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Venturing into Distant Realms of Knowledge through Technological M&A

: The Moderating Roles of the Acquirer Firm's Knowledge Diversity, Search Strategy, and Organizational Slack

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Seungryul Ryan Shin

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지도교수 강진아

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협동과정 기술경영경제정책 전공
신승렬

신승렬의 공학석사학위 논문을 인준함
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위 원 장 ＿＿＿＿＿＿＿＿＿＿(인)

부위원장 ＿＿＿＿＿＿＿＿＿＿(인)

위　　원 ＿＿＿＿＿＿＿＿＿＿(인)

Abstract

The main purpose of technological M&As is to acquire external knowledge that the acquirer firm does not possess, and to create value from it. In technological M&As, acquirer firms absorb not only related knowledge, such as similar and complementary knowledge, but also knowledge that is distant from the acquirer firm's existing knowledge base. Although distant knowledge is also valuable since it provides opportunities for novel recombination and value creation, prior research has overlooked the mechanisms of adopting and utilizing the knowledge from distant realms of knowledge and the characteristics of acquirer firms, which allow for a successful utilization of the distant knowledge. This study examines the impact of the acquired distant knowledge of the target firm on the firm's post-M&A exploration performance in distant realms of knowledge. It also seeks to identify characteristics of the acquirer firm that enhance the impact of distant knowledge on the firm's post-M&A exploration performance in distant realms of knowledge. Specifically, this study suggests that managerial and organizational conditions, a low level of knowledge diversity, in-boundary local search strategy and a larger amount of organizational slack, of the acquirer firm significantly enhances the impact of distant knowledge. This study employs a negative binomial model to analyze patent data of firms in the biopharmaceutical industry. The findings suggest that acquirer firms with a low level of knowledge diversity and boundary-spanning distant search strategy are best suited to adopt and utilize the distant

knowledge from the target firms and turn it into innovative outcomes.

Keywords: Technological M&A, Distant Knowledge, Exploration performance, Firm Characteristics
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Chapter 1.   Introduction

Rapid development of technology and the short technology life cycle in high technology industries require firms to keep up with the technological changes in order to sustain their competitive advantage (Eisenhardt and Martin, 2000; Teece, 2007; Sarkar, Echambadi, Agarwal, and Sen, 2006). Since firms are not able to develop all the required knowledge for innovation solely relying on their internal development due to a lack of abilities or the tremendous amounts of input required, they obtain highly developed technological knowledge or capabilities from outside the firm (Burgelman and Rosenbloom, 1989; Kozin and Young, 1994; Ranft and Lord, 2002). Among various external knowledge sourcing modes, technological M&A is one of the most widely utilized external knowledge sourcing modes (James, Georghiou, and Metcalfe, 1998; Cassiman, Colombo, Garrone, and Veugelers, 2005; Hagedoorn and Duysters, 2002; Kang and Kang, 2014). Technological M&A allows the acquirer firm to timely source knowledge that the acquirer firm needs (Dierickx and Cool, 1989), to develop synergy by recombining the acquired knowledge and capabilities of the target firm with those of the acquirer firm (Kogut and Zander, 1992), and to learn knowledge from new-to-the-acquirer firm knowledge areas (Sears and Hoetker, 2014; Makri, Hitt, and Lane, 2010). Technological M&A allows the acquirer firm to advance into unfamiliar knowledge areas as well as to enhance its innovation performance (Hagedoorn and Duysters, 2002; Cloodt, Hagedoorn, and Van Kranenburg, 2006).

Firms carrying out technological M&A aim to absorb other firm's technological knowledge and capabilities, which the firm does not possess or is difficult to develop internally (Burgelman and Rosenbloom, 1989; Sears and Hoetker, 2014). The acquired knowledge expands the knowledge base of the acquirer firm, providing benefits of an enlarged search scope (Fleming, 2001). The acquired knowledge may be recombined and integrated with the acquirer firm's existing knowledge, so as to create novel innovation (Taylor and Greve, 2006; Laursen and Salter, 2006). On the other hand, firms are less likely to acquire knowledge that the firm already possesses and has expertise on, since the acquired knowledge may result in redundancy and disruption in the acquirer firm (Sears and Hoetker, 2014; Song, Almeida, and Wu, 2003). Therefore, the purpose of firms utilizing technological M&As is more pursuing innovation through exploration of new possibilities rather than exploitation of old certainties (March, 1991).

Prior research on technological M&A focuses on the impact of knowledge relatedness between the knowledge bases of the acquirer firm and the target firm on the firm's post-M&A performance (Ahuja and Katila, 2001; Kapoor and Lim, 2007; Cloodt et al., 2006; Makri et al., 2010; Cassiman et al., 2005). Ahuja and Katila (2001) and Cloodt et al. (2006) emphasize the importance of adequate absorptive capacity, which allows for a successful utilization of the acquired knowledge. They argue that the knowledge base relatedness has a significant curvilinear effect on the firm's post-M&A innovation performance, which implies that a moderate level of knowledge relatedness between the acquirer firm and the target firm is the most beneficial for the firm's innovation

performance. Other researchers suggest that as the acquirer and the target firm have a higher knowledge relatedness, technological M&A facilitates creating innovation in its expertise areas, i.e., exploitative activities, but it impedes for research in new knowledge areas, i.e., explorative activities (Cassiman et al., 2005; Makri et al., 2010). However, one of the recent research on technological M&As argues that the acquirer firm's subsequent innovation performance after technological M&A is related with not only absorptive capacity for the acquired knowledge base, but also newness of the acquired knowledge (Sears and Hoetker, 2014). It emphasizes the newness of the acquired knowledge base which leads to less organizational disruption and provides more opportunities of novel recombination.

Despite emphasizing the importance of newness of the acquired knowledge (e.g., Ahuja and Lampert, 2001; Sears and Hoetker, 2014), prior research has not distinguished new-to-the-firm knowledge, specifically considering the degree of the differences in knowledge relatedness with the acquirer firm's existing knowledge base. It has only investigated the impacts of new-to-the-firm knowledge altogether. However, "new-to-the-firm" knowledge may be distinguished into two different knowledge characteristics according to the relative knowledge areas with the acquirer firm's existing knowledge areas: 1) Complementary knowledge, which is new to the acquirer firm knowledge area but still resides in the related knowledge realms, and 2) Distant knowledge, which is new to the acquirer firm knowledge area and resides in the unrelated or distant knowledge realms (Makri et al., 2010). While prior research has extensively examined the impact of

complementary knowledge (e.g., Makri et al., 2010; Cloodt et al., 2006; Ganzaroli, De Noni, Orsi, and Belussi, 2016), knowledge from distant knowledge realms has been overlooked and the impact of the distant knowledge on the subsequent innovation performance has not been closely examined. Considering that the purpose of technological M&A is to absorb other firm's knowledge and capabilities that the acquirer firm does not possess while being hard to develop internally, this study examines the impact of the distant knowledge on the firm's subsequent explorative innovation performance. Moreover, this study identifies the characteristics of the acquirer firm which allows for a successful identification and utilization of the distant knowledge. Since a firm's characteristic may be analyzed from various perspectives, the study examines the acquirer firm's characteristics that facilitates or impedes identification and utilization for the distant knowledge from three different perspectives which includes knowledge base characteristic (e.g., Cloodt et al., 2006), problem-solving search strategy (e.g., Katila and Ahuja, 2002), and organizational characteristic (e.g., Sears and Hoetker, 2014). Especially, this study examines the moderating effects of knowledge diversity for the perspective of knowledge base characteristic (Breschi, Lissoni, and Malerba, 2003; Miller, 2004), in-boundary local search for the perspective of problem-solving search strategy (Rosenkopf and Nerkar, 2001; Katila and Ahuja, 2002), and organizational slack for the perspective of organizational characteristic (Geiger and Cashen, 2002; Huang and Chen, 2010; Geiger and Makri, 2006).

