Platform Management Strategy in Different Network Externality Conditions

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Ⅰ Abstract

The concept of platform is very useful when we need to reduce development cost and fasten product development cycle to provide derivative and complementary products and services. The platform value proposal should be attractive enough to increase the installed base and lead to a market expansion. This market expansion is related to the economical network of users of the same platform, subject to the demand side effect—a characteristic of the network externality effect. The present essay analyzes which strategy should be adopted according to different platform and network externality circumstances to obtain a business sustainable growth.

This platform strategy involves platform openness degree, network compatibility and interoperability. The platform openness is related to the creation of complementary products and leverages the network externality effect. As a result of the analysis described in this article, we came to the conclusion that the platform has a dynamic behavior and due to this, it requires different strategy approaches in different network externality conditions and phases.

Keywords: platform strategy, network externality, platform dynamism.

Ⅱ Introduction

A first premise of this research is the turbulent and volatile Information Communication and Technology (ICT) environment that requires skilled management and strategy to cope with product and service development complexities and uncertainties. The more factors to manage, the more complicated is the platform development, due to many interrelated parts. Simultaneously to platform complexity, the project development itself is complex and it can be classified into organizational and technological (Lebcir, 2006). In technology, it is essential to be updated with new trends and choose the correct one that will be consolidated as a market standard. Nowadays, the possibility to succeed in business depends on how the organization can face external changes, digest them internally and deliver quick solutions that satisfy the customer's expectations and needs. An organization willing to have a customer-oriented and quick-response management, should always adapt itself to those environmental and technical changes. In response to those changes, we propose the platform management as a suitable strategy for today's turbulent times. A second premise, following the project development complexity, is the high initial investment required; few firms are capable to bear both project and investment risks. The platform sponsors, defined as platform leaders, do not have enough capabilities or resources to develop all the necessary system requirements inside the firm so they create partnerships with complementary product or service providers to leverage platform business (Gawer and Cusumano, 2005). By sharing the project risk between its participants, the platform leader in return should divide the profit pie and as a result, a dilemma arises between its own development and the partnership. Complementary product or service provider is defined

as a partner firm that possesses some product that does not belong to the main product platform and that increases the value to the users of the platform (Brandenburger and Nalebuff, 1997).

Despite many researches address discussion topics about the platform, they mainly focus on product platform and its derivative products (Meyer, 1997a). Other researches define the platform as a hardware that runs complementary software or applications and focus on its effects as well as on leadership to create ecosystem around the main platform. (Gawer and Cusumano, 2005). The success of the platform is intensively related to the demand side, the number of products or services introduced to the market and how to increase the installed base and as a result, increase the market share. This demand side scale economy is known as network externality, where positive feedback acts as what is known as “bandwagon effect”, a large number of users within the same platform network, represent more incentives for the creation of complementary products or services to participate into the network and consequently motivate more users to buy or use those products and services (Leibenstein, 1950; Oren and Smith, 1981). In this essay, instead of defining network as a physical interconnection between nodes, we will refer to it as externality, by focusing on the economical effects of the installed base, the network size and its compatibility and interoperability. The contribution of this research is to analyze platform strategy in different network externality conditions we have observed that there are few studies that analyzes combined platform management strategy associated with network externality focusing on the contextual factors that may affect the strategy. The main question of this research is how to manage a platform strategy in different network externality conditions that may lead to a sustainable business growth. Secondary questions discussed in this research are (1) what effect of platform complementary products and services to increase installed base and (2) how interoperability, compatibility and standardization influence direct and indirect on network externality.

Primarily, a platform is composed by subsystems and interfaces interacting between them, ruled by a common architecture (Meyer, 1997a, 1997b). In the present turbulent era in market and technology, the value chain model is changing hierarchically from vertical to horizontal in order to maintain a sustainable business growth. Envisioning cooperation from complementary product providers, the platform leader will open its specifications and interfaces as a way to motivate them to participate in the platform ecosystem. In general, platform leaders adopt an open policy, by opening the external interfaces of the platform to its partners. This external interface openness is directly interrelated to platform openness, ensuring interoperability between the platform and its complementary products. To increase network externality, and enlarge the installed base, the most adopted business model is Gillette’s tying model that consists in selling blazer at cost and gain profit by selling complementary razor products. In case of video game platform, the scenario is similar, selling console hardware at cost or even subsidizing and obtaining profit from game software. Other case is VTR (Video Tape Recorder) platform, having the recorder as hardware and videotape as software (Yamada, 1997). The success of the platform is related to the number of users, which provide economical return to the platform stakeholders. To achieve an increase in the installed base, not only platform openness, but also compatibility and interoperability are key factors. When the platform is open and complementary products are compatible and ensure interoperability within the same platform, the attractiveness of the product to the users is immense. The user psychological preference between small and large size network, in general the users tend to join to the large size network, where the benefit to join to the large size network is clear if compared to the small size network that may disappear in a near future. If the value proposed to join to the large network is consistent, it will motivate more users to join the network generating positive feedback effect, also known as network externality effect (Rohlfs, 1974). The role of compatibility is important to ensure interoperability between networks of users that utilize a certain service. Usually standards are established to ensure compatibility between networks, which can be de facto standard—defined by the market; and de jure standard—defined by governmental institutions. Comparing both, the most important is de facto standard, because it dominates the market and for this reason, every platform leader is looking to become de facto standard.

Based on platform openness and network externality conditions, we can identify four different strategies: stand-alone, lock-in, expansion and diversification. Both platform and network externality analysis demonstrates different platform strategy, based on the platform openness and network externality criteria. Usually, the platform strategy starts with a stand-alone phase, where both platform and network are closed; in a second phase, it moves to expansion or lock-in strategy and finally to diversification, where both platform and network are open. The findings of this research consist on platform dynamism, where the adoption of a platform strategy differs according to platform openness, network externality conditions and product life cycle.

