

**INTERNATIONALIZATION, SEARCH, AND CHANGE: AN ORGANIZATIONAL  
LEARNING MODEL OF STRATEGIC CHANGE IN THE PHARMACEUTICAL  
INDUSTRY**

A Dissertation

by

TOYAH L. MILLER

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2008

Major Subject: Management

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**ABSTRACT**

Internationalization, Search, and Change: An Organizational Learning Model of Strategic Change in the Pharmaceutical Industry. (August 2008)

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Research in international business and strategy emphasizes the important role knowledge plays in foreign expansion, and multiple research perspectives have viewed a firm's knowledge as the key driver of competitive advantage. Thus, in today's business environment, the ability to learn and source knowledge across boundaries is important to both firm performance and strategic change. My dissertation examines the "knowledge-seeking" motive for international expansion, which suggests that firms expand abroad to gain new technical capabilities and knowledge from diverse institutions, which allow firms to change in dynamic markets. I extend organizational learning, the resource-based view, and internationalization theory to examine empirically how internationalization influences strategic changes by affecting exploratory search. This research also challenges the standard assumptions about the positive benefits of exploration on change, suggesting that a curvilinear relationship exists. Further, I argue that innovation capabilities enhance the relationship between strategic change and firm performance. These questions are examined using longitudinal data on pharmaceutical firms.

The findings from this analysis reveal that internationalization has a curvilinear relationship with exploratory search. In addition, speed of internationalization, rhythm of internationalization, and international experience moderate the relationship between

internationalization and exploratory search. Exploratory search was found to have an inverted U-shaped relationship with strategic change, suggesting the high exploratory search may negatively affect the firm. The analysis also revealed innovation capabilities negatively moderated the relationship between strategic change and firm performance (ROA). This study provides important contributions to the fields of strategic management, international business, and organizational learning.

## **DEDICATION**

This dissertation is dedicated to my family. First, to my parents and brothers who have supported my every dream and goal, your belief in me has been a great inspiration and source of determination for me. I am also grateful to my brothers, Sean and Gabriel, who have always been proud of their big sis. To my best friend and sister, Gabrielle, I am so grateful to have your support and encouragement in this process. This dissertation would not be possible without my family. Thank you.

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## CHAPTER I

### INTRODUCTION

In today's dynamic business environment, the process of assimilating knowledge into the firm's knowledge base—organizational learning—has been seen as a source of strategic change and competitive advantage, two of the most important topics in management research (Barr, Stimpert, & Huff, 1992; Brown & Eisenhardt, 1995; Fiol & Lyles, 1985; Pettigrew, Woodman, & Cameron, 2001; Rajagopalan & Spreitzer, 1997). As such, knowledge search, the ability to source knowledge across boundaries, is important because few firms can internally generate the knowledge needed to gain a competitive advantage (Katila, 2002; Rosenkopf & Nerkar, 2001). Therefore, firms create experiences that allow them to explore and search for new knowledge through interacting with new cultures, demographics, regulations, and technologies (Cyert & March, 1963; Lant & Mezias, 1992; Levitt & March, 1988).

In fact, over the past several decades, it has been argued that knowledge is a major reason for expanding abroad and a driver behind performance gains from internationalization (Florida, 1997; Goedde, 1982; Hitt, Hoskisson, & Kim, 1997; Kogut, 1991; Kogut & Zander, 1992; Penner-Hahn & Shaver, 2005). Knowledge refers to “complex products of learning such as interpretations of information, beliefs about cause-effect relationships, or more generally, ‘know-how’” (Huber, 1991: 89). Knowledge is often easier to transfer within the organization than between organizations, and therefore the main competitive advantage of multinationals is the knowledge sourcing and transfer

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This dissertation follows the style of the *Academy of Management Journal*.

between subsidiaries located in different contexts (Dhanaraj, Lyles, Steensma, & Tihanyi, 2004; Grant, 1996b; Kogut & Zander, 1992). Therefore, scholars have suggested that experiences such as internationalization allow the firm to explore new domains and change (Dass, 2000; McDougall & Oviatt, 1996; Zahra, Ireland, & Hitt, 2000), yet we still know little of the relative importance of how this expansion influences search in firms or how subsequent knowledge search impacts strategic change.

Internationalization entails the expansion of firms across national boundaries for the purpose of selling and producing products and services (Hitt et al., 1997). While the majority of empirical studies have focused on the relationship between internationalization and performance, recent research has suggested other learning outcomes, recognizing the “knowledge-seeking” motive of international expansion (Hitt et al., 1997; Kogut, 1991; Shan & Song, 1997; Zahra et al., 2000). Local subsidiaries enable knowledge search in new technological domains that help renew the firm and encourage innovation (Almeida, 1996). As knowledge is transferred in-house, firms encounter divergent cognitive frameworks that challenge local thinking and help the firm take risks in complex and uncertain environments (Bartlett & Ghoshal, 1989; Luo, 2002). For example, Vermeulen and Barkema (2002: 639) wrote, “[i]nternational expansion requires [firms] to adapt these home-grown mental maps and consequently their structures, systems, and processes rooted in these maps, to fit an institutional setting.” These ideas form the basis behind the initial research in the relationship between internationalization and strategic change (Dass, 2000; McDougall & Oviatt,

1996), acknowledging strategic change is impacted by a firm's interactions in the global environment (Hitt, Boyd, & Li, 2004; Pettigrew et al., 2001). However, at present, there is a need for a better understanding of the connection between internationalization, search, and strategic change.

This dissertation examines the relationship between internationalization and strategic change by focusing on the mediating role of knowledge search. Previous research has examined the extent to which search sources knowledge across the firm's technological and geographic contexts, where exploratory search is the sourcing of knowledge or routines distant from the firm's current and local knowledge base (Katila & Ahuja, 2002; March, 1991). In contrast, exploitative search sources knowledge near the firm's local knowledge base. In this dissertation, I extend organizational learning and internationalization theory to examine how international expansion in the pharmaceutical industry encourages exploratory search at the corporate level through exposure to diverse knowledge sets and the pressures to adapt and gain legitimacy abroad. However, this effect may also be contingent upon the pattern of international expansion over time (Delios & Beamish, 2001; Vermeulen & Barkema, 2002). Many firms take large discontinuous steps abroad, move into distant institutional settings, and expand with high speed into international markets; and thus, the pattern of international expansion, characterized by its speed, international experience, and institutional distance, influences organizational learning and absorptive capacity (Eriksson, Johanson, Majkgard, & Sharma, 1997; Pedersen & Shaver, 2002; Vermeulen & Barkema, 2002).

Therefore, I argue that these characteristics of expansion affect the firm's ability to search in distant domains (Eriksson et al., 1997; Vermeulen & Barkema, 2002).

While previous work has specified that search leads to strategic change (Lant & Mezias, 1992; Rajagopalan & Spreitzer, 1997), this dissertation further explores the relationship between exploratory search and strategic change by evaluating the effects of exploration. Exploratory search encourages more awareness of the external environment, promoting learning and triggering change in the firm's mental models and beliefs. March (1991) suggested that exploration and exploitation involve different learning mechanisms that explain change within organizations. Therefore, I examine these tensions and discuss the curvilinear relationship between exploratory search and strategic change, as well as, investigate the moderating effect of innovation capabilities on the relationship between strategic change and firm performance (Lant & Mezias, 1992; Nelson & Teece et al., 1997; Winter, 1982).

