

# Assessing Exploitation Strategy: The Peripheral Determining Factors

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**Abstract**—In the world of technological competition, good innovative products must comply with appropriate method of exploitation in order to drive firms to success. Firms should be able to identify and understand the determinants of exploitation strategy to make effective decision. In this paper, we explore determinants of exploitation strategy which are difficult for firm to control or make adjustment, called peripheral factors. The qualitative research was conducted and two main dimensions of peripheral determining factors are found, i.e., transfer recipients and enforcement policies.

**Index Terms**—Exploitation, knowledge transfer, technology transfer, technology commercialization, technology strategy, innovation.

## I. INTRODUCTION

Firms in fast pace technological industries need constant improvement in order for them to stay competitive. The improvement can range from products to process, technology to management, or tactical decisions to strategy decisions. Because of rapid changes of technology, technology strategy for these firms needs continuing adaption to keep up with the technology or with their competitors. Technology strategy, unlike business strategy, cannot be simply generalized and put into corporate strategy. Instead, technology strategy is more ad-hoc in nature leading to managerial need to make decision case-by-case [1]-[2].

Among many decision makings, exploitation strategy is a crucial decision needed to make by firms. Exploitation strategy refers to how firms launch their products or commercialize their invention to the market. Successful exploitation strategy provides firms competitive advantage and brings handsome profit to the firms. Moreover, decisions on exploitation strategy should not be fixed and must be reevaluated throughout the product life cycle especially when the context of commercialization has changed [3]. Inappropriate exploitation choices could limit firm to gain the utmost advantage. Valuable invention could be left on the shelf should the firm unaware or ignore making choices [4]. In general, firms can choose to transfer their invention within their organization (internal exploitation) or via external

means (external exploitation). Transaction of external exploitation maybe part of, for example, joint venture, licensing, contractual agreement, while internal exploitation could include the same kind of transactions but limited to transfer among units of organization [5].

This paper attempts to answer what factors affect decision making process on successful exploitation strategy. A comprehensive understanding of these factors help firms make better decision and evaluate their circumstances in commercializing their innovation. Reference [6] discusses important factors within organizations and calls these factors 'domestic determinant'. In this paper, we extend the work to consider what factors outside the firms can affect exploitation strategy and will refer these factors as 'peripheral determinants'. These external factors are rarely discussed in the literature but are very important because they are originated from parties outside the organizations, and, hence, more difficult for them to influence/control. Firms should aware which peripheral factors they should pay attention to when making strategic decision on exploitation choice. This is crucial for firms to make necessary trade-off and come up with ultimate decision. Without a thorough understanding of these peripheral factors, firms cannot effectively evaluate their trade-off, advantage-disadvantage, and cost-benefit of each mode of exploitation. Thus, firms cannot make effectual mode of exploitation.

The paper is organized as follows. Section II discusses important peripheral factors relating to exploitation strategy, followed by a discussion of methodology in Section III. Our empirical results and proposed framework are discussed in Section IV and will be followed by conclusion.

## II. LITERATURE REVIEW

When firms make managerial decision to commercialize their proprietary technologies, various determinants are assessed in order to evaluate the right exploitation strategy. Several researchers have addressed these factors. These factors can be broadly divided into domestic determinants which are internal factors that firms can manipulate or peripheral determinants which are external factors that firms cannot easily manipulate. Reference [6] discussed the domestic determinants on the exploitation strategy and showed that firm resources and capabilities, tacitness level of products and stage of product life cycle are critical factors for these managerial decisions. In this paper, we will focus only on peripheral determinants to which firms cannot easily extend their influence. We will begin this section by discussing intellectual property protection.

### A. Intellectual Property Protection

The protection of IP has been one of managerial determining factors to choose among exploitation strategies

Manuscript received December 21, 2011; revised February 17, 2012. This work was supported by the Chulalongkorn University's Thesis Scholarship for Students.

