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Special Essay:

Have Japanese Companies Lost Sight of the Paradigm Shift in Competitive Advantage?

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My essay that follows reflects my own research development style that has served me in the last 30 years. First, I always ask a layman's question of a big kind and speculate loudly about what could be happening before seeking to develop either a new theory or use existing theories to explain my own layman's question. I write this essay in the hope that I can encourage Japanese IB researchers to tackle this big question with various issues I have observed of late. The big question is about what appears to be a negative, rather than positive, link between investment in technology and market performance.

Apple is known for its technological capabilities. Since the dawn of the 21st century, why has Apple, a U.S. company, been able to introduce more innovative products one after another to the world and so profitable than has Sony, a Japanese company? Apple developed various groundbreaking products such as iPod (2001), iPhone (2007), and iPad (2010). However, it is still fresh in our memory that in the last quarter of the 20th century, it was Sony that had been instrumental in introducing many innovative products globally, including cassette players, Walkman, CD players, DVD players, Blu-ray discs, and PlayStation. Just like Apple today, Sony used to be known for its technological capabilities.

Currently, however, Apple generally appears to have much higher technological capabilities than Sony. Since the U.S. market is the largest single market in the world, companies from around the world apply for patents for their technologies under the U.S. patent system. While I am aware of my broad-brush argument, let me play devil's advocate by using U.S. patent ownership as an indicator of a firm's technology stock (with an intention of encouraging future research on various implications coming out of my argument). Let's take a look at the top 20 U.S. patent holders in the year 2010 when Apple introduced the iPad to the world (see Table 1).

"Japanese technology stock is extremely high, and even potentially ranks No. 1 in the world. However, the market performance of many of those Japanese companies has been far from being commensurate with their enormous technology stock"

The first thing you notice from the table is that Japan boasted the largest number of top 20 U.S. patent holders with nine companies, followed by eight from the United States, two from South Korea, and one from Germany in 2010. Although not shown in this table, once you look at the past U.S. patent data, six to nine Japanese companies have always been listed on the top 20 U.S. patent holders list since 1990. Clearly, you can recognize that Japanese technology stock is extremely high, and even potentially ranks No. 1 in the world. However, the market performance of many of those Japanese companies has been far from being commensurate with their enormous technology stock. This point will be discussed later.

Table 1: Top 20 U.S. Patent Holders (2010)

Rank	**Company**	**Nationality**
1	IBM	United States
2	Samsung Electronics	S. Korea
3	Microsoft	United States
4	Hitachi	Japan
5	Canon	Japan
6	Panasonic	Japan
7	Toshiba	Japan
8	**Sony**	**Japan**
9	Siemens	Germany
10	Intel	United States
11	Fujitsu	Japan
12	Hewlett-Packard	United States
13	General Electric	United States
14	LG Electronics	S. Korea
15	Seiko Epson	Japan
16	NEC	Japan
17	Oracle	United States
18	Ricoh	Japan
19	Cisco Technology	United States
20	Honeywell International	United States
*	*	*
55	**Apple**	**United States**

Source: Intellectual Property Owners Association, www.ipo.org, 2011.

Next, let's compare Sony and Apple. In 2010 when iPad was introduced to the world, Sony was ranked 8th in U.S. patent ownership, and Apple, not even ranked in the top 20, placed 55th. Although the patent ownership ranking is based strictly on the number of U.S. patents and could not say anything about patent quality or significance, Apple did not appear to own as much technology stock as Sony. The changes in Sony and Apple's R&D spending and ranking in U.S. patent ownership between 2000 and 2015 are presented in Table 2.

Table 2: R&D Spending and U.S. Patent Ownership Ranking for Sony and Apple (2000 - 2015)

		2000	2003	2005	2008	2010	2013	2015
Sony	**R&D spending (in US$billion)**	$4.0	$4.1	$4.0	$5.7	$4.7	$4.7	$3.8
	U.S. Patent Ranking	6th	11th	11th	10th	8th	4th	10th
Apple	**R&D spending (in US$billion)**	$0.4	$0.5	$0.6	$1.2	$1.8	$4.5	$8.1
	U.S. Patent Ranking	187th	218th	184th	106th	55th	15th	12th

Sources: Intellectual Property Owners Association, www.ipo.org, various years for patent ranking; various sources for R&D spending.

Let's compare Apple's and Sony's technology stocks in terms of the number of U.S. patents owned by each company. During the first decade of the 21st century when Apple had released some of the most innovative products in the world, including iPod (2001), iPhone (2007), and iPad (2010), the company's U.S. patent ownership ranked from 218th in 2003 to 55th in 2010. Compared to Sony's technology stock represented by its U.S. patent ownership that kept its ranking between 6th and 11th during the same period, Apple's technology stock even appeared to have been much lower. On the other hand, we could safely say that Sony has maintained its technology stock at a high level over the years. Although we can list PlayStation and Cyber-shot digital cameras as its globally successful products during the same period, Sony simply has not measured up to Apple in terms of their innovations, global sales and profitability.

"Sony has maintained its technology stock at a high level over the years… (but) Sony simply has not measured up to Apple in terms of their innovations, global sales and profitability"

Now I would like to compare the number of U.S. patents held by Sony and Apple since 2010. Compared to Sony, Apple significantly increased investment in R&D from a meager $0.4 billion in 2010 to a whopping $8.1 billion in 2015, and accumulated its own technology stock at an astonishing speed. In 2015, while Sony just about maintained its status quo in both R&D spending (although it fluctuated somewhat due to changes in exchange rates) and U.S. patent ownership in the 10th place, Apple's patent ownership ranking moved up significantly to the "even if companies invested heavily in R&D and built their own technology stock, such corporate efforts would not necessarily result in high market performance"

12th place. However, Apple's new product development results have not been as rosy since 2010 as its R&D spending increase would have suggested. Although iWatch was introduced in 2015, it has not been nearly as successful and epoch-making as iPod, iPhone, and iPad. It is indeed more like a failed product. Since Apple started its R&D spending spree in earnest in 2010, however, it even appears to have started experiencing a technological paralysis of the kind that has been plaguing Sony in the last twenty years.

