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# Open and Integral Innovation on Tablet PC by Popularized Advanced Media as Industrial Cradle

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## 1. Introduction

When advanced media are used near us through the tablet PC such as iPad, user-push innovations prevail in the user industries by the following steps:

1. Simultaneously processing of multiple information by reciprocal information exchange
2. Integration of multiple knowledge into the conventional organizations/businesses
3. Intellectualization of users
4. Users push to innovate the use/utility of information

According to Shapiro (1999), internet created control revolution by relocating powers from organizations to individuals. This resulted in open-modular innovation that had forced to change the industrial model from centralized and vertically integrated system to decentralized and horizontally specialized system. In the digital industry, it is believed that the competitiveness is restored by open-modular system instead of closed integral system. In case of newly emerging innovation caused by cutting-edge advanced media, the fact is the opposite. Innovation is instantly handled by end-users in the open-integral manner on tablet PC. Instant innovation is thus creating power shift. Such a new type of power shift is undertaken by advanced media since new media are given a role as a tool for self-transformational innovation. The power of the media moves to media-users and changes the winner of business. This power shift made it possible for everyone to handle media easily and instantly to handle innovation by tablet PC.

New trend of the innovators' power shifts are provided by new scheme of innovation process model such as open-integral innovation by modularizing power of each function through advanced media. As the most typical example, penetration of tablet PC is breaking the closed system open even in the medical industry, which is well-known as the most typical closed business area, by the following steps:

1. Open modularization of each function by dividing specialized function
2. Use of information for explanation and communication among specialists
3. Integral use of information for users

#### 4. Open but integral use of information for everyone's ordinary life assistance

In conclusion, the industrial structure is converted to open-integral through open-modularizing power of the advanced media, on the basis of user-push innovation. Especially in case of medical industry, it comes to have a crucial function as industrial cradle. Industries of the next generation arise because the medical business becomes a platform where the related industry is strongly drawn.

This chapter also described the mechanism of win or loss in the new born market. This theory could clarify the reason why Apple could get success in developing platform by combining modules and why other firms failed? On the whole, win or loss in the new born market has a predetermined and preset agenda before starting competition.

## 2. Instant innovation on tablet PC

According to McLuhan (McLuhan and Fiore, 1967), "The medium is the message". McLuhan shoots down the idea that people construct meanings and transfer these meanings through a medium. After becoming the age of internet, the myth of internet has been believed, that internet is the most powerful medium yet invented. Although internet has penetrated into our everyday life, its utility has not yet practically improved in our real life, unless internet changes the way. With the advent of iPad in 2010, various ways of use on the internet expand and accordingly strangers separated by great distances can gather to engage one another in the same contents for the possible improvement and practical application of various technologies not merely related to IT technology. For the first time ever in the internet era, this gives these media the allure of a new dimension for the progress in our realistic life. It's been a beyond internet era where technology progressed remarkably and life was enriched by the spread of media through tablet terminals such as iPad, tablet PC etc. This phenomenon could be compared to online games on the internet, strangers separated by great distances can gather in a world of virtual reality to engage one another in contests and battles of every description. This chapter shows that internet media have been drastically being outdated by the new generation of smart phones such as iPad in 2010.

### 2.1 Change of the role of medium

2010 is said to mark the "first year of iPad (Nikkei Business, Jan. 18, 2011). This tablet PC is extremely easy to use even for baby or elderly. It brought many advantages to everyday life; extension of human capability, resolution of problem caused by information asymmetry and, popularization of use of cutting-edge high-tech media and high technology. According to Shapiro (1999), internet caused control revolution by relocating powers from organizations to individuals. This is apparently caused by power shift since controllability of information was a source of the power in organizations in the past. In fact, information has been still controlled in dictatorial states. At that time, internet was simply a tool for distributing information from organizations to individuals. Media were therefore thought to mediate the information from one to another in the past. This situation is coming to an end. After the era of tablet PC, the role of media has been changed from intermediate to creators. Regardless whether those in power like it or not, media make the move fast and exercise initiative for changing the power. Media have changed the role from power holders to power dispersants.

## **2.2 Extension of human capability**

The medium is nowadays furthermore playing a novel role for human perception as not only passive message but also proactive one. Cutting-edge media (advanced media) are penetrating to everyday life rapidly, and the ruler of medium is changing from the conventional major to the public. The medium exercises much more influence to not only contents of media but also everything including human activity in the human life. This owes to expansion of capability of new medium itself, since the newly emerging cutting-edge media are expanding the contents of the message beyond human perception. According to McLuhan (McLuhan and Carpenter, 1960, McLuhan, 1964, McLuhan, M. & McLuhan, E., 1988), the sociological role of medium is "expansion of the human being". This theory centered on the idea of technology expanding the realm of human knowledge and experience. After 2010, it has actually started exceeding the limit of the human capability with the function of the advanced media. Tablet PC started expanding the realm of message beyond the human perception. Those phenomena are symbolized by virtual reality (VR) human interface, for examples, VR simulation, augmented virtuality, augmented reality, ultra realistic communication and so on. Augmented Reality (AR) displays in a general sense, within the context of a Reality-Virtuality (RV) continuum, encompassing a large class of "Mixed Reality" (MR) displays, which also includes Augmented Virtuality (AV) (Miligram et al., 1994).