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[7]. However, not all firms choose to protect their intellectual property (IP). The closed innovation model encourages firms to protect its intellectual properties, while open business model does not emphasize importance of IP protection, but instead encourage the openness of their invention and reap profit from innovative open business model [8]. Nonetheless, most businesses are not entirely open or entirely close. Hence, IP poses a concern for exploitation strategy, especially for, partially closed innovation model. To find appropriate exploitation strategy, reference [7] developed a tree of game model to choose among export, direct investment and licensing strategy based on chance of imitation in each strategy. Reference [7]'s model implies that strong intellectual property protection favors internal exploitation because the model is based on assumption that imitation occurs only on external exploitation but not on internal exploitation. However, the influence of strength of IP protection and risk of imitation choice is supported by many others [9]-[11]. In addition, strength of IP is known to affect the possible return to firm's innovation and reduces threat of expropriation [12]. However, a recent empirical study showed that IP did not relate to cooperative commercialization strategy for both SME and large nanotechnology firm probably because nanotechnology was relatively new and there were no attractive non-corporative choices [13]. Reference [13]'s argument includes lack of licensees in undefined markets, lack of expertise in patent office regarding new technology, important of bargaining position over generating licensing fees, favorable acquisition condition and high amount of potential buyer.

*B. Country policy*

Country policy plays an important role in decision making. In this aspect, many literatures were focusing on the impact of host country's government policy related to commercialization of firm's invention [14]-[15]. In case of international commercialization, both government policy of host country and recipient country are often discussed. Reference [11] mentioned that national policies of recipient country define limit on what is permissible; these policies can be subsidies, trade policy, or IP regimes. Reference [16] suggested that developing country saw knowledge gained from technology transfer as one of the dominant reasons to attract foreign investment to the country. As a result, developing countries are implementing beneficiary policy to attract investment from potential multinational corporations. Hence, these beneficiary policies given by recipient country are one of the determinant factors to choose between foreign direct investment and other mode of commercialization. Reference [17] explained that beneficiary country policies like taxation can overcome the fear of reluctant to transfer technology due to spillovers. Not only policy of either source country or recipient country matter, but also the interaction between both ends has long-term impact on technology transfer [18].

*C. Market and Consumer*

Very little literatures in current body of knowledge discuss the linkage between market perspective and exploitation strategy. Reference [19] proposed conceptual framework

which integrates market perspective into external technology exploitation strategy. However, the framework does not suggest how market perspectives should fit into exploitation strategy. For innovative products, especially radical products, the technology owner often requires to create the market for product ideas due to absence of preexisting consumers for such new ideas. Some literatures mentioned about the linkage between absence of market for technology and the exploitation strategy. Reference [20] suggested two scenarios, the exploitation through product market and market for ideas. The absence of market for ideas is a crucial factor when comparing options between product market and market for ideas. The technology assets may have an option to be sold directly to product market. In case market for ideas is presence, technology assets may be sold or cooperated with an established firm who would further develop and implement invention to product market. There are number of advantages that firms could potentially obtain from choosing exploitation method in market for ideas. These advantages are, for example, decreasing in sunk cost investment, lowering potential product market competition [20]. Behavior of existing market for ideas and product market could be a determining factor to choose exploitation strategy due to the fact that contexts around market for ideas and product market are different. In case market for idea is not absence, the inexistence of market for ideas could potentially reduce the ability to earn returns on invention. Section IV of this study provides empirical results which explain relationship of market perspective toward exploitation strategy.

*D. Cognitive Ability of Recipient*



Fig. 1. A schematic representation of knowledge transfer. Source: [21]

Another issue on recipient side of innovation is how well the recipient could understand set of knowledge transferred to them. As seen in Fig. 1, the cognitive systems are needed at the knowledge recipient as well as at source of knowledge in order to facilitate knowledge transfer [21]. Reference [22] defines transfer capacity of recipient as “a transferee’s ability to assimilate and retain knowledge from a willing source”. The emphasis shall be put to the word “willing source” as Martin further explained that transfer capacity translate to ability to understand from a willing and cooperative source. Absorptive capacity referred to ability to capture knowledge from “unwilling source” [22]-[23]. Therefore, recipient transfer capacity and absorptive capacity are two different concepts that we are addressing in this section.

High recipient transfer capacity is predicted to lower transfer cost of licensing agreement and alliance when comparing to direct investment [22]. Reference [24] classified three main capabilities that technology recipient needs to possess including capability to operate, capability to expand its capacity and capability to innovate from transferred technology. Recipient firms need a cognitive

system to understand the transferred technology in order to operate on it, expend it and certainly need high level of absorptive capacity to innovate on it. Concept of learning could also be another explanation to importance of cognitive system of technology recipient. Reference [25] defined learning as “improvements in the ability to anticipate and respond to contingencies that cannot be pre-specified in a formal contract”. Reference [25] further explained the respond to contingencies in relation to the tacit knowledge and concluded that stronger learning effect is positively related to stronger choice of alliances.

