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1. Introduction

We generally acknowledge that the necessity of product innovation could be realized under the matured stage of both market needs and technology seeds. In case of the product change, it is well known that incremental product innovation is excellently managed by the cooperation between marketing knowledge and technology knowledge. If the acquisition of marketing needs and technology seeds are enough to introduce the necessary product change, market leader with research capability can continuously be a successor in the field. The reality is different from this assumption. The successor is very often changed by another market player.

Apart from this discussion, there is a lot of discussion on the successful factor of the product innovation. What is the determinant for the successful product innovation, technology-driven or market-pull? According to Dosi, product innovation is driven by technological innovation. On the contrary, market-driven product innovation is well known. These discussions have not lead any sufficient conclusion. With respect to new product development (NPD), the above-mentioned two opposite theories have competed each other. Although the applicability of the theory depends on respective product, it is absolutely obvious that product is an embodiment of technology and market knowledge.

In case that the novel technology emerged, technology seemed to serve as a major driving factor to introduce the relevant product into a market. It is also well recognized that marketing knowledge can stimulate successful NPD. It seems to be obvious that marketing knowledge assist the accumulation of technology knowledge. Apparently, both technology knowledge and marketing knowledge are able to serve as the enhancing factor for successful NPD. If so, market leader can keep its leading position to market the next generation of new product and hence market leader cannot be easily taken over by the new comer even if the existing product is replaced by the next product.

Opposite to this common recognition, reality is different. There are a lot of example that major players have lost the strong position in the market when the new product emerged in the market. Why leading companies cannot maintain the best position in the market? It seemed to be related to the characteristics of the product. This problem has not yet been solved by the current discussions on NPD.

For demonstrating the existence of the inhibitory factor for product innovation, a recently emerging product change in a pharmaceutical market is analyzed. To focus the matured stage of market needs and technology seeds for the product innovation, anti-hypertensive market is selected since its market is almost matured and its final products have just launched. In this stage, technology seeds and market needs are commonly shared among almost firms. By the survey on the behavior of

the market winner and the next comer, it is demonstrated that the strong product inhibits the product development of newly emerging product that will replace the existing product.

2. Characteristics of pharmaceutical product change

Although pharmaceutical product is usually classified into a kind of material, due to the significant influence to the human health, any product innovation is not immediately embodied into the product. The average development cost is 50 million dollars for one product and recently increasing rapidly. This means that sufficient discussion is required to complete NPD from both stand points of technology and marketing before initiating the development. This feature of pharmaceutical industry characterizes the process of NPD. The market leader could keep the strong position according to the following reasons:

1) Selection by marketing knowledge

Before initiating the clinical development, clinical candidate should be selected by marketing function. If the sales estimation is enough to recover the huge investment, clinical candidate enters into the development stage from the research phase. From these reason, all clinical candidates are filtered and selected by market knowledge of each company. Market leader is at the best position to access the market needs.

2) Necessity of the superior or differentiated points for NPD

We would like to propose that there are two types of product innovation. As summarized in Table 1, one is a new product with a superior point and another is a new product with a differentiated point.

Table 1: Two types of product innovation

Type of Product	Superior Point	Differentiated Point
Relation with Existing Product	Direct competing	Indirect competition or neutral
Style of Market Penetration	Replace	Produce new market
Influence to Product Innovation	Enhancing	Inhibitory

Once new product with superior point is on the marketed, the existing product will lose the market share because of the direct competition against an existing product. New product with superior point replaces the existing product in the market segment. In case that new product with differentiated points is on the market, new market will be established. New product with differentiated point produces additional market in the existing market segment because this product dose not directly threaten the existing product.

Although from this argument, product innovation is considered to occur preferentially for creating

a new product with differentiated point, our finding is opposite. Although product innovation to replace the existing product is easily recognized for many companies to pursue, product innovation to create the new market is inhibited by the existing product.

In both cases, the market size of a new product is easily estimated from the market size of the existing market if the positioning of new product in the market is appropriately understood.

Due to the rapid replacement of the existing product by the superior product, the characteristics of pharmaceutical market is completely different from the ordinary commodity. This characteristics owes to the nature of pharmaceutical product. Although pharmaceutical product change is caused by the innovative product, both technology contribution and market knowledge are necessary.

3) Professional as a sales target

Since pharmaceutical product is required to select the best one for the end-user, professional knowledge is requested. Due to the professional characteristics of the product, marketing target is not end-user but professional. Pharmaceuticals are selected and prescribed by professional such as physicians and hence marketing target of the pharmaceutical product is not the end-user but the physician. Professionals have kept the position to get the information on technology trend and market needs due to their expertise.

Marketing representatives have kept the frequent contact to the physicians through the distribution. Patients who need medication visit professionals to consult the disease and the disease treatment. Market leader has a strong contact to the market through the professional and can keep the strong position to collect the market needs.