## **2.3 Counter measure against principle-agent problem caused by asymmetric information**

Next issue of the change is how to remove the barrier of understanding of information. Information is not equally distributed to everyone even if the same information is transferred or given. Any distribution method of information cannot avoid the problem of asymmetry of information. Information asymmetry creates an imbalance of power in transactions which can sometimes cause the transactions for the inferior to go awry in the market or transaction. In 2001, the Nobel Prize in Economics was awarded to George Akerlof, Michael Spence, and Joseph E. Stiglitz for their analyses of markets with asymmetric information. In accordance with this hypothesis, the major has kept a leading position in the market by creating imbalance of the power. Problems caused by these examples are adverse selection and moral hazard in the market or society. Information asymmetries most commonly cause principal-agent problems. Typical case is power relationship between patient with a fatal disease and surgeon in the operation room. As a solution of this case, advanced media are actually disclosing or revealing the happening in the operation room.

## **2.4 Popularization of advanced technology through advanced media**

By extending human capability, man could select and use the necessary information through advanced media. In other words, advanced media become to mediate the selection and the use of information. This leads to attenuating the influential power of market player for innovation, since user could select the best for him by himself.

If cutting-edge high technology is popularized by advanced media, user could find and select directly the best way of using. This means that the diffusion rate of cutting-edge high technology is greatly accelerated by popularized media. When advanced media are used

Near us through the tablet PC such as iPad, user-push innovations prevail in the user industries by the following steps:

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According to Cowhey and Aronson (2008), innovation in ICT fuels the growth of the global economy. The diffusion of internet, wireless, and broadband technology, growing modularity in the design of technologies, distributed computing infrastructures, and rapidly changing business models signal another shift. Attributing to a path breaking action of tablet PC, new technology is emerging in the field of research and immediately developed on tablet PC. Once innovative application is tested and confirmed, innovation ends up in widespread use and instantly popularized.

Rogers (1962, 2003) explains how new ideas spread via communication channels over time. Such innovations are initially perceived as uncertain and even risky. To overcome this uncertainty, most people seek out others like themselves who have already adopted the new idea. Thus the diffusion process consists of a few individuals who first adopt an innovation, then spread the word among their circle of acquaintances. Such a diffusion process of innovation typically takes months or years. Becoming internet era in the 1990s, use of new technology may have spread more rapidly than before since internet is changing the very nature of diffusion by decreasing the importance of physical distance between people. Internet has transformed the way of communication and adoption of new ideas.

Tablet PC changed the mode of diffusion of innovation and the process of adoption of technology. Advanced media have opened the window for experimental and direct use by users. Innovative technology is instantly adopted once utility is recognized by users. Instant innovation could remove the gap between experiment and adoption of innovation. Instant innovation accelerates the frequency of feasibility study extremely and increases the number of trial-and-error. Innovators are not corporate actors or opinion leaders but also end-users.

### **3. Modularity in the healthcare business**

Healthcare business requires expertness and know-how. For this reason, each expertise is originally divided into each specialized functional division or firm. To put it more precisely in the concrete, hospital has two primitively specialized functions to diagnose and treat patients. They are integrated into one synchronized activity by combining therapy and diagnosis. In this way, healthcare business consists of modularized parts from the diversification of specialties. These components are integrated at hospital by unified activities for treating each patient. By rapid penetration of advanced media, various barriers for integration are rapidly conquered. It owes to integrative function of tablet PC especially by rapid progress in diffusion of iPad among physicians.

#### **3.1 Modularity of expertise as a source of competitive advantage**

In today's information-rich environment, companies can no longer afford to rely entirely on their own ideas to advance their business, nor can they restrict their innovations to a single

path to market. According to Henry W. Chesbrough (2003), the traditional vertical integration model for innovation has been becoming obsolete. Open-modular innovation is believed to be the post 20 century’s firms’ success model since it leverages internal and external sources of ideas and takes them to market through multiple paths.

Baldwin and Clark (2000) explained the merits of modularization, as follows:

1. Expand controllable capability with a minimum of complexity, which builds complex products from smaller subsystems that can be designed independently yet function together as a whole.
2. Save time and mutual adjustment by the effect that modularity freed designers to experiment with different approaches, as long as they obeyed the established design rules.
3. Manage uncertainty effectively.