Ⅲ Platform Definition

Technology innovation and uncertainties are factors that influence the platform development, including complementary technology acquisition or alliance with partners. In recent years, product life cycle is short, requiring huge investment amount to develop new products or services. The use of platform is one of the most efficient approaches to attend different customer needs and to quickly response to the market demand, by amplifying derivative products or family products. The platform is defined as an evolving "system" made of independent components, each of which can be innovated upon separately (Gawer and Cusumano, 2005). Also, platform is defined as composition of subsystems and its interfaces ruled by a common architecture that produces derivative products. A product family can be defined as developed products that share some common elements (Meyer and Utterback, 1993; Yang et al., 2006; Sanderson and Uzumeri, 1996). Platform approach aims to create a variety of products at low cost while using main platform to develop derivative assets (Meyer, 1997a; Kano, 2000; Tatikonda, 1999). Usually the main platform product created at the initial phase is denominated "new platform" and its secondary products, "derivative products" (Wheelwright and Clark, 1992). Although several platform definitions mentioned above, those definitions are based on from a product family point of view, and not from an upper level view, where platform is considered a system solution, a mix of systems and subsystems to create new products within the same market or intra-market, which means providing services that integrate different solutions beyond the product family platform, eliminating limitations within the same market segment. In a general point of view, platform is defined as the competence base for external service and management system linkage. The benefits of the platform approach are: economical increase, creation of an innovation, guarantee of an adequate competition and increment in the customer's utility, reuse of new platform to develop variety of services to attend different market segment needs, and consequently low development cost (Meyer, 1997a; Soumusho, 2008). Also, rapid response to the market can leverage platform economical benefits (Muffatto, 1999). One of major concerns of platform is how to maintain the integrity of the platform while facing continuous technological innovation and independent product strategy for outside firms, which can affect internal product architecture between subsystems. Another problem is how to maintain compatibility with existing complementary products with platform evolution. If the engine increases its capacity in terms of efficiency, scalability, power and complements, the platform around the engine limits the engine. Other components should evolve simultaneously with the platform evolution; otherwise, those components become a bottleneck for the entire system (Gawer and Cusumano, 2005). We broadened the definition of platform, not merely dealing with products, but also as a system that includes business and service based on the premise that anyone enjoys provision of service or product, activates the transaction with third parties and provides the role to create new businesses, which leverages new market development, based on competencies and value propositions (Aoki, 2002). In summary, platform success is related to its architecture, both technical and business, and how it is designed, factor that influence enormously in its development and its performance.

1 Platform Openness

According to Gawer and Cusumano (2005) most of the platform leaders do not have capabilities or resources to create all the system by themselves, especially complementary subsystems and products, which are essential to implement platform leadership, so they rely on partners to develop the entire system. As a result, they usually need to work closely with other firms. Moreover, the platform success is closely associated with four key factors: scope of the firm, product technology, relationship with external complementary providers and internal organization.

As previously discussed, platform is traditionally defined as the design of common architectures formed by subsystems and its interfaces that interact between them, developing and producing derivative products. Usually those subsystems are called function components that interact between them through interfaces, originating platform. Those physical components and interfaces are the major elements from an architectural perspective. Architecture is the scheme where the product function is allocated to its physical components, mapping functional elements to physical components and interfaces interacting among them (Ulrich, 1995). The role of interfaces is to execute crucial functional links; they accommodate connection, transformation, and interaction functions. Interfaces are classified into internal and external: Interfaces at a subsystem or module level are called internal interface, interacting protocol between platform internal structure and functions. They are the essential element that integrate and disintegrate the architecture of the product. Modules are subsystems that embody a specific function, while internal interfaces provide interrelation between modules (Chen, et al., 2005). In product family deployment, it is essential to share common subsystems or modules, which are interchangeable and ruled by the architecture in the platform. The presence of interfaces is essential because they contribute to the commonality and compatibility and ensure the module independency and decoupling (Meyer, 2001). On the other hand, external interfaces are responsible for the interaction between platforms and complementary providers, attending platform leaders outsourcing needs. As a result, the platform openness is intimately related to its interface openness to accommodate complementary assets and at the same time guarantee the existence of major conditions for system openness that is compatibility and scalability (Yamada, 1997).

2 Openness of Interface

In this context inter-market means the cooperation beyond the same industry to create value added services by aggregating different solutions. For example, intra-market competition will be at component level, as semiconductors and modules. To aggregate different solutions from different platforms, upper level system integration is required, where this system or platform and complementary assets interact through external interfaces. The interaction rule is defined by the commonality and compatibility of the external interface. As a result, external interfaces compatibility is a key factor for platform and complementary assets interaction, where the interface interaction degree is characterized by interface openness. Also, openness is considered as level, which the technical knowledge of product is accepted by social systems (Fujimoto, 2001). Another interface openness definition is a degree of sharing system information and knowledge, commonly accepted as standards (Suarez and Utterback, 1995). Open tendency of interfaces are measured by standardization process and interface commonality; the last dictates how frequent interfaces are in platform production and usage (Chen, et al., 2005). When the platform interfaces are “open” —that is, when the platform leaders specifies publicly how to connect components to its platform, such open disclosure could facilitate the work of competitors that desire to understand at a deep level how a competing product works. Open platform is commonly observed in modular architecture. Once having a coalition of other firms and aligned their interests with platform leaders, common interface is a powerful obstacle for potential entrants. Platform leaders and specific complements can then create “applications barrier of entry” for firms that would like to compete with alternative platforms. When the platform is open, the external relationship with platform complements is the key for all platform success and it should pursue to achieve

	Competition	Cooperation
Customer		
- Market size	Small	Large
- Penetration speed	Slow	Fast
Competition		
- Power of competitors	Own Firm>Others	Others>Own Firm
- No. of competitors	Small	Large
Company Resources		
- Business Goal	Profit Oriented	Revenue Oriented
- Standard core technology	Own	Need Other’ s Resource
- Revenue with complementary products	No	Yes

Source: (Yamada, 1997)