High absorptive capacity of subsidiary is one of the factors that proven to increase the level of internal knowledge transfers to the multinational corporation subsidiary [26]. Reference [26]’s study has proven that the firm’s human dynamic capability increases absorptive capacity of firm’s subsidiary. Consequently, absorptive capacity increases level of knowledge transfer. In other words, subsidiary needs to be able to absorb knowledge transmitted from either headquarter or other subsidiaries. Other than context of Multinational Corporation, the impact of human aspect of recipient firm is highlighted in a study technology transfer in hotel industry. The human intensive of service industry makes firm’s human resources become a key determinant of transfer process [27]. Some scholar believed that the absorptive capacity of technology recipient was the most important factor among other factors [28].

### III. METHODOLOGY

#### A. Research Design

The data were collected qualitatively using literature review and interview method. The qualitative research method is known to be a more suitable approach when the researcher need to answer the “Why”, “What”, and “How” questions [29]-[30]. Moreover, qualitative approach is appropriate where researchers seek to generate new theory or when little is known about connections among variables [31]. The respondents were asked the same open-ended questions formulated in semi-structured approach. For instant, “What are the main concerns when choosing exploitation strategy for this product?” Then, data from both literature review and interview were grouped into similar concepts to create propositions and a new theory framework.

#### B. Sampling

This research adopted purposive sampling as it is the appropriate method for smaller sample size such as case study [32]. Particularly, we purposely select companies who possessed and exploited technological innovation. The interviewees were asked questions regarding how, what, and why they chose the particular exploitation methods to understand the determinant of exploitation strategy behind their ultimate decision. The interviewees were knowledgeable or experienced in the subject of research. In this case, the interviewees were mid to high level management personnel who directly engage in exploitation process of firm’s technological invention. Data were

collected from total of 10 cases, noted that 9-12 cases in the aggregate are substantial if the pattern is found across multiple case [29]. These 10 samples were drawn from different industries, different sizes, and different countries of origin in order to show the generalizability of finding through mutual pattern. Table I summarizes the background of the selected companies.

TABLE I: SUMMARY OF INTERVIEW SUBJECTS

Firm No.	Country of Origin	Industry	Approximate number of employees	Product descriptions
Firm 1	Finland	Metal	100	Circulation coins and medallion
Firm 2	Germany	Plastic/Metal	100	Industrial Electroplated products
Firm 3	Switzerland	IT	300	Forensic IT system
Firm 4	Israel	Telecommunication	1200	Telecommunication infrastructure
Firm 5	Thailand	Logistic/IT	80000	Large scale IT logistic solution
Firm 6	Thailand	Pharmaceutical	50	Supplement and drug packaging
Firm 7	Thailand	Telecommunication/IT	50	Call center system/ Robot
Firm 8	Thailand	Education/IT	100	Learning aid IT product
Firm 9	Thailand	Graphic and Animation	10	Augmented reality
Firm 10	Thailand	Electronic	30	Data center cockpit/ data storage device

### IV. RESULTS AND DISCUSSION

This sections discusses important peripheral determinants firms need to take into account in order to make appropriate exploitation strategy. We will begin this section with a discussion of intellectual property protection.

#### A. Method and Impact of Intellectual Property Protection on Exploitation Strategy

For intellectual property protection (IPP), we attempted to discuss two important propositions, i.e., whether strength of intellectual property influenced decision makers, and 2) whether IPP was an important factor given firms wanted to protect their invention.

##### *P1a. Strength of Intellectual Property is a determinant of exploitation strategy*

The results proved that this proposition is not true for all cases. As mentioned in literature review section, most previous literatures emphasize the connection between strength of IPP and method of exploitation. Contrary to many past literatures, strength of IPP is not a concern for most firms when choosing among different choices of exploitation