This study uses a data sample which consists of technological M&A deals conducted

by firms in the biopharmaceutical industry. Negative binomial regression was adopted to test each of the hypotheses. The results confirm that, in the context of technological M&A, the acquired distant knowledge of the target firm positively affects the acquirer firm's post-M&A distant exploration performance. Moreover, the results confirm that firms having a low level of existing knowledge diversity and pursuing a boundary-spanning distant search strategy are suitable to adopt and utilize the acquired distant knowledge.

This study makes several contributions and implications to the research on technological M&A and knowledge management. First, it investigates the mechanism of the acquirer firm identifying and utilizing the distant knowledge, which prior research has overlooked. Second, this study suggests that acquirer firms with a less diversified knowledge base, an in-boundary local search problem-solving strategy, and a higher level of organizational slack to redeploy have a higher chance to achieve a successful identification and utilization of the distant knowledge. Further, this study suggests a framework that acquirer firms can utilize and diagnose themselves before a technological M&A is carried out for advancing into distant knowledge realms.

Chapter 2.   Theory and Hypothesis

2.1 Distant knowledge of the target firm & Post-M&A exploration performance in distant realms of knowledge

Prior research emphasizes that knowledge relatedness between the acquirer firm and the target firm has a significant impact on the firm's post-M&A innovation and development (Ahuja and Katila, 2001; Kapoor and Lim, 2007; Cloodt et al., 2006; Makri et al., 2010; Cassiman et al., 2005). Considering knowledge relatedness between the acquirer firm and the target firm, knowledge base of the target firm can be classified into two knowledge sections, knowledge in the familiar realms of knowledge, which is similar or complementary with the acquirer firm's existing knowledge (Makri et al., 2010; Cassiman et al., 2005), and knowledge in the distant realm of knowledge, which is new to the acquirer firm and unrelated with the existing knowledge base of the acquirer firm (Ahuja and Katila, 2001; Kapoor and Lim, 2007; Cloodt et al., 2006; Sears and Hoetker, 2014). Makri et al. (2010) and Cassiman et al. (2005) examine the impact of the related knowledge on the firm's post-M&A innovation performance. They suggest that the complementary knowledge base, which has a relatively higher technological distance from the acquirer's existing knowledge base comparing to the similar knowledge, allows the acquirer firm to have novel and high quality innovation. Further research, Sears and Hoetker (2014), highlights the importance of newness of the acquired knowledge for the firm's subsequent value creation. It argues that the more non-overlapped knowledge the

target firm have, the more opportunities of novel recombination are provided and the less organizational disruption occurs, thereby leading to a successful explorative innovation for the acquirer firm.

Especially in this research, I examine the impact of distant knowledge of the target firm on the acquirer firm's post-M&A innovation performance in distant realm of knowledge. Distant knowledge of the target firm is defined as knowledge that is new-to-the-firm and resides in distant realms of knowledge comparing to the acquirer firm's existing knowledge areas. Distant knowledge has a higher technological distance from the acquirer firm's existing knowledge base comparing to similar and complementary knowledge of the target firm, which are knowledge in related knowledge realms that the acquirer firm 'demonstrated familiarity with, or mastery of' (Ahuja and Katila, 2001; Makri et al., 2010). In other words, distant knowledge is unfamiliar knowledge that is neither similar nor complementary to the acquirer firm's existing knowledge (Makri et al., 2010). To help the understanding, figure 1 was inserted to indicate each of the similar, complementary, and distant knowledge areas of the target firm. This study focuses on the impact of the target firm's knowledge from distant realm of knowledge, i.e., distant knowledge of the target firm, on the acquirer firm's post-M&A explorative performance in distant realms of knowledge.
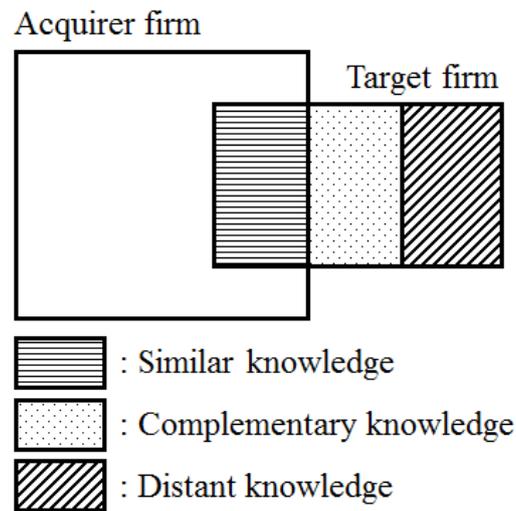
Figure 1. Similar, Complementary, and Distant knowledge areas of the target firm

Since distant knowledge is new to the acquirer firm, the acquirer firm lacks absorptive capacity for the distant knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002). The acquirer firm lacks not only the ability to learn and integrate with the existing knowledge, but also the ability to recognize the value and the potential of the distant knowledge (Zahra and George, 2002). However, since utilizing technological M&A allows to acquire the entire organization of the target firm, the acquirer firm may absorb the target firm's technological capabilities for the distant knowledge, such as human resources and R&D stocks specialized on the distant knowledge areas, along with the distant knowledge components (Ahuja and Katila, 2001; Cloodt et al., 2006; Ranft and Lord, 2002). The acquired technological capabilities and knowledge workers with expertise and understanding on the distant knowledge allow the firm to utilize the distant

knowledge for recombining and integrating with other proper existing knowledge of the acquirer firm (Grant, 1996; Song et al., 2003). Moreover, the acquired knowledge workers and the acquirer firm's existing knowledge workers would collaborate and complement each other when their active knowledge field and knowledge expertise differ from one another (Sears and Hoetker, 2014; Song et al., 2003). When the acquirer firm's existing knowledge workers have different expertise with the acquired knowledge workers, fewer conflicts may arise between knowledge worker groups of the acquirer firm and the target firm. Both workforces recognize that collaborating with each other based on proper capabilities and knowledge would benefit both workforces by creating novel innovation. In addition, Ghoshal (1987) and Hitt, Hoskisson, Johnson, and Moesel (1996) suggest when technological capabilities of the acquirer firm and the target firm have expertise on different areas, technological M&A allows the acquirer firm to have enlarged knowledge base and various opportunities for learning. Therefore, the absorbed capabilities of the target firm allow the distant knowledge to be recombined and integrated with the acquirer firm's existing knowledge more effectively. This recombination would result in the firm's explorative innovation in distant realms of knowledge.