To split complex products into modules increases the likelihood of innovation by combining products and services of the best of several prototypes (BOB: Best of Breed). This will be able to choose the most suitable option for many. It means that complex problem is transformed into simple multi-option choice question. In 21 century, this control system has apparently acquired competitive advantage that overcome 20 century’s manufacturing and R&D model prevailed among traditional big firms.

3.2 Modularity of healthcare business by high-tech cutting edge media

With introduction of IT and the development of digitalization, work assignments have been sub-divided based on specialty in computer, automotive, telecommunication and power industries. Before common industry became modularized, each function of healthcare business has been already specialized based on professional, from cleaning in a laundry to diagnosis in a laboratory and treatment in a consulting room. Table.1 shows the ratio of outsourcing at the hospital in Japan. More than 90% of laboratory test such as examination of blood sample has been already outsourced in 20th century. As a recent world-wide trend, collecting patient data or ordering drugs and lab tests using handheld devices can be very effective in reducing errors. iPad has rapidly penetrated and come into general usage for security and support at hospital.

	1991	2009
Linen	95.4%	97.4%
Disposition of waste	79.3%	96.9%
Laboratory test	90.3%	95.5%
Cleaning service	70.2%	81.7%
Food service operation	19.8%	62.3%
Administrative and clerical support	23.1%	31.8%
Sterilization and disinfection practice	14.3%	20.7%
Commodities Management	0%	16.8%

Table 1. Trend of outsourcing at hospital in Japan (Weekly Diamond, 2010)

Healthcare business consists of modularized parts for the purpose of the diversification of specialties. These components are integrated at hospital for the activity of treatment and promote to integrate the healthcare enterprise as indicated by initiative of Radiological Society of North America. In contrast with the move of healthcare industrial standard, the medical treatment in clinical practice did not open its system to outside, rather protect to be opened and resisting the order or restriction asked by the Health Authorities in the open. Furthermore, extremely high specialty has fixed power of majors in the market due to lack of new entry from another sector, although major loses the market share in case a new market is created by a product or business that competes indirectly or neutrally with the major players in the existing market as described in Chapter 4.

Practical applications of high-tech cutting-edge media are in progress for diagnosis and medical treatment in many situations. Local medical service is seriously suffering from a shortage of medical doctors. By modularization of physicians’ expertise, it is gradually becoming possible to reconstruct a total healthcare system in a remote spot or even in space (Akiyama, 2008).

3.3 Instant innovation on tablet PC

In case of modular product, simple modularization became impedance to expanding its performance drastically. However, using a tablet PC as window of cutting-edge media, user could explore the possibility for practical application directly. While maintaining interoperability and compatibility, as shown in Figure 1, user could easily and directly test the utility of various sets of integral parts in the open-modular by trial and error. On tablet PC, innovation happens instantly.


	Integral product	Modular product	Cutting-edge media	Open-modular & integral
Modular		○	<div>Medical</div> <div></div>	○
Open		○		○
Integral	×			○
Closed	×	×		×

Fig. 1. Structure change of mode of development on tablet PC

A variety of practical application is in progress at hospital. Remote diagnostic system and therapeutic equipment are already developed by integrating modular parts. Surgical robots also explore the limit beyond human capability by precise and automated manipulation. For communicating or checking the operation, iPad plays a central role.

Healthcare industry is mostly dependent on information. Among many information devices, almost doctors are Mac lovers. Because of this, iPad is penetrated into ordinary use among physicians. iPad and iPhone exceeds 80% of the share among physicians including general practitioner (QLife, 2010). iPad has rapidly gained popularity and been quickly accepted among physicians. More than half of doctors have already used as a standard tool, as follows:

“iPad/iPhone revolutionize medical services” in Nursing Journal “Kangogaku Zassi”, December, 2110.

1. Review or check digitized diagnostic image.
2. Clinical records (Takahashi, 2010)
3. View Attachments (Horinaga, 2010)
4. Explain to the patient (Miyagawa, 2010)
5. Description of the next-generation medical treatment (Sugimoto, 2010)
6. Post-graduate clinical training (Sakai et.al., 2010)
7. Description preoperative anesthesia (Seino et.al., 2010)
8. diagnostic imaging (Suzuki, 2010)
9. Home medical care (Toya, 2010)

Considering many application of agile idea by users, innovation model on tablet PC converts the innovation path from prototype development to launch as shown in Fig. 2. In the conventional innovation model, how to innovate platform with keeping agility is the biggest issue. Tablet PC provides users with platform and therefore develop deep differentiating capabilities. Managers do not need to care for anything except keeping watch for the progress by various uses experimented by many end-users.

On tablet PC, idea is directly and instantly confirmed by practical use as an experimental trial, this facilitates the speed of innovation. Most important change is to make the value of power meaningless. Majors cannot impede entry from another sector.