Figure 1 Characteristics between Competition and Cooperation

two objectives simultaneously: (1) obtain consensus among key complementary providers with regard to the technical specifications and standards that make their platform work with other products. (2) Maintain control over critical design decisions at other firms that affect how well designed the platform and complementary providers to cooperate for new product generations (Gawer and Cusumano, 2005). Mainly the platform leader, aligning each player’s interests and reaching their consensus, should lead ecological control of the platform environment. If a majority of key players does not agree on interface specifications for the whole product, then the “industry” will not develop complementary and compatible products. Also the platform leader should manage a relationship with developers of complementary products, engage in a carefully and balancing act of collaboration and competition and platform leaders should build its reputation as organizations that do not step out of their product boundaries into the territories of their complementary providers to avoid competition between them. They also should always create “win-win” situations and assume the role of “industry enablers”. This balancing act requires firms to trust the platform producer as a partner; however, to maintain producer’s trust to the other is difficult because the relationship can be ambiguous. It is not always clear if another firm is a supplier, competitor or complementary provider, and the relationship can change among the product life cycle.

Basically, the choice between competition and cooperation is mainly regarded to platform leaders capabilities, market share, power and resources, as cited in Figure1:

Sometimes, to achieve critical mass rapidly, the dominant platform leader tends to open technical specification and motivate other firms to follow them and create family products or complements. By adopting open policy, the market grows naturally and it becomes more competitive with several product providers participation, which increases entire platform ecosystem. It also creates incentives for product providers to participate in the platform ecosystem due to the extent number of users and potential market growth and it simultaneously creates incentives for users to be part of the large network to benefit from the network externality effect, which will be described further. As a conclusion, the platform openness represents a parameter of how platforms can interact with its complementary assets. More open the interface, more complementary assets are developed, and more users are interested to join to the platform ecosystem.

Ⅳ Network Externality

In the past, it was the end user that kept almost all the information, or it was stored at each individual terminal; however, with the development of network technology, incremented with large broadband and transaction speed, the storage process changed from a terminal side to a centralized storage side. Before this, the information source used to be the vendor side, but at present users are participating as an information source and moreover, the network evolution

Software Stock Value		Data Exchange Needs	
		Low	High
	High	Japanese Word Processor – stand alone	VTR Personal computer (Network Externality effect)
	Low	Remote control	Digital Camera Fax

Source: Adapted from (Yamada, 1999)

Figure2 Example of software stock value and data exchange needs

is allowing users to share information and interact between them, creating a new terminology called “prosumers”, term that can be defined as a merge between consumers and producers. The system model that concentrates computer resources beyond the network is known as “cloud computing”. This model is being widely practiced and has different denominations such as Software as a Service (SaaS) and Platform as a Service (PaaS), where users access to the network to address any application they desire. The data storage value at the user’s side is called “software stock value” —value obtained when the data is repeatedly used at the user’s side as data stored in FD (floppy disk). Japanese word processors do not require data exchange between them; the most frequent use of these word processors is limited to address personal letters and edit private document; there is no need to transfer data to another equipment or exchange data between them, working as stand-alone machines. On the other hand, during its introduction phase, PCs (personal computers) were most commonly used at home to perform overtime tasks from work, but then it was necessary to exchange data between the PC at home and the one at work. Due to the influence of network externality, PC home models needed to evolve at the same level of those PCs used at the workplace (Yamada, 1999). As shown in Figure 2, high software stock value and high data exchange needs propelled network externality effect.

Furthermore, network evolution increased productivity and proposed new value to the users, triggering network externality effect. The network externality is defined as consumption decisions done by the demand side through compatible network size that influences the consumer’s preference (Economides, 1996a). For instance, in telecommunication services, the customer’s utility grows proportionally to the number of users that access to the same network or installed base. Installed base is considered an economy of scale generated by the demand side; the network externality may also be referred as the number of active systems in use. If a consumer predicts that certain network or standard will be competitive, this means that the user is willing to pay in order to join that network or standard, increasing its competitiveness (Farrel & Saloner 1985, 1986a, 1986b; Economides, 1996b). There are two effects of network externalities: the first one is the direct effect produced when consumption externalities are generated by a direct physical effect. In the case of telephone users, they depend on the number of other households that belongs to the same telephone network. The second effect is the indirect effect; this occurs when for example, the decision of purchasing computer hardware is based on the variety of software this hardware offers and this factor acts as an incentive agent to buy similar hardware. A typical case is the competition between Betamax and VHS videotape formats (Yamada, 1997). The last format obtained competitive advantage not technically, but through the variety of films (software) that complemented the hardware itself, even though it was evident that the Betamax technical format was superior. Lots of software used in a specific hardware and its market competitiveness creates a “lock-in” effect (Deguchi, 2005).

Network externality is characterized by the existence of the following phenomena:

a) Critical mass—within certain period, the demand should surplus equilibrium point called critical mass,

minimum number of users that should be achieved;

b) Hardware and software paradigm—existence of close relationship between hardware and software sales. Although QWERTY keyboard allocation was inefficient, the format was largely accepted because of typist school adoption; (Ida, 2001)

c) Lock-in—deep dependency conditions are created for users, increasing the switching cost and new product entry barrier, creating lock in situation. Even QWERTY keys are considered as "historical small events" , once lock-in is observed, it will define post economical activities; (Katz and Shapiro, 1985)