The acquirer firm may escape from 'competency trap' through utilizing the acquired distant knowledge. Firms are usually being routinized (Nelson and Winter, 2009) or being fallen into a 'competency trap' (Levitt and March, 1988) as they develop their competency or as they become successful in their existing knowledge areas. However,

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since firms carrying out technological M&A have a purpose of overcoming the 'competency trap' and adopting new-to-the-firm knowledge from new knowledge areas (Burgelman and Rosenbloom, 1989; Sears and Hoetker, 2014), firms would devote its effort on creating novel innovation from the acquired knowledge. Once the target firm's knowledge base is combined with those of acquirer firm through technological M&A, the acquirer firm may take advantage of new-to-the-firm knowledge (Cassiman et al., 2005). The acquirer firm utilizing its broadened knowledge base can take the benefits of enlarged search scope. This enlarged search scope provides diversity and heterogeneity to the acquired firm's existing knowledge, thus, it provides various recombination and integration opportunities to the acquirer firm, which would lead to a new-to-the-firm knowledge creation (Prabhu, Chandy, and Ellis, 2005; Kim, Song, and Nerkar, 2012; Makri et al., 2010; Sears and Hoetker, 2014).

In sum, even though distant knowledge is new to the acquirer firm, the acquired distant knowledge can be absorbed and utilized effectively through technological M&A, which absorbs the entire technological capabilities of the target firm such as inventors or R&D capabilities. The acquired distant knowledge helps the acquirer firm to overcome 'competency trap' as well as to create novel innovation by providing various recombination opportunities with enlarged search scope. Hence, the first hypothesis states, as follows:

Hypothesis 1: Distant knowledge of the target firm has a positive effect on the acquirer

firm's post-M&A exploration performance in distant realms of knowledge.

Although technological M&A is an effective external knowledge sourcing strategy for acquiring knowledge from distant realms of knowledge, the extent to which the acquired distant knowledge is adopted and well-utilized by the acquirer firm highly depends on the acquirer firm's various firm characteristics. These characteristic may be analyzed in various perspective of the acquirer firm, such as the acquirer firm's existing knowledge base characteristics, problem-solving firm strategy, or organizational characteristics. Therefore, in the following sections, we examine the moderating effects of three different firm characteristics of the acquirer firm from each of the perspectives which includes knowledge base, problem-solving strategy, and organization characteristics are closely investigated.

2.2 Knowledge base characteristic: The moderating role of knowledge diversity

As one of the acquirer firm's knowledge base characteristics, the study examines the moderating effect of the acquirer firm's pre-M&A knowledge diversity on the relationship between the distant knowledge acquired from the target firm and the post-M&A exploration performance in distant realms of knowledge. Knowledge diversity is the degree to which the firm has diversified its knowledge portfolio in order to make benefits

from knowledge from diverse knowledge areas (Quintana-García and Benavides-Velasco, 2008; Leten, Belderbos, and Van Looy, 2007). Firms diversifying their own knowledge portfolio are willing to take advantages of diverse knowledge base by creating more opportunities of cross-fertilization and novel recombination between internalized knowledge areas, thereby facilitating the acquirer firm's innovation activities (Granstrand, 1998; Leten et al., 2007).

Knowledge diversity of the acquirer firm, however, gives a negative moderating effect on the relationship between distant knowledge of the target firm and the acquirer firm's post-M&A exploration performance in the distant realms of knowledge. This makes negative impact on the acquirer firm's absorptive capacity on the distant knowledge acquiring from the target firm in terms of both potential and realized absorptive capacity (Zahra and George, 2002). Firms with diverse knowledge base have less incentive to search and to identify external knowledge from distant realms of knowledge. Firms that already have diversified their knowledge base and equipped sufficient diverse knowledge required for their innovation activities may have less incentive to acquire new-to-the-firm knowledge, especially knowledge from distant realms of knowledge (Miller, Fern, and Cardinal, 2007). Lower willingness to identify and adopt external knowledge from distant knowledge realms leads the acquirer firm devoting less effort on searching distant knowledge form external sources and identifying values of knowledge from distant knowledge realms (Breschi et al., 2003). Even after distant knowledge is acquired through external knowledge sourcing, the acquirer firm may not fully utilize the distant

knowledge due to resource and attention allocation problems. The acquirer firm with highly diversified knowledge base is more likely to learn within related knowledge areas through learning processes of the existing knowledge areas since these learning processes allow the firm to take advantage of economies of scale and complementarity (March, 1991; Breschi et al., 2003). Moreover, the acquired distant knowledge requires completely different capabilities in order to utilize and develop, which entail additional coordination costs, resources input, and managerial attention (Granstrand, 1998; Leten et al., 2007; Koput, 1997). Lastly, even if the acquirer firm already possesses knowledge from diverse knowledge areas, distant knowledge from external sources requires large amount of efforts to make novel recombination with the existing knowledge (Rosenkopf and Nerkar, 2001; Makri et al., 2010). Based on these reasons, highly diversified acquirer firm is less likely to identify the importance of distant knowledge of the target firm and less likely to utilize and develop the distant knowledge of the target firm. Hence, the second hypothesis states, as follows:

Hypothesis 2: Technological diversity of the acquirer firm will have a negative moderating effect on the relationship between distant knowledge of the target firm and the acquirer firm's post-M&A exploration performance in distant realms of knowledge

2.3 Problem solving strategy: The moderating role of search strategy

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This study examines the moderating effect of the acquirer firm's search strategy on the relationship between the distant knowledge of the target firm and the acquirer firm's post-M&A exploration performance in distant realms of knowledge. When a firm confronts with barriers and hurdles in its process of innovation activities, it searches solutions from knowledge inside or outside the firm. Following prior research on the firm's search scope or search strategy (Katila and Ahuja, 2002; Rosenkopf and Nerkar, 2001), firms' problem-solving strategy may be classified into local search and distant search. Firms chasing efficiency and high productivity are more likely to search knowledge from inside the firm and related knowledge areas with the existing knowledge base, that is, pursuing in-boundary local search strategy (Katila and Ahuja, 2002). On the other hand, firms chasing new and impactful knowledge creation are more likely to search knowledge from new-to-the-firm knowledge areas and look for beyond the firm knowledge boundary, that is, pursuing boundary-spanning distant search strategy (Rosenkopf and Nerkar, 2001). A firm's search strategy evolves from the firm's unique search history, thereby forming routines and trajectories on the firm's search behavior (Nelson and Winter, 1982). The two different problem solving strategies, in-boundary local search strategy and boundary-spanning distant search strategy, lead firms to adopt and utilize different types of knowledge when they search problem-solving knowledge for their innovation processes.