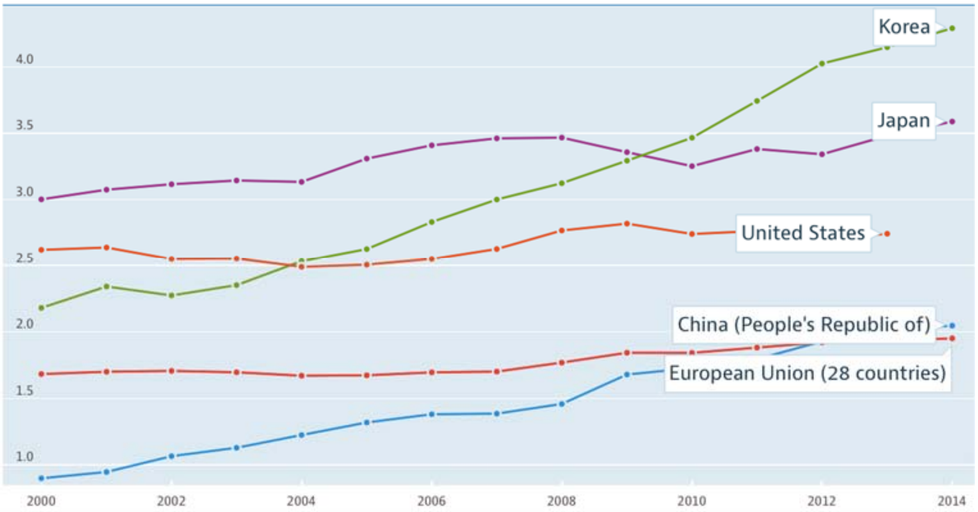
What can we see from the stories of Sony and Apple? Of course, although it is not a result of a rigorous academic investigation, a casual observation would lead us to speculate that even if companies invested heavily in R&D and built their own technology stock, such corporate efforts would not necessarily result in high market performance. Or more bluntly stated, it even appears that the less R&D efforts would result in more new and innovative products and hence better market performance. Alas, this speculation would amount to an antithesis to the conventional wisdom.

Competitive Advantage: The Past and the Present

The word "competitive advantage" has been used in the business field to describe a situation that economists would call a "monopoly power" (i.e., a unique status in the minds of customers) that a company seeks vis-à-vis competitors so that it can enjoy a higher than normal profit. As soon as its competitors have imitated and/or improved on the unique status enjoyed by the innovator company, the innovator company loses its competitive advantage. In other words, the more difficult it is for competitors to imitate or outmaneuver the innovator company's competitive advantage, the more valuable it will be to the innovator company. In most IB research, such advantage is considered to come from R&D efforts. This R&D-driven competitive advantage argument could explain U.S. companies' technology-driven market dominance in the 1960s-80s. It also explains Japanese corporate juggernaut, including Sony's, driven by heavy R&D investment that was once considered almost invincible in the 1980s-90s.

However, a persistent structural recession caused by the burst of the "bubble" economy in Japan in mid-1990s has since caused the Japanese economy to stay economically stagnant and deflationary. Even in such a recessionary environment, Japanese companies have continued to emphasize R&D investment, and as a result, they have continued to accumulate and maintain world-class technology stock. The same can be said at the national level. Looking at the ratio of R&D investment to GDP (see Figure 1), Japan has invested about 3.4% of GDP in R&D since 2000, which was the highest in the world until South Korea surpassed Japan in 2010 (which is often referred to as the Samsung effect). In the United States, the ratio has been about 2.6%, and it seems to have even begun to fall. Although I will not discuss the Samsung effect in South Korea here, the increase in Korea's R&D expenditure relative to its GDP is remarkable, nevertheless.

Figure 1: R&D Spending Relative to GDP by Country (2000-2014)



Source: OECD, https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm, 2016.

"the conventional wisdom that investment in R&D should lead to competitive advantage in the market no longer appears to be true"

At the national level, Japanese companies appear to have been putting consistent emphasis on R&D investment as a primary source of their competitive advantage. However, looking at the data in the United States, you can observe that U.S. companies do not appear to have been as much intent on R&D investment as have Japanese companies and indeed even appear to have begun to reduce R&D investment relative to the size of the U.S. economy in recent years. Nevertheless, over the past 15 years, the U.S. economy has experienced a higher GDP growth rate than the Japanese economy both at a macro level and on a per-capita basis. It is a testament that the U.S. economy has been more competitive than the Japanese economy. My speculation leads me to think that the change in competitive advantage "story" about Sony and Apple has been happening even at the national level. In other words, the conventional wisdom that investment in R&D should lead to competitive advantage in the market no longer appears to be true.

Changes in the Technological Environment

In the past, when a company developed innovative products, it enjoyed a monopolistic profit at least for a few years until its competitors successfully imitated or surpassed the performance of the original innovator's products on the market. However, in recent years, competing products get introduced to the market so quickly either by competitors that have instantly imitated the original innovative products or by companies that have been working essentially on the same products at the same time as the original innovator.