## INTERNATIONALIZATION

In the last three decades, firms have increasingly utilized global strategies to compete and gain competitive advantage. As such, considerable research has focused on internationalization, which reflects the degree to which a firm operates in foreign markets. Research on the subject has its early roots in international business, economic, and management theories.

From its inception, early theories took an economic perspective, suggesting that the theory of portfolio investment explained international capital movements. Hymer (1976) later challenged this perspective, putting forward the benefits of

internationalization through the theory of foreign direct investment, which proposed that investors seek control in order to ensure the safety of their investment, effectively use resources, and lessen competition. Later, Caves (1996) suggested that the motivation for foreign expansion was high transaction costs for firms conducting business internationally with intangible assets. Consequently, instead of transacting in the market with the threat of opportunism, firms internalized these transactions through internationalization. Similarly, Kogut and Zander (1993) suggested that because tacit knowledge is difficult to transfer in the market, in order to mitigate these risks, firms prefer to enter a foreign country via a wholly owned subsidiary rather than a joint venture. Drawing from the theoretical rationale of Caves (1996) and Buckley and Casson (1976), one line of research has sought to establish the relationship between the desire to exploit intangible resources and internationalization (Delgado-Gomez, Ramirez-Alesin, & Espitia-Escuer, 2004; Hitt, Bierman, Shimizu, & Kochhar, 2001; Hitt, Bierman, Uhlenbruck, & Shimizu, 2006; Nachum & Zaheer, 2005).

Nachum and Zaheer (2005), however, said that firms do not simply expand abroad for efficient transfer of knowledge. They also internationalize to seek out intangible resources from the host country (e.g., technological knowledge and intellectual capital). For example, a firm's technological skills may allow the firm to both explore and exploit the technological knowledge in a host country to varying degrees (Henisz & Macher, 2004). Firms that are asset or knowledge-seeking look to gain resources abroad (Kogut, 1991). In fact, the acquisition of knowledge is cited as one of the major reasons for expanding abroad (Florida, 1997). Emphasizing this



perspective, Penner-Hahn and Shaver (2005) described internationalization of research and development (R&D) as a technology-building strategy whereby firms can adapt their products to local markets and access technological knowledge (Frost, 2001).

Consequently, several studies found support for the influence of internationalization on innovation (Hitt et al., 1997), organizational learning (Yeoh, 2004; Zahra et al., 2000), and strategic change (Dass, 2000). As firms go abroad, new markets challenge organizational mindsets, trigger firms to search for new ways of doing business, and spur change in the firm (McDougall & Oviatt, 1996).

## RESEARCH QUESTIONS

The purpose of this dissertation is to provide a deeper understanding of the influence of internationalization on search and strategic change. This focus suggests five important research questions regarding the influence of international expansion paths on search, how exploratory search influences strategic change, and the interaction between strategic change and innovative capabilities that influences firm performance. These relationships are represented in Figure 1.

1. How does internationalization affect a firm's exploratory search for knowledge?
2. How does exploratory search affect strategic change?
3. Does exploratory search partially mediate the relationship between internationalization and strategic change?
4. Does exploratory search partially mediate the internationalization-strategic change relationship?

5. Do innovative capabilities enhance the effects of strategic change on firm performance?

Using these research questions, I make several contributions to research in strategic management, international business, and organization theory. First, this research underscores the importance of knowledge and learning within the firm. While research has shown that internationalization may have mixed effects on firm performance depending on the extent of diversification and the pattern it takes over time, there continues to be an increasing trend toward internationalization, suggesting that diversification may result from other motivations, such as the search for knowledge (Bartlett & Ghoshal, 1989; Cantwell, 1989; Florida, 1997). Because traditional internationalization theories focused on exploitation of current knowledge and transfer of knowledge from the parent to foreign subsidiaries (Caves, 1996; Kogut & Zander, 1992), the equally important knowledge-seeking motives of parent firms have been neglected. Research on internationalization has been extensive, yet with the exception of several studies (Hitt et al., 1997; Ruigrok & Wagner, 2003; Vermeulen & Barkema, 2001; Wagner, 2004; Zahra et al., 2000), organizational learning perspectives on internationalization have been few. Further, Penner-Hahn and Shaver (2005) noted a lack of empirical research on the previously proposed knowledge-seeking motives for foreign expansion.

Understanding the process of organizational learning in firms is critical if researchers are to move beyond anecdotal understanding, which relegates learning to a “black box” (Crossan & Berdrow, 2003). Fiol and Lyles (1985: 805) said “strategy

influences learning by providing a boundary to decision making and a context for perception and interpretation of the environment.” They further suggest that learning may be represented by experimentation and search, which subsequently brings up the question of whether higher-level learning is associated with global firms that operate in varied contexts. Through examining the effects of internationalization on search, I explain how international expansion facilitates access to and use of knowledge (Almeida, 1996). Understanding knowledge search is also important for managers. For managers of local firms, increasing attention should be given to protecting valuable knowledge, since firms are increasingly searching for knowledge as they expand. In contrast, managers should also recognize that internationalization may be a way to find new knowledge; however, its efficacy is dependent upon the path of expansion.

Second, this research contributes to literature on international strategy. Although only a handful of studies have examined the effects of characteristics of internationalization (Vermeulen & Barkema, 2002; Wagner, 2004; Zahra et al., 2000), these expansion characteristics are important because they influence the way the firm learns as patterns affect organizational learning and the future opportunities available to the firm. Many have suggested that understanding the process of international expansion is important because expansion should not solely be captured at a static point in time, but it should also incorporate an understanding of how the firm has expanded over time (Andersen, 1997; Sharma & Blomstermo, 2003). Therefore, the location and pattern of international expansion over time influence the rate and modes of organizational learning (Delios & Beamish, 2001; Vermeulen & Barkema, 2002). Consequently, I

argue that speed of internationalization, international experience, and institutional distance are important patterns of internationalization because they affect the ability of firms to learn and absorb knowledge.

Third, this study also has an important impact on the strategic change literature; at a broad level it explains how firms can change in response to internationalization and search, an important unanswered question (Pettigrew et al., 2001). Strategic change is an important action studied in strategic management, which reflects the firm's strategy to better fit changes in the environment and organization (Hitt et al., 2004; Rajagopalan & Spreitzer, 1997). While there has been little research on the relationship between a firm's existing capabilities and strategic change, knowledge search routines may trigger change as double-loop learning or exploration occur (Lant & Mezias, 1992). As a result, I suggest that as firms search, they are better able to detect changes in their environment, acquire new knowledge, change the firm's dominant logic, and update ingrained organizational routines, which all enable strategic change.

However, because search has been conceptualized as exploratory or exploitative, there are trade-offs between the degree of learning and efficiencies within the firm. Exploratory search creates new ideas and variety that challenge organizational beliefs, yet its results are more variable and distant in time (March, 1991). In addition, in order to integrate novel ideas, extensive exploratory search sacrifices stability of operations that is often needed to implement strategy. By focusing on the positive and negative aspects of exploratory search, I clarify the relationship between exploratory search and strategic change.