When a firm is more likely to pursue in-boundary local search, the firm is prone to rely on knowledge from knowledge areas related to the firm's existing knowledge base

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rather than knowledge from distant realms of knowledge. First, firms that conduct in-boundary local search and repeatedly create knowledge only within specialized knowledge areas may easily fall in 'propinquity trap', leading the firm to have path dependent and routinized searching patterns (Ahuja and Lampert, 2001; Nelson and Winter, 1982). Firms in the propinquity trap are less likely to exhibit explorative knowledge searching behaviors. Especially, exploration toward distant realms of knowledge requires the acquirer firm to have entrepreneurship (Ahuja and Lampert, 2001; Zahra, Sapienza, and Davidsson, 2006) and high incentive to change its expertise areas (Jain, 2015). Therefore, firms fallen in propinquity trap are less likely to identify and adopt knowledge from distant knowledge realms. Moreover, the propinquity trap of the acquirer firm may cause Not-Invented-Here syndrome (NIH syndrome) in the process of identifying and absorbing the distant knowledge (Hussinger and Wastyn, 2011; Katz and Allen, 1982), which hinders the acquirer firm's exploration in unfamiliar knowledge areas.

In contrast, firms pursuing boundary spanning distant search identify and acquire new-to-the-firm knowledge from outside the firm for problem-solving solutions. The acquired new-to-the firm knowledge is transferred to inside the firm and cross-fertilized with the firm's existing knowledge base, thereby allowing them to generate various novel distant combinations (Tushman, 1977; Von Hippel, 1994). Moreover, since the firm has a characteristic of openness in its search process, the acquirer firm is more likely to make risk-taking decisions in knowledge adaptation and utilization. Therefore, firms are more

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likely to acquire the target firm with distant knowledge and utilize the distant knowledge through vigorous cross-fertilization with the existing knowledge base (Miller et al., 2007). Hence, the third hypothesis states, as follows:

Hypothesis 3: Pursuing an in-boundary local search strategy has a negative moderating effect on the relationship between distant knowledge of the target firm and the acquirer firm's post-M&A exploration performance in distant realms of knowledge.

2.4 Organizational characteristic: The moderating role of organizational slack

Prior studies describe organizational slack as actual or potential resources that may play a role of cushion which allows a firm to adapt successfully to external environment change, such as market or technology shifts, or to internal pressures for firm adjustment (Bourgeois, 1981; Lawson, 2001; Huang and Chen, 2010). Prior research distinguishes organizational slack into absorbed slack and unabsorbed slack according to the existence forms of organizational slack (Sharfman, Wolf, Chase, and Tansik, 1988; Geiger and Makri, 2006; Huang and Chen, 2010). While unabsorbed slack is the slack resources readily available to a firm, absorbed slack is the resources embedded in a firm but is recoverable when the firm needs the slack for internal or external needs (Bourgeois and Singh, 1983). Some research argues that different types of organizational slack have different impact on a firm's innovation (Geiger and Makri, 2006; Geiger and Cashen,

2002). The study examines the impact of organizational slack with the two dimensions which include absorbed slack and unabsorbed slack. I argue that both types of organizational slack support the acquirer firm utilizing knowledge from distant knowledge realms for its innovation since both types of organizational slack facilitate the firm's explorative behaviors (Greve, 2003; Bourgeois, 1981; Cyert and March, 1963; Geiger and Cashen, 2002).

In order for acquirer firms to achieve a successful explorative innovation in distant knowledge areas, they should be able to overcome the uncertainty of explorative experiments. Since unabsorbed slack of firms plays a role of buffer for the uncertainty (Bourgeois, 1981; Cyert and March, 1963; Geiger and Cashen, 2002) while providing more discretion for managers (Nohria and Gulati, 1996), a firm can create innovative culture when it has a high amount of unabsorbed slack. This innovative culture and discretion given allows managers to have adventures on creating innovation through making novel recombination. Unabsorbed slack not only allows firms to resolve problems with new problem-solving approach, but it also makes firms to avoid from its familiar trap or competency trap (Ahuja and Lampert, 2001). Therefore, there would be more opportunities to utilize distant knowledge when the acquirer firm has a high amount of unabsorbed slack. Moreover, unabsorbed slack may buffer the additional cost for innovation projects (Damanpour, 1991; Huang and Chen, 2010), so the acquirer firm can put persistent investments on creating innovation from the acquired distant knowledge.

Absorbed slack also helps firms to have effective exploration activities. Although

absorbed slack is hard to be redeployed within a short period, it can be used as a buffer to support the firm's operations or maintenances (Huang and Chen, 2010; Sharfman et al., 1988; Cyert and March, 1963). Absorbed slack provides the required resources for innovation projects (Huang and Chen, 2010; Geiger and Makri, 2006) and it allows firms to have innovative activities, such as explorative learning (Singh, 1986). Moreover, redeploying creative and smart individuals for various innovation projects in a firm would facilitate knowledge transfer and learning activities throughout the firm (Huang and Chen, 2010). This way, the firm would be able to enjoy the benefits of economy of scope (Huang and Chen, 2010). Eventually, the firm may have a higher level of cross-fertilizations of knowledge from different fields, which include the knowledge from distant knowledge realms (Greve, 2003). Since distant knowledge is in different technological fields with the acquirer firm's existing knowledge and it requires various innovation projects to make novel recombination, it may be utilized more effectively in a firm where the more absorbed slack is present. Hence, the fourth hypothesis states, as follows:

Hypothesis 4: Organizational slack of the acquirer firm will have a positive moderating effect on the relationship between distant knowledge of the target firm and the acquirer firm's post-M&A exploration performance in distant realms of knowledge
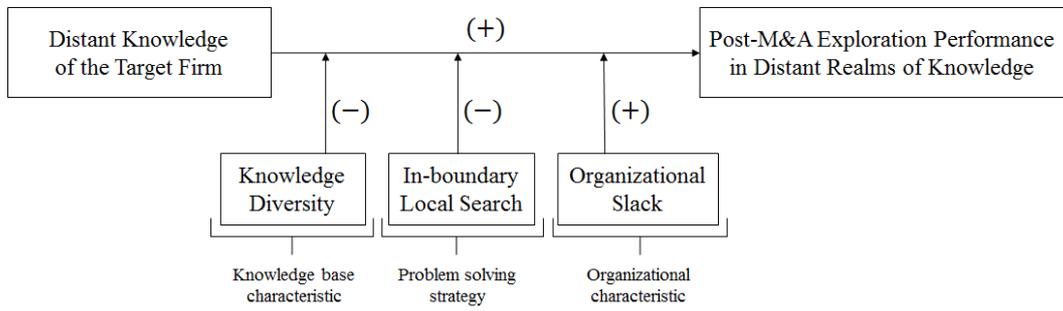
Figure 2. Research Model

Chapter 3.   Data and Method

3.1 Data specification

This study utilized data from a high-technology industry, specifically, the biopharmaceutical industry. The reasons I have collected this data from the biopharmaceutical industry are as follows (Bierly and Chakrabarti, 1996). First, a patent is a reasonable measure of firms' knowledge base operations in this industry. Firms in the industry apply for a patent once they develop new invention or innovation in order to legally protect the new knowledge. Since this industry has characteristics of high imitability and low secrecy, it is hard to protect the new knowledge without patenting the knowledge. Second, a firm's competitiveness is determined by the firm's technological learning in the industry. A firm's internal knowledge and the corresponding capabilities affect the firm's competitiveness or profitability more than other economic factors. Therefore, this industry is suitable for examining the effects of knowledge base operation strategy and the other firm factors on the entire firm's innovation performance.