d) Installed base—referred to the number of users. Although firms benefit from the installed base and enjoy its economy of scale, the bigger is the existing installed base, there is less freedom in decision-making. The firm should provide software compatibility, narrowing its strategy and on the other hand, new entrants are less restricted for strategy decision-making. Similarly to the concept of network externality standard, dominant design (Albernathy, 1978) is adopted when a new product is launched in the market and its usage or functionality is not clear. A product is recognized as a dominant design when the potential market needs are being reflected in such product and there is a feedback to the users and vice-versa, that is, there is a mutual understanding of the product specification through a process called "learning by using" (Suarez and Utterback, 1995). An installed base will expand fast when either the dominant design or the network externality standard succeeds in increasing installed base, surpassing the critical mass and when it has achieved certain amount of potential network users or market penetration (Yamada, 1997, Rogers, 1995). This is the reason why most providers try to expand its network quickly, usually jump-start ones, even selling at below cost in the initial phase and taking first mover advantage (Lieberman and Montgomery, 1988). After a product has a consolidated position in the market, it becomes a market standard or de facto standard, which generates positive spiral feedback and dominates the market, which can lead to a movement known as the winner-take-all phenomena (Hill, 1997). Nowadays, it is hard to monopolize the market, unless a firm possesses its own resources to develop the system; most of the firms recur to partnership and alliance to obtain de facto standard. Firms form alliances due to: (a) number of intellectual properties and patents to obtain de facto standard; flat level in R&D level technology between the firms to impede all the patents to monopolize de facto standard as occurred in the past with IBM and Xerox; (b) globalization and digital technology that allowed quick technology dissipation through the network, eliminating barriers such as product, industry and region, and (c) open policies that avoid the monopoly of de facto standard and eliminates the winner-take-all effect.

In the past those partnerships and alliances used to be complementary, each firm lacks in some kind of technology and complements considered as weak points. In a recent study, it is shown that alliances occur between top market share firms to emphasize their strengths and competencies so they can dominate the market. A typical case observed is the alliance between Visa and Mastercard to develop electronic money or debit cards. The characteristics of an alliance between winners are: (1) different market leaders become partners to reinforce their competencies and capabilities, creating competitiveness and widening the market share; (2) Core competence is a must requirement to join to the winner alliance; (3) there is a need of knowledge or intellectual capital to create a systematic process that controls the usage of limited resources (e.g. people, technology, capital and information) (Ogawa, 2005). Therefore, network externality is conditioned to the demand side effect and the success of network externality is strongly related to: first mover advantage by tipping effect; critical mass; the winner-take -all, through positive feedback; and lock-in effect.

1 Network Interoperability, Compatibility and Standardization

Many discussions regarding network openness are common today, however, there are few theoretical studies related to network externality openness. We define network externality openness as the degree of a product or service interoperability and consequently compatibility between them within the same platform user network. Many researchers consider connectivity as a key factor to join to the network; however, connectivity is a consequence of interoperability. If the network does not interoperate and it is not compatible through its protocol, there is no connection to the network. Furthermore, as stated on its own definition, network connectivity is the degree of interconnection between different networks, which connection was originated from the first network and terminates to the second network and vice-versa. The term connectivity is different from compatibility; hence in connectivity a dominant incumbent network can deny rival network interconnection rights. Even compatibility can ensure interconnection; dominant network interconnection refusal can impede network entry (Shapiro and Varian, 1999; Shapiro, 1999). A classic case is the Operation Systems (OS) between Macintosh and Windows. They are not interoperable and compatible; however both can access Internet and exchange data, their connectivity is ensured by common Internet protocol called TCP/IP.

In Network Externality, the degree of network benefit is closely related to the number of users that joins to the same network. When purchasing goods, the consumer behavior of other users is essential to forecast the network size. If a product standard is already established, users are quite comfortable in purchasing the product; however, the purchase of a wrong product format may isolate the network or the product network may even disappear; a wrong decision taking prejudices users. The pay-off gap between loser and winner network is huge, that's why firms usually decide to be aligned to a standard alliance (Besen and Farrel, 1994). When the users are not sure about which standard will be the de facto standard, they postpone the purchase decision until this de facto standard is determined. This phenomenon is known as Penguin effect, where Penguins prefer to wait until others enter to the water first, making sure that there is no presence of predators (Farrel and Saloner, 1986a). To resolve the above mentioned problem, lobby activities to obtain de facto standard use to happen even before the product launch, with the objective to captivate customers and manufacturers to participate in the product network and obtain users consensus by increasing social incentives of the network. A key factor of compatibility in network externality is the social incentive offered to join to the network. The proper incentive should be established to determine interoperability and compatibility between networks (Matures and Regibeau, 1988). Currently, there is a gap between private and social incentives to join the network, which compatibility achievement is low in terms of social aspects (Katz & Shapiro, 1985). Also Farrel and Saloner (1986a) refer that in network externality circumstances, not always the market mechanism guarantees socially desired resource distribution, causing market failure. There are two types of market inefficiencies: excess of inertia, when the inefficient old technology impedes the adoption of efficient new technology because of the market is based on an old technology; excess momentum, when inefficient new technology is predicted to be adopted and the efficient old technology disappears (Farrel & Saloner, 1985, 1986a, 1986b). The typical case is QWERTY keyboard that was created to reduce typing speed to avoid keyboard lock, when the keyboard lock problem was resolved and a more efficient Dvorak keyboard was introduced, it did not become a market standard because of QWERTY keyboard had already an installed base (David and Greenstain, 1990). Also, according to David (1985), standards classifications by its constitution process are: ⑴ Unsponsored standards—when a specific owner does not own proprietary rights, but the standard is largely accepted in social terms. ⑵ Sponsored standards—One or many sponsors own directly or indirectly proprietary rights, suggesting the adoption of the standard by other firms. ⑶ Agreement standards—Standard institutions as ANSI (American National Standards Institute) and ISO govern the standards. ⑷ Mandate standards—Standards that mandated and regulated by governmental institutions. Also, based on their level, standards can be classified in ⑴ none, ⑵ firm-wide, (3) quasi-industrial standard and ⑷ industrial standard. In the present research, standardization is mentioned in a

