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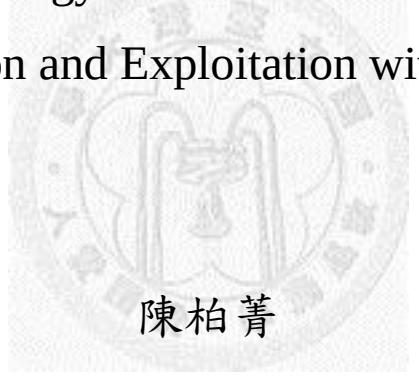
技術策略與公司策略在探索與利用架構下之影響

The Impact of Technology Orientation and Strategy Orientation: Exploration and Exploitation within Firms



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中文摘要

企業為了維持競爭優勢，透過各種方式發展技術能力是很常見的，過去許多學者探討技術創新的兩種模式：探索(Exploration)與利用(Exploitation)何者較為適合，然而卻較少學者關切在兩者同時並重下的效果與影響。因此藉由資源基礎理論與雙依(Ambidexterity)觀點，本研究特別針對同時追求探索(Exploration)與利用(Exploitation)兩種模式對於公司財務績效之影響，並進一步探討技術創新模式與公司策略之搭配所產生最適之情境。

本研究在資料蒐集方面，以 2000 至 2009 年美國地區上市公司發表的專利為主，以 USPTO 與 COMPUSTAT 資料庫為主要的資料來源進行研究，對於企業的技術發展策略與公司策略作深入探討。然而，在探討此關係時，鑒於投資 R&D 以發展技術是公司獲取技術的一個主要途徑，本研究亦將公司對於 R&D 投入之方式納入考量。

本研究最後提供了實務上的管理意涵，意即公司在實際發展技術時應如何有效分配其資源作為投入，並且搭配公司現有的公司策略與 R&D 投入進行決策，藉此極大化公司財務之表現。

關鍵字：技術策略、公司策略、探索(Exploration)、利用(Exploitation)

ABSTRACT

Developing technology capability is one of the main ways of maintaining firm's competitive advantage. Previous studies has focused on exploration and exploitation and discussed which kind of technology orientation is better to firms. However, seldom of them discussed the ambidexterity effect between exploration and exploitation. Based on resource-based theory and ambidexterity view, our study focuses on the effects of technology orientation and strategy orientation to firm's financial performance.

The data of our study mainly came from 2000 to 2009 patents in USA. The databases are USPTO and COMPUSTAT. However, since investing R&D is also a common way of reaching technology capability, we further take R&D into consideration in our study.

In the end, our study proposed some practical managerial suggestion to help firms make relevant decision when it comes to technology orientation and strategy orientation. Also, we provided a feasible way of investing R&D to optimize firm's financial performance.

Key words: technology orientation, strategy orientation, exploration, exploitation

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Chapter 1 INTRODUCTION

1.1 Research Background

In the past hundred years, the social economy of human being has transformed dramatically. We begin with agricultural society which stands for the labor intensive formation of social economy. After industrial revolution, the human society became more capital-intensive. In such kind of society, capital is the most valuable asset to entrepreneurs and also the symbol of productivity. For the recent decades, the human society became technology-intensive. Now a day, knowledge is the thing which we value the most and the key point when firms competes each other, especially for the high knowledge-intensive industry (ie. semiconductor industry, biotech industry).

When it comes to such kind of knowledge-intensive industry, technology capability is always one of the key indicators of firms' competence relative to others. Among all different composition of technology capability, patent is one critical attribute of measuring technology capability. However, there are diversified ways to develop the technology portfolio. Organizational scholar March (1991) defined two concepts of ways when firms tries to develop technology distribution as follow: "Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution".

In light of the ambidexterity view from March (1911), there are some conceptualizations of highlighting the balance of the conflictions from exploration and exploitation. Nevertheless, most of these studies which tried to use the balanced view between exploration and exploitation (e.g., Levinthal, 1997; Rivkin & Siggelkow, 2003) have noted that there are alternative organizational forms, for instance, centralized structures versus decentralized structures and mechanistic versus organic ones, are better than either exploration and exploitation boundaries (Brown & Eisenhardt, 1997; Nickerson & Zenger, 2002; Siggelkow & Levinthal, 2003). Recently, scholars have paid more attention on the construct of balancing the exploration and exploitation (e.g., Raisch and Birkinshaw 2008). Such kind of firm and organization that reach ambidexterity is considered to performance better due to the dual-capacity.

The technology tendency may be driven by different firm strategies since every types of strategy have different way in allocating resources. However, there are a lot of strategies announced by scholars (e.g., Miles and Snow, 1978; Rumelt, 1974; Barlow, 2000). Also, scholar (Porter 1996) argued that different strategies are appropriate in pairing different resources. This kind of relationship between strategies and resources allocation are called strategic fit. Strategic fit refers to the consistency of firm's activities, capabilities and resources, which creates synergy and further support the strategies of firms to sustain the competitive position among competitors.

On the other hand, R&D intensity has been discussed as various roles when we analyze the technology related issue. Previous researches have regarded the R&D intensity as an independent variable (Sahaym et al., 2010) or a control variable (Lavie and Rosenkopf, 2006; Dikova and Witteloostuijn, 2007; Belderbos et al., 2010). Therefore, R&D intensity is one of our main topics in this study.

To be more specified, our main purpose is to discuss the relationship between technology orientation and firm's financial performance. In light of previous studies, we believe that the balanced development of technology portfolio would be better for firm's financial performance. Moreover, we also argued that the technology orientation should followed by firm's corporate strategies and business strategies. On the other hand, R&D intensity is also considered as a critical moderator variable for technology orientation and firm's financial performance.

1.2 Research Purpose

Out of strategic consideration, technology capability is always one of the main indicators when it comes to how firms compete with each other. March (1911) has announced the concept of exploration and exploitation. It has always been a question, which kind of technology orientation has better effects in helping firms improve their financial performance. Furthermore, we are also interested in the relationship between

technology orientation and other firm's corporate or business strategies. Therefore, this study tries to understand which kind of technology orientation

1.3 Research Procedure

In our study, we started from our research objectives, followed by the literature review and theoretical background along with hypotheses. Afterward, we move forward to the research structure and methodology which describes the definition and measurement of each variable along with the source of database and how we deal with them. Then, we demonstrated our research result according our empirical statistical analysis. In the end, we present our conclusion and proposed some managerial implication for further studies regarding technology strategies. The research flow is shown as Figure 1-1.