strategy. The explanation comes in two folds. First, firm may not need to protect the intellectual property at all. The explanation for not protecting IP right could be the adoption of open strategy. Firm no. 1 mentioned that *"We don't need to protect our invention because it was meant for other firm to understand it."* Otherwise, firm management personnel don't take IPP into account. For example, Firm no.5 mentioned that *"IP protection is never a concern. We almost can't keep up with the demand for the internal need of new innovation."* Second, Firms may want to somehow protect their IP but did not believe in the existing IP protection system. Most firms under this study agreed that they cannot fully protect their intellectual property protection regardless of protection level and enforcement from government. Many firms chose not to protect the IP at all. For instant, Firm no.8 mentioned that *"No matter which exploitation method we use, they will copy...I don't really care all that much anymore. If they stole the idea, at least the society has more invention. If they copy it totally, it's not worth it to sue them. The protection is quite weak."* This fact applied not only to group of firms that located in the region where intellectual protection is weak like Thailand, but also in the region where the protection is stronger like Europe. The Switzerland based firm no.3 said *"The imitation of intellectual property is the risk you have to take"*. Almost all firms refuse to rely solely on the patent protection and the enforcement from country level. Many claimed that it is mostly the risk that innovative firm has to take and they best they can do is to use the alternate creative method to increase the level of protection.

The results of this study confirmed that IPP is not always a determinant of exploitation strategy because many firms may not want to protect their inventions from imitation or perceived usefulness of IPP toward invention weak.

***P1b. When firm chose to protect their invention from imitation, method of intellectual property protection is a determinant of exploitation strategy***

Instead of relying on the severity of imitation and strength of IP protection, firms came up with its own way to protect its intellectual properties as an additional mechanism or as a replacement of patent protection. The results showed that method of IPP affect the chosen exploitation strategy for all firms under the study who chose to protect their IP. As a result, this new way of protection has direct impact on their final exploitation decision. For example, Firm no.9 mentioned that *"Protection of IP in Thailand is rather hard especially in software. The imitator incurred minimal expenses to copy the invention. We need to exploit the product in a way that it is harder to be copied for instant to invest in compatible hardware So that if the imitator really wants to copy, they have to invest more."* Firm no.2 chose non-disclosure agreement as an alternative protection method which compliments co-operative exploitation strategy. Firm no.3 analyzed how they might protect their IP if they exploit the invention a certain way. Then they traded-off pros and cons arise from different method of protection equipped with each exploitation strategy. Firms no. 4, 7 and 10 used the complication of technology as a barrier to imitation, which make internal exploitation slightly more a favorable method of exploitation. The results show that firms do engage in alternative method to protect their invention. Consequently,

these alternatives method partly determine final decision as they favor some exploitation strategies and disfavours other exploitation strategies.

***B. Country Policy Impact on Exploitation Strategy***

As seen in literature, several countries, especially low technology countries, wanted to improve their knowledge on technological advances via these technological firms. This need partly influence countries to implement related policies to control various aspect of innovation in their region. In this section, we attempted to find if country policy impacted firms' exploitation strategy, and thus, the following proposition is discussed.

***P2. Country policy is a determinant of exploitation strategy***

TABLE II: SUMMARY OF INTERVIEW RESPONSES ON COUNTRY POLICY

Firm No.	Impact of country police on Exploitation Strategy	Direction of impact
Firm 1	Yes	Limit
Firm 2	Yes	Limit/Support
Firm 3	Yes	Limit
Firm 4	Yes	Limit
Firm 5	Yes	Support
Firm 6	Yes	Support
Firm 7	Yes	Support
Firm 8	Yes	Support
Firm 9	Yes	Support
Firm 10	Yes	Support

Interview responses showed that country policy, at both firm's country and recipient's country, significantly impacted the choice of firm's exploitation strategy. The sample statements that support this proposition are those from Firm no.4 which said *"We follow government rule. We have to play their game"*. As seen in Table II, all 10 firms showed consensus responses that country policy is a determinant of exploitation strategy and summarized the impacts of country policies toward exploitation strategy. The results showed that there are mainly two board types of impacts from country policy, the policy that limit the possibility of certain exploitation strategy and policy that make certain exploitation strategy more attractive.

The first kind of policies is the policies that compliments certain method of exploitation, and, therefore make the choice become more attractive. This result conforms to the research by reference [16]. For Firm no. 8, treaties among ASEAN countries open up more possibility for exploitation of certain invention. They said *"When we do external exploitation we have to study rule and regulation of those countries. It will definitely affect the choice of exploitation strategy. For example, before ASEAN economic community, the choice of exploitation might be limited. Now that there is an ASEAN economic community which Thailand is a member, choice of exploitation is more open in those member countries."* Firms no.6, 7, and 10 agreed that financial support policy from government, when implement effectively, does make choice of internal exploitation more attractive. Firm no. 9 took advantage of assisted business matchmaking policy from government to aid creation of joint venture method. For Firm no.5, advantage gain from tax policy is one of the reasons to make internal exploitation

decision.