quasi and industrial standard level. The competition that matches technology and market needs is defined as dominant model development competition, which de facto standard competition has an important role to define the dominant model (Albernathy, 1978; Funk, 2003). The differences of standard competition between product competition are: multi-layer competition among general and internal standards, and generations; existence of network externality effect; strategy adoption considering different product life cycle and market competition positioning (Yamada, 1997). Therefore, standardization plays an important role to define the competitiveness in the market and obtain users support and expand the market share. Most of companies endeavor its standard become a market or global standard, no matter approved or not by a standardization institution; the most important is to become de facto standard, largely accepted by the market. Nowadays, to eliminate governmental and market gaps, de jure standard imposed by a governmental or standardization institution such as JIS (Japan Industrial Standard) and ISO (International Standard Organization) are followed or simultaneously be aligned with de facto standard. The advantages of de facto standards are: possibility of rapid standardization, simultaneous development of product and standardization, favorable for the standard developer to expand the market share and possibility of royalty revenue. On the other hand, the disadvantages are: privatization of standardization merit, incomplete information disclosure, and restricted member participation, lack of transparency for standard rectification and existence of early purchasers of loser standard. The analysis of "what" (which product becomes de facto standard), "when" (when de facto is defined) and "how" (how to become de facto) is essential to study de facto standard emergence and consequently market competitiveness (Yamada, 1999). The features of recent standardization are relevant to de facto standard adoption, where firms enjoy (1) increased product awareness by the customer (2) cost advantage due to economy of scale and (3) increased complementary products as software and peripheral devises. Those are the main reason why firms aim to reach de facto standard, the dominant standard that owns a high market share. Once the standard is established, the market will shift to price oriented market, the product becomes commodity and there is no product differentiation among the providers (Farrel and Saloner, 1986b). The challenger firm that wishes to obtain market share from the leading firm tries to create a product differentiation to avoid using the same strategy as leading firm; however, a careless differentiation strategy, especially for standardized products, can lead to product incompatibility. Also, open trend complicated firms to monopolize de facto standard, needs for alliances and partnership to obtain market share, practicing low price strategy for the product introduction phase to increase its installed base. There are four main reasons why de facto standard is not profitable: (1) low skimming price, that is low penetration prices practiced to leverage the product at introduction phase—skimming price is usually applied when the product market penetration speed is low, low user price elasticity, patent protection, need for fast investment return and user awareness between price and quality; (2) fast market shrinkage during mature phase or market does not achieve mature phase; (3) no revenue expectation from patents; (4) market desire for an open standard (Yamada, 1997). In general, most of the firm's energy is concentrated on how to become de facto standard, despite the concern of how much to profit with de facto standard, it creates a revenue stream from firm's core competences, and a standard opens the policy to increase complementary and family products, resulting on an increase of its installed base and taking advantage from the scale economy. Another revenue source is to develop intellectual properties, patents and especially providing key components as mechanical deck, optical pick up, laser diode and DA converter, in case of the CD player, which Sony provided optical pick up in approximately 70% of all the CD players in a peak period (Yamada, 1997; Farrel and Saloner, 1992). After obtaining de facto standard, a concern arises regarding on how to maintain de facto standard and deal with new technologies and generation compatibility policies. Although Playstation was considered a newcomer to the videogame industry, it succeeded not only for innovating industry distribution channel but also for the generation compatibility strategy that allowed next generations to accept previous generations' software. Before Playstation, the videogame industry used to "refresh" the platform every few years and create a new generation platform

to stimulate innovative software that mostly has different architecture, which is not considered as same product family between generations. However, Sony constructed an architecture capable to accept both new and old generation software, innovative approach and benevolent for both users and game developers: users enjoyed playing old games in a new machine and game developers felt more comfortable in developing upgraded version for previous game series. Once the firm dominates the market with its de facto standard, it is very convenient and comfortable to keep the status-quo and try to prolong the product life cycle. Proper strategy should be adopted to balance the trade-off between current and new product, try to prolong the product life cycle without affecting the market share. However, an innovative technology or standard will inevitably emerge to substitute the existing one, and in the future will carry another dilemma, which is when to switch to a new technology or generation to minimize the market share impact. De facto standard shows similar phases as product life cycle that consists of development, introduction, growth and maturity phases equivalent respectively to the following phases: obtain de facto standard; profit from de facto standard; sequence de facto standard to next product/service generation. In de facto standard phase, it is not barely possible to even reach the mature phase of its life cycle, when is expected the investment return phase, due to rapid technology changes. As an example, we can mention the FD (floppy disk) that moved quickly to more high-density storage media such as CD-ROM, which decreased drastically FD market share in storage media market. Another observation is the standard withdrawal from the market at the introduction phase, when a technology defeats standard competition and there is no perspective to become de facto standard. This fact occurs when the firm that has lost gives up from its standard, before facing increased sunk cost in the future or due to high initial investment to manufacture the product and the installed base or return is not comparable for such investment. The product withdrawal is inconvenient for the users as well; they are prejudiced for future support and maintenance, reduced network externality benefits and incurred sunk cost and switching cost to another standardized product network. Usually de facto standard is defined when the product achieves between 2−3% of market penetration and is supported by early adopters, who influence the purchase decision of other users, acting as opinion leaders. Before 2−3% of market penetration, the user layer mainly consisted of innovators, who possess profound technical knowledge, admiration for new technology and price inelastic behavior rarely influence mass users at the initial phase (Yamada 1999, Rogers, 1995).

2 Network Closed Policy and Open Policy

Normally, a closed policy is adopted when a firm is capable to launch the product by itself with typical vertical value chain organization structure. The advantage of closed policy is profit maximization by creating the entire product or service by itself, using internal resources and technology that are proprietary assets, not recurring to partnership or intervention of other players, fact that allows the firm to respond quickly to the market demand and becomes the market dominant player. In most of the cases, closed policy is applied when the firm tries to achieve the critical mass with its own effort to increase its installed base. On the other hand, the negative effect of closed policy is the competition between several formats to become de facto standard, prejudice to arise the market standard and as a consequence, it will lack of interoperability, impeding the market growth (Shibata, Shintaku and Konomi, 2000). A typical example of closed strategy is the provision of an enhanced quality product at low price to conquer the market. In closed policy, sometimes having the main goal to increase its market share, the firm practices predatory pricing at the initial phase to increase installed base or strategically executes a “pre-announcement” of its new product to create customer’s expectation and defend its market share from competitors in order to entry the market, avoiding users to switch to another network (Farrel and Saloner, 1986a). This practice was adopted by Nintendo, with its dominant video game player Family Computer, 8 bits game console market, that pre-announced 16 bits game console launch after its competitor Sega Enterprises launched 16 bits Mega Drive. However, Nintendo Super Family Computer was launched to