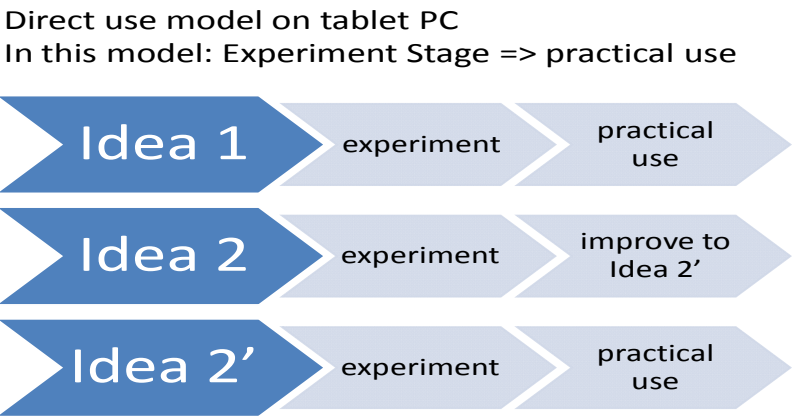


Fig. 2. Conversion of innovation path on tablet PC

Exemplary case is EHR (Electronic Health Record). EHR has easily made by general practitioners on iPad platform. This has been prevented by EHR vendors such as IBM in the US, Fujitsu in Japan etc. If common packaged software dominates in hospital, users do not need vendor. From view points of hospital or physicians, they cannot reveal the fault or mistake since accidents happen very often during operation or patients care. Both vendor and physicians share mutual interests to obscure the true nature in hospitalization. They disguise fictitiously lack of their efforts and commoditize EHR as a justified reason to be independent of the professionals in each facility.

This results in the very low levels of adoption of EHRs in U.S. hospitals. According to recent survey by Ashish K. Jha et.al.(2009), only 1.5% of U.S. hospitals have a comprehensive electronic-records system (i.e., present in all clinical units), and an additional 7.6% have a

basic system (i.e., present in at least one clinical unit). Computerized provider-order entry for medications has been implemented in only 17% of hospitals. Larger hospitals, those located in urban areas, and teaching hospitals were more likely to have electronic-records systems. Respondents cited capital requirements and high maintenance costs as the primary barriers to implementation, although hospitals with electronic-records systems were less likely to cite these barriers than hospitals without such systems. Although Japanese medical community is recognized to be protected stronger than the US, 20.7% of Japanese hospitals have EHR system (Seed Planning, 2010) and the number is much higher compared to 1.5% of the US hospitals. These low numbers symbolize the result of resistance to the objective goal of the Authorities.

### 3.4 Tablet PC as platform of experiment & use

Why tablet PC has penetrated into our life beyond our expectation? Why tablet PC has extreme influences to change the fixed idea or to overwhelm major firms' impedance so quickly? All happening is derived the change of the position of maker and user, because tablet PC was simply used as platform on which users gather. Although end-users have not want test product so much utility, on this platform their unaware dream of real wants could come true. This fact is narrated by Steve Jobs, founder of Apple Inc., "Only thing to do was to leave product intact. Competitors did gang up on product filled with junk."

The important distinct characteristics of tablet PC platform are completely different from conventional platform. Base of conventional or authentic platform is modularization and de fact standardization. Old platform strategy is apparently for major players to build success in the market. For this purpose, product is the first and utility is followed. This assumption is set in mind and therefore it has been a cause for majors to stifle innovation.

According to Gawer and Cusumano (Gawer, A & Cusumano, M.A., 2002), firm must innovate internally to succeed, yet its success may equally depend on corresponding innovations by external firms. Under such a tough competitive situation, some firms have developed strategies that have made them industry's powerhouses and world-class innovators. They were, so to say, platform leaders. By becoming platform leaders, companies could continue to provide the technological foundation on which other products, services, and systems are built. Platform leaders have orchestrated industry innovations to support their products and, in the process, established dominant market positions. Cusumano distils six enduring principles for success as platform leaders (Cusumano, M.A., 2010). The first two principles are platforms (not just products), and services, for product firms. These are relatively new and broader ways of thinking about strategy and business models. The other four are capabilities (not just strategy), the "pull" concept, economies of scope, and flexibility (not just efficiency). All contribute to agility, which is a mix of flexibility and speed. They are also essential to a new world dominated by platforms and technology-enabled services.

Unfortunately to platform leaders, what happened for real is beyond their thought and former success pattern till 2010, after tablet PC appeared. After that time, any firms could not become powerhouse by agile management in the turbulence. Table 2 summarizes the major different points of tablet PC platform from conventional platform theory.