I collected the data from three different data sources, Thomson Reuters SDC Platinum database, Datastream, and United States Patent and Trademark Office (USPTO) database. First, information on M&A deals conducted by firms in the U.S biopharmaceutical industry between 2001 and 2008 was collected from the Thomson Reuters SDC Platinum database. Then, each firm's financial information was collected from Datastream. I collected information on the patents granted to each firm between 1996 and 2014 from

the United States Patent and Trademark Office (USPTO) database. Then, in order to compose the dataset with only appropriate M&A deals, I excluded self-acquisition M&A deals, which firms perform in order to acquire their remaining assets or financial stocks. Following Ahuja and Katila (2001), none-technological M&A deals, i.e., deals in which the target firm has no granted patent before the M&A deal, were excluded in order to comprise a data set containing only M&A deals related to technological acquisition. The final dataset includes 235 technological M&A deals conducted by firms in the U.S biopharmaceutical industry between 2001 and 2008.

3.2 Variables

3.2.1 Dependent variable

Acquirer firm's post-M&A explorative performance in distant knowledge realms

This study defines each of the pre- and the post-M&A time periods in order to compare the knowledge base operation of the acquirer and the target firm before and after the M&A deal. I selected 5 years prior to the M&A deals as the pre-M&A time periods, and captured pre-M&A knowledge base of the acquirer firm and the target firm based on patent granted to each firm during the time period (e.g., Cloodt et al., 2006). Then, I used a two-year time lag due to consideration for the M&A effectuation period and for the time it takes for applied patents to be granted (Phene, Tallman, and Almeida, 2012). I set the time period of five years after the two-year time lag as the post-M&A time periods, and captured the post-M&A knowledge base of the acquirer firm based on patents granted for

the acquirer firm during the time period (Ahuja and Katila, 2001).

The dependent variable *Acquirer firm's post-M&A explorative performance in distant knowledge realms* is captured using the number of patents granted to the acquirer firm during the post-M&A time period (Hitt et al., 1996; Sørensen and Stuart, 2000; Geiger and Makri, 2006; Makri et al., 2010). In order to classify the post-M&A innovation performance in distant knowledge realms in which the acquirer firm has not granted any patent before the M&A deal, I adopted the related subject matter classification arranged by USPTO (2012). The related subject matter classification classifies the USPTO 3-digit main patent class classification according to relatedness between knowledge areas. Thus, utilizing the classification is suitable to classify distant knowledge, i.e., unfamiliar and unrelated knowledge areas with the acquirer firm's existing knowledge areas. I counted the number of patents granted to the acquirer firm during the post-M&A time period, focusing only on patents that belong to the related subject matter classification, in which the acquirer firm had no patent granted before the M&A deal.

3.2.2 Independent Variables

Distant knowledge of the target firm

Prior studies utilize various measurements for knowledge relatedness between two firms' knowledge base. While some of the prior studies utilize the ratio of target firm's knowledge base that is overlapped with the acquirer firm's entire knowledge base for measuring the knowledge relatedness of the acquirer and the target firms' knowledge base

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(Ahuja and Katila, 2001; Cloodt et al., 2006), other research counts the number of patents

that were granted to both of the acquirer firm and the target firm in common knowledge

areas for measuring the degree of patent overlap (Makri et al., 2010; Orsi, Ganzaroli, De

Noni, and Marelli, 2015). Especially, Makri et al. (2010) utilizes patent main-class

numbers, which have been classified into 417 patent classes by United States Patent and

Trademark Office (USPTO) database, as well as technological subcategory numbers,

which were aggregated the 417 main classes into 36 technological subcategories by Hall,

Jaffe, and Trajtenberg (2001), in order to measure similar technology and complementary

technology. While similar technology was captured using the number of patents, which

are assigned to the duplicated patent class number, complementary technology was

measured using the number of patents, which have the duplicated subcategories number

but non-duplicated patent class numbers. Then, each patent count was divided by the

acquirer firm and the target firm's pre-M&A entire knowledge base in order to construct

each of the similarity and complementarity variables. Extending the measure of Makri et

al. (2010), this study measured distant knowledge of the target firm by counting the

number of patents granted to the acquirer firm during the pre-M&A time period, which

belongs to related subject matter classification that the acquirer firm had not granted any

patent during the pre-M&A time period. Then, I divided the number of distant knowledge

of the target firm by the pre-M&A entire knowledge base of the acquirer and the target

firm in order to construct the variable. Hence, the independent variable *Distant

knowledge of the target firm* was constructed using the following equation.

$$\text{Distant knowledge of the target firm}$$

$$= \frac{\text{The target firm's patents granted in distant knowledge areas}_{(t-5,t-1)}}{\text{Patents granted to the acquirer firm} + \text{the target firm}_{(t-5,t-1)}}$$

Knowledge Diversity

Knowledge diversity of the acquirer firm was measured based on the acquirer firm's pre-M&A time period knowledge base. Following prior research (Ahuja and Katila, 2001; Huang and Chen, 2010; Ganzaroli et al., 2016), Shannon entropy index $\sum P_i \times \ln(1/P_i)$, where P_i is percentage of number of the patent granted belong to ith USPTO 3-digit mainclass over the entire knowledge base of the target firm, was adopted to calculate pre-M&A knowledge diversity of the acquirer firm.

In-boundary Local Search Strategy

In-boundary Local Search Strategy of the acquirer firm was measured based on the backward citation information of the patent granted to the acquirer firm during pre-M&A time period. I counted the number of backward citation made on the patent granted to the acquirer firm, i.e., self-cited citations. Then, divide the number of self-cited citations by the whole number of citation made by the acquirer firm's patent during pre-M&A time period, thereby creating a continuous variable for a precise measure of the firm's search strategy. Hence, high value of *In-boundary Local Search Strategy* represent the firm's tendency to search and rely on In-boundary and local knowledge for its innovation

solution.