Finally, the present study examines how innovation capabilities interact with strategic change to affect firm performance, making a contribution to both the entrepreneurship and strategy literature. Previous studies exploring the relationship between strategic change and firm performance have been equivocal, with some finding positive, negative, and even no relationship, more recent attention has been placed on moderators. Rajagopalan and Spreitzer (1996) suggested that an important unanswered research question lies in understanding how changes in strategy and changes in organizational conditions explain economic organizational outcomes. Thus, a line of research has found that strategic resources and capabilities, especially those linked to firm's learning ability, enhance the effects of strategic change as they expand the firm's opportunities and represent knowledge that can be leveraged to implement change (Bloodgood & Morrow, 2003; Kraatz & Zajac, 2001; Morrow Jr., Sirmon, Hitt, & Holcomb, 2007; Zajac, Kraatz, & Bresser, 2000). In addition, previous research has asserted that innovations are a means of renewal and subsequent sustainable returns because of the organizational learning involved (Danneels, 2002; Dougherty & Hardy, 1996). Schumpeterian innovation has been characterized by the firm's ability to generate returns through the introduction of new products into the market that change and destroy both the firm's and markets current way of doing business (Nelson & Winter, 1982; Schumpeter, 1942). However, research has not investigated how strategic changes made in conjunction with innovation capabilities influences firm performance. Therefore, this study investigates how innovation capabilities moderate the relationship between strategic change and firm performance.

## THE PHARMACEUTICAL INDUSTRY

The research questions in this study are investigated within the pharmaceutical industry. This industry is dedicated to the discovery, development, and manufacturing of chemical compounds, substances, and drugs. This industry faces high barriers to entry as the costs of drug developing and patenting are high and the intellectual resources are scarce. In fact, out of all industries, companies in the pharmaceutical industry invest one of the highest percentages of sales to R&D. The industry has experienced strong growth due to innovation, demographic trends, and regulations (Richardson, 2004) which has lead to increasing concentration among firms. In addition, a number of transformations have disrupted the industry where the most being the advent of biotechnology.

This dissertation explores three important processes within the pharmaceutical industry: internationalization, knowledge search, and strategic change. To generate continuous streams of new products in an industry characterized by patent protections, regulations, and increasing industry R&D expenditures, knowledge search in new technological domains is critical to product development (Frost, 2001). Chung and Alcacer (2002) found that compared with the semiconductor and electronics industries, pharmaceutical companies had the largest positive valuation of foreign R&D intensity, suggesting that knowledge-seeking is more important in pharmaceuticals than other industries. In fact, many firms have begun to acquire knowledge by locating their R&D activities in international venues to source local knowledge for the discovery of new drugs (Gambardella, 1995; Gassmann, Reepmeyer, & Von Zedtwitz, 2004; Pearce & Singh, 1992; Shan & Song, 1997). The pharmaceutical industry has become global, as

displayed by the fact that exports in the United States, itself, have more than more than tripled within the last 15 years (Gassmann et al., 2004).

Pharmaceutical firms are also constantly challenged to update their product portfolios to treat unmet needs (i.e., diseases) in diverse therapeutic areas as the competitive, general, and institutional environment changes. For example, Pfizer possesses drugs within a number of therapeutic categories, such as musculoskeletal, cardiovascular, central nervous system, endocrine, infectious, and respiratory diseases, as well as cancer. When the competitive landscape of these therapeutic markets changes as patents on blockbuster drugs expire, new innovative drugs are positioned to enter the market (Gray, 2006). In addition, changes in legislation and demographic characteristics make therapeutic areas more attractive, such as in the obesity and stem cell drugs markets. Therefore, because of the emphasis on knowledge search and the need for change in product portfolios, this industry provides a good setting for the study of internationalization, knowledge search, and strategic change.

#### SUMMARY AND ORGANIZATION OF DISSERTATION

This dissertation investigates the relationship between internationalization, exploratory search, and strategic change. The rest of the dissertation proceeds as follows: In Chapter II, I present theory development and specific hypotheses. Following this, Chapter III provides the statistical methodology, variables, and data sources used in the study.

## CHAPTER II

### THEORETICAL DEVELOPMENT AND HYPOTHESES

The previous chapter explained that international firms competing in a dynamic environment often go abroad in search of new knowledge and technological capabilities. This chapter is concerned with the following question: How do international expansion paths influence strategic change through exploratory search?

Within the last few decades, firms have increasingly expanded abroad, prompted by both internal and external factors, such as the slow growth in domestic markets and the desire to acquire and exploit resources and capabilities. This phenomenon has occurred in many industries, including the pharmaceutical market, with pressures from increased regulations, competition from generic manufacturers, and shortening window of patent protection (Gassmann et al., 2004). Recent research in strategic management and international business has explored the effects of internationalization on firm performance (Geringer, Tallman, & Olsen, 2000; Gomes & Ramaswamy, 1999; Hitt et al., 1997; Tallman & Li, 1996), organizational learning (Chang, 1995; Yeoh, 2004; Zahra et al., 2000), and innovation (Hitt et al., 1997). These studies have begun to support anecdotal evidence suggesting that as firms internationalize, they learn from encounters with diverse cultures and institutions, adapt to local markets, and manage a growing scope of operations, all of which may result in strategic change.

Knowledge search is an important routine reflecting learning from organizational experiences such as international expansion (Lant & Mezias, 1992). Several studies have suggested the difficulties inherent in changing a firm's natural tendency toward



searching for knowledge locally. Jaffe et al. (1993) pointed to the localization of knowledge in a geographic context as determining the search patterns of firms. Rosenkopf and Almeida (2003) said that “firms to a large extent are bound to and limited by the technological and geographic contexts in which they find themselves.” Alliances and scientist mobility of investors help facilitate access to distant knowledge (Almeida & Kogut, 1999; Rosenkopf & Almeida, 2003; Song, Almeida, & Wu, 2003). These solutions allow distant knowledge to flow into firms, yet other strategies such as international expansion may also affect the exposure to distant technological and geographical contexts. In support of this, a stream of research has suggested that multinational firms are able to benefit from subsidiaries who tap foreign knowledge (Almeida, 1996; Florida, 1997; Kenney & Florida, 1994; Shan & Song, 1997).

Organizational routines change as firm experiences change (Espedal, 2006; Lant & Mezias, 1992), and thus internationalization represents an experience that may influence exploratory search, depending on the characteristics of internationalization. I seek to enhance understanding of these issues by investigating how internationalization influences search routines, and ultimately strategic change.

#### FIRM-LEVEL OUTCOMES OF INTERNATIONALIZATION

Internationalization refers to firm expansion across national borders into different world regions or markets (Hitt et al., 1997). It has gained attention in research primarily because of the recognition of its effects on firm performance (Capar & Kotabe, 2003), although findings about that relationship have been mixed. Internationalization was viewed by early international business theorists as a method for diversifying risk through

the flow of capital from countries with low interest rates to countries with high interest rates. However, Hymer (1976) found that this theory failed to explain the degree of control held by firms expanding abroad. In fact, researchers have put forth many diverse motives for international expansion, such as increasing market power, capitalizing on economies of scale, exploiting differences in the market's inefficiencies, and economizing on transaction costs, organizational learning, acquisition of resources and capabilities, and competition.