	Tablet platform	Conventional platform theory
1)Management control	Evil	Essential
2) Autonomy	Voluntary	Compelled
3) Intention	Spontaneous	Strategic
4) Experiment & use	Simultaneous	Linear or concurrent
5) Powerhouse	Stifle	Centralize as powerhouse
6) Initiative	User	Platform Leader
7) Concern	Utility	Product
8) Actor for innovation	Popularized	User or firm

Table 2. Difference of tablet (PC) platform from conventional platform

1. Management control  
No management: management is rather evil. Market is never controlled by major firms.
2. Autonomy  
“Trial and error” is not compelled to do by firm but voluntarily made by users.
3. Intention  
Every innovative opportunity are tried voluntary, neither compelled nor intentionally.
4. Experiment & use  
Experiment and use are reciprocally and simultaneously made. This means they are coupled with feasibility test by end-user. Agile management becomes meaningless.
5. Powerhouse  
It impedes the challenge to the new opportunity to become powerhouse for centralized to other firms, although it was essential to get the position as platform leader in the conventional platform model. From new tablet platform theory as afore-mentioned, conventional management model lose the role. It is rather evil to stifle the market possibility.
6. Initiative  
Who has initiative for new product development? On tablet PC platform, leader is neither major nor firm but user.
7. Concern  
Firm’s most concern is apparently product and its sales. People have forgotten that we are not interested in product itself but its utility to improve something in the life. Thus, major concern has shifted from product to utility.
8. Actor for innovation  
We did not doubt the process of commercialization or development owes to mutual communication between user and firm. Opposite to such an assumption, development and use of product is made voluntarily and coupled with users since they can input or improve the method for use by themselves on tablet PC platform. Innovation is separated from the first-mover to user. Actor for innovation is popularized.

Before 2010, platform was provided by firms for the purpose of their product development. Becoming tablet PC era, the role of platform is changed from passive to proactive. People could handle their idea and information to meet their own utility. Platform has become a place for life and work on which everyone has been building his product and/or business. Furthermore, advanced media intermediate the commitment of user to innovation.

4. Absolute win or unavoidable loss in industry: Why Apple could launch tablet PC

Many existing major businesses have failed in seemingly promising development projects especially of innovative products or businesses. Their extensive and preceding investments for R&D or facilities, including those for establishing new laboratories or huge infrastructures, did not prevent newcomers with different backgrounds from winning their market shares. The typical feature of the investment is prioritized and authorized by top management among the high tech related industries in common. Even with knowledge of new technologies, products and markets at the same level as their competitors, majors will certainly lose under some conditions, while winning under others. Apple’s iPod explains such fate of success and failure. Sony once became the No.1 player in the world market by Walkman; Sony denied the new down-load music market just at top management decision meeting in 1999 before launch of iPod. Apple did not have any music device. In 2000, Apple’s PC business could not recover in spite of launch of a series of new model of Apple computer. While Apple did not stand virtually any chance of success about PC business, it made a desperate bid by iPod. During marketing iPod, Apple could learn platform business. iPad is launched as a fusion device of iPod, iPhone and PC. In fact, Apple did not have inventory since the first order is far from the sales perspective. If Apple were a strong market leader, it would deny tablet PC.

4.1 Win or loss in the new born market

As a typical case of high-tech related market, in the applications of the recombinant DNA technique, fate is separated without relation to the efforts and power. Success and failure is invisibly determined just like manipulated by invisible God’s hands regardless of their endeavors by fate. Under the prevailing bio-tech era in 1980s, all related firms had established bio-tech institutes. This bio-tech institute boom is not only limited to life science related firms such as pharmaceuticals, beer, fermentation etc. but also absolutely unrelated firms in such industries as chemical, textile, food, steel, electrical industry etc. All businesses have believed still now that establishing only institute could strike gold mine from the huge unveiled markets.

The fate of win or loss were opposite, as shown in Table 3. New Product Developments (NPDs) conducted by agricultural majors were successful in excluding newcomers from the recombinant plants market, while no pharmaceutical majors were able to commercialize recombinant drugs, nevertheless, large-scale R&D programs are dedicated in laboratories. Typical common phenomena were all majors never doubted that their capability and knowledge was the top-tiered in the existing market.

	Existing businesses’ result	Winning business sector
Recombinant plants	Complete Victory	Agro-business
Recombinant pharmaceuticals	Unavoidable Loss	Pharmaceutical business

Table 3. Fate of major businesses in the new born market of recombinant bio-products

Meanwhile, the chemical industry, once seen as the leader in commercializing bio-products, has shown a general tendency of divestiture of bio-businesses, including the pharmaceutical business. Those new companies usually focus their resources in limited product areas. This

results in cutthroat R&D competition in a small number of themes, naturally raising the share of R&D expenditure. This in turn necessitates pursuit of large sales by focusing on lucrative products, creating a vicious circle.

From this aspect, almost R&D invest has wasted immeasurable resources in vague and do not produce any good things. This is a fatal social loss to determine the wealth of nations near future. PPM (Product Portfolio Management) is one of common tools for strategic decision. It causes a fatal mistake, because it only measure or calculate the future market based on the current market situation and product profile. This system places irrelevant estimation for the future especially on every occasion creating new-born market. In fact, many firms restructured PC business. They could not undergo a renaissance of ICT related business by bringing tablet PC to the market. Apparently, strategist in many firms should be to be blamed due to misplaced estimation, they have repeated the same mistake even after their fault becomes revealed to the public. The most important thing is to make the new scale for product evaluation before calculating the sales estimation from null or small current market.