Organizational slack

Following the measure utilized in prior research (Bourgeois, 1981; Bourgeois and Singh, 1983; Geiger and Makri, 2006), organizational slack was measured using the firm's quick ratio for a year before the M&A deal, which represents the firm's resources that are readily available.

3.2.3 Control Variables

Several control variables were included in order to control the other influences on the dependent variable that may stem from other firm and M&A deal specific factors. *Absolute size of Knowledge base* of the acquirer firm was included as a control variable. The variable was captured using the whole number of patents granted to the acquirer firm during pre-M&A time period. This variable controls the influence of accumulated knowledge stocks, R&D capabilities, and absorptive capacity (Ahuja and Katila, 2001; Phene et al., 2012) on the post-M&A explorative performance in distant knowledge areas. *Relative size of knowledge base* was included in order to control the effect stems from knowledge base size difference between the acquirer firm and the target firm (Ahuja and Katila, 2001; Sears and Hoetker, 2014). The variable was calculated by dividing the number of patent granted to the target firm by the number of patent granted to the acquirer firm during the pre-M&A time period. *Firm size* was included, so as to control

the influence stems from difference in the firm size. The variable was calculated by taking natural log on the number of employee in the previous year of the M&A deal (e.g., Rosenkopf and Almeida, 2003). *Sales* of the acquirer firm was included as a control variable since financial performance of the firm would have significant impact on the firm's post-M&A innovation outcomes. Sales during the previous year of the M&A deal were collected to construct the variable (Phene et al., 2012). *R&D intensity* of the acquirer firm was included as a control variable since R&D intensity of the acquirer firm would influence the firm's post-M&A innovation outcomes. The variable was calculated by dividing the R&D expense by the sales in the previous year of the M&A deal (Kim et al., 2012). *M&A stock percentage* was included in order to control the influence stems from M&A stock acquired percentage difference (Phene et al., 2012). I also included several dummy variables for control influences stem from *M&A deal year, Technological sector, Foreign acquisition,* and *Firm nationality*.

3.3 Method – Negative binomial regression

Since the dependent variable, *Acquirer firm's post-M&A explorative performance in distant knowledge realms*, is constructed using the number of patents granted to the acquirer firm, the variable has non-negative discrete and integer values. For this type of dependent variable, Poisson regression or Negative binomial regression may be utilized (Hausman, Hall, and Griliches, 1984). However, in order to employ Poisson regression, the dependent variable should not be over-dispersed and the mean and variance of the

variable should be nearly the same, which the dependent variable for this research does

not satisfy. Therefore, I used Negative binomial regression to test the hypotheses.

Chapter 4.   Results

<Table 1> shows the descriptive statistics for each variable and the correlation between each variable. None of the correlation values exceeds 0.70 threshold, which confirms that no correlation problem occurs between the variables (Cohen, Cohen, West, and Aiken, 2003). Moreover, I performed variance inflation factors (VIF) tests in order to ensure that no multi-collinearity problem exists in each of the testing models. Maximum and mean values of VIF are represented in each model in <Table 2>. All of the VIFs have value of under 3, which confirms that each of the models does not have multi-collinearity problems (Myers, 1990).

The results from negative binomial regression are shown in <Table 2>. From Model 1 to Model 5, each model examines the effects of the control variables and independent variables on the dependent variable. Model 1 indicates that the control variables *Absolute size of Knowledge base, Firm size, and R&D intensity* have significant impacts on *the post-M&A exploration performance in distant realms of knowledge.* As Model 2 shows, the direct effect of distant knowledge of the target firm has positive and significant ($p<0.05$) effect on the post-M&A explorative performance in distant realms of knowledge. This positive and significant effect is also confirmed by other models, model 3 to model 5. Therefore, Hypothesis 1, which argues the positive effects of *distant knowledge* of the target firm on the acquirer firm's post-M&A explorative performance in distant realms of knowledge is supported. Model 3 examines moderating effect of

Table 1. Descriptive Statistics

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Distant explorative performance	5.29	6.15	1.00										
2. Distant knowledge	0.05	0.11	0.05	1.00									
3. Knowledge diversity	3.14	4.10	-0.05	-0.19	1.00								
4. In-boundary local search	0.10	0.09	-0.07	-0.21	0.16	1.00							
5. Organizational slack	2.76	2.83	-0.12	0.08	-0.23	0.18	1.00						
6. Knowledge base (Absolute)	276.47	477.74	0.00	-0.22	0.32	0.21	-0.23	1.00					
7. Knowledge base (Relative)	0.66	2.65	0.01	0.40	-0.11	-0.14	0.04	-0.13	1.00				
8. Firm size	3.73	0.89	0.19	-0.33	0.40	0.03	-0.57	0.47	-0.18	1.00			
9. Sales	1.67E+07	6.86E+07	-0.04	-0.06	-0.01	0.16	-0.08	0.00	-0.05	0.16	1.00		
10. R&D Intensity	109.66	1675.44	0.15	0.03	-0.03	-0.04	0.07	-0.04	0.00	-0.07	-0.02	1.00	
11. M&A stock %	85.68	31.99	0.01	0.07	-0.12	-0.07	0.07	-0.03	0.00	-0.17	-0.04	-0.16	1.00

knowledge diversity of the acquirer firm. While the moderator variable *Knowledge diversity* has non-significant effect on the dependent variable, the interaction term of *Distant knowledge* and *Knowledge diversity* has negative and significant effect ($p<0.05$) on the dependent variable. Model 4 and Model 5 also confirm the negative and significant effect of the interaction term of distant knowledge and knowledge diversity on the dependent variable. This shows support for hypothesis 2, which argues the negative moderating effect of knowledge diversity of the acquirer firm on the relationship between distant knowledge of the target firm on the acquirer firm's post-M&A explorative performance in distant realms of knowledge. Model 4 examines the moderating effect of *In-boundary local search* strategy of the acquirer firm. As Model 4 indicates, the interaction term of *Distant knowledge* and *In-boundary local search* has negative and significant ($p<0.05$) effect on the dependent variable. Model 5 also confirms the negative and significant effect of the interaction term. This supports hypothesis 3, which argues negative moderating effect on the relationship between distant knowledge and the post-M&A explorative performance in distant realms of knowledge. Model 5 shows the effects of each variable on the dependent variable with including all the variables in the model. Model 5 indicates that the moderating term *Organizational slack* and the interaction term of *Distant knowledge* and *Organizational slack* have non-significant impact on the dependent variable, thereby not supporting hypothesis 4.