Hymer (1976) was one of the first to theorize that firms face costs of doing business abroad, and profits in addition to interest rates spurred firms to internationalize. He explained that firms retain control to reduce competition between subsidiaries, which allows them to exploit subsidiary capabilities. Other perspectives on international expansion also evoked transaction costs theory. Market inefficiencies that have an impact on contracts and property rights often prompt firms to expand abroad, internalizing transactions in order to gain advantage over the market by operating with a central authority and efficient information dissemination (Hennart, 1982). Buckley and Casson (1976) also suggested that time lags, exploitation of market power, and government interventions drove firms to expand their operations abroad. Underscoring the role of knowledge, Caves (1996) similarly said that internalization occurred due to the risk of transacting with intangible assets.

Perhaps because of the focus on exploitation of resources and the economic rewards of international expansion, early researchers generally studied the relationship between internationalization and performance. Early studies considered the relationship

to be linear (Hughes & Sweeney, 1975; Vernon, 1971). For example, several researchers found the scope of internationalization to be positively related to firm profitability because it expands market opportunities (Buhner, 1987), diversifies risk (Kim, Hwang, & Burgers, 1993), and increases market power (Grant, 1987). However, internationalization is not without its costs. Zaheer (1995) introduced the term “liabilities of foreignness,” originating from the works of Hymer (1976), to describe the costs that arise from doing business abroad, such as higher coordination costs, cultural distance, unfamiliarity with political institutions, and lack of social contacts. This became the foundation of many studies that posited a relationship between internationalization and performance that was not linearly positive, but curvilinear. Performance increases were due to the economies of scale and scope created by expansion, but later declines occurred due to the costs of coordinating unrelated environments (Gomes & Ramaswamy, 1999; Hitt et al., 1997). However, Nachum and Zaheer (2005) explained that the motivation to expand internationally is not only financial performance, but also access to knowledge and resources (Kogut, 1991). Consequently, scholars have focused on how internationalization influences organizational learning (Barkema, Bell, & Pennings, 1996; Barkema & Vermeulen, 1998; Geringer et al., 2000; Ruigrok & Wagner, 2003; Zahra & George, 2002).

### **Knowledge and Internationalization**

Internationalization theories have been grounded in both exploiting and exploring knowledge. Knowledge refers to information held by an organization that may be stored in routines, rules or procedures, or that is formed through learning from past experiences

(Huber, 1991; Shultz, 2001). To incorporate new knowledge within the organization's knowledge base, firms "purposely adopt structures and strategies to encourage learning. They are not totally reactive, and can proactively seek to influence the environment in which they learn" (Dodgson, 1993: 387). In accordance with this thesis, organizational learning has been cited as one of the major reasons for expanding abroad, and possibly the reason for performance gains from internationalization (Florida, 1997; Hitt, Tihanyi, Miller, & Connelly, 2006; Kogut, 1991; Penner-Hahn & Shaver, 2005). Organizational learning refers to the collective and individual phenomena whereby firms improve themselves through garnering greater knowledge and understanding (Fiol & Lyles, 1985: 803). It is seen as a precursor to adaptation and improved efficiency due to the accumulation of knowledge (Fiol & Lyles, 1985). Lower-level (Fiol & Lyles, 1985), first-order (Lant & Mezias, 1992), or single-loop learning (Argis & Schon, 1996) refer to that which reinforces the firm's current mindset, organizational practices, and existing knowledge base, affecting short-term performance (Dodgson, 1993). In contrast, higher-level, second-order, or double-loop learning change the norms, activities, frames of reference, and knowledge bases within the organization to achieve long-term rewards (Argyris & Schoen, 1996). This kind of learning is characterized by the "search for and exploration of alternative routines, rules, technologies, goals, and purposes" (Lant & Mezias, 1992: 49). Because strategies and environments may influence learning through altering the firm's environment and mindsets, internationalization and multinational operations have been associated with double-loop learning (Dodgson, 1993; Fiol & Lyles, 1985).

Many studies have suggested that organizational learning and capability development may explain when and why performance gains may be obtained (Barkema et al., 1996; Delios & Beamish, 2001; Sapienza, Autio, George, & Zahra, 2006; Zahra et al., 2000; Zahra, Sapienza, & Davidsson, 2006). For example, Zahra et al. (2000) investigated the breadth, depth, and speed of technological learning during international expansion. They showed that internationalization affects the breadth and depth of technological learning, and negatively influences the speed of learning. In a study on sequential entry into foreign markets, Chang (1995) found that as firms may learn from their failures and use these experiences to enter more diverse countries. Still others have related it to such outcomes as social and market learning (Yeoh, 2004), organizational knowledge (Toften & Olsen, 2003), innovation (Hitt et al., 1997), and scale and scope economies (Kogut, 1985). Hitt and colleagues (1997) used organizational learning to explain the early gains in firm performance during international expansion, a period in which firms seek to both exploit resources and build innovation capabilities. Anecdotal evidence within the pharmaceutical industry suggests that exposure to different cultures has been associated with search and discovery of unmet needs in therapeutic areas (Blackwell, 2005). These studies have also indicated the boundaries of learning and capability development during internationalization (Hitt, Tihanyi et al., 2006). Diversity of international operations results in broad and deep knowledge acquisition; however, it may slow organizational learning because of the synthesis required to incorporate that knowledge into current business practices (Zahra et al., 2000). When expansion occurs

too quickly or with an irregular rhythm, firms are unable to absorb new knowledge and leverage past experiences (Vermeulen & Barkema, 2002).

More evidence of knowledge-seeking comes from literature on knowledge transfer and internationalization of R&D in multinational firms. Knowledge transfer can be particularly high because foreign markets provide access to new ideas can be subsequently applied in other countries; however, knowledge transfer may be inhibited by lack of embeddedness (Almeida, 1996; Bartlett & Ghoshal, 1989; Dhanaraj et al., 2004; Frost, 2001; Kogut, 1991; Kuemmerle, 1997). Foreign subsidiaries draw upon knowledge within their local area—distant from headquarters—and are able transfer it within the firm, increasing the diversity of knowledge in which the firm searches (Almeida, 1996; Kuemmerle, 1997). Ahuja and Katila (2004) found that as firms change their international product-market presence, they begin to search for knowledge in more diverse geographic areas. Subsidiaries are more innovative when they draw from technical ideas from the host country, rather than their home country because technological knowledge is largely heterogeneous and specialized throughout different countries (Archibui & Pianta, 1992; Bartholomew, 1997; Frost, 2001). Research suggests that pharmaceutical and biotechnology firms go abroad to exploit and expand their R&D capabilities, and pharmaceutical firms place a high value on the ability to source knowledge and enhance technological variety (Cantwell & Janne, 1999; Chung & Alcacer, 2002; Kuemmerle, 1997).

International strategies are unique because they are determined by the firm and propel the organization into new institutional and cultural environments where they

might learn and make changes to their strategies to adapt. The relationship between learning and change has been underscored in previous literature, highlighting the adaptive nature of firms to update their routines based on organizational experiences (Fiol & Lyles, 1985; Lant & Mezias, 1992). Uniting capabilities and organizational learning perspectives, an emergent body of work has suggested that internationalization is positively related to strategic change due to the learning required and external pressures from internationalization. Hitt et al. (1997: 1770) suggested that “experience with product diversification can build managerial capabilities that allow more effective management for internationalization,” and therefore, experiences in international markets might also change the way a firm approaches its product diversification. The organizational learning perspective on strategic change suggests that activities, which encourage increased awareness of the environment, search of new domains, and information-gathering from diverse sources, may positively affect strategic change (Cho & Hambrick, 2006; Lant & Mezias, 1992; Simons, 1994). As firms internationalize, they pressures for local responsiveness and customizations and encounter new knowledge bases and cognitive beliefs may trigger change. For example, McDougall and Oviatt (1996: 27) said that because the capabilities needed to compete internationally differ from those needed to compete domestically, “it is reasonable to assume that as ventures expand internationally they must make changes in their strategy to be congruent with their new environment.” While they were unable to find a relationship between internationalization and firm performance, they suggested this was due in part to because of the survey methodology and short window of time used to

detect the relationships. In an analysis of diverse industries, Dass (2000) also suggested that internationalization provides resources and a capability for strategic change, finding a positive relationship between internationalization and an abrupt change in strategy.