		Internal Resource	
		High	Low
Market Share	High	Closed policy	Semi closed policy
	Low	Semi open policy	Open policy

Source: Yamada 1997

Figure 3 Closed or open policy selection, based on market share and internal resource

		Network	
		Close	Open
Platform	Open	Complementary Assets, No Interoperability	Complementary Assets, Interoperability
	Close	No complementary Assets, No Interoperability	No Complementary Assets Interoperability

Source: Author

Figure 4 Platform openness and network openness characteristics

the market only after two years from its pre-announcement, elevating user's expectation and avoiding users to switch to Sega game network. Strategically, in a market where does not exist network externality to obtain competitive advantage, firms use to create product differentiation by trying to defend themselves against product copy and market dominance at an early phase. In a market with network externality, however, the strategy is different. By adopting open policy and opening product technical specification and socially common standard interfaces, or architecture to other firms, incentives to copy are created and collaboration with other firms will be reinforced to create common market standards that ensure interoperability. In open policy, firms try to increase installed base, cooperating with other by transferring knowledge and intellectual properties, allowing them to copy the product and create incentives for compatible products and its complements production, originating network externality effect. In opposition, the incentives to open technical specification and motivation to others to copy the product will reduce opportunities to monopolize the market, arising trade-off between become market standard or bear the risk and enter to the market alone (Meyer, 1997b). It seems to be an irrational behavior; however, most of the firms tend to choose the first option, market standardization, interoperability and increased installed base. The selection of each strategy is based on firm's core competences or internal capabilities and market positioning as showed in Figure 3:

Nevertheless, choosing a strategy only between open and closed, but a mixed and match of both to create the most suitable strategy to the firm and leverage the performance as a holistic business model is essential. By adopting an open policy and an open interface, much of the component manufacturer profitability is even higher than the platform provider, following "smile curve". It is the case of IBM PC, where Intel and Microsoft are more profitable than merely computer assembly firms; similar case is observed in the bicycle components firm as Shimano, excellent in bicycle components that has high profit rate, if compared to bicycle assembly manufacturers such as Miyata and Maruishi.

V Platform Strategy in Network Externality

Based on the discussions above, we can create a strategy framework for different platform and network externality conditions. The openness of the platform is interrelated with its interface openness to accommodate a complementary product and service applications. More interfaces are opened, more complementary products participate in the platform

Platform \ Network	Close	Open
Open	Lock-In	Diversification
Close	Stand-Alone	Expansion

Source: Author

Figure 5 Platform and Network Openness Strategies

ecosystem. Furthermore, the openness of the network is based on the product or service compatibility, interoperability and the standardization process executes an important role for product and service interoperability, creating incentives for users to join the same network. Figure 4 shows platform openness based on interface openness and consequent complementary product creation, and network openness based on product interoperability and compatibility.

Based on Figure 5 and combining platform openness in different network externality conditions, we propose the following four basic strategies:

1) **Stand-Alone Strategy:** When both platform and network are closed, the platform acts as an isolated agent standing alone, with no complementary products and without any compatible or interoperable network. In this strategy, there is a fundamental trade-off between secrecy and disclosure, where secrecy protects the incentives of the investors and ensures to reap financial rewards based on reduced possibility of copying. The secrecy is favorable to prevent substitute innovation and to encourage profit-seeking entrepreneurs to innovate stand-alone products (Gawer and Cusumano, 2005). Another way to prevent the substitute innovation is the use of patents, despite its limited validation, because those patents will expire after certain period. Disclosure is the most suitable way to encourage complementary innovation because it allows many investors to reap financially; even if they have no competence to develop a core system or platform. This strategy is observed at the initial phase of Japanese word processors, when its software was incompatible and not interoperable, isolated from other word processors network; even storing data in a floppy disk and transfer it to the other word processor, it did not work. Each word processor data was compatible only to the same company's standard and data from one company couldn't be edited or modified by using other company's software. Usually, Stand-alone strategy is adopted when the firm possesses a generous quantity of internal resources such as people, knowledge and capital, unique technology, an existing installed base or majority market share and brand name recognition.
2) **Expansion Strategy:** This strategy is adopted when the platform is closed and network is open. The incentives to expand market will open standards, and facilitate interoperability to join the same user network, consequently amplifying installed base and market share, but the platform interfaces are still closed and they do not allow the emergence of other complementary products and services. This strategy is commonly applied to develop family products or to penetrate in different market segments, expanding the product portfolio by using the same platform. A typical case is the ATM, where each bank develops its own technology, knowledge and know-how embedded to the platform. However, the network is open, allowing different bank networks to interoperate between them, which represent a benefit for the customers because they are able to use an expanded ATM network. Also, local bank users enjoy nationwide bank service, that is, a local bank interoperates with other bank's network, extending the area coverage without additional investments for ATM infrastructure.
3) **Lock-In Strategy:** When the platform is open and network is closed, the lock-in strategy occurs. The incentives

Platform Strategy	Common value	Profitability	Sustainability
Stand-Alone	Increases product/service royalty to hold installed base; high price	High	R&D, internal development/ production
Lock-In	Increases complementary partners to attract customers; high price, low quantity	High	Alliance, core internal and non core outsource
Expansion	Become de facto standard to obtain market share; scale economy, reasonable price.	Medium	OEM, Licensing
Diversification	Cost leadership competition, product/ service commoditization; speed	Low	Outsourcing, Globalization

Source: Author

Figure 6　Common value, profitability and sustainability of each platform strategy

		Network	
		Close	Open
Platform	Open	Nintendo PSP	Internet VHS-C
	Close	Word Processor	ATM

Source: Author

Figure 7　Examples of platform and network openness

to open the platform are related to the increase of complementary products and services that leverage the installed base and non-interoperable network ensuring a high profitability to the firm. This strategy is usually adopted when the firm has internal resources and capabilities to develop the platform by itself. For example, an adoption of Lock-in strategy is observed in video game. Both Nintendo and PSP used to open their platform interfaces to increase attractive software. By offering interesting complementary software, game platform agents are able to bring more users to join the network. More recently, the development in broadband and Internet environment allows one player to play games with another player on line within the same game network, increasing the player options and value to the network users.