Table 2. Negative binomial regression results table

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
Independent Variables					
Distant Knowledge		1.223**	2.457***	2.680***	2.584*
		(0.588)	(0.854)	(0.868)	(1.558)
Knowledge diversity			-0.015	-0.012	-0.012
			(0.022)	(0.022)	(0.022)
Distant Knowledge X Knowledge diversity			-1.642**	-1.540**	-1.506*
			(0.703)	(0.715)	(0.828)
In-boundary local search				0.396	0.395
				(0.841)	(0.858)
Distant Knowledge X In-boundary local search				-5.042**	-5.064**
				(2.307)	(2.318)
Organizational Slack					0.001
					(0.0419)
Distant Knowledge X Organizational Slack					0.018
					(0.250)
Control Variables					
Knowledge base (Absolute)	-0.001***	-0.001***	-0.000***	-0.001***	-0.001***
	(0.000)	(0.000166)	(0.000)	(0.000)	(0.000)
Knowledge base (Relative)	0.0274	0.007	0.009	0.003	0.003
	(0.027)	(0.026)	(0.027)	(0.027)	(0.027)
Firm Size	0.637***	0.689***	0.716***	0.703***	0.703***
	(0.101)	(0.103)	(0.103)	(0.104)	(0.132)
Sales	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R&D Intensity	0.000*	0.000*	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M&A Stock %	0.003	0.003	0.003	0.004*	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	235	235	235	235	235
Control Dummy Variables	Included	Included	Included	Included	Included
Log likelihood	-618.968	-616.240	-613.849	-613.844	-621.329
Prob> chi-square	0.000	0.000	0.000	0.000	0.000
LR χ^2	56.79	62.24	67.02	67.03	52.06
Mean VIF	1.26	1.29	1.36	1.37	1.44
Max VIF	1.59	1.65	1.72	1.80	2.43

Chapter 5.   Discussion and Conclusion

This study examines the effect of the distant knowledge acquired from the target firm on the acquirer firm's post-M&A explorative performance in distant realms of knowledge. It further suggests the acquirer firm's knowledge diversity, in-boundary local search strategy, and organizational slack as three different acquirer firm's characteristics which would affect identification, adaptation, and utilization of the distant knowledge of the target firm. The study examines the hypotheses based on dataset from 235 technological M&A deals conducted by firms in U.S biopharmaceutical industry utilizing Negative binomial regression. Overall, the results confirm that distant knowledge from the target firm has a positive impact on the post-M&A explorative performance in distant realms of knowledge. Moreover, both acquirer firm's characteristics of knowledge diversity and in-boundary local search strategy have negative moderating effects on the relationship between distant knowledge of the target firm and the post-M&A explorative performance in distant realms of knowledge.

In addition, I increased the robustness of the results through case analyses. I selected two M&A deal cases from the research data sample and analyzed the cases in detail. First case is the technological M&A deal in which Volcano Corp. acquired AXSUN Technologies Inc. in order to integrate the laser and optical technologies of AXSUN Technologies Inc. with Volcano Corp.'s existing expertise on diagnosis and treatments of peripheral artery and coronary diseases. Second case is the technological M&A deal in

which Newport Corp. acquired Design Technology Corp in order to enhance the Newport Corp.'s existing knowledge on designing and manufacturing precise instruments by combining with Design Technology Corp's automation and robotics designing capabilities. Both firms were possible to further develop the target firm's expertise while having the possibility to successfully integrate their existing knowledge base with those of the target firm after the M&A deals. Both cases show that technological M&A is an effective means to absorb knowledge form distant knowledge areas. Moreover, both cases reveal that firms with a low level of existing knowledge diversity, boundary-spanning distant search strategy, and a high level of organizational slack are suitable to adopt and utilize distant knowledge of the target firm successfully. More details on the cases are described in the appendix A1 and A2.

This study makes several contributions on the research fields of knowledge management. First, to the best of our knowledge, the study first closely investigates the characteristics of knowledge acquired from distant realms of knowledge. This study examines the effect of knowledge from distant realm of knowledge and the mechanism of distant knowledge adoption and utilization. Especially, focusing on the context of technological M&A, this study explicates processes of knowledge detection, adoption, and utilization for the target firm's distant knowledge. The findings suggest that detecting and adopting knowledge from distant realms of knowledge requires firms' tendency to have explorative searching behaviors and entrepreneurship which allow the firm to have risk-taking behaviors and challenging for uncertainties. Moreover, utilizing knowledge

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from distant realms of knowledge may be facilitated when the firm is possible to invest and to put efforts on the knowledge areas. This implies that distant realms of knowledge requires higher efforts and risk-taking in order to realize the potential of the knowledge.

Second, this study suggests technological M&A as an effective external knowledge sourcing strategy, which allows the acquirer firm to successfully learn knowledge from distant realms of knowledge. Prior research argues that although distant knowledge from outside the firm provides novelty to the acquirer firm, the distant knowledge is hard to adopt and utilize by the acquirer firm since the acquirer firm lacks absorptive capacity on the distant knowledge areas (Cohen and Levinthal, 1990), thereby hindering the firm's innovation performance in distant realms of knowledge (Ahuja and Katila, 2001). However, since technological M&A is unique in that the acquirer firm acquires the entire organization of the target firm, the acquirer firm is possible to equip both potential and realized absorptive capacity through acquiring from the target firm (Zahra and George, 2002). This allows the acquirer firm to fully utilize the acquired distant knowledge and successfully develop within the distant realms of knowledge.

The findings of the study provide several managerial implications for firms conducting technological M&A to advance into distant knowledge realms or to acquire distant knowledge. This study suggests acquirer firm's firm characteristics which facilitate the acquisition and utilization of the distant knowledge from the target firm, thereby allowing firms to diagnose themselves before they actually carry out technological M&A for advancing into distant realms of knowledge. First, firms should

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focus on certain knowledge areas and have in-depth knowledge in certain knowledge areas rather than diverse knowledge areas. In other words, firms should be specialized and focused on small number of knowledge areas. Second, firms should have a boundary-spanning search routine, which prevents the firm from falling in 'propinquity trap' or NIH syndrome and to find problem solving solutions that are unfamiliar and new to the firm. Lastly, firms should try to possess a larger amount of organizational slack, which helps the firm to overcome uncertainty and to support the acquirer firm's effort on advancing into unfamiliar knowledge realms. Managers may diagnose the acquirer firm itself before they advance into distant realms of knowledge utilizing technological M&A.

Although this study provides numerous theoretical contributions and managerial implications, it still has limitations which I hope future studies may address. First, the study utilized granted patent data to capture the acquirer and the target firm's knowledge base operation. Prior research points out several limitations of using patent data for measuring knowledge base of firms. Under different circumstances, firms may not apply for patent in order to secure the secrecy on its innovation and knowledge. Moreover, patents represent the firm's explicit knowledge that may be codified and be documented into writing, so that it may exclude the firm's tacit knowledge (Kleinknecht, Van Montfort, and Brouwer, 2002). Second, the study tested hypotheses using dataset based on technological M&A conducted in U.S biopharmaceutical industry. Future research should test the hypotheses in different settings of external knowledge sourcing modes and in various industries in order to generalize the findings.

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Appendix: Case analyses

A1. Case 1: Volcano Corp. Acquiring AXSUN Technologies Inc.