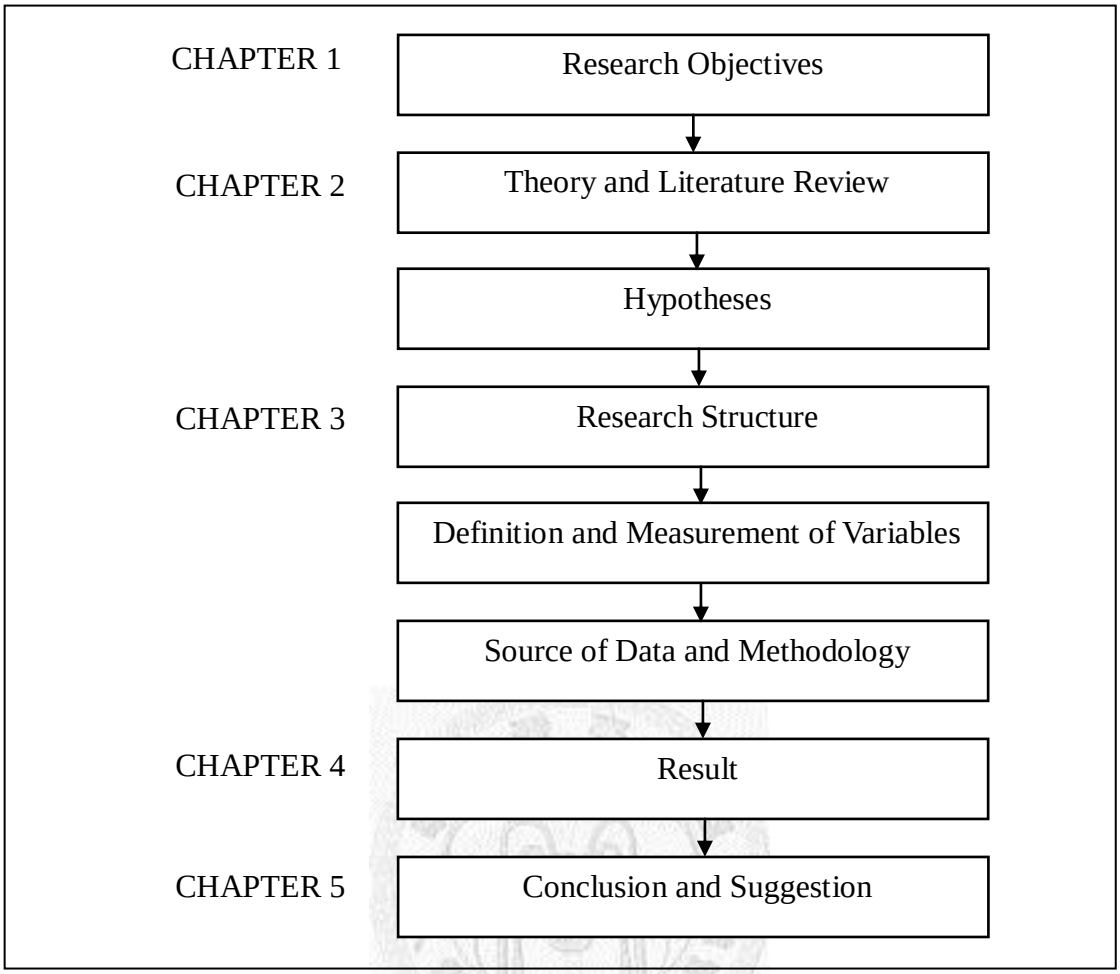

Figure 1-1 Research Flow

Chapter 2 THEORY AND HYPOTHESES

2.1 Literature Review

Among all the theoretical perspectives, resource-based view played an important role in how firm's capabilities affect its performances. Resource-based theory declares that assets, capabilities, organizational processes, information, firm attributes and knowledge are firm resources (Barney, 1991). These resources could be categorized into physical capital, human capital and organizational capital. The resources shown above could help firm to execute different level of strategies and improve firm's efficiency and effectiveness. For all the resources, technology activities and capabilities are regarded as important resources to firms. Also, Research and Development (R&D) is one of the major ways for developing new capabilities.

However, there are many questions arisen of how these kinds of firm resources and capabilities affect performance (Priem and Butler, 2001). One of the perspectives has tried to answer the question by a behavioral and organizational way. Organizational scholar March (1991) defined these two learning behaviors as follow: "Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution". After then, the perspective of exploration and exploitation has been broad discussed. Nevertheless,

there are amount of studies have examined the effects of ambidexterity on innovative performance (Uotila et al., 2009), seldom studies have tested the final impacts on firm's financial performance.

On the other hand, the organization's overall strategy could also reflect in the resources allocation on the processes and activities of exploration and exploitation (Siggelkow & Levinthal, 2003). Exploration usually creates innovative competencies that support continuous innovation and result in long-term instead of short term (Geroski, Machin, & Van Reenen, 1993). This kind of benefits are balanced from the risky development and research activities, which always require large amount of investment with uncertainty feedback (Gupta, Smith, & Shalley, 2006). Exploitation, however, creates value from modifying current capabilities and competencies to retain viability from successful exploration. Ideal exploitation creates a buffer for firms to withstand the shocks of exploration, and burden less risk that exploration to firms (Gatignon, Tushman, Smith, & Anderson, 2002).

In light of the ambidexterity view from March (1911), there are some conceptualizations of highlighting the balance of the conflictions from exploration and exploitation. Nevertheless, most of these studies which tried to use the balanced view between exploration and exploitation (e.g., Levinthal, 1997; Rivkin & Siggelkow, 2003) have noted that there are alternative organizational forms, for instance, centralized

structures versus decentralized structures and mechanistic versus organic ones, are better than either exploration and exploitation boundaries (Brown & Eisenhardt, 1997; Nickerson & Zenger, 2002; Siggelkow & Levinthal, 2003).

Recently, scholars have paid more attention on the construct of balancing the exploration and exploitation (e.g., Raisch and Birkinshaw 2008). There are some common agreements that an ambidextrous firm is the one which can not only exploiting current capabilities and competencies but also exploring new opportunities. Such kind of firm and organization that reach ambidexterity is considered to performance well due to the dual-capacity. However, according to March (1911), these two kind of innovation activities seem to conflict with each other. That is, the trade-offs between exploration and exploitation would be inevitable. Some followers of March's (1911) has focus on the aspect of confliction between exploration and exploitation tried to find appropriate balance (e.g., Auh and Menguc 2005, Ghemawat and Costa 1993, Sidhu et al. 2007, Smith and Tushman 2005). On the contrast, some researchers characterized exploration and exploitation as two independent and orthogonal activities to each other (Gupta et al. 2006). In this kind of view point, ambidexterity has been regarded as to pursuit exploration and exploitation simultaneously (e.g., Beckman 2006, Jansen et al. 2006, Lavie and Rosenkopf 2006, Lubatkin et al. 2006) rather than the relationship of trade-offs.

Resource-based theory asserted that resources could help firm to execute different level of strategies and improve firm's efficiency and effectiveness. A firm is regard as the same as a broad bundle of resources which it owns (Wernerfelt, 1984). On the other hand, Das and Teng (2000) also stated that what resource-based theory focuses on is the analysis of diversified resources gained by a firm.

In terms of knowledge-based theory, knowledge is the most valuable resource among all resources (Grant, 1996). Scholars of knowledge-based theory argued that firms should properly manage their knowledge in the firm due to they asserted knowledge is always be the most important resources of corporation. Also, scholars (Bresman et al., 2009) shown their findings of the value creation through knowledge transferred between firms.

2.2 Theoretical Background

2.2.1 Ambidexterity view

Firms are behavioral players that exposed in the broad social and economic environments and have to survive by means of past experiences and future activities (Cyert and March, 1963; March and Simon, 1958). In order to deal with the unsteady and uncertainty external environments, flexibility and stability are two main components embedded in the managerial discretion (Burgelman, 1991, 2002). The

ambidexterity view is composed of two broad patterns of learning behaviors, exploration and exploitation. Organizational scholar March (1991) defined these two learning behaviors as follow: “Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution”. According to this definition, Levinthal and March (1993) made another pair of addition that exploration involves pursuing of new knowledge. Also, exploitation involves using the developing things that are already known. That is to say, exploration is refers to the innovative activities and new capabilities that firm creates related to the basic area of research, experiments and search. However, exploitation refers to the using and moderating existing resources and capabilities in the area of standardization and processes.