For example, in 1999, NTT DoCoMo of Japan announced the world's first internet phone, i-Mode, using its own proprietary mobile internet in the Japanese market. i-Mode instantly became the dominant internet phone in Japan, which indeed heralded the dawn of the smartphones around the world. In the U.S. market, Research in Motion from Canada introduced a BlackBerry line of smartphones almost at the same time in the same year. Similarly, as soon as Apple introduced its own iPhone under its iOS operating system on the market in 2007, Google introduced its own smartphones under Android operating system (which is partially open standard) called T-Mobile G1. In the same year, Samsung Electronics began emphasizing smartphone development in earnest, and in a matter of 1-2 years by 2009, the Korean company had grown to become the dominant player in the global smartphone market with the Galaxy brand with Android specification. Understandably, NTT DoCoMo that was busy developing the Japanese market had little or no time to launch its smartphones with its own i-Mode specification in the large U.S. market.

While there are many reasons for today's rapid technological development, let me highlight two major ones. First, technology-based competition has become extremely intense in the last 20 years, compared to the previous era. Today, whether companies are from developed or from developing countries, many of them are all engaged in similar technological development as well as sharing technologies with much technological knowledge in common. As technology-based competition has intensified, the life cycle of technological innovation has become so short that innovating companies have little or no time to enjoy any measurable monopoly period to gain profits by using their technology as their predecessors used to in the 1960s and 1970s. Second, although it is not widely known, the current intellectual protection laws around the world are actually designed to encourage dissemination of knowledge (say, through learning from others, or more bluntly stated, through imitation). These two reasons are clearly inter-related. In the next section, let me elaborate on the second reason.

"Today, whether companies are from developed or from developing countries, many of them are all engaged in similar technological development as well as sharing technologies with much technological knowledge in common"

Limits to the Intellectual Property Protection Laws

Let's talk about patent laws around the world, and their less well-known implications here. Depending on the country and the type of technology, the patent generally gives the developer and owner of the technology a legal monopoly status for 15 years to 21 years. As explained earlier, if a company owns a technology that generates huge profits, competitors will always try to imitate it or outsmart it. The competitive advantage, or monopoly power, enjoyed by the innovator company does not last long because of this competitive reaction. Therefore, the most important thing for the innovator company to do is to lengthen its competitive advantage by offering products that are difficult for competitors to imitate and that customers continue to appreciate. In a way, the concept of "inimitability" in resource-based view becomes important.

A patent legalizes the inimitability of technological knowledge for 15-21 years. Two patent systems exist in the world: "First-to-Invent" and "First-to-File".[1] The United States is the only country in the world whose patent system is based on the "First-to-Invent" principle, and the rest of the world, including Japan, is based on the "First-to-File" principle. Briefly speaking, the U.S. "First-to-Invent" principle is based on the logic that the person (or company) who developed the technology first is the real owner of the patent. Although it seems obvious, it has profound implications. Suppose that someone else already got a patent on a technology in the United States. Under the U.S. "First-to-Invent" principle, if you could later prove that you had indeed developed it first, you could successfully challenge the current patent holder for patent infringement in a damage lawsuit for a huge sum of compensation and have the patent reverted to you. In other words, a legal concept, "prior use," or the fact that you invented it first becomes vitally important as a means of protection against imitation. However, under the "First-to-File" principle in all countries other than the United States, you must apply for a patent for protection against imitation. Of course, if you did not apply for a patent, you would never receive a patent, thus no protection against imitation. As a result, under the "First-to-File" patent system, patent applications become more important than patent grants for intellectual property protection.

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Although these two principles are not widely known to begin with, there is another fundamental difference between the two systems. Under the U.S. "First-to-Invent" system, there is a non-disclosure principle (Secrecy Requirement) when applying for a patent in the United States. The patent application will stay sealed and will never be made available to the public. Without having a possibility of being imitated, the patent-pending technology remains secret. However, under the world-wide "First-to-File" principle, the patent application will be "laid open" (i.e. published and released) and made available to the public within 15 to 18 months of application, depending on a country. It usually takes several years for a patent applicant to receive a patent. In the past, if you were to keep tabs on your competitors' technological development, you would have to physically register yourself at your local patent office and page through their published patent applications. Knowledge on your competitors could be acquired, but it was a time-consuming (and probably expensive) endeavor. Now thanks to the development of the

[1] For example, Masaaki Kotabe and Kristiian Helsen (2017), *Global Marketing Management, 7th ed.*, Hoboken, NJ: Wiley, Chapter 5.

"What I would like to stress here is that applying for a patent is now a sure way to get your patent-pending knowledge disseminated (i.e., learned and imitated) rather quickly, whether you like it or not, and wherever you are located"

internet, you can simply sign up on to a local patent office's website, browse and even download the pdf files of various patent applications filed by your competitors that have not yet obtained a patent, and then "learn" from them, whether intentionally or accidentally. Since most U.S. companies also have to apply for patents in various countries around the world in which to do business (to say the least, within the North American Free Trade Area, which is treated as domestic market, i.e., Canada and Mexico), their patent applications that are kept secret in the United States will be subject to the world's "First-to-File" system in which their patent applications will get "laid open" in less than a year and a half after application. What I would like to stress here is that applying for a patent is now a sure way to get your patent-pending knowledge disseminated (i.e., learned and imitated) rather quickly, whether you like it or not, and wherever you are located.