4.2 Absolute win or unavoidable loss in ICT industry businesses

Information and Communication Technology or ICT allows users to participate in a rapidly changing world in which work and other activities are increasingly transformed. ICT can be employed to give users quick access to ideas and experiences from a wide range of people, communities, cultures and political issues. In the recent decades widespread incorporation of ICT into many tiers of business and structuring of the global economy has occurred.

In accordance with diversification of communication method, this trend, ICT accelerates the business model from mortal to click. By structuring network among everything, ICT increases the accessibility to the necessary information and decrease of the transaction cost. This feature of ICT brought forth new economical role as intermediate. Among a variety of ICT products, tablet PC has given the new role of ICT as a popularized platform that connect cutting-edge media with real life.

Win or loss is complete opposite from what many firms expected. Critical changes by ICT owed to the increase of utility of information and therefore caused in changes of transaction systems. Down load music completely changed the transaction system from mortal to click. Opposite to the semiconductor business, existing businesses such as securities, retailing, advertisement, music did not take initiative for the transaction business system by using ICT, as shown in Table 4. Beyond the common expectation, all the new business systems are taken over not by outsider but also by new comers. This is the typical feature of ICT business, which is not observed in other high tech field.

	Existing businesses' result	Winning business sector
Securities	Loss	Internet security business
Retailing	Loss	Internet shopping
Advertisement	Loss	Net businesses
Music	Loss	Download music

Table 4. Fate of major businesses in the new born market related to ICT

The case in the network music business was the same. Network Music business is a rapidly emerging new market. Furthermore, the business approach has been changed frequently in response to rapid changes in customer preferences and the constant evolution of technical platforms. Network music systems are rapidly changing from one technology to another. In order to achieve optimal corporate profit, the most crucial factor should be “how to create strong customer relationships” through the network as a continuing source of network music business. Key success factors in the network music business are now understood to be the capability to continuously create new products based on the infrastructure of customer satisfaction in the network system. Before download music market, Walkman has prevailed across the world. Walkman was the strange tool because the use was limited only through earphone not by speaker. Download music player like iPod is much easier to store and select the music. Sony denied the market potential of download music at top management conference in 1999 (Idei, 2009). Furthermore, it is noteworthy that Japanese firms are most good at the technologies used in iPod. This proved that technological top tier is not sufficient for win the new market, in other words, not useful for successful launch of innovative product. Key success factor is not technical but market insight. From this reason, commonly used PPM has repeated the same mistake to deny the market potential of new-born products in the future market.

#### **4.3 Structural problems of high tech industry management**

These situations raise a question whether the typically research-intensive high tech industries like bio, nanotech and ICT, with by far the largest or larger R&D expenditure in the whole industrial sector, have succeeded in innovation through high tech. The largest firm with the largest R&D expenditure such as Sony failed to get the chance in spite that it has the strongest position until it denied the market and obeyed to the noise from Sony Music Enterprise. Sony's fault owed to top management's decision to pursue No.1 position in the world. Sony's strategy was, so to say, mirror strategy which intends to get market share in Japan in reflection of the name value in the US. Becoming larger, forget the reason of its strong position and lost sight of basic points.

In case of pharmaceutical firms, while publicizing themselves as the leaders in bioengineering for healthcare, existing companies in this field are losing the new market to newcomers, and trying to counter by expansion through M&A, resulting in yearly changing sales ranking. Their problem is they misunderstands that only way to increase R&D efficiency is scale, that is broadcasted by big pharmaceutical firms, US government, securities firm and consulting firms. Therefore, they do not deny the method of PPM since it is a tool to access the advantage of M&A. Merck Co. lost the position. Merck had kept the absolutely first-tier positioned firm in all pharmaceutical industry. Merck recruited many top-class bio-scientists to the bio-pharmaceutical institute. All pharmaceutical firms denied the value of bio-pharmaceuticals, like Sony did. Bio-scientists of Merck Co. dropped out from the company and build Amgen Do. Its sales exceed the Merck's total sales even only by licensing fee of bio-pharmaceuticals. This was the fact of Merck that drop-out of bio-dugs provided comparable sales revenue to Merck. Smaller enterprises are forced to focus on a limited product lines. This may bring about higher efficiency and profit for a short period, but its long-term effectiveness is questionable, because they compete in the same therapeutic area since its sales is estimated as large as others do.

5. Win or loss in the development of high tech products and businesses

This chapter discusses the management of high tech businesses to show that circumstances exist:

1. where major businesses succeed in product innovation allowing no newcomers to participate in the new market
2. where they fail because of the "revenge of past success";
3. factors exist that decide the win or loss.
4. by elucidating the mechanism of the win and loss, it is demonstrated that the product development in the high tech business requires a management strategy different from that for other industry branches.