Recent studies have applied these ideas to inter-organizational instead of only with in organization (e.g., Child, 2001; Grant & Baden-Fuller, 2004; Holmqvist, 2003; Ingram, 2002; Lane & Lubatkin, 1998; Larsson, Bengtsson, Henriksson, & Sparks, 1998). Moreover, according to this dichotomy, the concept of exploration and exploitation has been elaborated into diversified research areas including innovation management (e.g., Benner and Tushman, 2002; Jansen, Van den Bosch, and Volberda, 2006; O’Reilly and Tushman, 2004; Lubatkin et al., 2006); strategic management (e.g.,

He and Wong, 2004; Uotila et al., 2009); alliances (e.g., Faems, Van Looy, and Debackere, 2005; Koza and Lewin, 1998; Rothaermel and Deeds, 2004); technology sourcing (e.g., Rothaermel and Alexandre, 2009; Schildt, Maula, and Keil, 2005) and organizational design (e.g., Andriopoulos and Lewis, 2009).

In our study, we focus more on the technology activities and discuss the relationship between technology activities and firm's financial performance. Based on the definition of exploration and exploitation, Belderbos, Faem, Leten and Looy (2010) have also defined "Explorative technological activities are defined as the development of ideas that are situated in technological domains where the firm has not patented technology during the past five years. In contrast, exploitative technological activities are acts of creation in technological domains where the firm has patented technology in the previous five years".

2.2.2 The Resource-Based Theory

Resource-based theory declares that assets, capabilities, organizational processes, information, firm attributes and knowledge are firm resources. These resources could be categorized into physical capital, human capital and organizational capital. The resources shown above could help firm to execute different level of strategies and improve firm's efficiency and effectiveness. A firm is regard as the same as a broad

bundle of resources which it owns (Wernerfelt, 1984). On the other hand, Das and Teng (2000) also stated that what resource-based theory focuses on is the analysis of diversified resources gained by a firm. According to Barney (1991), there are two basic assumptions to establish the resource-based theory. In the first instance, companies in the same industry or strategic group, the resources that firms possessed must be heterogeneous. The heterogeneity of the resources that firms owned leads to the differences between firms. Second, these resources may imperfectly mobile across firms. To sum up with the two assumptions, the resources that firms possessed have two attributes, heterogeneity and immobility. By possessing different and unique resource, firm could transform the resources into capabilities and reach sustained competitive advantages that other firm cannot duplicate the benefits in the same way.

However, based on the two assumptions of resources mentioned in the last paragraph, Barney (1991) also stated that there are four critical criteria that the resources should be followed so that these resources could lead firms to develop competitive advantages. First, the resource must be valuable so that it could develop opportunity and/or balance threats in a firm's environment. Second, the resource must be rare among a firm's current a potential competitors so that the other competitors are not be able to have it in the same time. Moreover, the rarity of the resource sets the unique position to the firm from other competitors and enables the focal firm to have

first-mover advantages. Third, the resource still must be imperfectly imitable to make it difficult for other competitors to learn and do in the same way. The last one is that there cannot be equivalent substitutes for this resource.

Though RBV has critiques which could be divided into eight categories (Kraaijenbrink et al., 2010), it has been applied to many different academic fields as a key perspective. Das and Teng (2000) derived four essential components of the resource-based theory of alliance. Kunc and Morecroft (2010) elucidated the relationship between managerial decision making process and firm performance according to the resource-based theory. Moreover, Terziovski (2010) also asserted that a firm's innovative activity is positively related to the firm's performance based on the resource-based theory, which is highly connected with our study. Therefore, we take the resource-based theory as an important theoretical role in this study and further develop and explain the hypotheses based on the resource-based theory in the next section.

2.3 Hypotheses

2.3.1 Technology Orientation and firm's financial performance

In light of March (1911), exploration is refers to the innovative activities and new capabilities that firm creates related to the basic area of research, experiments and search. On the other hand, exploitation refers to the using and moderating existing resources and capabilities in the area of standardization and processes. Therefore, both

these two kinds of innovation activities seem critical to firms. However, there are several different aspects when we mention innovation activities of exploration and exploitation. As illustrated in Table2-1, we listed three aspects when we talk about the ambidexterity. The first aspect is dichotomous comparison. The dichotomous comparison is measured by which type of innovation activities dominate more. Firm A is exploration oriented since its exploration performance greater than its exploitation. On the other hand, Firm B is exploitation oriented. The second aspect is proportional comparison which could be measured by the proportion of exploration and exploitation. Therefore, Firm A has a proportion of 10/5 and Firm B is 8/9. The last aspect is absolute comparison. It is measured by summing up the performance of exploration and exploitation. That is, Firm A gets 15 points and Firm B gets 17 points. In this study, we care about these three kinds of aspect. However, we paid more attention the first two aspects, dichotomous comparison and proportional comparison. For the absolute comparison, we also regarded it as an important variable and therefore took it into consideration as a control variable.

	Exploration Performance	**Exploitation Performance**	**Dichotomous Comparison**	**Proportional Comparison**	**Absolute Comparison**
Firm A	10	5	Exploration Oriented	10/5	15
Firm B	8	9	Exploitation Oriented	8/9	17

Table 2-1 Exploration and Exploitation Comparison

Ever since March (1911) initiated the concept of exploration and exploitation and

the other pair of additional definition made by Levinthal and March (1993), pursuing exploration or exploitation has always be the question. Many scholars (e.g., He and Wong, 2004; Jansen et al., 2006; Levinthal and March, 1993; McGrath, 2001; Tushman and O'Reilly, 1996) argued that a critical part of corporate strategy is how to distribute resources between exploration activities and exploitation activities. Exploitative activities are more tended to enforce the effectiveness and efficiency of the current core capabilities. That is to say, exploitation is considered to cause positive short term performance. Nevertheless, focusing too much on exploitation and pushing out exploration may transfer the current core capabilities into core rigidities. In this situation firms tends to sacrifice and even ignore to develop the abilities of responding the coming technological or industrial changes (Christensen and Overdorf, 2000; Leonard-Barton, 1992). On the opposite, exploration can help firms to survive from the future munificence, but may ignore the problem of current financial condition or efficiency effectiveness. Thus, Focusing on exploration solely could be fatal to firm's performance, especially the financial performance. Moreover, relying on exploration solely could cause the repetitive cycle in which "failure leads to search and change, which leads to failure, which leads to more search and so on" (Levinthal and March, 1993). He and Wong (2004) were the first ones who tested the balanced ambidexterity formation. Also, they found that exploration and exploitation demonstrated a positive

interaction relationship. Moreover, relative imbalanced exploration and exploitation relates to growth negatively. Another study by Uotila et al. (2009) also found that firm's exploration orientation and market valuation has an inverted U-shaped relationship.