The second kind of policies is the policies that limit exploitation strategy with set of constraints. Thus, these policies make the choice less attractive to the firm. The result also conforms to a result by reference [11]. For Firm no. 1, country policy of recipient firm pushes them to exploit using open strategy. The internal exploitation of technology is impossible due to the limitation of policy to purchase unique technology. The company cannot make a sale if they are the only one firm in the world who can produce certain innovation. Therefore, Firm no.1 chose to give away the invention to set industry standard. Similar to Firm no.1, Firm no. 2 said *“Most of our clients are government of different countries. Many countries' policy won't allow exclusivity attached to product they are buying. As long as invention is not patented, it is difficult to prove that it is exclusive.”* The policy restriction also limits Firm no. 2 from licensing their invention. Firm no. 3 and no.4, direct investment option was rule out for international exploitation to some countries because of country policy restriction. For example, Firm no.3 mentioned that *“China is a very good example, you want to sell the system to them you have to made the system in China. These things effect your decision”*.

Firm has to evaluate the impact of recipient country policy on each strategic choice in order to come up with management decision. The ultimate choice depends vastly on the trade-off between possible value created from policy and the limitation arises from policy.

### C. Market and Consumer Impact on Exploitation Strategy

The market and exploitation strategy are rarely mentioned in the past literatures. Nonetheless, we found patterns of interview results indicating that absence of market for ideas and behavior of technology recipients are determinant of exploitation strategy as following discussion.

Many times, new innovation has no preexisting market before launch period. The following discuss impact of market absence toward exploitation strategy.

#### ***P3a. Absence of market for idea is a determinant of exploitation strategy***

In line with previous literatures, absence of market for idea does limit the choice of exploitation strategy. From Table III, all firms whose market for products is absence agreed that the inexistence of market does impact the choice of exploitation strategy. Firm no.1 is in there industry where there are no mechanism to sell the invention resulting in limitation in option to sell as mention in following statements. *“There is no mechanism to sell this kind of invention in the industry...The only thing is that we could sell is the idea to our customer. Still, we will be the one to produce it.”* Firm no.2's innovation is very specific to their own industry with a handful number of player. There is no applicable market exists in other industries; and therefore they are not licensing or selling the invention but instead rather kept the invention internally for strategic objective. Firm no.7 explained the differences between their two products, with and without existence of market for idea. The product without existence of market for idea will need exploitation strategy that allow firm to penetrate to the early adopter. For this, firm no.7 chose exploitation strategy that allows them to do pilot test of

the invention with a few firms as explained by the following statements. *“One of the differences between two products is level of newness. One product is a radical innovation. The market for product doesn't exist. We need exploitation strategy that could reach the early adopter. The other product has existence of market for it. We don't really focus on exploitation strategy that reaches certain group, but instead we try to differentiate the product for the existing market group”*. For Firm no.10, the innovation was built on totally new platform comparing to existing products. It has compatibility issues when trying to license part of invention to existing customers. Therefore, the exploitation strategy is rather limited to those that allow the total system to be transferred to customer instead of partial system as mentioned in following statements. *“The platform of our invention is totally different from other in the industry. The others are electronic-based, while mine is mechanic-based. This inexistence of new platform limited some exploitation methods. For instant, we can't license part of the invention. They need a whole system to work.”*

TABLE III: SUMMARY OF INTERVIEW RESPONSES ON EXISTENCE OF MARKET FOR IDEAS

Firm No.	Market for idea
Firm 1	Absence
Firm 2	Absence
Firm 3	Presence
Firm 4	Presence
Firm 5	Presence
Firm 6	Presence
Firm 7	Absence/Presence
Firm 8	Presence
Firm 9	Presence
Firm 10	Absence

The results confirm that absence of market for idea is a determinant of exploitation strategy. In brief, the absence of market in our interview subjects is either from newness of invention or nature of invention that applicable to small industry. Both ways, absence of market complicates the exploitation process due to the need to create the new market and/or business ecosystem for invention. Hence, firms shall be aware of the limitations that the absence of market idea caused to each exploitation strategy.