Volcano Corp. acquired AXSUN Technologies Inc. in 2008. Before the M&A deal, Volcano Corp. has developed products that diagnose and treat coronary and peripheral artery diseases. AXSUN Technologies Inc., specializing in developing laser and optical engines, is acquired to enhance Volcano Corp.'s existing diagnosis and treatment products and to integrate the existing product with AXSUN Technologies Inc.'s optical imaging technologies. A year after the M&A deal, AXSUN, a wholly-owned subsidiary of Volcano Corp., successfully came up with a breakthrough integrated light source architecture for OCT (Optical Coherence Tomography) imaging, which improves the imaging speed and laser-based designs (Volcano Corporation, 2009). Moreover, about three years after the M&A deal, the firm announced a development of advanced photonic components and subsystems, which allow to contribute on telecommunication system development (Ahern, 2013).

AXSUN Technologies Inc. had granted 56 patents, 93.3 % of the entire number of patent granted to AXSUN Technologies Inc. in pre-M&A time period, in knowledge areas that are distant or unrelated to the pre-M&A knowledge base of Volcano Corp. This reveals that the M&A deal acquiring AXSUN Technologies Inc. was intended to acquire distant knowledge from the firm. This resulted in novel innovation through successful integrations between the acquirer and the target firm's knowledge bases.

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The pre-M&A firm characteristics of Volcano Corp. allow them to successfully adopt and utilize the distant knowledge of AXSUN Technologies Inc. First, Volcano Corp. has focused on a small number of knowledge areas before the M&A deal. It has developed its core competency in treatment care and diagnosis technologies. Specifically, it only had granted patent in two different main-class categories, which are classified as 'Body treatment care – Surgery' and 'Manufacturing – Metal working' by USPTO. Second, search strategy of the firm was heavily relied on boundary-spanning distant search. Self-citation only took up 1.8% of the firm's overall citations or solution search processes, which implies that the firm had rarely found the solutions for invention from their existing knowledge. Lastly, the firm possessed a large amount of organizational slack. The quick ratio was 6.86, which is very high relative to the average value of our research sample, 2.76. In sum, a low level of existing knowledge diversity, pursuing a boundary-spanning distant search strategy, and a high level of organizational slack before the M&A deal enabled Volcano Corp. to effectively develop the distant knowledge after the M&A deal.

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A2. Case analysis 2: Newport Corp. acquiring Design Technology Corp.

Newport Corp. acquired Design Technology Corp. in 2001. Newport Corp. had specialized in designing and manufacturing highly precise instruments and components before the M&A deal. It had improved productivity and precision for various manufacturing, measurement, and other engineering devices. Design Technology Corp. had its strength at designing machinery and automation systems, which allows to integrate various applications with robotic assembly systems (Cargile, 2001). Newport Corp. acquired Design Technology Corp. in order to 'enhance fiber optics automation, robotics, and testing capabilities (Cargile, 2001)'. Newport Corp. created various inventions by integrating the firm's existing knowledge base with the acquired Design Technology Corp.'s expertise after the M&A deal. This allowed Newport Corp. to enhance its manufacturing productivity and measurement precision.

Design Technology Corp. possessed 9 patents granted in knowledge areas that are distant or unrelated to the pre-M&A knowledge base of Volcano Corp. before the M&A deal. This takes up 100% of the entire number of the patents granted to in pre-M&A time period, which implies that the M&A deal was aiming to acquire Design Technology Corp.'s knowledge in unrelated and distant knowledge realms. Newport Corp. proved that it has successfully developed knowledge in previously unknown knowledge areas by granting 11 patents in distant knowledge areas during the post-M&A time period.

The pre-M&A firm characteristics of Newport Corp. were also suitable for developing knowledge and expertise in distant knowledge areas. First, Newport Corp. had a low level

of knowledge diversity. It only had in-depth knowledge and expertise on two different categories, 'Measuring, Testing, Precision Instruments: Optical: Systems and Elements' and 'Stock Material'. Second, Newport Corp. has a low level of self-citation. The self-cited citation only takes up 5.2% of its entire problem solution search processes, which implies that the firm had been more likely to rely on boundary-spanning distant search strategy in creating new inventions before the M&A deal. Lastly, the level of organizational slack in the firm was very high. The quick ratio of Newport Corp. before the M&A deal was 7.34, which largely exceeds the average quick ratio value of our research sample. This supports the arguments of the study, which suggest focusing on a small number of knowledge areas, possessing a large amount of organizational slack, and pursuing a boundary-spanning distant search strategy before the M&A are beneficial for adopting and utilizing the acquired distant knowledge.

References for Case analysis 2

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Abstract (Korean)

기술중심 인수합병 (Technological M&A)의 주 목적은 인수기업이 기존에 가지고 있지 않던 분야의 기술을 외부로부터 습득하여 가치를 창출하는 것이다. 실제로, 기술중심 인수합병은 인수기업의 기존 기술과 지식관련성이 높은 유사하거나 상호보완적인 기술뿐만 아니라 지식관련성이 낮은 비관련 기술 (Distant knowledge)을 습득하기 위해 활발히 활용되고 있다. 외부로부터 획득한 비관련 기술은 기업에 기술의 재조합과 가치 창출 기회를 제공하는 중요한 요인임에도 불구하고, 기존의 연구에서는 흡수역량 (Absorptive Capacity)의 부재를 이유로 비관련 기술의 도입과 활용 메커니즘을 간과하였다. 또, 비관련 기술의 성공적인 도입과 활용을 위해 갖추어져야 할 기업의 특성에 집중하지 않았다. 본 연구에서는 기술중심 인수합병이 비관련 기술을 인수하는데 유용한 외부 지식 습득 전략임을 제시하며, 피인수기업의 비관련 지식이 인수합병 이후 인수기업의 비관련 기술 분야로의 탐색적 혁신 성과에 미치는 영향을 규명한다. 또, 인수기업의 각 지식기반 특성, 지식 탐색 전략, 조직적 특성의 관점에서, 지식 다양성 (Knowledge diversity), 기업 내부 국지적 탐색 전략 (In-boundary local search strategy) 그리고 조직여유 (Organizational slack)가 인수합병을 통한 비관련 기술의 가치 식별 (Value identification)과 활용 (Utilization)에 미치는 영향을 분석한다.

본 연구는 미국 바이오 약품 산업에서 2001년과 2008년 사이에 발생한

235개의 기술중심 인수합병 데이터와 각 기업의 특허 데이터를 음이항 모형 (Negative binomial regression)을 사용하여 분석했다. 이를 통해, 기술중심 인수합병을 통한 피인수기업의 비관련 지식 유입이 인수기업의 탐색적 혁신 성과로 이어질 수 있음을 입증했다. 또, 인수기업이 낮은 지식 다양성을 가지고 있고 기업 외부 광역적 탐색 전략을 활용할수록 기술중심 인수합병을 통해 인수한 피인수기업의 비관련 지식이 더 큰 탐색적 혁신 성과로 이어짐을 확인했다.