Moreover, scholars (Granstrand, 1998; Suzuki and Kodama, 2004; Turner and Fauconnier, 1997; Almeida and Phene, 2004; Lin et al., 2006) have examined that there are positive contribution from exploitation technology orientation due to economy of scale and knowledge sharing. On the other hand, there are also negative effects from the over-diversification trap of coordination and integration across various technology domains.

Thus, according to the scholars and their findings, we expected that firms who balancing exploration and exploitation may out performed then those who does not.

Hypothesis 1: There is an inverted U-shaped relationship between technology orientation and firm's financial performance.

2.3.2 Moderator effect of strategic orientation

The technology tendency may be driven by different firm strategies since every types of strategy have different way in allocating resources. However, there are a lot of strategies announced by scholars (e.g., Miles and Snow, 1978; Rumelt, 1974; Barlow, 2000). The strategies we chosen to be added in our study are the most classic ones, cost leadership strategy and differentiation strategy (Porter, 1980). Firms who implement

cost leadership strategy successfully can make their products cost less and further lead to product prices. Nevertheless, differentiation strategy focuses on value added instead of lowering costs (Hill, 1988). According to March (1991), returns on exploration are unpredictable and usually negative for short term. However, returns on exploitation are positive and certain.

In our study, we argued that the competitive strategies will have to fit with the technology orientation. This kind of relationship between strategies and resources allocation are called strategic fit (Porter 1996). Strategic fit refers to the consistency of firm's activities, capabilities and resources, which creates synergy and further support the strategies of firms to sustain the competitive position among competitors. Based on this, we argue that the cost leadership strategy would be better supported by the exploitation technology orientation. As we discussed in the previous section, firms with cost leadership strategy may tend to lower their costs and save expenses from exploration and R&D related activities. On the other hand, differentiation stands for high premium from the uniqueness of products and also different from competitors. That is, we argued that firms with differentiation strategy may tend to search exploration technology as its strategic fit. Also, exploration technology provides the possibilities of new products and services, which matches the differentiation firms' needs.

Hypothesis 2a: Firms focus on cost leadership strategy will perform better with the fit of higher exploitation technology orientation.

Hypothesis 2b: Firms focus on differentiation strategy will perform better with the fit of higher exploration technology orientation.

2.3.3 Moderator Effect of R&D Intensity

Resource-based theory declares that assets, capabilities, organizational processes, information, firm attributes and knowledge are firm resources. The resources shown above could help firm to execute different level of strategies and improve firm's efficiency and effectiveness. According to this, we also regard the technology capabilities such as patent, innovation experience as firm resources. In order to make sure that the technology capabilities are always qualified the constraints which resource-based view asserted, investing in R&D is proved an efficient way. In addition, the absorptive capacity developed by R&D activities provides abilities for exploring new product and services (Sahaym et al., 2010).

Therefore, we argued that the R&D intensity has a there is a positive moderator effect of R&D intensity and exploitative technology orientation to firm's financial performance due to the following two reasons. First of all, the accumulation of technical expertise created by R&D activities enables firms to better understand and recognize the value of current technological developments, which in return provides insights of how

to exploiting current skills and knowledge (Cohen and Levinthal, 1990). Second, as firms accumulate its technical knowledge, it becomes more efficient to assimilate external knowledge into the similar field causing from the positive feedback of experience and learning (Levinthal and March, 1993; Lieberman and Montgomery, 1998). Third, applying similar knowledge in current domains to refine a product is consistent with existing organizational processes . Therefore, a high level of R&D capability should facilitate greater exploitation of existing know-how (Stuart and Podolny, 1996). Fourth, the pressure created from organizational inertia intensifies as firms accumulate diversified technological skills and forms its unique processes (Hannan and Freeman, 1984). Such kind of inertia pressure encourages the firm to rely on its existing know-how and engage in search activities that improve efficiency and produce reliable performance (Lavie and Rosenkopf, 2006).

Hypothesis 3: There is a positive moderator effect of R&D intensity and exploitative technology orientation to firm's financial performance

Chapter 3 RESEARCH DESIGN AND METHODOGY

3.1 Research Structure

Base on the hypotheses we developed in the previous chapter, we further structuralize our hypothesis into the research framework in Figure 3-1. To be precise, we first examined the effects of our main variable, technology orientation and strategy orientation, to the firm financial performance (ROA). Afterwards, we continued to test the two moderator effects. We assumed that the R&D intensity has a moderator effect on technology orientation, and technology orientation itself also is a moderator to the strategy orientation.

After we dealt with the main variables and moderator variables, we also add several control variables such as knowledge stock, market value, firm size and organizational

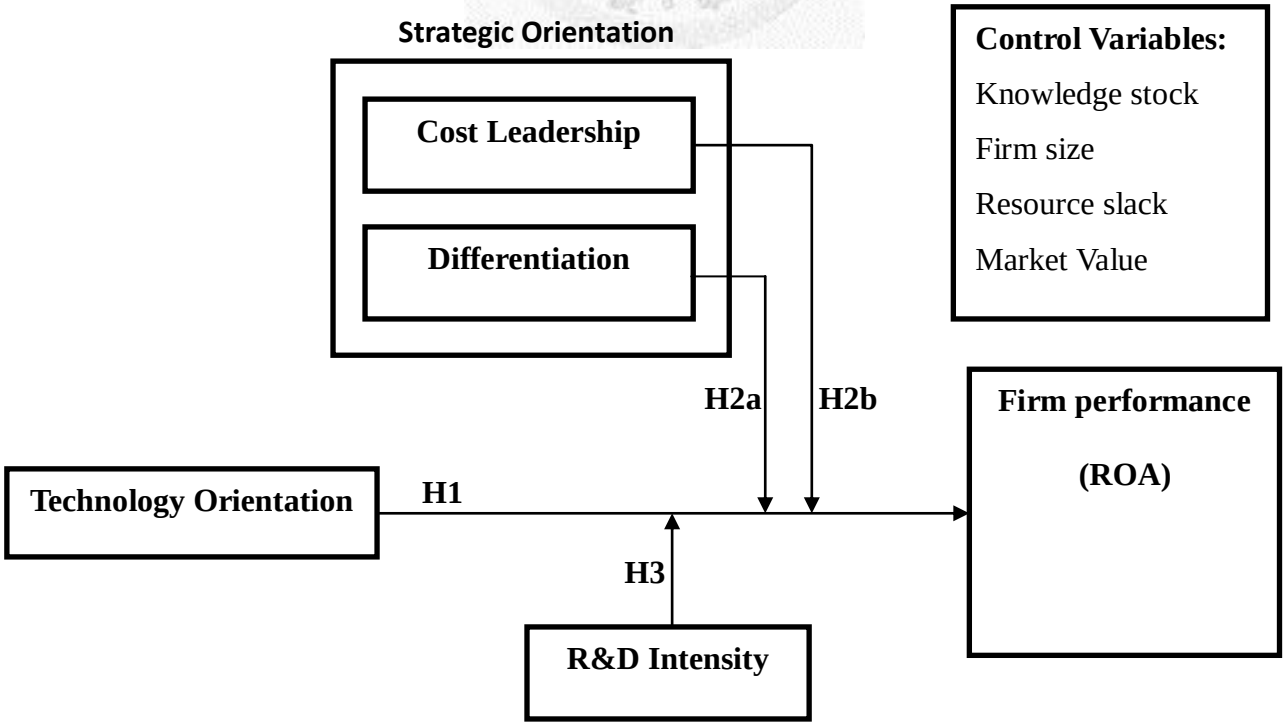

Figure 3-1 Research Structure

slack into our structure in case of other factors interfering the main effects which we care about. According to the framework, we will conduct the statistic tests for our six hypotheses.