4) Strong position of market leader

Market leader has the best position to collect the technology seeds and market needs through the network of the professionals who are the window persons to the end-user of pharmaceuticals and technology seeds.

For the market leader, its major strategy is to maintain the strong contact to the professionals to keep its market position. Owing to the strong contact to the professional, market leaders can often utilize their superior position to collect the market and technological information. This kind of strong relation with professionals contributes to keep the position to incorporate the market needs and technology seeds into their market knowledge and technology knowledge. To identify the next product, market leader is believed to have the best position to collect the sufficient information on the next product. Opposite to this assumption, market leaders often lose the opportunity to develop the next product to get the future market.

3. Case study of product change in pharmaceutical market

1) Stage of anti-hypertensive market

Cardiovascular market is the largest in the world. In cardiovascular market, hypertensive is the largest both in the leading countries and in the world as well.

Anti-hypertensive market has been almost matured, because almost 90% of patient is treated by the existing products. The last new product innovation is emerging very recently and all the companies are closing the research activity in this research area. In this sense, anti-hypertensive market is at the maturation stage and the final products derived from a new technology have launched very recently.

2) Major products in anti-hypertensive market

In hypertensive market, there are two major products, Ca and ACE. Fig 1 illustrates the market shares of major product segments in the American and European anti-hypertensive market in 1998. As seen in Fig. 1, major products in USA and Europe are ACE (Angiotensine Converting Enzyme Inhibitor) inhibitors (ACE) and Ca blockers (Ca).

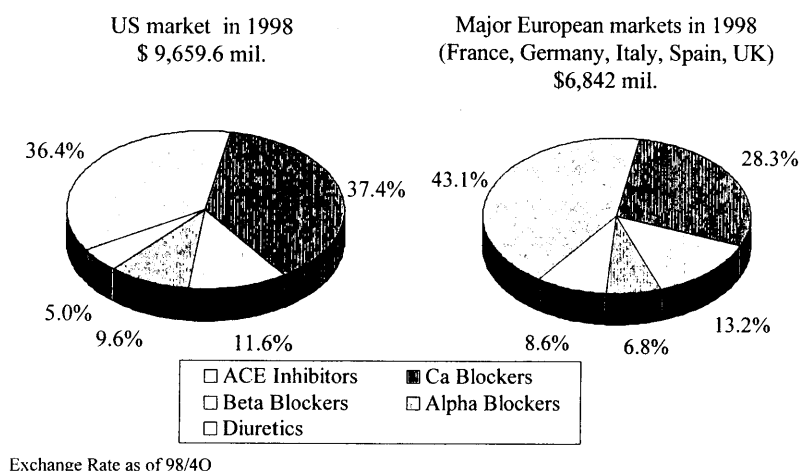
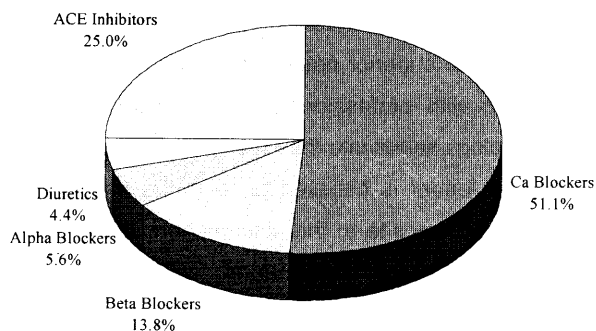


Figure 1. Anti-Hypertensive Markets in US and Europe Total market: ¥ 551.59 bil.

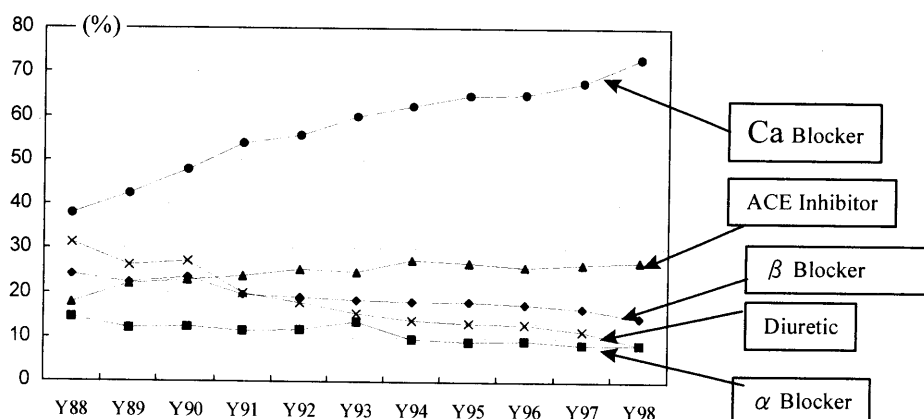
Compared to this figure, Japanese market is different from USA and Europe as shown in Fig.2. Ca has the biggest share in the Japan in 1998. The trend of the market is shown in Fig.3. Market share of Ca is still increasing in Japan, although only one product, once a daily tablet of Pfizer Co., is increasing the sales amount and the others are losing the market shares.