4) **Diversification Strategy:** The diversification strategy is adopted when both platform and network are open. The openness of both platform and network leads to interoperability and emergence of complementary products and services, amplifying users choices and maximizing the network externality effect. The users are comfortable and feel secure to join the specific platform and network product, due to the existence of established network interoperability and a large number of platform complementary assets. As a result, the similarity of the platform product and its complementary products has little differentiation, which may induce to price competition. If there is a large number of players, it increases the possibilities of the products to become a commodity are very considerable. In order to avoid commoditization process, the product or service should be differentiated and diversified at the same time, proposing more perceptive values to the users. As an example we can mention the Internet network, where the platform is open, it uses several open sources as Linux and Java to provide variety of services. The network is also open and its interoperability is guaranteed by the standardized protocol IP/TCP that allows access to the Internet. Nowadays, the Internet offers not only data services, but also VOIP and video services; a convergence of voice,

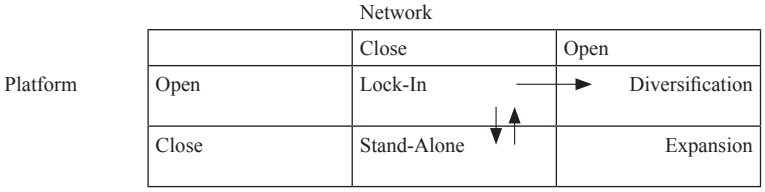
data and video that expands the horizons of Internet services, creating diversified and attractive new services. The problem of the diversification strategy is the fact that every single provider follows the standards and consequently, the interoperability is guaranteed and it does not matter the manufacturer of such product of service. The unique competitive advantage is price and, the winner is usually the one who excels on strong operation management and economy of scale.

Ⅵ Platform Dynamism and Different Strategy Approaches

The platform is dynamic and it can adopt different strategies during its product life cycle, even apply two strategies at the same time to adapt itself to the external environment changes. For example, the initial phase of Nintendo is considered a Lock-in strategy, because Nintendo was dealing only with its own network users. However Wi-Fi functionalities that were incorporated in the device, enabled the business horizon to different market segments and user layers such as Internet access, chat and SNS (Social Networking Services) with other network users. Nintendo users can join not only to Nintendo game players network, but also to other SNS services and even competitor's platforms as PSP (Playstation Portable). The time axis is not included in the strategy scenario, but one platform can demonstrate different strategies among different time spans. Also, the platform is dynamic and evolves in order to adapt to the external environment. By analyzing the environmental changes and platform evolution, we note that the most common start is stand-alone strategy, then it evolves to the next phases: lock-in, expansion and diversification. The final phase of each platform evolution used to be diversification strategy, which guarantees network interoperability and compatibility, associated with platform openness, allowing emergence of complementary assets. As previously discussed, the last strategy tends to create commoditization process in the product and service, due to its compatibility that ensures interoperability between networks, resulting in a lack of differentiation in the product or service. In some cases, the firms endeavor to avoid commoditization process and try to differentiate their products or services by creating new standards or returning to the initial stand-alone strategy.

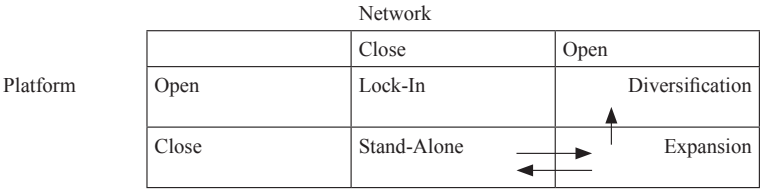
1 Scenario Stand-alone -> lock-in -> diversification

The initial strategy scenario starts at stand-alone and closed platform is induced to open its interfaces, in order to increase the installed base. By opening the platform interface, users can enjoy a large number of different applications and complementary assets. When the TV game and game & watch (Nintendo) were launched, the software was included in the hardware console. At a second phase, Nintendo allowed users to change software cartridges to play different variety of games using the family computer console, amplifying its users network. This business model introduced the concepts of platform creation and incentive complementary software development, and was followed by a strong synergy between platform provider and complementary application software providers. At the same time, it allowed users to enjoy different games within the same Nintendo network. Another economical benefit is the creation of a second hand software market, where users that do not want to continue playing the same game contained in the software are able to change or purchase other software at a reasonable price. By adopting this strategy, users became literally locked-in to Nintendo family computer network. It is important to note that the after lock-in strategy, it can shift to diversification strategy or simply ends up in lock-in strategy. We have two different new scenarios after lock-in strategy. In video game, if we consider generation changes from Nintendo family computer to Nintendo 64 (N64), definitely the processor capacity increased, however there was no software compatibility and interoperability between new and old generation consoles. In this phase, the users of family computer were locked in only to family computer platform and its complementary software, and were not able to use the new generation platform. On the other hand, Nintendo DS users



Source: Author

Figure 8 Platform dynamism from stand-alone, lock-in to diversification



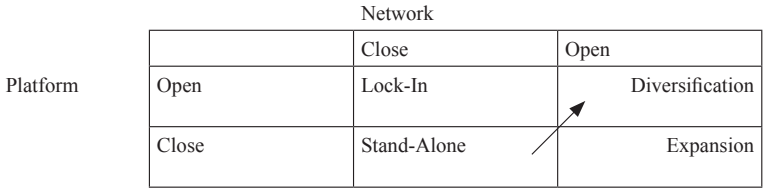
Source: Author

Figure 9 Platform dynamism from stand-alone, expansion to diversification

are able to download different applications and access to other user network via Wi-Fi network. The use of Internet environment by DS is not merely restricted to Nintendo's network, but extended to other Internet application network, shifting to diversification strategy. In this case, DS is considered media platform, where other useful information and applications are provided (Figure 8).