3.2 Variable Measurement

3.2.1 Dependent Variable

To capture the firm performance from the economic perspective, we considered to applying return on assets (ROA) obtained from the year-end reports in COMPUSTAT as our dependent variable (Bettis et al., 1982; King et al., 2004; Ndofor et al., 2011; Yamakawa et al., 2011). Due to COMPUSTAT does not offer the variable of ROA, we obtained ROA by the calculation of dividing Net profit by Total asset in the same year. However, firm's technology orientation and competitive strategy might not immediately have effects on the current performance. We adopted, therefore, a one-year lag from the focal year (Ndofor et al., 2011).

3.2.2 Independent variable

According to the typology of firms' technological activities developed by Belderbos et al. (2010), firm patents could be classified into two types of categories: exploration versus exploitation technological activities. A patent will locate in the category of explorative patent as it situated in the technology domain which is a new

area. In other words, we considered a patent as an explorative one if the firm has no prior experience of the technology domain (Belderbos et al., 2010).

We applied the definition by Belderbos et al. (2010) to define a technology domain as a new one to the firm in year t if the firm had no patent released in the technology domain during the past five years (t－1 to t－5).

The year of five was referred to that most technology areas lose most of its technical and also economical relevance within five years (Ahuja and Lampert, 2001; Hall et al., 2005; Leten, Belderbos, and Van Looy, 2007).

3.2.3 Moderator variable

Strategy orientation:

Strategy orientation has two kinds of strategies: cost leadership strategy and differentiation strategy. We therefore calculated these two types of strategies separately.

Cost leadership strategy: According to Hambrick (1983), we developed the cost leadership strategy by two indicators, which are cost efficiency and asset parsimony. Cost efficiency is measured by the ratio of cost of goods sold over total sales. Cost efficiency is also considered as an core measurement of cost leadership strategy (Porter, 1980). Asset parsimony is measured by the ratio of total asset over total sales. We further summing up the two indicators above into a composite variable as the measurement of cost leadership strategy since both of them have the same denominator

which is total sales (Nair and Filer, 2003, Yamakawa et al., 2011).

Differentiation strategy: The differentiation strategy is calculated by the ratio of firm's general selling administration expenses (SG&A) over total sales. The measurement shown above could reveal the firm's tendency of willingness to spend on advertising, marketing and other kinds of selling activities to differentiate its product (Berman et al., 1999; David et al., 2002). The higher value here stands for the higher degree of differentiation strategy.

R&D intensity:

The definition of R&D intensity has been discussed broadly and was commonly calculated as the ratio of R&D investment to the net sales for each industry after the data published by Schonfeld and Associates (1994, 1995, 1996). The measurement Schonfeld developed above was based on the government resource and published financial data (Siegel and Hambrick, 2005). Moreover, this measurement of R&D intensity is also proven to be feasible for each four-digit SIC code (Swan and Ettlie, 1997) so that we could further adopt the according definition in our study. Previous researches have regarded the R&D intensity as an independent variable (Sahaym et al., 2010) or a control variable (Lavie and Rosenkopf, 2006; Dikova and Witteloostuijn, 2007; Belderbos et al., 2010). However, we took R&D intensity as a moderator variable in this study.

3.2.4 Control variable

ROA might be influenced by several variables. Consequently, we extract four factors as our control variables from COMPUSTAT and USPTO. The first one is *knowledge stock*. Similar to Yamakawa, Yang and Lin (2011), we controlled the knowledge stock which is measured as the number of patents firm released in the focal year. Further, we controlled the firm size by using the total revenue as the measurement that stands for two aspects, organizational size and market performance (Voss et al., 2008). We also take into account the *resource slack* by the net income of the focal year. The last one we take into consideration is *market values*.

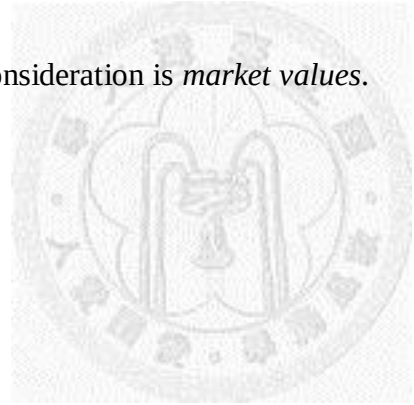

Table 3-1 Summary of Variables

Variables	Measurement	Calculation
Dependent Variables		
Return on Assets (ROA)	Dividing the Net profit by Total asset in the same year	t+1
Independent Variables		
Technology Orientation	Calculating the percentage of the following two types of patents: *Exploration patent*: If the patent situated in a technology domain which did not patent in the past five years *Exploitation patent*: If the patent situated in a technology domain which did not patent in the past five years	t
Cost Leadership Strategy	Summing up the following two indicators: *Cost efficiency:* cost of goods sold divided by total sales *Asset parsimony*: total assets divided by total sales	t
Differentiation Strategy	Selling administration expenses (SG&A) over total sales	t
Moderator variables		
R&D Intensity	R&D investment divided by net sales	t
Technology Orientation	As the description above	t
Control Variables		
Knowledge stock	Number of patent in the focal year	t
Market Value	Market Value in the focal year	t
Resource slack	Net income in the focal year	t
Firm size	Total revenue in the focal year	t

3.3 Data collection and sample

The data we used for our empirical analysis is collected from two resources, COMPUSAT data base and United States Patents Trademark Office (USPTO). The patent data was obtained from USPTO and the financial data was extracted from COMPUSTAT. The time line we chose was from 2000 to 2009, total for ten years. Since the financial performance has a one-year lag from the technology activities, we extracted financial data from USPTO to 2010 at most.

The industry we focused on is the pharmaceutical industry which refers to the SIC code of 2834 and 2836. In the beginning as we dealt with the patent data, there are 143 firms in the focal industry, which have patent activities. However, after mapping with the data from COMPUSTAT, several firm data encountered the issue of missing data. Therefore, during the ten years period, after the mapping procedure, there are 120 firms last. According to these firms, we had 390 firm-years as our observations which we also took as our sample size.

3.4 Statistical method

We conducted SPSS as the statistical tool to test our hypotheses in our regression analysis. The whole examine methodology processes and the statistical models are stated as follow.

3.4.1 Descriptive Statistics and Correlation Analysis

For the purpose to make the study more reliable and stable, we will introduce the statistics and methods such as mean, standard deviation and inter-correlation which we used in the analysis.

Arithmetic mean, medium and standard deviation provide different kinds of information which help us to revise the data attributes. By using the arithmetic mean and medium, we could observe the central tendency of the whole data. On the other hand, we also use deviation to capture the dispersion tendency. With the statistics shown above and the additional information supported from residual plots, we can examine some basic assumptions such as the requirements of normal distribution and do some transformation if necessary in order to ensure that all the variables we took into consideration are feasible to the regression model. Moreover, we eliminated several outliers to make sure our regression results will not be deviated by these abnormal samples.

Further, we examine the Pearson correlation coefficient to each pair of variables.