In fact, the Obama administration switched the U.S. patent system in principle to the world's "first-to-file" system as of March 18, 2013. Although its actual adoption may take some time, the United States has officially joined the system of patent protection used by the rest of the world. In other words, we now live in the world where patent applications will be officially published in the public domain within less than a year and a half of application. In other words, any company can fairly easily acquire competitors' technological knowledge. Consequently, lawsuits for patent infringement may occur frequently, but it is to be reminded that such lawsuits and countersuits occur both ways, as amply illustrated by the recent Apple-Samsung lawsuits / countersuits against each other over some smartphone-related technologies. In many cases, however, both parties usually decide not to sue each other as such lawsuits are not only expensive but also counter-productive as they detract from product development activities. Just learning, either intentional or accidental, from published patent applications continues unabated and unchallenged. Under the "First-to-File" system, the patent that was originally designed to give legal monopoly on technology has just about lost its effect today.

In such a world, how could companies obtain and maintain competitive advantage? The answer seems to be lurking in the fact that relative to the size of their respective economy, U.S. (and European) companies as well as companies of emerging economies like China are not investing as heavily in R&D as Japanese companies.

Speculation on A New Competitive Advantage Paradigm

Over the past 30 or more years, Japanese companies have continued to believe that technological strengths will lead to competitive advantage (monopoly power), and have continued to accumulate technology stock by investing heavily in R&D activities. This Japanese business model has been patterned after the old U.S.

business model that had allowed U.S. companies to achieve remarkable market success based on technological superiority in the post-WWII era. As indicated earlier, this business model had worked fine during the period when technological change had been relatively slow. However, in recent years when technology changes extremely fast, companies that do not have an organizational structure that allows them to utilize their own technologies immediately would end up seeing their technologies becoming obsolete or imitated (intentionally or unintentionally) by their competitors. In other words, self-developed technologies, if left unused, would become a useless possession. In my mind, Japanese companies, including Sony, NEC, Fujitsu, and Ricoh, that have continued to invest heavily in R&D in developing new technologies and be recognized as some of the most patent-holding companies in the United States, are experiencing this problem. It seems to be heralding the end of the conventional competitive advantage paradigm based on in-house technology development.

"It seems to be heralding the end of the conventional competitive advantage paradigm based on in-house technology development"

Although I do not speculate whether U.S. and other companies have anticipated this transition, Fortune 500 industrial companies, while still investing at a reduced rate in R&D on their own, seem to have adopted a new business model of acquiring new technologies through licensing, acquisitions of high-tech startups, and "learning" from other companies' patent applications published in the public domain, among others. You can observe this trend if you look at the U.S. R&D investment relative to the country's GDP in Figure 1. Of course, companies from emerging economies such as China have been using this new model of technological acquisitions from the beginning.[2]

Let's go back to Apple's technological strategy discussed earlier. As you can see from the ranking of U.S. patent ownership, Apple did not use to invest heavily in self-technology development but instead relied heavily on state-of-the art technologies owned by others through licensing and acquisition of high-tech startups. And, of course, Apple has been good at "learning" from other companies' published patent applications on a global basis. According to some pundits, a majority of Apple's iPhone technologies came from many large and small Japanese companies with various special technological applications. However, as shown in Table 2, Apple has recently started to increase its R&D investment significantly, resulting in the U.S. patent ranking rising rapidly to the 12th place in 2015 and almost equal to Sony's 10th place. Given its lackluster technological and market performance in the past 5-6 years, I can even speculate that just like Sony, Apple may have invested too much in self-

[2] Kotabe, Masaaki and Tanvi Kothari (2016), "Emerging Market Multinational Companies' Evolutionary Paths to Building a Competitive Advantage from Emerging Markets to Developed Countries," *Journal of World Business*, 51 (September), 729-743.

technology development and lost its ability to use its in-house technologies fast enough on its own.

If my speculation is correct, wouldn't it be possible to imagine a new competitive advantage paradigm? In other words, rather than trying to build competitive advantage by investing in heavy R&D, it might be more important for companies to build a corporate structure that can allow them to use new technologies fast, regardless of their own or someone else's. This line of argument can be broadly explained under the concept, "dynamic capabilities," which is defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments."[3] While it is a nice academic concept, it is devoid of the actual process of how companies build such capabilities. My observation adds more realism to the concept.

[3] David J. Teece, Gary Pisano, and Amy Shuen (1997), "Dynamic Capabilities and Strategic Management," *Strategic Management Journal*, 18 (7), 509-533.

Special Essay:

The Switching Model of International Competitive and Cooperative Entry Modes: Highlighting the Validity of a Revised Transaction Cost Approach to the Theory of MNE

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Ⅰ Introduction

Since Year 1990 the explanative power of the transaction cost analysis model (thereafter, TCA) as a general theory of the multinational enterprise (MNE) appeared to be gradually diminishing, which is asserted by some authors who criticize it as oversimplification for a general theory and also point out the difficulty of testing transaction costs in empirical studies and others who repeatedly stress that the weight of transaction costs shared in MNE's selecting an optimal entry mode has been lost by the frequent and conspicuous events of non-equity and minority equity entry modes such as strategic alliances (SA).

Among Reading School, however, as Casson (2000) suggests, TCA is seen still now not to lose its effectiveness, so long as TCA is in part revised and then transaction costs can be integrated into a broad framework for explaining what type of market entry mode including strategic alliances & M&A is more preferable for which MNE over time in terms of introducing information cost (IC) and communication cost (CC).

Taking such a separate evaluation to TCA into consideration, it is granted to revise the traditional TCA employed by Rugman (1981) in developing the general theory of MNE, whereas the revised context is forced to omit from this paper for the constraint on the volume. That is why this paper focuses on extending the revised TCA to MNE's decision-making on SA not only for manufacturers but also for soft developers. In particular, the optimal conversion point among competitive and cooperative entry modes should be highlighted. Finally each role of IC and CC as a determinant of market entry modes selected by MNE is proposed in a comprehensive entry model.

Throughout this theoretical development, the validity of TCA might be demonstrated.