A broad review of the literature finds few studies have investigated the relationship of between internationalization and strategic change—thus, what is needed is a theoretical conceptualization of how internationalization affects knowledge search to enable change. Next, I explain how internationalization presents a source of complexity, learning, and constraints that influences exploratory search in the firm. Zahra and colleagues (2000: 928) wrote “[d]iverse ideas and capabilities encountered in international business operations produce combinative knowledge. This knowledge leads to the development of dynamic routines that promote complex problem solving.” These problem-solving routines may be described as exploratory search, because experience often determines how firms search to address problems (Garud & Nayyar, 1994; Lant & Mezias, 1992). The subsequent hypotheses explicate how characteristics of internationalization influence search and change.

#### INTERNATIONALIZATION AND KNOWLEDGE SEARCH

Extant literature has recognized the “knowledge-seeking” motive for foreign expansion, recognizing that firms not only exploit their firm-specific advantages in foreign countries, but knowledge search is also an important outcome of internationalization (Almeida & Kogut, 1999; Bartlett & Ghoshal, 1989). I define knowledge search as an organizational routine to source knowledge across firm boundaries, used to investigate problems and gaps between desired and actual



performance in product or process design (Greve & Taylor, 2000; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001). It has also been described as a “combinative capability” (Kogut & Zander, 1992), “dynamic capability” (Winter, 2000; Zollo & Winter, 2002; Zott, 2003), and “architectural competence” (Henderson & Cockburn, 1994), because of the role of knowledge search in the introduction, change, and renewal of products at the corporate-level. Zott (2003) suggested that the search for new resource configurations or alternative solutions is a key to renewing the firm. These organizational routines are composed of knowledge that is path dependent, dependent upon existing routines, and target oriented, working toward some predetermined outcome (Kogut & Zander, 1992; Levitt & March, 1988; Nelson & Winter, 1982).

Knowledge search may occur across technological areas (Fleming, 2001; Fleming & Sorenson, 2005; Rosenkopf & Nerkar, 2001), geographic domains (Almeida, 1996; Frost, 2001; Stuart & Podolny, 1996), time periods (Katila, 2002; Nerkar, 2003), or the firm’s own knowledge base (Katila & Ahuja, 2002). The search literature has roots within work by March and Simon (1958), explicating the adaptive learning process whereby boundedly rational managers induce search when performance falls below aspiration levels. New product development is a problem-solving process (Brown & Eisenhardt, 1995; Dougherty & Hardy, 1996), regarding the “product concept, plan, design, and knowledge and skills to perform related actions” (Marsh & Stock, 2006: 424). As a result of search, firms can integrate new capabilities and skills into their knowledge base and reconfigure resources and capabilities to generate new skills, and

consequently it helps firms gain a competitive advantage (Fleming, 2001; Katila & Ahuja, 2002; Nelson & Winter, 1982).

Consequently, search reflects an important routine within the firm for many reasons. First, learning emerges from a coordinated search routine in which repetition, imitation, or experimentation allow tasks to be performed better, resulting in new product opportunities (Zott, 2003). In fact, the organizational learning perspective “suggests that the acquisition and processing of information about alternatives takes place in a relatively costly process of search” (Lant & Mezias, 1990: 149). Knowledge search allows firms to identify new opportunities through codified search routines (Winter, 2000); thus, the ability to search for new products, ideas, and processes is integral to organizational learning. Next, search may also be the result of experiential, double-loop learning (Lant & Mezias, 1992). Rosenkopf and Nerkar (2001: 289) described search as a “second-order competence: the ability of a firm to create new knowledge across boundaries.” As such, search may reflect the extent to which a firm seeks out distant or novel knowledge or reuses or exploits local knowledge. A primary function of search is to generate new knowledge through the recombination of ideas (Fleming, 2001). Therefore, search may reflect the recombinant nature of knowledge (Katila & Ahuja, 2002; March, 1991). Finally, knowledge search reflects this value-creating routine within the product development cycle (Eisenhardt & Martin, 2000: 1107). It is a firm routine used to combine varied skills and resource profiles to create rent-generating products and services that renew the firm, leading to innovation and change (Dougherty, 1992; Eisenhardt & Martin, 2000).

Previous research has conceptualized search by whether it was exploitative or exploratory (March, 1991), experimental or imitative (Zott, 2003), or distant or local, that is, seeking knowledge both within and without organizational boundaries (Rosenkopf & Nerkar, 2001; Stuart & Podolny, 1996). Local versus distant search reflects the proximity of knowledge within the firm's technological and geographic contexts, whereas distant search refers to searching that transcends the firm's boundaries (Baum, Li, & Usher, 2000; Stuart & Podolny, 1996). Therefore, the idea of local versus distant search is closely aligned with March's (1991) ideas of exploration versus exploitation. Scholars have noted that both exploration and exploitation involve learning, albeit different types (Gupta, Smith, & Shalley, 2006; March, 1991). Similar to distant search, exploration refers to learning modes that entail the "search for new knowledge" and, similar to local search, exploitation entails the "ongoing use of a firm's knowledge base" (Vermeulen & Barkema, 2001). Therefore, exploratory and exploitative search address different tensions involved in learning.

Exploitative search addresses problems using the firm's preexisting knowledge base and local area knowledge (Baum et al., 2000; Katila & Ahuja, 2002), closely associated with single-loop learning, which enforces stability and the firm's existing knowledge base (Argyris & Schoen, 1996). Exploitative search results when firms "consider only alternatives that lie close to the status quo (Siggelkow & Levinthal, 2005: 89). Exploitative search is incremental, resulting in gains only in areas previously learned, providing a narrow set of choices, defined by time, content, or location (Baum et al., 2000; Levitt & March, 1988). Deeper exploitative search within a particular area

may increase the firm's proficiency in that area as they refine the product and the firm's skills (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001), and it may enhance many related skills within the firm, resulting in related new products or services. In support, Stuart and Podolny (1996) found that firms have a natural tendency to patent in areas in which they have previously patented; therefore, firms tend to be bounded in their search for new knowledge (Jaffe et al., 1993; Stuart & Podolny, 1996). Exploitative search opens up the possibility for core rigidities, in which firms may become more inert and begin to overlook new opportunities, causing performance to decline (Henderson, 1993; Katila & Ahuja, 2002; Leonard-Barton, 1992). This occurs because of the cost of redirecting resources to the development of new capabilities (Kogut & Zander, 1992) and the uncertainty associated with exploration (Levinthal & March, 1993).