Pearson correlation coefficient &VIF

3.4.2 Regression Analysis

We conducted the multiple regression models to test our hypothesis in this study accordingly. By using the processes of stepwise regression analysis, researchers can

observe the effects of variables including independent variables and moderator variables more precisely and in the end build a more reliable model (Efroymson, 1960).

For the only dependent variable, ROA, in this study, the multiple regression model is suitable as well. ROA is a continuous variable which measured by the ratio of EBIT to total asset. According to the attribute of ROA, there is no doubt to apply the multiple regression model as our regression method.

In order to test the effects of moderator variables, we adopted the moderating regression model which has been regarded as a suitable model and statistical techniques by Schoonhoven (1981) and Darrow and Kahl (1982). To test the moderator, strategic orientation and R&D intensity, in this study, moderating regression model analysis made us possible to examine the interaction terms which stands for the moderating effects for the whole model. By the way of it, we implemented the product of moderating variables and independent variables as the moderating effects (Sharma et al., 1981) in this study. If the interaction terms show significant improvement of explaining the variance of the whole model, we could infer that there exists a moderating effect between these two independent variable and moderator variable. Furthermore, the positive sign of coefficient of the interaction effect stands for that the relation of dependent variable and the independent variable becomes larger when the moderator variable raises to a bigger value. Oppositely, the negative sign of the coefficient shows

the evidence that as the moderator variable grows, the relationship between the independent variable and the independent variable would be weakened.

Chapter 4 RESEARCH RESULTS

4.1 Descriptive Statistics and Correlation Analysis

We initiated with the summarization of the descriptive statistics for the whole variables in Table 4-1. The table is composed of mean, standard deviation, maximum value, minimum value and then the final one, Pearson correlation coefficient.

By reviewing Table 4-1, we could observe the positive and negative coefficient of the variables between each variable including independent variables, moderator variables, control variables and dependent variables. The sign also allowed us to have a pre-examination of the hypotheses before we move forward to the regression model. On the other hand, by checking the Pearson correlation coefficient, we could examine if there are correlated variables existed and made us considered removing those variables. In the researches shown before, researchers have made a definition that the coefficient between 0 and 0.3 is lowly correlated, moderately correlated if between 0.3 and 0.7, and higher than 0.7 would be highly correlated. We could tell from Table4-1 that there is no seriously significant correlation issue existed in our model so that we could establish a reliable model.

Additionally, we examine the collinearity problem of the independent variables and control variables. In the same time, we also test the variance inflation factors (VIF) which shown beside the figures of Pearson correlation coefficient to ensure that our

model does not affect by the problem of multicollinearity. Kennedy (1992) suggested that if the VIF is greater than 10, that is to say, implies multicollinearity ploblem, should the variables be removed.

Table 4-1 Correlation and Descriptive Statistics

Variables	Mean	S.D	MIN	MAX	1	2	3	4	5	6	7	8	9
1. ROA	0.409	1.084	-11.920	1.270	1.000								
2. Technology Orientation	0.940	0.280	0.000	3.000	.344	1.000							
3. Cost Leadership Strategy	352.423	4031.300	0.690	73175.00	-.018	.014	1.000						
4. Differentiation Strategy	10.357	114.380	0.200	1594.900	-.112	.006	.012	1.000					
5. R&D Intensity	54.880	449.810	0.000	7098.000	-.047	.017	.941	.104	1.000				
6. Knowledge Stock	14.103	28.534	1.000	178.000	.176	.089	-.038	-.045	-.052	1.000			
7. Market Value	7598.278	2502.985	1.110	19101.040	.159	.051	-.027	-.036	-.038	.272	1.000		
8. Resource Slack	657.7448	226.950	-1533.650	1334.000	.164	.029	-.027	-.037	-.039	.461	.674	1.000	
9. Firm size	3723.403	1103.796	0.00	3723.403	.173	.023	-.030	-.041	-.043	.458	.701	.954	1.000

4.2 Regression Analysis

With an emphasis on the relationship between technology orientation, strategic orientation and ROA addition to the moderating effects of R&D intensity in this study, we implemented the multiple regression model to test our four hypotheses which we mentioned in previous chapter. The stepwise and full research result is shown in Table4-2.

Before we started testing the main effects of our focal variables, we first build Model1 for all the control variables. After Model 1, we added the first independent variable, technology orientation, to establish model 2 and test if technology orientation influences firm's financial performance (ROA). Next, we tested the first moderator variable, R&D intensity, in Model3. See if R&D intensity shows any effects to strengthen or weaken the relationship between technology orientation and ROA. Then in Model 4, we tested the second independent variable which is strategic orientation to observe if there is any significant relationship between strategic orientation and ROA. For the last model, Model 5, we tested the moderator effects of strategic orientation to check if strategic orientation has enough influence to strengthen or weaken the relationship between technology orientation and ROA.

To make sure that all the models above could predict the outcomes precisely, we adopted coefficient of determination R^2 (Steel and Torrie, 1960). The R^2 of our full

model in our study is 47.3% which adequately implies our models are explanatory very well.

4.2.1 Direct Effect of technology orientation and firm financial performance

In Model 2, we examined the relationship between technology orientation and firm financial performance (ROA). The result of the regression model shows that there exists a inversed-U relationship between technology orientation and firm financial performance (ROA). That is to say, Hypothesis 1 which asserts that there exists a inverse-U relationship between technology orientation and firm financial performance (ROA) was supported by the result of Model 2. The coefficient of first degree is positive and the second degree is negative and both of them are strongly significant.

4.2.2 Moderator effect of strategy orientation

In model 5, we tested the moderator effect of strategy orientation. The strategy orientation is composed of two types of strategies, cost leadership strategy and differentiation strategy. Both of them show significant moderator effect on technology orientation and firm's financial performance. The coefficient of differentiation strategy and technology is negative that implies our Hypothesis 2a is sported. The coefficient of cost leadership strategy and technology is positive that implies our Hypothesis 2b is also sported.

4.2.3 Moderating effect of R&D intensity

In Model 5, we also tested the moderator effect of R&D intensity and added the interaction terms of technology orientation and R&D intensity. As the result displayed in Model 5, the interaction terms of technology orientation and R&D intensity are significant that implies our Hypothesis 3 is also supported.

Table 4-2 Regression Analysis

Relationship Between Technology & Competitive Strategy and Firm Financial Performance

	Model 1	Model 2	Model 3	Model 4	Model 5
Control Variables					
Number of Patent	0.128*	0.080	0.095*	0.090	0.103*
Market Value	0.085	0.055	0.067†	0.065	0.083
Resource slack	−0.053	−0.060	−0.031	−0.028	0.009
Firm size	0.104	0.139	0.088*	0.084	0.021
Independent Variables					
R&D Intensity	−0.066	−0.046	−1.690***	−1.792***	−1.709***
Technology Orientation		0.503***	1.44***	1.439***	1.317***
(Technology Orientation)^2		−0.239**	−1.011*	−1.012*	−1.098**
Technology Orientation * R&D Intensity			2.479***	2.467***	2.454***
Differentiation Strategy				−0.084*	−0.569***
Cost Leadership Strategy				0.127	0.744*
Differentiation Strategy * Technology Orientation					−0.633***
Cost Leadership Strategy * Technology Orientation					0.648†
Adjusted R^2	0.035	0.140	0.312	0.319	0.473
F-value	3.784**	10.059***	20.59***	17.581***	27.870***

Note: Observation = 390 (two-tailed test). †p≦0.1; *p≦0.05; **p≦0.01; ***p≦0.001.