Ⅱ A Theoretical Model of Strategic Alliances

Let Company B be a follower MNE, provided that Company A is defined as a leader MNE. In the first phase, A retains a technological advantage and sells its technology to B, before B manufactures a sort of finished products utilizing this licensed technology in order to supply A with the products under an OEM agreement for A's own brand, while some manufactured products are sold with B's brand.

Company A has already divested from producing these items. An initial condition for A is that A has not only a technological advantage but also a brand one. Necessary variables for analyzing both MNEs' behavior are defined as follows.

B's total supplying volume of finished products manufactured by B; Q_B
A's selling price of its own brand; P_A
B's selling price of its own brand; P_B
B's selling price of manufactured products for A; P_C
B's total average production and supplying cost; C_B
B's ratio of selling its own brand to B's total quantity of manufactured products; x $(0 \leqq x \leqq 1)$

Under a licensing agreement A receives an assured licensing fee from B. The rate of this licensing fee is measured by a certain ratio of B's total sales volume while producing the goods inclusive A's technology. The rate of this licensing fee is denoted as y like $0 \leqq y \leqq 1$. Since B starts manufacturing the related products, it's postulated A has no touch with supplying parts and materials for B's production.

Among the above variables, a few initial conditions are found. For A's brand can be sold at a higher price than B's brand, $P_A > P_B$ is assured. Moreover, since B has to incur sales promotion cost when selling its manufactured products with B's brand, B is enforced to put its own brand price higher than the selling price of B's products for A. Then $P_B > P_C$ is assumed. B had better get some adding values from its manufacturing so as to keep producing. So $P_C > C_B$ is naturally made clear.

Thus the initial condition follows that

$P_A > P_B > P_C > C_B$, Therefore, $P_A + P_B > 2P_C$ ——①

For simplification of discussion, the transportation, tariff and insurance costs are neglected when A imports all manufactured products from B. Rather several variables are added to the above existing variables.

Annual A's total profit; R_A
A's revenue of licensing fee ; L_A
A's sales profit with its own added brand value; B_A
B's total profit; R_B
Here $R_A = L_A + B_A$.
$L_A = P_B Q_B \, x \, y + P_C Q_B (1 - x) \, y$ ——②
$B_A = (P_A - P_C) \, Q_B (1 - x)$ ——③
$R_B = (P_B - C_B) \, Q_B x + (P_C - C_B) \, Q_B (1 - x)$ ——④

Then A's residual technological development cost is denoted as T_A and its total R&D cost related this technology is T_O.

Each sales year for A since a new product was introduced by A in the market is defined as I, and the years since A released its own technology is shown by k. T_A is,

$$T_A = T_O - \sum_{i=1}^{n} B_{Ai} - \sum_{k=1}^{m} L_{Ak} \quad ⑤$$

In the first A's decision-making to involve selling its technology to B depends on the condition satisfying $R_A = L_A + B_A > R_B$, as long as $T_A > 0$ is continued. The reason why if $L_A + B_A < R_B$, A should leave T_A at the time of licensing out and find the total future revenue gained by A may be lower than that of B. In this case A may notice that A would have never kept a motive for its technological development. If $T_A > 0$ is assumed by A but as a result of licensing out, $L_A + B_A < R_B$ is realized, A can't perform to collect the total cost for its technological development and sunk cost will be arisen. This sunk cost is regarded as a sort of transaction cost.

Therefore as far as A's rational behavior is assured, it turns out to the below formula.

$$\{P_B Q_B x + P_C Q_B (1-x)\} y + (P_A - P_C) Q_B (1-x) > (P_B - C_B) Q_B x + (P_C - C_B) Q_B (1-x) \quad ⑥$$

Derived from equation ⑥, the condition for defining the rate of licensing fee is solved as below.

$$y > \frac{(P_A + P_B - 2P_C)x + 2P_C - C_B - P_A}{(P_B - P_C)x + P_C} \quad ⑦$$

In the next phase, at the time period of $T_A = 0$, A's technological value is diminishing while B's brand is going up. That is why the condition of $P_B = P_C$ may be balanced for both as a price negotiation term. Consequently B's brand value tends to become equivalent with the market price evaluated by actual traders. Here $P_B = P_C$ can be substituted into equation ⑦, thus the new equation ⑧ is derived.

$$y = \frac{(P_A - P_C)x + 2P_C - C_B - P_A}{P_C} \quad ⑧$$

Finally, at $T_A < 0$, B can strengthen its brand power and B's brand selling price becomes equal to the world standard price, which can be denoted as $P_A = P_B = P_C$. Thus the negotiation concerning the existing technology becomes against A. Taking advantage of such a reversal on the licensing fee, B becomes stronger than A in deciding the fee shown by ⑨.

$$y < \frac{P_C - C_B}{P_C} \quad ⑨$$

In addition to this analysis, so as to solve the optimal condition for A in licensing out, one stable equilibrium about the rate of A's technological licensing fee should be derived from totally differentiating equation ⑧ under $y'=0$ as follows.

$$x=\frac{P_C(P_A+P_B-2P_C)+(P_A+C_B-2P_C)}{(1+P_C-P_B)(P_A+P_B-2P_C)} \quad \text{——⑩}$$

As X is constrained to be non-negative and $(1+P_C)>P_B$ is clearly kept,
$P_A+P_B \geqq 2P_C$, and $P_A+C_B \geqq 2P_C$ ——⑪

As $P_A+P_B>P_A+C_B$ is established, A's stable time period concerning A's negotiating power over its licensing fee is defined as below.

$$P_C \ll \frac{P_A+C_B}{2} \quad \text{——⑫}$$

In such a condition that A's sales added value is higher than B's manufacturing added value, A becomes more advantageous over B in negotiating its licensing fee.