Exploratory search is defined here as actions taken by the firm to address problems using knowledge or routines distant from the firm's current and local knowledge-base (Katila & Ahuja, 2002; March, 1991). Exploratory search creates a diverse set of alternatives and therefore is associated with double-loop learning that creates a new knowledge base within the firm (Shultz, 2001), underscoring its adaptive nature (Argyris & Schoen, 1996; Benner & Tushman, 2003; McGrath, 2001). As search increases the diversity of knowledge explored by the firm, new possibilities for unique knowledge combinations result (Katila & Ahuja, 2002). However, exploration also decreases efficiency, sacrifices short-term performance, and has variable results (Katila & Ahuja, 2002; March, 1991). The variability in returns from exploration may be partially explained because products or innovations from exploration may be extreme

successes or failures and new knowledge requires integration, which is difficult for many firms (Cohen & Levinthal, 1990; Taylor & Greve, 2006). Exploration of new knowledge is more likely to challenge the dominant logic of the firm, resulting in opposition to integration (Levinthal, 1997; Miller, Zhao, & Calantone, 2006; Schildt, Maula, & Keil, 2005). When the knowledge to be integrated is too distant, firms are unable to absorb new knowledge (Cohen & Levinthal, 1990). More resources and time are needed to search new areas and integrate them within the firm, and consequently, the performance effects of exploratory search are distant and uncertain (March, 1991). Figure 2 displays the antecedents of exploratory search, which include double-loop learning (Lant & Mezias, 1992). Because double-loop, or second order learning, causes firms to recognize “that certain experiences cannot be interpreted within the current belief system,” firms are prompted to search for new goals and ways to achieve those goals (Lant & Mezias, 1992: 49). In addition, search may be prompted by poor performance or organizational problems (Ahuja & Katila, 2001; March & Simon, 1958), geographic or environmental stimuli (March, 1991; Rosenkopf & Almeida, 2003; Stuart & Podolny, 1996), international product market presence (Ahuja & Katila, 2001), or knowledge sharing across divisions or people (Miller et al., 2006; Nagarajan & Mitchell, 1998), causing firms to break away from exploitative search to more exploratory search. Thus, internationalization may trigger exploratory search because of the exposure to new markets and technologies, learning experiences, transfer of knowledge within the firm, and change in location, prompting the firm to explore along two different dimensions, geography and technology (Almeida & Phene, 2004).

## HYPOTHESES

More recently, scholars have suggested that internationalization may be a source of knowledge acquisition as well as exploitation because it promotes an organizational learning process (Barkema & Vermeulen, 1998; Bartlett & Ghoshal, 1989; Chang, 1995; Dunning, 1994; Johanson & Vahlne, 1977). In fact, previous research suggests that international location decisions are often made based on the desire to gain knowledge (Almeida & Phene, 2004; Cantwell, 1993). Internationalization affects exploratory search because firms that increase their expansion into diverse countries are exposed to different knowledge bases, which creates the opportunity for organizational learning (Ghoshal, 1987; Hitt et al., 1997; Lei, Hitt, & Bettis, 1996). Learning is influenced by the exposure to new knowledge, so diversity in location of expansion may increase learning as firms expand because countries possess different knowledge sets and capabilities influenced by different cultural, political, and economic institutions (Cantwell, 1989; Fiol & Lyles, 1985; Shane, 1993; Zahra et al., 2000). Increasing exposure to diverse knowledge sets stimulates learning about different ways to combine knowledge, thus exploration increases (Taylor & Greve, 2006). Countries have become more specialized technologically over time (Archibui & Pianta, 1992); therefore, internationalization allows firms to gain from subsidiaries' search and capitalize on technologically and geographically diverse knowledge (Cantwell, 1993). In support, Fiol and Lyles (1985) said that firms operating in more diverse environmental contexts achieved greater double-loop learning. Through foreign expansion, the firm is likely to find access to R&D facilities and human capital that form much of a country's

knowledge base (Bartholomew, 1997). Therefore, internationalization has been linked to diverse political, economic, social, customer, and competitor environments that provide learning opportunities for executives, overcoming their local myopia (Carpenter & Fredrickson, 2001; Tallman & Li, 1996; Zahra et al., 2000).

Second, internationalization leads to search because subsidiaries are more prone to use problem-driven search to adapt and understand local markets to achieve legitimacy and overcome liabilities of foreignness. Cyert and March (1963) described the firm's response to a threatening or challenging situation in which a firm no longer has a guaranteed solution. As a result, the firm must explore many solutions to a problem because of great uncertainty. Similarly, because of the lack of embeddedness in host countries when firms expand abroad, firms encounter increased ambiguity, uncertainty, and lack of legitimacy that create obstacles in operating abroad (Bartlett & Ghoshal, 1989; Hymer, 1976; Jensen & Szulanski, 2004). The costs of doing business in a foreign country, their liability of foreignness, prompt firms to search for local knowledge to increase the flow of information between the firm and the host country, allowing them to learn and adapt (Hymer, 1976; Shultz, 2001; Zaheer, 1995; Zaheer & Mosakowski, 1997). This often occurs as subsidiaries explore local practices and local markets to help them adapt products and processes to the host country (Almeida & Kogut, 1999; Shan & Song, 1997; Vernon, 1979). Barbara Pritchard of the Pritchard Group, a firm providing healthcare and pharmaceutical consulting, discusses how expansion into Latin America prompted a search into local needs: "there are situations where drugs are not available there, or certain therapies are too expensive. The prevalence of a disease can differ, as

can treatment regimens” (Blackwell, 2005: 3). Pharmaceutical firms can become cognizant of diseases and conditions that influence different races and ethnicities as well as ethnic or cultural influences shaping how the firm should best meet these needs as they internationalize (Blackwell, 2005). Therefore, as firms expand abroad, they often explore and search in order to learn more about local needs.

Third, internationalization not only prompts search through in its subsidiaries, but also in the parent firm and other subsidiaries. The benefit of multinational firms has been their ability to transfer knowledge within the firm (Zander & Kogut, 1985). Exposure to new information from expansion prompts horizontal and vertical knowledge flows within the firm (Jensen & Szulanski, 2004; Shultz, 2001). As the parent firm and other subsidiaries experience diverse knowledge, search is triggered. Kuemmerle (1997) suggests that the goal of international expansion is for subsidiaries to absorb local knowledge and transfer it to the company’s headquarters, where the multinational corporation (MNC) can integrate this diversely sourced knowledge.

*Hypothesis 1: Internationalization is positively related to exploratory search.*

### **International Expansion Paths and Exploratory Search**

Because knowledge search is a routine based upon learning, which is path-dependent, evolutionary paths, that is the trajectory of decisions made by the firm influence the current learning opportunities (Eisenhardt & Martin, 2000; Gersick, 1994; Teece, Pisano, & Shuen, 1997). “What the firm can do and where it can go are ... constrained by its positions and [prior] paths” (Teece et al., 1997: 524). For example, Levitt and March (1988) suggest that improvements of an existing competency may be



path dependent because investments in the competence may discourage experimentation with alternatives. Therefore, previous strategic decision may influence the firm's organizational learning and search.