#### ***P3b. Recipient behavior in the market is a determinant of exploitation strategy***

For those firms whose market for invention is presence, we found that behavior of technology recipient in the market affect decision-making of exploitation strategy. Our results show that consumer behavior, such as buying behavior and culture, is a signification determinant of exploitation strategy. Firms do pay attention on how the market behave and try to adjust the exploitation strategy to fit the behavior if needed. Firm no.3 put emphasis on culture of region where the firm is trying to penetrate by explaining in following statements. *“Culture is very important. It defines how people do thing including business. For example, in the US you can sell forensic product by calling chief of police yourself. In Asia, no one will talk to you, you may need local partner. Culture is stronger than anything else, you can't change their culture. Policy might be even easier to be changed”*. Firm no.4 mentioned that they are dealing with small number of clients

who are large size firm. They may have a set of rules and standards to purchase the product in a certain way. For Firm no.5, the main consumer is internal demand from mother firm. The spin-off unit is to serve the exponentially growing need internal consumption. Firm no.6 set up a choice of exploitation methods based on market responses. Firm no.7 and no.9 looked at buying behavior of each market segment. For example, Firm no.7 mentioned that *“Part of the approach depend on behavior of consumer. For regular consumer, they might want to buy license from internet download or off-the-shelf. For enterprise, they are not going to do that, we have to go to them; they need consultancy and services that come with the package. When the need is more complex, sometime they need special device. It is a whole different set of approach.”* Firm no.8’s exploitation strategy started from market behavior and then matches them with appropriate exploitation methods as mentioned in following. *“The analysis of exploitation method starts from customer and market side not from the need to sell the product. We want to know the potential of client and what we can offer them”*. Therefore, it is important for firm to understand how the market will react to the chosen exploitation strategy in order to make an effective strategic decision.

Therefore, firms shall be able to identify whether or not market for new invention is absences in order to find the right fit exploitation strategy to create new market and/or new business ecosystem to ensure successfully commercialization. In case of presence of market, the behavior of technology recipient within the market partly determines exploitation strategy. Firms shall look for choices that comply with existing market behavior or else creates an innovative way to shift consumer behavior to the chosen strategy.

#### D. Cognitive Ability of Recipients Impact on Exploitation Strategy

##### P4. Cognitive ability of recipient is a determinant of exploitation strategy when choices involve external exploitation

TABLE IV: SUMMARY OF INTERVIEW RESPONSES ON COGNITIVE ABILITY OF RECIPIENTS TOWARD EXPLOITATION STRATEGY

Firm No.	Chosen exploitation strategy	Recipients	Cognitive ability as a determinant
Firm1	Internal Exploitation & External exploitation	Own Firm/ Competitors/ Customers	Yes
Firm2	Internal Exploitation & External exploitation	Own Firm/ Partners	Yes
Firm3	External exploitation	Partners/Licensees	Yes
Firm4	Internal exploitation	Own Firm	No
Firm5	Internal exploitation	Own Firm	No
Firm6	Internal exploitation	Own Firm	No
Firm7	Internal Exploitation & External exploitation	Own Firm/Partners	Yes
Firm8	Internal Exploitation & External exploitation	Partners/ Franchisees	Yes
Firm9	External exploitation	Partners/Licensees	Yes
Firm10	Internal exploitation	Own Firm	No

As mentioned earlier, past literatures stated that cognitive ability is very important to transfer knowledge [21]. However, the research results confirmed that the cognitive ability of recipients is a determinant of exploitation strategy for firms

whose choice involved external exploitations at some point. Dealing with knowledge transfer perspective, we need to know who is recipient at the receiver end of knowledge transfer. The recipients could be partner, product consumer or third party who buy or license technology. For external exploitation, the transfer of knowledge is across organizations. As seen in summary table IV, when recipients of technology involves at least one external party, source firms do concern about how much the recipient could understand the knowledge embedded in the technology. Corresponding to the past literatures, firms with external recipients set up cognitive system to support the knowledge transfer between themselves and the recipients [14]. Some of them simply send the technician to ensure the understanding of recipient, while others use manual in various form such as text and multimedia. It is important for the source firm to know that recipient could be able to absorb the knowledge of invention during the transfer process as Firm no.2 mentioned in following statements. *“The transfer of technology may or may not be an issue depends on situation case by case. Depending on who is the partner, the understanding of the partner, how much they understand the technology, his own set up and his own role in the industry, what is it that you want from the partner.”* It is important to note that there are no evidence found that high recipient cognitive ability adds value to particular method of exploitation. Instead, low recipient cognitive ability depreciates the value of exploitation method attached to it. For example, Firm no. 8 mentioned *“At our firm, there are number of exploitation model we practice. One of the things we need to look at is the expertise of recipient. We need to understand how much they can take.”* The results also revealed that firms who engaged in internal exploitation did not take cognitive ability at knowledge source as a factor to determine ultimate exploitation choice. Out of 8 firms who engaged in internal exploitation, 7 of them did not mention any form of dedicated cognitive system at recipient side. The behavior of 7 firms might be explained by referring to schematic representation of knowledge transfer in Fig. 1 [21]. For these 7 firms, knowledge source and recipient are the same organization. The existing cognitive systems at knowledge allows them to understand set of knowledge at codification process, therefore they may not need additional cognitive system at interpretation process. Only Firm no.5 creates the cognitive system for recipients when exploitation is done internally. This could be explained by the spin-off structure that creates inter-organizational transfer instead of intra-organizational transfer of Firm no.5.