5.1 Win or loss in the high tech products

The performance of major businesses in the development of high tech products is shown in Table 5. All the majors in the agricultural products have successfully commercialized bio-products such as recombinant crops and remain as market leaders. The food majors have also succeeded in high tech. For example, Ajinomoto has assimilated biotechnology for renovation of production processes and development of new products. Ajinomoto crushed competition of Ajinomoto from Chinese firms. In contrast, the pharmaceutical and chemical majors were unsuccessful in antibody formulations and other bio-drugs, except for products earlier developed such as insulin or growth hormones, although they established new laboratories and dedicated to bioscience. Chemical companies have also lost the potential market of nanotech products even after the winners appeared from other fields. Situations were similar in a related area: leading manufacturers of injectable syringes did not develop needle-free syringes regardless painless and bloodless advantages.

	Majors' result
Agriculture	Win
Food	Win
Bio-pharmaceuticals	Loss
Antibody pharmaceuticals	Loss
Nanotech materials	Loss
Needle-free injectable syringes	Loss

Table 5. Win or loss of major businesses in new markets by high tech products

Win in biotech products development seems to depend on several factors. Table 6 sets win case to loss case for clarifying market position of majors to high tech products. Situations of agricultural products and biopharmaceuticals described earlier may be analyzed in terms of a few aspects.

	Agricultural majors	Pharmaceuticals majors
Business result	Win	Loss
Competition	Direct	Indirect/neutral
New products	Replace existing products	Create new markets
New product development	Promoted	Neglected

Table 6. Position of majors to high tech upcoming products

New agricultural products, such as recombinant crops, are in direct competition with existing products and will replace them as far as the advantage of the new products are maintained. This prompts the market leaders to keep their position by developing new products instead of insisting on their existing products. They can exploit wealth of relevant information for their competitive advantage, leaving little hope of market entry for potential newcomers. In fact, examples of successful entry by newcomers are limited to those in niche markets neglected by the majors. Representative success example is recombinant blue rose by Suntory, which could not create by traditional cross breeding. Since blue rose is not so huge market as crops, majors did not give heavy weight. Recently, vaccine business landed in the similar results. Vaccine prevents the death of infant or elderly with pneumonia infection. It is recommended for elderly over the age of 50 to receive the vaccine.

Reverse is the case for bio-pharmaceuticals and antibody pharmaceuticals. Leading manufacturers of first-generation of bio-products such as insulin and growth hormones initiated the development and launch in the market once the technology has been confirmed. As the facts described, they have immediately followed the emerging high tech itself and furthermore master the production and marketing of the bio-pharmaceuticals. In spite of core capabilities, all of majors failed in development of granulocytic proliferation factor (G-CSF), the multibillion-dollar erythropoietin (EPO), or antibody pharmaceuticals such as antibody against TNF for radical treatment of rheumatoid arthritis or antibody against EGF for radical treatment of cancer, which compete only indirectly with existing products or are neutral to competition, and create their own new markets. As shown in Table 7, majors neglected product Development, because they could not only recognize but also deny the potentially huge market for those products. What they predicted, instead, was extremely small niche market. In other words, majors were not willing to be competitors in the new field, thus allowing newcomers to dominate the market easily.

	First-generation bio-pharmaceuticals	New born bio-pharmaceuticals
Business result	Win	Loss
Competition	Direct	Indirect/neutral
New products	Replace existing products	Create new markets
New product development	Promoted	Neglected

Table 7. Position of existing majors to first-generation bio-pharmaceuticals and new born bio-pharmaceuticals

This miscalculation was also responsible for their failure to respond to the need for marketing partners of the newcomers without established sales network, which would have meant an opportunity to seize on the new market without compromising the existing products. This is a typical case of the "revenge of success" (Takayama, 2002, 2005, 2010; Takayama & Watanabe 2002). Amgen, a pioneer of bio-pharmaceuticals, benefited from these circumstances so much so that CEO of Amgen were assigned as President of Pharmaceutical Research and Manufacturers of America.

5.2 Win or loss in the new born market

Following the afore-mentioned discussion, Table 8 summarizes mode of competition in some win cases of existing majors in the new born markets that happened on the occasion of high tech innovation.

	Existing majors	Mode of competition
Cassette tape recorder	Record player	Direct
CD player	Cassette tape recorder	Direct
Digital camera	Camera film	Direct
DVD	VHS manufacturers	Direct

Table 8. Win cases of existing majors in the new born markets

Table 9 summarize mode of competition in some loss cases of existing majors in the new born markets created by high tech innovation.

