry standards in relation to competition between companies has come to be recognized in recent years, and actual business practices have developed in a manner that reflects this awareness. Competition and cooperation among companies have become intertwined in the wake of such increasing awareness, and underlying strategic aims appear to have become more complex. Moreover, business models that apply and stress international standards have started to attract attention among companies in both developed and developing countries in recent years (Ogawa, Shintaku, & Yoshimoto, 2005; Shintaku, Ogawa, & Yoshimoto, 2006; Tatsumoto, Ogawa, & Shintaku, 2011).

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