But in the case of $(P_A-P_C)=(P_B-P_C)$, A becomes to suffer from getting the satisfied agreement for A. That is, when A's sales profit ratio with A's brand comes out below B's sales profit ratio with B's brand value which is made clear by $P_C>C_B$, A is forced to reduce its status for negotiating the licensing fee.

In conclusion, A should start its licensing out from the time period satisfying the condition of $P_C<\frac{P_A+C_B}{2}$ and determine to expire its licensing agreement at the time coincident with $(P_A-P_C)=(P_B-P_C)$.

Ⅲ Decision-making Model for SD's Foreign Market Entry Modes

TCA has been often applied to entry modes for service firms. Erramilli（1990） attempts to explain this variation in terms of certain service attributes and motives for foreign market entry, using TCA as its theoretical basis. The observation indicates that service firms' entry mode choice associated with hard services resembles that in manufacturers. Erramilli & Rao（1993）investigates the internationalization pattern of service firms by three stage model. They apply TCA to build a theoretical and empirical model. The relationship between high asset specificity and sole FDI are positively observed, whereas low asset specificity links with shared-control modes like JV. Both results support conventional TCA. High capital intensity has a positive relation with sole FDI while middle one necessitates shared-control, which coincides with TCA.

From these two research results the internalization process of service firms turns out to have commonality with the one of manufacturing firms. TCA is also useful for service firms in applying it to their decision-making on what entry mode is to be selected.

For this reason we suggest the criterion for a software developer's selecting market entry modes referring to any idea of the preceding research. Here pay attention to off-shore development typically seen to the software industry and how much both opportunity cost and dissipation cost as a special cost influence firm's decision- making on the optimal entry mode.

Many independent and dependent variables available to solving the problem of what entry mode is best for a software developer (SD) in various situations are shown and specify the all variables based on each definition.

R_1 : import sales volume of software developed by other companies

R_2 : total revenue by licensing out internally developed software technology to other companies

R_3 : total revenue by selling internally developed software with its original brand

I_1 : total cost of importing externally developed software

M_1 : sales promotion expenses for software imported

M_3 : sales promotion expenses for internally developed software with its original brand

M_4 : sales promotion expenses of software depending on the development ratio of consignees

P_1 : net profit by importing and selling externally developed software

P_2 : net profit by licensing out internally developed software technology to other companies

P_3 : net profit by selling internally developed software with its original brand

P_4 : total net mixed profit of by selling internally developed software with its original brand and selling its software served for another brand

O_1 : opportunity cost incurred due to missing the sales of internally developed software

O_2 : opportunity cost incurred due to licensing out internally developed software technology to other companies

D_1 : expense required for developing an internal existing software, some of which will be contributing to developing the next generation software (it is postulated that its depreciation has already expired)

D_2 : existing software development cost incurred before licensing out internally developed software technology

D_3 : newly additional cost for developing the next generation software

r_2 : technological dissipation cost accompanied with licensing out internally developed software technology $(0 < r_2 < 1)$

What degree of share the existing software development expense (D_1) is expected to account for in contributing to save the development cost for the next generation software assuming that the existing software technology can create the next one, which is defined as α $(0 < \alpha < 1)$.

Then, $O_1 = R_3 - (D_3 - D_1\alpha) - M_3$ ——①

In order not to incur O_1, the vital condition is designated.

$R_3 < D_3 - D_1\alpha$ ——②

The constraint ② relates to mean that huge investment cost should bear in order to succeed in the new generation software and the synergy effect between the new generation one and the existing one can't be greatly brought out, thus that is why the technological continuity is trivial, which results in not bearing O_1.

As P_1 has co-relationship with O_1, thus the below equation is derived.

$P_1=R_1-I_1-M_1-O_1$ ——③

Here $P_1=\sum_{i=1}^{n}\prod_{1i}-\sum_{i=1}^{n}O_{1i}$ ——④

The above left item in the right equation shows the net sales profit of imported software over years (n) since at the stage its related opportunity cost has never been accounted. Its right item describes the opportunity cost due to not developing software inside the SD and selling it. ; Thus

$\sum_{i=1}^{n}O_{1i}=\sum_{i=1}^{n}R_{3i}-D_3$ ——⑤

Generally when the opportunity cost is larger than the development cost, the internal development should be selected.

On the other hand, how SD estimates the profit accrued from licensing out the software internally developed over years (n) should be considered. If the technology licensed out can contribute to develop other software, technological dissipation risk will happen. Since a result of such risk (r_2) is taken into consideration, the net profit by licensing out internally developed software technology to other companies is defined as equation ⑥.

$P_2=R_2-D_2-O_2$ ——⑥

The net profit accruing from licensing out internally developed software technology over years (n) may bring about technological dissipation cost (r_2). When the technological dissipation cost (r_2) is higher, it reduces the net sales profit of its technological license out. Therefore equation ⑦ can be drawn.

$P_2=\dfrac{\sum_{i=1}^{n}\prod_{2i}}{(1+r_2)^n}$ ——⑦

In the third, the net profit accrued from selling internally developed software with its own brand is described by equation ⑧.

$P_3=R_3-D_3-M_3$ ——⑧

It should be noted that the business types of selling such software are mainly divided into sales with its original brand and via trusted development. Here the development degree of trusted development accounted for total order volume from customers is denoted as β（$0<\beta<1$）.

The higher this degree is, the lesser naturally its sales expense is, because the consignor sells software marking its own brand and thus pays for market development activities with its own cash.