	Existing majors	Mode of competition
Electrics	Lamp, Mill	Indirect or neutral
Automobile	Carriage	Indirect or neutral
Cassette tape	Vinyl record	Indirect or neutral
PC	Computer	Indirect or neutral
Amazon	Book store	Indirect or neutral
Net securities	Securities	Indirect or neutral
Net retailing	Department store	Indirect or neutral
Net news	Newspaper, TV	Indirect or neutral

Table 9. Loss cases of existing majors in the new born markets

In summary, win cases of existing major in the new born markets are explained by direct competition in the new born market. On the contrary, loss cases of existing majors in the new born markets are characterized by indirect or neutral competition of new product to the existing product.

5.3 Win/loss matrix and replacement of the majors

The practically deterministic situation may be summarized in the win/loss matrix shown in Table 10. Before establishing the market, the degree of the commitment was different n accordance with the position of the existing product to newly-emerging product.

An enterprise (major or otherwise) will make serious efforts in developing a new product that may compromise existing core products. In this case, leading companies with a wealth of experience and information associated with those core products are in a highly advantageous position, so that chances for inexperienced newcomers are scarce.

	Direct competition	Indirect competition
Majors	Win	Loss
Newcomers	Loss	Win

Table 10. Win/loss matrix

In contrast, the majors will do nothing if the new product does not compete with their existing products: they lose the opportunity because they are unaware of the market potential of new product. This mechanism will lead to replacement of the majors if the new product creates its own new market, because it is dominated by newcomers and the majors who would be most familiar with the market are excluded.

5.4 Win/loss in modular, platform, new media and tablet PC

Industrial technological trajectories did not move through the same route as corporate technology traditions. Focused on the technology trajectories to tablet PC are; module, platform, new media and then tablet PC as indicated in Table 11. Tablet PC is made from modules. Modules are developed by electrics majors or EMS majors, since their core competence was key device and/or key part for the final product. On the contrary, platform was not so easily built by electrics major or module majors. The reason is why module major could not become platform major. If they become platform major like Apple, they could not sell module to other modular majors since modular majors sell the finished goods by exchanging modules without infringing competitors’ patent right. The reason of Apple’s win as a platform leader was Apple did not supply modules. By the same reason, Intel could become platform leader since Intel only sell parts. By the same reason, Apple could develop tablet PC as a platform of new media since it dose not have inside or outside of obstacles.

	Win	Loss
Modular	Electrics, EMS	Newcomer
Platform	Intel, Newcomer, Amazon	Electrics
New media	Electrics	Venture
Tablet PC	Apple	Electrics

Table 11. Win or loss of the majors at each step on the route from module to tablet PC.

Tablet PC is a device for new media. Electrics majors focused on new media and have developed a variety of prototype. They have only kept watching the timing of launch; they could not know the marketability of tablet PC due to new market. Once tablet PC is launched, advanced media have become available and easily handled on tablet PC.

6. Tablet PC as industrial cradle for innovation

Tablet PC is opening the barrier between human and advanced media. Typically in the healthcare industry, media plays a decisive role for diagnosis and treatment. Tablet PC is used to check the possibility of the utility of new technology. From this aspect, tablet PC became a very significant tool for innovation as described in section 2.3. On tablet PC, experiment and use co-existed and monitored by all attendees in concern. This means the new era for innovation has come to our hands in everyday life. Tablet PC has changed innovation model from time-wasting to instant innovation. Like this, innovation model has been changed on tablet PC.

New trend of the innovators’ power shifts are provided by new scheme of innovation process model such as open-integral innovation by modularization power of each function

through advanced media. Penetration of tablet PC is opening the close conservative system even in the medical industry as the most typical area by the following steps:

1. Open modularization of each function by dividing specialized function
2. Use of information for explanation and communication among specialists
3. Integral use of information for users
4. Open but integral use of information not only for users but also for ordinary life assistance

In conclusion, the industrial structure is converted to open-integral through open-modularization power of the advanced media, on the basis of user-push instant innovation. Especially in case of medical industry, it comes to have a crucial function as industrial cradle because of arising of next generation's industry though the medical business becomes a platform where the related industry is strongly drawn.

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The book "New Technologies - Trends, Innovations and Research" presents contributions made by researchers from the entire world and from some modern fields of technology, serving as a valuable tool for scientists, researchers, graduate students and professionals. Some practical applications in particular areas are presented, offering the capability to solve problems resulted from economic needs and to perform specific functions. The book will make possible for scientists and engineers to get familiar with the ideas from researchers from some modern fields of activity. It will provide interesting examples of practical applications of knowledge, assist in the designing process, as well as bring changes to their research areas. A collection of techniques, that combine scientific resources, is provided to make necessary products with the desired quality criteria. Strong mathematical and scientific concepts were used in the applications. They meet the requirements of utility, usability and safety. Technological applications presented in the book have appropriate functions and they may be exploited with competitive advantages. The book has 17 chapters, covering the following subjects: manufacturing technologies, nanotechnologies, robotics, telecommunications, physics, dental medical technologies, smart homes, speech technologies, agriculture technologies and management.

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