## V. DISCUSSION AND PROPOSED FRAMEWORK

Firms generally want to take most advantage of new invention that they possess, and thus, need to take into account important factors or determinants for the success of commercialization. Previous sections explain impacts of peripheral determinants of exploitation strategy which are one of many important factors to be considered to build an exploitation strategy. Although each peripheral determinant has direct impact toward decision-making process as discussed in previous sections, the ultimate chosen exploitation strategy may not correspond to general impact

caused by single determinant. Instead, the ultimate choice derived from a combination of various determinants. Table V displays exploitation strategies chosen by firms together with various peripheral determinants associated to each firm. For example, policy that supports internal exploitation for Firm no.7 may not be a strong enough determinant to keep firms from engaging with external exploitation. Firm no.10 chose internal exploitation even though absence of market for idea results in higher sunk costs. Firm no.6 exploited their invention internally despite strong practice of patent protection in pharmaceutical industry. These examples do not represent usual relationship between peripheral determinants and exploitation strategy. However they do confirm that chosen exploitation strategy constituted by various determinants combined.

Framework displayed in Fig. 2 depicts the managerial framework to assess peripheral determinants of exploitation strategy. Peripheral determinants represent all determining factors of exploitation strategy relates to parties outside firm who possesses the invention. Peripheral determinants are challenging for firms to influence or make adjustment due to nature of indirect involvement between firms and

determinants. The peripheral determinants were discussed in previous sections and they composed of absence of market, market behavior, cognitive ability of recipients, intellectual property protection and country policy. The assessment of peripheral determinants is dynamic in nature. Firms shall keep an eye on changes occurred to each peripheral determinants, for example, changes in country policies, change in market behavior. Dynamic assessment allows company to replace the existing strategy with new one or decide to launch new strategy in parallel to the old one in order to keep exploitation strategy up-to-date with current commercialization contexts.

In addition to assessment of peripheral determinants of exploitation strategy, firms shall assess all other related determinants. For example, other determinants include domestic determinants of exploitations strategy which compose of firm's objectives, firm's resources and capabilities, level of invention tacitness and product life cycle [6]. All determinants of exploitation strategy shall be traded-off in order to employ a new exploitation strategy.

TABLE V: SUMMARY OF RESPONSES ON VARIOUS DETERMINANTS TOWARD EXPLOITATION STRATEGY

Firm No.	Chosen exploitation strategy	Impact of country policy toward exploitation strategy	Market for idea	Intellectual property protection method	Recipients
Firm 1	Internal Exploitation & External exploitation	Limit	Absence	No protection	Own Firm/Competitors/Customers
Firm 2	Internal Exploitation & External exploitation	Limit & Support	Absence	Non-disclosure agreement	Own Firm/Partners
Firm 3	External exploitation	Limit	Presence	No protection	Partners/Licensees
Firm 4	Internal exploitation	Limit	Presence	Product complication	Own Firm
Firm 5	Internal exploitation	Support	Presence	No protection	Own Firm
Firm 6	Internal exploitation	Support	Presence	Patent	Own Firm
Firm 7	Internal Exploitation & External exploitation	Support	Absence & Presence	Product complication	Own Firm/Partners
Firm 8	Internal Exploitation & External exploitation	Support	Presence	No protection	Partners/Franchisees
Firm 9	External exploitation	Support	Presence	Product complication	Partners/Licensees
Firm 10	Internal exploitation	Support	Absence	Trade secret	Own Firm