Chapter 5 CONCLOSION AND SUGGESTION

5.1 Research Conclusion

When it comes to firm's technological development strategies, there is always be a question of what kind of technology orientation should we pursue. In this study, we implemented the dichotomy of the categorization, exploration and exploitation. However, as previous studies discuss about ambidexterity, not many of them focus on the relationship between technology orientation and the ultimate performance, financial performance. Therefore, this is the main purpose of discussion based on ambidexterity view and resource-based theory. The time line we chose was from 2000 to 2009, total for ten years. Since the financial performance has a one-year lag from the technology activities, we extracted financial data from USPTO to 2010 at most. The industry we focused on is the pharmaceutical industry which refers to the SIC code of 2834 and 2836. In the beginning as we dealt with the patent data. During the ten years period, after the mapping procedure, there are 120 firms last. According to these firms, we had 390 firm-years as our observations which we also took as our sample size. Besides, we developed three hypotheses to exam the relationship among all the variables, and they are all supported.

First of all, the inverted-U shape relationship between technology orientation and firm's financial performance is in line with our expectation. Exploitative activities are

more tended to enforce the effectiveness and efficiency of the current core capabilities. That is to say, exploitation is considered to cause positive short term performance. Nevertheless, focusing too much on exploitation and pushing out exploration may transfer the current core capabilities into core rigidities. In this situation firms tends to sacrifice and even ignore to develop the abilities of responding the coming technological or industrial changes (Christensen and Overdorf, 2000; Leonard-Barton, 1992). On the opposite, exploration can help firms to survive from the future munificence, but may ignore the problem of current financial condition or efficiency effectiveness. Thus, Focusing on exploration solely could be fatal to firm's performance, especially the financial performance. Thus, the result of our regression model fully supported our Hypothesis 1.

Even though the technology orientation is critical to firm's financial performance, we argued that the firm's strategies should match its resource allocation. That is to say, as firm implements certain strategy, it better fits its resource with the strategy. In our study, we argued that the competitive strategies will have to fit with the technology orientation. This kind of relationship between strategies and resources allocation are called strategic fit (Porter 1996). Based on this, we argue that the cost leadership strategy would be better supported by the exploitation technology orientation. As we discussed in the previous section, firms with cost leadership strategy may tend to lower

their costs and save expenses from exploration and R&D related activities. On the other hand, differentiation stands for high premium from the uniqueness of products and also different from competitors. According to our statistical outcomes, our hypothesis 2 is also supported.

Last but not least, we found that there existed a positive moderating effect of R&D intensity on the relationship between exploitation and firm's financial performance. The accumulation of technical expertise created by R&D activities enables firms to better understand and recognize the value of current technological developments, which in return provides insights of how to exploiting current skills and knowledge (Cohen and Levinthal, 1990). Also, as firms accumulate its technical knowledge, it becomes more efficient to assimilate external knowledge into the similar field causing from the positive feedback of experience and learning (Levinthal and March, 1993; Lieberman and Montgomery, 1998).

5.2 Managerial implication

Although the innovation and allocation of technology resources have been discussed under the ambidexterity view for frame for some times, we provide some managerial implications in choices of technology orientation techniques from this research, and as other situations are considered.

First of all, we found that firm should take both exploration and exploitation technology resources into consideration when it comes to allocating the technology resources. However, firms face different circumstances and individual situation, for instance, industry, extent of competition, we cannot conclude an optimal ratio of allocating these two kind of technology resources.

Moreover, firms do have its' corporate strategies and business strategies. Therefore, when firm tries to develop its technology capabilities, it would be better take its present or future strategies in to consideration in the same time. In this study, we chose two classic competitive strategy for demonstration, cost leadership strategy and differentiation strategy. According to the concept of strategic fit, firms which implement cost leadership strategy along with exploitation technology orientation would perform better in financial performance. However, firms which adopt differentiation strategy along with exploration technology orientation also perform well.

Last, when firm develop exploitation technologies, that is, diversified technology instead of focusing on sole area, R&D intensity will show significant moderator effect between exploitation technology orientation and firm's financial performance. Based on our research, firms which develop diversified technology domain would perform better with high intensity of R&D on their financial performance.

5.3 Limitation and future Direction

Although we derived three hypotheses and all of them are supported, there are still some limitations that we have to admit. Besides, we also provide some future direction for relevant research afterwards.

First, our measurement of technology orientation is based on the extent of patent diversification. Highly diversified in different technology domain is distinguished as exploitation technology orientation. On the other hand, focusing on certain technology domain is categorized as exploration technology orientation. However, there are many different ways to measure the concept of exploration and exploitation. Each way may not lead to the same outcome perfectly. Therefore, if we want to prove the relationship of exploration and exploitation with other variables, adopting different measurement of exploration and exploitation to test a certain concept and hypothesis would be convincible.

Second, we took the two classic competitive strategies, cost leadership strategy and differentiation strategy, as an example of the concept of strategic fit. We argued that technology orientation should fit firm's current or future strategies. However, there are some strategies that cannot be easily distinguished referred to exploitation or exploration. In such situation, it may have to conduct research of the moderator effect or mediator effect to find out the indirect relationships.

Last, we tested the moderator effect of R&D intensity. However, R&D intensity is just one of the measurements under the absorbed capability concept. In order to construct a completely research of absorbed capability and firm's technology orientation, future research is suggested to conduct a completely variable based on absorbed studies.

REFERENCE

Ahuja, G. and C. Morris Lampert (2001). "Entrepreneurship in the large corporation: A longitudinal study of how established firms create breakthrough inventions." Strategic Management Journal **22**(6-7): 521-543.

Almeida, P. and A. Phene (2004). "Subsidiaries and knowledge creation: the influence of the MNC and host country on innovation." Strategic Management Journal **25**(8-9): 847-864.

Andriopoulos, C. and M. W. Lewis (2009). "Exploitation-exploration tensions and organizational ambidexterity: Managing paradoxes of innovation." Organization science **20**(4): 696-717.

Auh, S. and B. Menguc (2005). "Balancing exploration and exploitation: The moderating role of competitive intensity." Journal of Business Research **58**(12): 1652-1661.

Benner, M. J. and M. L. Tushman (2003). "Exploitation, exploration, and process management: The productivity dilemma revisited." Academy of management Review **28**(2): 238-256.

Brown, S. L. and K. M. Eisenhardt (1997). "The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations." Administrative science quarterly: 1-34.

Child, J. and R. G. McGrath (2001). "Organizations unfettered: Organizational form in an information-intensive economy." Academy of Management journal: 1135-1148.

Christensen, C. M. and M. Overdorf (2000). "Meeting the challenge of disruptive change." Harvard business review **78**(2): 66-77.

Cohen, W. M. and D. A. Levinthal (1990). "Absorptive capacity: a new perspective on learning and innovation." Administrative science quarterly: 128-152.

Darrow, A. L. and D. R. Kahl (1982). "A comparison of moderated regression techniques considering strength of effect." Journal of management **8**(2): 35-47.