Source: Author's estimates based on data base from IMS, July, 1999

Figure 2. Japanese Hypertensive Market in 1998

Figure 3 . Transition in the Prescription of Anti-hypertensives in Japan



3) Strongest product in Japanese anti-hypertensive market

Although there are two major categorized products (Ca and ACE) in the existing market, Ca has been the current market leader in Japan since its efficacy is the strongest in this therapeutic area. According to the interview to major top 10 Japanese pharmaceutical companies, all companies without exception have believed myth of Ca that Ca will keep the largest share for the future.

4) Final product in anti-hypertensive market

With respect to the product profile, Ca has rapid onset of the effect to reduce the blood pressure but inhibited to treat the kidney malfunction patients such as diabetes patients, that are big market target. ACE has no warning for the diabetes patients due to the mild efficacy but side effect such as cough.

Recently, another category of anti-hypertensive product, ATII inhibitor (ATII) is being marketed. ATII is technologically discovered by a finding of the involvement of an enzyme (ATII) to elevate blood pressure. ATII has both differentiated point and superior point to existing two major products, ACE and Ca. ATII has no side effect such as cough that is frequent side effect of ACE and organ protection effect that overcomes Ca. Owing to the organ protection function, ATII can treat the diabetes patients and heart disease patients but the efficacy is between ACE and Ca. Owing to the differentiated and superior feature of newly emerging product, it is commonly known that ATII will expand the anti-hypertensive market and will replace some old products at the moment.

Since Ca antagonist has been the strongest efficacy in anti-hypertensives, Japanese companies had believed a kind of myth that Ca antagonist can cure the almost patient and hence it is used as a first choice drug as mentioned before. They have denied the chance to develop ATII as a first runner in the world. A Japanese largest company (Takeda) made the first ATII product in the world but discontinued the development due to the evaluation result of the marketing estimation.

5) The reason of the failure of NPD of ATII

Although Japanese companies failed to develop ATII, ATII was found first in the world by a

Japanese company. Its company (Takeda) discontinued once and restart the clinical development. When the other Japanese companies tried to catch up the next ATII, the stage is already behind. That owes to the strong existing product (Ca) in Japanese market. As a result of the failure of NPD of ATII, foreign companies could succeed NPD of ATII in Japanese market, as summarized in Table 2.

These finding clearly demonstrates that strong existing product inhibits the next product development. Strong product inhibits the product innovation even if new product is recognized to replace the existing strong product. As shown by the analysis of the behavior of pharmaceutical companies, although new product development could be made by the technology-push manner, product is not successful developed if market knowledge denied. As a result of this analysis, it is demonstrated that new product development is extremely influenced by market knowledge and in this case marketing knowledge is a failure factor for new product development.

Table 2. Stage of Angiotensin-II Competition in Japan

Compound	Company	Stage (a)	Expected Yr. of Launch
Losartan	MSD	Approved	1998
Candesartan	Takeda	NDA	1999
Valsartan	Novartis	NDA	2000
Irbesartan	BMS	P-III	2001
Telmisartan	BI	P-III	2002
CS-866	Sankyo	P-II	2004
Tasosartan	Wyeth	P-II	2004
KRH-594	Kissei/Wakunaga	P-II	2004
KD-3-671	Kotobuki/Daiichi	P-II	2004
YM-358	Yamanouchi	P-II	2005
GA-0113	Yoshitomi/Asahi Glass	P-I	2005
TA-606	Tanabe	P-I	2005

Source: Asu-no Shin-yaku, Aug '99

4. Concluding remarks and implications

Our question was why the strong market player cannot keep the strong position In the market in case of product change in spite that the strong market player has the strongest expertise to collect the market information. In order to address this question, we have survey the behavior the pharmaceutical companies in the current anti-hypertensive market. Anti-hypertensive market is recognized as almost at the maturation stage and ATII is recognized as the final product.

Many authors emphasizes the necessity of the technology knowledge and market knowledge and furthermore both knowledge are critically important to make new product development successful. Surprisingly, our conclusion is negative to these common recognition. We have demonstrated that market knowledge serves as a failure factor.

With respect to technology knowledge, we have demonstrated that technology can contribute to new product development even if the new product compete with in-house existing product.

There are dispute for the product innovation between technology-push theory and market-pull theory. Our finding supports market could work as an inhibitory factor for new product development. Considering those finding, technology knowledge is neutral for new product development.

From the marketing point of view, new product development is categorized in "market substitution type" and "market change type". In the latter case, successful NPD is not derived from market knowledge creation but initiated by technology knowledge if the market knowledge is frozen.