2 Scenario stand-alone -> expansion -> diversification

The initial strategy scenario is stand-alone, both platform and network are closed and by imposing interoperability and compatibility, the network becomes open. Typical strategy change occurs when the early technology developer opens its standard to attract more product or service providers to achieve compatibility, reducing competitor's standardization effect. For example, bank transactions used to process only by tellers at its initial phase; each bank' s transaction platform was isolated and closed and incompatible with the others and was not able to interoperate with other bank networks; all of these are characteristics of stand-alone phase. After the introduction of ATM and interoperability between the banks, users were able to execute banking transactions not only at a particular ATM of a specified bank, but also at other banks within the ATM network, increasing the user's utility. The bank transaction platform is still closed; there is no complementary assets development due to security issues and at a determined phase, its network open, allowing network interoperability and compatibility. The lack of compatibility between two networks developed a third tool called converter, which converts one network protocol to adjust to another network protocol and become compatible networks. The excessive use of converters may cause inefficiencies, due to the intervention of a third party which increases the transaction cost and in a social aspect, it is not a desirable solution. In the future, the trend in banking transactions is to have unique platform that permit every banking system to connect, develop universal complementary products and networks to become interoperable and compatible as the Internet banking (Figure 9).



Source: Author

Figure 10 Platform dynamism from stand-alone to diversification

3 Scenario stand-alone -> diversification

In scenario from stand-alone to diversification, from both closed network and platform shift to open network and open platform. However, there are only few cases where a stand-alone shifted to diversification, without passing through intermediate phases as lock-in, neither expansion. For example, initial personal computers like Commodore and Apple used to work as stand-alone units. The only way to exchange data between computers was using floppy discs. After the development of network technology, all the computers were able to interconnect through LAN (local access network) within the local network and later to the worldwide Internet network. The Internet TCP/IP protocol allowed computers to access Internet, provided data, video and voice converged service, let users share information and accentuated its presence around the world, where everybody can enjoy network access, anytime, anywhere and any kind of means (any terminal). Another case is the VHS, as described earlier. Even though VHS is not considered technically the best solution, but it was successful by opening its compatible standard to motivate other manufacturers to join the same network and at the same time, offer a variety of complementary software to users, which explained why more users wanted to join the VHS network. Nowadays, the choice of a standard can occur simultaneously at the stand-alone and diversification phases, when the provider of such standard used its standard and made it public with the purpose to create consortium and therefore, lead the market. A typical case is the competition between Blue-ray disc supported mainly by Sony, Panasonic and Sharp and the HD DVD format, supported by Toshiba and NEC. Although HD DVD format was not launched yet, most of complementary software providers supported the Blue ray disc, so the firms that supported HD DVD declined to launch this technology and accepted Blue ray disc as a new standard technology. Similarly to the adoption of a lock-in strategy, the diversification strategy can return back to the stand-alone strategy. An example of this is the launch of the DVD recorder as a new technology, fact that changed dramatically the existing standard format. When a strategy reaches the diversification phase, this mostly means that it has already established certain standardization and compatibility between the users of the network, ensuring product and service interoperability. The next step will be to open platform to diversify its family and launch new derivative products like the VHS-C, which was created to attend customer demand of compact and portable video cameras. The customer behavior also changed from a passive to pro-active position by participating directly in the creation of its own video and not act only as a merely spectator of pre-recorded Hollywood blockbusters. Moreover, customers demanded the development of the portable video camera market, which competed against 8mm video camera format.

Manufacturers show concern about the right timing to change their product portfolio, especially from an existing generation to new one, or even to create different formats. They want to avoid product cannibalization, from the current cash cow product to the new product, which will require an investment for the infrastructure of such new product. If the product life cycle is long, they will generate more profit, due to the manufacturing knowledge and the infrastructure facilities depreciation. On the other hand, the adoption of a new technology requires a high initial investment, training

of manufacturer staffs and this will also require educating their users. Despite the technological changes, most of VHS manufacturers desired to extend the lifecycle of the VHS by creating a transition product such as the dual VHS and DVD player, before the consolidation of DVD format (Figure 10).

Ⅶ Conclusion and Implications

The platform strategy suggests which strategy should be adopted to build a platform capable to attend a variety of demands and deal with the external changes of the environment, especially those different network externality conditions that lead a firm to achieve a sustainable business growth. The platform approach is very useful to segment the market and reflect its needs by creating derivative or family products, which can save development cost and create competitive advantage as short market in lead-time. Simultaneously, the platform should provide attractive value to develop complementary assets that increase installed base and consequently, market expansion through network externality effect. The success of platform is intimately related to incentives to conquer complementary product or service providers to join the platform network, which is ruled by external interface openness. More open the interface, more incentives for complementary providers to associate to platform coalition, that ultimately does not simply complements each product or service weakness, but coalition of firms that possess core competences and have capabilities to provide additional value to the platform, that is, the coalition of winners. This winner's coalition positioning in the market is strong enough to cause the winner-take-all effect, provide positive spiral feedback that attracts more users to the winner's network and obtain the market dominance.

The analysis of platform and network externality in different circumstances according to its openness suggests four platform strategies: stand-alone, lock-in, expansion and diversification. The platform openness is directly related to the capability to create complementary assets that leverages the platform ecosystem. On the other hand, network externality openness is related to degree of interoperability and compatibility between two networks. The findings of this research is platform dynamism, where majority of the platform is originated at the stand-alone phase, platform closed and network closed situation and evolves to lock-in or expansion phases and finally reaches to the diversification phase to adjust to external environmental changes. The most significant influence to the network externality is the development of ICT (Information, Communication and Technology) and globalization process that increased productivity by accessing to the global Internet network. Until this moment, we focus on "when" apply the specific platform strategy for different platform and network externality conditions, arising future research objectives as "how" platform strategy can be applied and contribute to business sustainable growth. Also for the future research, the factors, which influence strategy selection, should be analyzed.

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Platform Management Strategy in Different Network Externality Conditions.

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