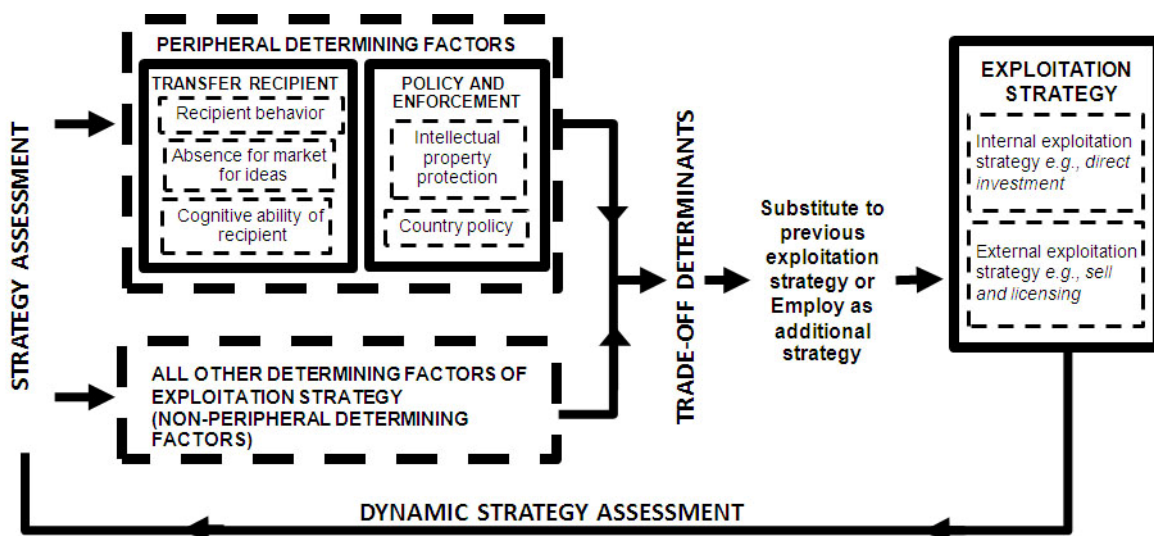


Fig. 2. Peripheral determinants of exploitation strategy framework.

## VI. CONCLUSION

It is essential for firms to choose the right method of exploitation for their invention. Firms need to be aware of the determinants that affect exploitation strategy in order to make necessary assessment. Empirical research found peripheral determinants of exploitation strategy as seen in proposed managerial framework in Fig. 2. This paper discusses finding of peripheral determinants of exploitation strategy and proposes a framework. Peripheral determinants refer to external factors firms have little or no influence to make adjustment or change. Research findings in this paper both confirm peripheral determinants of exploitation from past literatures and reveal new peripheral determinants. To assess peripheral determinants, firm should evaluate impact of intellectual property protection mechanism and country policies toward exploitation strategy. Each policy related to commercialization of invention may limit or favor certain exploitation strategy. Firm shall explore the regional policy of both transfer source and recipient in order to evaluate limitation and level of policy assistance to each exploitation method. In addition, firms shall understand the existence of market together with its behavior. When newness level of invention is very high, the market for idea may not exist thus certain method of exploitation might be limited or less attractive. When the invention has preexisting market, firm shall be able to assess the level of compatibility between choice of exploitation and existing or future consumer behavior. The chosen exploitation strategy shall align with market or consumer behavior. Moreover, cognitive understanding of recipient is also one of the key determining factors. Firms should plan the supporting cognitive system at recipient especially when transfer recipient is external party. Manipulating peripheral determinants are challenging because origination of these traits are mostly from external parties. Firms shall keep an eye on changes in these environments in order to make necessary adjustment on exploitation strategy.

## VII. LIMITATION AND FURTHER RESEARCH

This research discusses only peripheral determinants of exploitation strategy. When firms make decision on exploitation strategy, they should take into account both peripheral determinants and other type of determinants that affect exploitation strategy, for instance, domestic determinants.

In addition, the finding revealed generalized determinant from multiple industries, firm sizes and origins. Further researches on specific industry, firm size, and origin are encouraged in order to explore whether or not there are additional peripheral determinants in specific environments.

## ACKNOWLEDGMENT

This research is funded by Chulalongkorn University's 90<sup>th</sup> year Anniversary Scholarship.

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