Das, T. K. and B. S. Teng (2000). "A resource-based theory of strategic alliances." Journal of management **26**(1): 31-61.

Dikova, D. and A. Van Witteloostuijn (2007). "Foreign direct investment mode choice: entry and establishment modes in transition economies." Journal of International Business Studies **38**(6): 1013-1033.

Efroymson, M. (1960). "Multiple regression analysis." Mathematical methods for

digital computers **1**: 191-203.

Faems, D., B. Van Looy, et al. (2005). "Interorganizational Collaboration and Innovation: Toward a Portfolio Approach*." Journal of product innovation management **22**(3): 238-250.

Gatignon, H., M. L. Tushman, et al. (2002). "A structural approach to assessing innovation: Construct development of innovation locus, type, and characteristics." Management Science: 1103-1122.

Geroski, P., S. Machin, et al. (1993). "The profitability of innovating firms." The RAND Journal of Economics: 198-211.

Ghemawat, P. and J. E. I. Ricart Costa (1993). "The organizational tension between static and dynamic efficiency." Strategic Management Journal **14**(S2): 59-73.

Granstrand, O. (1998). "Towards a theory of the technology-based firm1." Research policy **27**(5): 465-489.

Grant, R. M. (1996). "Prospering in dynamically-competitive environments: Organizational capability as knowledge integration." Organization science **7**(4): 375-387.

Grant, R. M. and C. Baden-Fuller (2004). "A knowledge accessing theory of strategic alliances." Journal of Management Studies **41**(1): 61-84.

Gupta, A. K., K. G. Smith, et al. (2006). "The interplay between exploration and exploitation." The Academy of Management Journal ARCHIVE **49**(4): 693-706.

Hambrick, D. C. (1983). "High profit strategies in mature capital goods industries: A contingency approach." Academy of Management journal: 687-707.

Hannan, M. T. and J. Freeman (1984). "Structural inertia and organizational change." American sociological review: 149-164.

He, Z. L. and P. K. Wong (2004). "Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis." Organization science **15**(4): 481-494.

Holmqvist, M. (2003). "A dynamic model of intra-and interorganizational learning." Organization Studies **24**(1): 95-123.

Jansen, J. J. P., F. A. J. Van Den Bosch, et al. (2006). "Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators." Management Science: 1661-1674.

Koza, M. P. and A. Y. Lewin (1998). "The co-evolution of strategic alliances." Organization science: 255-264.

Kraaijenbrink, J., J. C. Spender, et al. (2010). "The resource-based view: A review and assessment of its critiques." Journal of management **36**(1): 349-372.

Kunc, M. H. and J. D. W. Morecroft (2010). "Managerial decision making and firm performance under a resource-based paradigm." Strategic Management Journal **31**(11): 1164-1182.

Lane, P. J. and M. Lubatkin (1998). "Relative absorptive capacity and interorganizational learning." Strategic Management Journal **19**(5): 461-477.

Larsson, R., L. Bengtsson, et al. (1998). "The interorganizational learning dilemma: Collective knowledge development in strategic alliances." Organization science: 285-305.

Lavie, D. and L. Rosenkopf (2006). "Balancing exploration and exploitation in alliance formation." The Academy of Management Journal ARCHIVE **49**(4): 797-818.

Leonard-Barton, D. (1992). "Core capabilities and core rigidities: A paradox in managing new product development." Strategic Management Journal **13**(S1): 111-125.

Leten, B., R. Belderbos, et al. (2007). "Technological diversification, coherence, and performance of firms." Journal of product innovation management **24**(6): 567-579.

Levinthal, D. A. and J. G. March (1993). "The myopia of learning." Strategic Management Journal **14**(S2): 95-112.

Lieberman, M. B. and D. B. Montgomery (1998). "First-mover (dis) advantages: Retrospective and link with the resource-based view." Strategic Management Journal **19**(12): 1111-1125.

Lubatkin, M. H., Z. Simsek, et al. (2006). "Ambidexterity and performance in small-to medium-sized firms: The pivotal role of top management team behavioral integration." Journal of management **32**(5): 646-672.

March, J. G. (1991). "Exploration and exploitation in organizational learning." Organization science: 71-87.

Miles, R. E., C. C. Snow, et al. (1978). "Organizational strategy, structure, and process." Academy of management Review: 546-562.

Ndofor, H. A., D. G. Sirmon, et al. (2011). "Firm resources, competitive actions and performance: investigating a mediated model with evidence from the in-vitro diagnostics industry." Strategic Management Journal **32**(6): 640-657.

Nickerson, J. A. and T. R. Zenger (2002). "Being efficiently fickle: A dynamic theory of organizational choice." Organization science: 547-566.

O Reilly, C. A. and M. L. Tushman (2004). "The ambidextrous organization." Harvard business review **82**(4): 74-83.

Priem, R. L. and J. E. Butler (2001). "Is the resource-based" view" a useful perspective for strategic management research?" Academy of management Review: 22-40.

Raisch, S., J. Birkinshaw, et al. (2009). "Organizational ambidexterity: Balancing exploitation and exploration for sustained performance." Organization science **20**(4): 685-695.

Rivkin, J. W. and N. Siggelkow (2003). "Balancing search and stability: Interdependencies among elements organizational design." Management Science: 290-311.

Rothaermel, F. T. and M. T. Alexandre (2009). "Ambidexterity in technology sourcing: the moderating role of absorptive capacity." Organization science **20**(4): 759-780.

Rothaermel, F. T. and D. L. Deeds (2004). "Exploration and exploitation alliances in biotechnology: A system of new product development." Strategic Management Journal **25**(3): 201-221.

Sahaym, A., H. K. Steensma, et al. (2010). "The influence of R&D investment on the use of corporate venture capital: An industry-level analysis." Journal of business venturing **25**(4): 376-388.

Schoonhoven, C. B. (1981). "Problems with contingency theory: testing assumptions hidden within the language of contingency" theory"." Administrative science quarterly: 349-377.

Siegel, P. A. and D. C. Hambrick (2005). "Pay disparities within top management groups: Evidence of harmful effects on performance of high-technology firms." Organization science: 259-274.

Siggelkow, N. and D. A. Levinthal (2003). "Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation." Organization science: 650-669.

Smith, W. K. and M. L. Tushman (2005). "Managing strategic contradictions: A top management model for managing innovation streams." Organization science: 522-536.

Steel, R. G. D. and J. H. Torrie (1960). "Principles and procedures of statistics." Principles and procedures of statistics.

Stuart, T. E. and J. M. Podolny (1996). "Local search and the evolution of technological capabilities." Strategic Management Journal **17**(S1): 21-38.

Suzuki, J. and F. Kodama (2004). "Technological diversity of persistent innovators in Japan: two case studies of large Japanese firms." Research policy **33**(3): 531-549.

Terziovski, M. (2010). "Innovation practice and its performance implications in small and medium enterprises (SMEs) in the manufacturing sector: a resource-based view." Strategic Management Journal **31**(8): 892-902.

Uotila, J., M. Maula, et al. (2009). "Exploration, exploitation, and financial performance: analysis of S&P 500 corporations." Strategic Management Journal **30**(2): 221-231.

Yamakawa, Y., H. Yang, et al. (2011). "Exploration versus exploitation in alliance portfolio: Performance implications of organizational, strategic, and environmental fit." Research policy **40**(2): 287-296.