Consequently, grounded in the early work of Penrose (1959), numerous scholars have investigated the effects of firms' patterns of international expansion over time, referred to as '*expansion paths*' (Delios & Beamish, 2001; Vermeulen & Barkema, 2002; Wagner, 2004). Firms expand abroad in different expansion paths, affecting the rate and modes of organizational learning (Delios & Beamish, 2001; Penrose, 1959; Vermeulen & Barkema, 2002). While Johanson and Vahlne's Uppsala model (1977) described internationalization as an incremental process in which the firm sells first through an agent before establishing experience and contacts that allow the firm to further internationalize, recent research suggests that the Uppsala process may lack explanatory power, as many firms take discontinuous expansion moves, "big steps" into international markets, expand abroad quickly, especially due to industry-specific considerations (Andersen, 1997; Madsen & Servais, 1997; Oviatt & McDougall, 1997; Pedersen & Shaver, 2002; Rhee, 2005; Vermeulen & Barkema, 2001). Some firms have expansion patterns marked by high speed as they move quickly into distant markets (Vermeulen & Barkema, 2002; Wagner, 2004). Other firms decide to move into more distant institutional locations or expand deeper over time into different regional, cultural, or institutional areas, honing experiential knowledge (Eriksson et al., 1997; Eriksson, Majkgard, & Sharma, 2000).

These characteristics of expansion—international experience, speed, and institutional distance—affect the absorptive capacity, and therefore exploratory search. Organizational learning is path-dependent, and as a result, the pattern of international expansion may help or hinder search because it is a “cumulative pattern of activity” (Penner-Hahn & Shaver, 2005: 123), as resource, time, and knowledge commitments may restrict alternatives (Dierickx & Cool, 1989; Levitt & March, 1988).

Understanding international expansion paths is important because internationalization should not solely be captured at a static point in time, but should incorporate an understanding of how the firm has expanded over time; something that critics of international research note is frequently overlooked (Andersen, 1997; Hitt, Tihanyi et al., 2006; Sharma & Blomstermo, 2003). Time is important because internationalization influences the way firms learn and absorb new knowledge (Vermeulen & Barkema, 2002). Time has also been used to describe the investment in developing resources and capabilities, referred to as time compression diseconomies (Dierickx & Cool, 1989). This is due to the fact that different paths may facilitate or hinder learning within firms when the cognitive abilities to learn are stretched (Teece et al., 1997). Eisenhardt and Martin (2000: 1115) described this process, writing that “experience that comes too fast can overwhelm managers, leading to an inability to transform experience into meaningful learning.” The trajectory of search represents an investment in time that cannot be hastened, largely due to the absorptive capacity of firms, making the speed of internationalization important (Cohen & Levinthal, 1990; Zahra & George, 2002). Time is also linked to richness of internationalization

experiences that enhance the firm's knowledge, (Chang, 1995; Eriksson et al., 1997; Kogut & Singh, 1988). As firms accumulate more time in an international market, they gain knowledge that decreases their liabilities of foreignness (Zaheer, 1995). Consequently, I further theorize how paths of international expansion paths, international experience, speed of internationalization, and institutional distance affect exploratory search.

### **International Experience**

International experiences signify knowledge that can be translated into new capabilities and may become a source of advantage for the firm (Daily, Certo, & Dalton, 2000; Luo, 2000; Teece et al., 1997; Zott, 2003). As firms expand abroad, they build greater knowledge of the internationalization process, thereby facilitating future expansion (Chang, 1995), and the institutional and culture knowledge gained as a firm expands abroad may result in a competitive advantage (Eriksson et al., 1997). Theorists of the Uppsala model suggest that experiential knowledge promotes organizational learning as a firm expands abroad (Barkema et al., 1996; Eriksson et al., 1997; Johanson & Vahlne, 1977; Kogut, 1985). Eriksson and colleagues wrote:

When entering a foreign market, experiential knowledge about international business is gained and stored in the firm's routines and programs. This accumulated experiential knowledge then exerts an influence on the future internationalization of the firm through its influence on information search processes, e.g., what type of information is sought, and where (Eriksson et al., 1997: 345).

Thus, increased international experience in one country or type of country results in rich knowledge accumulation that can become a competitive advantage (Barney, 1991; Reed & Defillippi, 1990).

International experience prompts exploratory search in two ways. First, firms may also build institutional knowledge when they gain more understanding of laws and regulations, culture, customer preferences, and politics of local markets. “Through the accumulated experience in a foreign market, the firm gains local market knowledge and develops routines and processes for dealing with the foreign context” (Sapienza et al., 2006: 915). As firms gain cumulative experience in an area, their absorptive capacity increases (Zahra & George, 2002). Firms build tacit knowledge and relate this learning to prior knowledge as they gain experience over time that allow them to overcome initial liabilities of foreignness (Cohen & Levinthal, 1990; Hitt, Li, & Worthington, 2005; Levitt & March, 1988; Zahra & George, 2002). Zaheer and Mosokowski (1997) investigated liabilities of foreignness in trading rooms around the world, finding that as firms expanded abroad, lack of knowledge about the culture, governmental regulations, and relational networks existed, yet this liability decreased over time. Foreign firms had lower survival rates than local firms when first established; however, this effect decreased over time, indicating the ability of firms to gain knowledge through experience abroad. International experience helps firms absorb knowledge as they are able to make associations between current and previous knowledge, encouraging double-loop learning (Cohen & Levinthal, 1990). Firms also have time to recognize patterns from diverse experiences, encouraging exploratory search (Crossan & Berdrow, 2003;

Seremata, 2000). Drawing upon this theory, Frost (2001) found that as multinational parent firms have more presence in the host country, there is a greater likelihood that their subsidiaries can draw upon the ideas from the host country. As firms learn, their old mental models become invalidated, causing firms to search for new ways to address problems (Lant & Mezias, 1992). Therefore, repeated experiences over time with the same or similar technologies, cultures, and economies, provide time for firms to learn, which enables exploratory search (Crossan & Berdrow, 2003).

Second, as firms expand deeper internationally, they begin to foster social networks that allow them to access foreign knowledge (Almeida & Kogut, 1999; Kraatz, 1998; Saxian, 1994). Experience abroad encourages and facilitates firms in becoming more embedded within a culture. In a study of innovation in work teams, Taylor and Greve (2006) found that as team experience increased, firms were more likely to have exploratory outcomes that generated large returns or failures because team socialization enhanced communication, work norms, and cooperation. Dhanaraj and colleagues (2004) found that relational embeddedness in international joint ventures, measured in terms of tie strength, shared values, and trust facilitated the transfer of knowledge between firms. In fact, research suggests that tacit market and technological knowledge flow best between regional networks (Saxian, 1994). A firm's interorganizational relationships may determine its ability to identify and access new knowledge (Andersson, Forsgreen, & Holm, 2001; Rosenkopf & Almeida, 2003; Saxian, 1994), thus as a firm becomes embedded over time and increases the number of its subsidiaries, the firm is better able to recognize and search out new knowledge (Andersson et al.,

2001). Therefore, I expect internationalization to have a stronger effect on exploratory search when international experience is high because it increases the firm's absorptive capacity and facilitates interorganizational knowledge flows. These arguments suggest that:

*Hypothesis 2a: International experience positively moderates the relationship between internationalization and exploratory search.*

### **Speed of Internationalization**

Speed of internationalization reflects the rate at which a firm expands abroad over time, and has been acknowledged as one of the important moderators of the internationalization-firm performance relationship (Vermeulen & Barkema, 2002; Wagner, 2004). Because international expansion involves learning whereby firms gain knowledge of the internationalization process, institutions, and foreign cultures (Aharoni, 1966; Johanson & Vahlne, 1977), previous literature suggested that the speed of internationalization affects organizational learning (Oviatt & McDougall, 2005; Vermeulen & Barkema, 2001; Wagner, 2004). This is important because a firm's absorptive capacity reflects its ability to recognize, assimilate, and apply new knowledge and influences a firm's innovative capabilities and search (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998). Consequently, speed affects organizational learning and firm performance (Autio, Sapienza, & Almeida, 2000; Vermeulen & Barkema, 2002; Wagner, 2004).