Instead of it, its sales profit ratio becomes reduced compared with selling original brand as its consignee must give up gaining some of sales profit due to its consignor (buyer)'s holding the goodwill of selling software. Consequently the ratio of the consignee's giving up sales profit to its consignor accompanied with this trusted development for consignor's brand is defined as γ $(0<\gamma<1)$. In this way considering the business model of the consignee in exporting its software for its consignor, sales promotion expenses of software depending on the development ratio of consignees is denoted as M_4 and then define as $M_4=M_3(1-\beta)$.

Assuming that the total sales revenue is the same in both own brand selling and original equipment manufacturing (OEM), and R&D cost is required in both types, the net sales profit gained by the mixed type is derived from the equation ⑨.

$$P_4=\{R_3(1-\beta\gamma)-M_3(1-\beta)\}-D_3=R_3-M_3-\beta(R_3\gamma-M_3) \text{ —— ⑨}$$

In equation ⑨, P_4 shows a bigger value when satisfying $R_3\gamma-M_3<0$, for $\beta>0$.

Therefore as long as satisfying $R_3\gamma-M_3<0$, that is, $\gamma<\frac{M_3}{R_3}$,it is more desirable for consignee to raise the ratio of OEM supply of software developed by it so as to gain more sales profit. Such a condition that M_3 becomes greatly bigger than $R_3\gamma$ is best required for a consignee so long as the larger $\beta$is, for$\beta>0$.

Ⅳ A Conceptual Framework and Theoretical Integration

Following Casson's theory (2000) that IC has TC related field to some extent, let information cost (IC) be employed as well as communication cost (CC) and TC in order to distinguish the criterion for the selection of foreign market entry modes such as foreign direct investment (FDI). What is the biggest influencing factor is focused on.

The theoretical background is also essentially required. Whether wholly-owned or joint venture type of FDI has been preferred by Japanese parents should be clarified comparing with other entry modes such as licensing and exporting plants. All of manufacturers should have strong firm specific advantages in entering each foreign market by setting up their wholly-owned subsidiaries equal to internalization. Before entering foreign countries most of manufacturers might hold some strategic intent mainly divided into globalization or localization, since such a strategic motive necessarily influences on the performance of each subsidiary.

Then let the determinants of several entry modes be clarified.

Firstly manufacturers must hold specific assets in entering foreign countries so as to compete with their rivals not only in a host country but also in the world market. A local production in a wholly-owned subsidiary may become a promising entry mode for attaining the goal of market share. This mode strongly commits corporate resources to link with many markets. Consequently once such a project fails, this MNE takes highest risk and feels it hard to recover from a crucial damage. To make a wholly-owned subsidiary stronger, a parent must develop strong-binding asset specificity in technology or knowledge enough for its subsidiary to be transferred to learn well. From a long perspective, its subsidiaries can be expected toward developing an original design of technology and business model.

This entry mode has a merit in that it can erase TC for the following reasons. A manufacturer's parent can transfer its technology and knowledge to its subsidiary without caring about market inefficiencies illustrated by unstably evaluated value of a new technology due to the lack of technology market mechanism and asymmetry information as well as unduly moral hazard by a licensee where a new type of technology may be sold to the third party by this licensee ignoring the licensing agreement concluded between a license holder and a technology buyer. So as to prevent from opportunistic behavior of a licensee, its licensor must always audit and monitor the partner's behavior. Therefore the licensor often has to endure policing cost（PC）, even though paying PC might not be perfectly control its licensee to act freely with moral hazard, even if it has been continuously paying PC since the licensing

As a matter of fact, a licensing at the early stage of its product life cycle like a phase of introducing a new product in the world entails highest risk for a licensor in that the maximum dissipation cost (DC) might happen to the licensor from earlier releasing out this type of technology which causes licensee to catch up with or overtake the licensor in selling a big volume of the products whose technology is derived from the licensor.

Before setting up a wholly-owned subsidiary, a manufacturer has to research where is best for locating its subsidiary and when to start its operation, as market research and feasibility study are required for this MNE. That is why the MNE must pay high IC from the feasibility study. After it starts operation in its subsidiary, this MNE has to incur high IC so that the parent controls and coordinates many subsidiaries whenever integrating the role of each subsidiary into its global strategy. How to integrate a variety of subsidiaries into the corporate level of global strategy depends on much information available to the parent. As a result of information processing, this MNE can work together with its local subsidiaries. CC between a parent and its wholly-owned subsidiaries becomes critically important after a local production and R&D start. The managers at local subsidiaries also regard mutual communication with their parent company as the most important element for decision-making and expanding transactions within the own firm beyond national borders. In this way the parent comes to formulate a world mandate product strategy in a speedy way. Therefore CC is apt to augment in integrating wholly-owned subsidiaries.

Joint ventures (JVs), however, demand both partners to pay maximum CC to conduct an optimal decision making. If one's goals become divergent from another partner's ones, both managers must often keep in touch with each other, and many times attend a variety of meetings after several discussions. Therefore each decision making in a JV tends to be deferred (particularly in a equality ownership type of JV). Such a slow decision making induces a project to be delayed or postponed, which worsens both partners' business performance due to the late response to the changing environment. To solve this problem, information sharing shouldn't be neglected. That is why JVs must incur relatively high IC instead of saving highest CC. Even if CC and IC can be covered by MNE, another big problem happens to every JV partner.

Sunk cost is often caused by opportunistic behavior of one side of partner when another partner has invested huge resources and cash into its own plant whose type is limited to a specific usage for production. If one partner rejects selling the product fabricated in this JV, another partner, that is, a real plant owner can't compensate such a facility investment cost because another type of product can't be made or assembled in its JV's plant. Such a partner is enforced to give up covering sunk cost, while an opportunistic partner doesn't have a will to pay for sunk cost. Partnership tends to be easily collapsed as soon as the production and sales regulation specified in the JV agreement can't be observed by one partner who has never touched with the facility investment.

Thus transaction costs（TCs）are comprised of three cost factors; ①Dissipation cost (DC), ②Policing cost（PC）, ③Sunk cost（SC）. Obviously at the same time, TC have some relations with information cost（IC）and communication cost (CC).

Then let us proceed to build theoretical models. At first focusing on the role of information collecting cost (ICC) used to research a product market and a labor market for each type of entry mode, it can be found that a theoretical framework which is lent itself to explain what type of entry mode is best for a manufacturer depending on the requirement levels of ICC allotted for a product market (PM) and labor market (LM).

Generally FDI is classified into a wholly-owned type and a majority or equally-owned or minority JV. What type of FDI is preferred depends on the production process (method) of whether abundant labor can be employed. For example, a minority JV is suitable to small lot of production as one partner can't have much interest on business performance compared with running a majority JV.

To be more interested for a majority JV, the manufacturer who is eager to research a labor market and save product market research cost is likely to adopt a labor intensive production method, whereas its partner manager who emphasizes the role of marketing research on its own product rather than collecting information on a labor market, a capital intensive facility seems to be utilized. A Wholly-owned FDI prefers high-tech and mass production employing a labor intensive facility.

The above proposition as to a majority JV may be well fit to Japanese automobile parts subsidiaries located in Thailand and China according to the author's analyzing the data whose source is Directory of Japanese Companies' Going Abroad（Kaigai Shinshutsu Kigyo Soran）in 2008 published by Toyo Keizai Publishing Co.

Good performance subsidiaries were inclined to have production-orientation explicitly when their local operations launched. Let show all figures of the sample subsidiaries belonging to good performer; initial facility investment = 77289 ten thousands Yen, the number of employees = 364 persons, total sales volume in year 2007 = 461341 ten thousands Yen. Therefore, a labor intensive production method is popularly found in a large number of production-oriented JV.

The subsidiaries whose main motive for starting their operations was to develop the local new market are much more seen in the bad performance group compared with the production-orientation type. This marketing-orientation type subsidiaries have different profile like the below on average; ownership ratio = 81.6%, the initial facility investment = 102033 ten thousands Yen, the number of employees = 238 persons, total sales volume in year 2007 = 319699 ten thousands Yen. These figures coincide with the proposition that a capital intensive facility seems to be utilized among majority JV emphasizing the role of marketing research. Consequently both types of subsidiaries support the above proposition.

Here return eyes onto cost factors changing over time. In terms of taking the changing costs by each foreign market entry mode into consideration, the determinants of MNE's selecting several entry modes can be derived.

Exporting plants （EP） takes a step forward into becoming MNE. For EP, the cost size relation may be CC>TC>IC. Particularly CC incurs entailing several technological instructions for a plant importer.

For Licensing, TC>CC>IC is objectively observed, for the dissipation cost of technology is highest on average than any other entry modes, because due to externalize a licensor's asset specificity, the licensee can learn it and then appear as a competitor in the world market, which is emphasized by Rugman,

In the case of JV, three hypothesized relationships might come true without considering internalization models proposed by Rugman etc. Rather linking with a decision-making speed for JV partner's managers and relationships with local partners and headquarters lead to the comparison of cost sizes as follows.

For minority JV, TC>CC>IC.

Equally-owned JV is expected to establish TC=CC>IC. CC is highest among all entry modes, as it takes a long time and largest frequency in business decision between the partners concerned who have the same decision making rights.

Majority JV has a different aspect. Higher equity ownership ratio in JV ensures the parent company to appropriate its own asset specificity, contributing to reduce TC.

According to Casson's theory (2000), IC has a TC related field to some extent. Namely, to recognize an inseparable sphere from TC in IC is to be emphasized. What overlapping field with TC can be seen in IC? TC-unrelated factor of IC is to search for skillful labors and extension to a new market. On another side, sunk cost accruing from JV partner's opportunistic behavior is often seen in its own facility invested by a majority owner parent company as this parent tends to mainly invest into its subsidiary's plant. Such a factor is counted as IC related with TC.

Here let us discern TC-related IC from TC-unrelated IC (pure IC) and employ TC-unrelated IC. In the case of a wholly-owned subsidiary, IC>CC>TC is plausibly applicable to many MNE. Over the years having passed since a wholly-owned subsidiary was established, it may come to be positioned in a series of world mandate strategy type by its headquarters. By this IC will continue augmenting in order to develop the world market and look for new transaction partners involved in a sort of supply chain management.

V A Conclusion and Future Research Agenda

All of the three theoretical considerations in each section emphasize that the power of a TCA is still now effective in explaining what entry mode is optimal for MNE over time, which has been often addressed by Rugman, Buckley and Casson, etc. Even though examining the determinants of MNE''s selecting strategic alliances came to add much importance rather than reviewing the ones of traditional internalization and externalization, the theoretical and analytical frameworks based on transaction costs shouldn't be ignored.

Combining the traditional TCA as an economics theory with the principal-agency theorem, the resource-based view, the dynamic capability approach, the network approach as the theory of the firm seems to become a mainstream in reformulating the theory of the MNE where to be noteworthy, Rugman(2014), Buckley(2012) and Casson (2016) have already tackled with the theoretical synthesis. After examining whether these types of theoretical approaches are in effect substitutive or complementary to TCA, MNE research theorists should now address expanding the possible sphere to integrate the above five approaches into reformulating the international entry mode theory of the MNE. Ideally it is the time we should clarify what approach as applied to the theory of the MNE is best.

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