When the speed of internationalization becomes too great, it may thwart the absorption of knowledge, resulting in information overload for executives and the

organization. Because organizational learning requires complex processes within the organization to absorb knowledge, time is necessary between each new experience. For example, Hayward (2002) found that too many acquisitions in a short period of time negatively affected acquisition performance. “Learning is inherently incremental, and the speed with which organizations expand internationally is subject to what Dierickx and Cool (1989) call ‘time compression,’ i.e., diminishing returns from efforts to speed up the adjustment process” (Barkema et al., 1996: 154). Organizations can only digest a certain amount of information within a span of time (Cohen & Levinthal, 1990), and consequently the ability to develop routines is contingent upon a firm’s absorption of knowledge (Zollo & Winter, 2002). These routines are difficult to develop under extreme time pressures (Dierickx & Cool, 1989).

Therefore, speed of internationalization greatly influences exploratory search because time pressures on learning urge firms to learn quicker and more effectively, prompting them to reject larger quantities of knowledge that are distant from the firm. Firms that expand abroad quickly are required to learn rapidly and efficiently. This often leads them to narrow the focus of search to local domains, discarding diverse knowledge because the more distant the learning, the more time is needed to integrate the knowledge (March, 1991). Exploration requires time to recognize patterns in firm experiences (Crossan & Berdrow, 2003), which is hindered by fast expansion. Thus, I expect internationalization to have a weaker effect on exploratory search under conditions of greater expansion speeds because of the stress it places on learning distant knowledge.

*Hypothesis 2b: Speed of internationalization negatively moderates the relationship between internationalization and exploratory search.*

### **Institutional Distance**

While diversification of international operations into diverse foreign locations may benefit search, firms may be hindered by institutional distance between home and host countries, which challenges organizational learning. Understanding institutional distance is important because a firm's acquisition of new knowledge and capabilities is influenced by the institutional environment (Brouthers, 2002; Hitt, Tihanyi et al., 2006). Institutions have been conceptualized as the "rules of the game" including laws, regulations and informal rules, thus firms must learn the rules to survive (Meyer & Rowan, 1977; North, 1990). Researchers first theorized the influence of distance on multinational firms, referring to those cultural and geographic factors that interfere with the flow of information to the target multinational firm as psychic distance (Johanson & Vahlne, 1977; Johanson & Wiedersheim-Paul, 1975; O'Grady & Lane, 1996). Drawing on Johanson and Vahlne's (1977) early work, which argued that firms face a psychic distance that constrains knowledge transfer when they do business overseas, Kostova (1999) suggested that institutional distance—the differences or similarities between the MNC home and host country institutions—also affects the firm.

A large institutional distance means that MNCs may have more difficulty understanding their new environment and attaining legitimacy (Kostova, 1999; Kostova & Zaheer, 1999), because similarity between institutional contexts helps their understanding of strategic actions (North, 1990). Thus, institutional distance influences



search because of the challenges it presents to learning, gaining legitimacy, and efficacy of business practices. Researchers have noted that as institutional distance increases, firms face more difficulties in transferring organizational practices (Kostova, 1999; Kostova & Roth, 2002). Organizational learning perspectives suggest that learning is largely history dependent (Levitt & March, 1988), and it depends on the similarity between the knowledge to be acquired and the firm's knowledge base (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998); thus, institutional distance may influence absorptive capacity. The parent firm's embeddedness in its own local institutions may place hurdles in the path of transfer of knowledge with its foreign subsidiary, or it may impose its institutional framework on the foreign subsidiary, preventing its adaptation to its own local environment, decreasing the flow of knowledge between the local environment, subsidiary, and parent firm (Johanson & Valhne, 1977). Therefore, institutional distance may influence the ability to understand, acquire, and transfer new knowledge, hindering search.

In addition, a large institutional distance creates increased complexity and ambiguity in overseas operations, which may overwhelm managers, creating increased costs of doing business abroad (Eden & Miller, 2004; Goerzen & Beamish, 2003; Kostova & Zaheer, 1999). Goerzen and Beamish (2003: 1292) wrote, "the more dissimilar the country profile, the more difficult it would be to understand the requirements of the collection of operations and to respond appropriately to local demands." Therefore, as distance increases, firms face more ambiguity as they are unable to understand linkages between outcomes and actions, decreasing the transfer of

knowledge (Simonin, 1999). In addition, the coordination costs and complexity of managing the international operations increase and the available managerial resources to oversee search decrease as information processing demands from institutional distance increase (Egelhoff, 1991; Shultz, 2001; Tihanyi & Thomas, 2005). This occurs because strategic actions and organizational practices may differ by country; therefore, the efficacy of various firm actions is affected by institutions (Kostova, 1999). For example, within the pharmaceutical industry, differences in regulatory environments have a significant impact on the firms because of the effects of laws regarding drug safety, liability, and patent protections (Herling & Brenner, 2005). The complexity in managing operations in many different locations overwhelms the firm, taking up time and resources. Managers begin “to use greater cognitive efforts and incur incremental information search costs to assess their foreign operations” (Tihanyi & Thomas, 2005: 286). In the midst of this complexity and ambiguity, firms are more likely to choose exploitation than exploration because institutional distance makes the gains from exploratory search less clear, more costly, and more uncertain; whereas exploitive search is characterized by quicker feedback and more certain returns (March, 1991). Consequently, firms are less apt to engage in exploratory search when institutional distance is high because of the difficulties in learning and increased operational complexity and ambiguity. Thus, I expect internationalization to have a weaker effect on exploratory search under conditions of high institutional distance because of the challenges to learning and predicted gains from exploration.

*Hypothesis 2c: Institutional distance negatively moderates the relationship between internationalization and exploratory search.*

### **Search and Change**

Strategic change is seen as an important source of competitive advantage, where the dominant perspective is that firms are adaptive and it is important that they recognize the need for change (Brown & Eisenhardt, 1998; Carpenter, 2000). Firms can alter their strategies when management detects differences between the organization's strategy and its environment (Aldrich, 1979). Strategic change reflects a modification in the firm's alignment and fit with the external environment (Hofer & Schendel, 1978; Van de Ven & Poole, 1995), thus altering the content of a firm's strategic actions. For example, demographic and regulatory changes in the pharmaceutical industry have opened up new product markets for drugs while making others less attractive. Strategic change has largely been described in terms of the "content of strategy, i.e., the specifics of what was decided in terms of goals, scope, and/or competitive strategy, and in terms of the process of strategy-making" (Ginsberg, 1988: 560). Thus, it is often associated with business, corporate, or collective strategy (Rajagopalan & Spreitzer, 1997). The majority of studies have investigated strategic change as an alteration of a firm's product/market areas and related resource allocations, which often occurs due to restructuring, acquisitions, mergers, and internal development of new products and services (Ansoff, 1965; Ginsberg, 1988). For example, Goodstein and Boeker (1990) measured strategic change as the absolute change in the breadth of products or services offered by a firm.

Consequently, strategic change is defined herein as adjustments in the alignment of the firm with its external environment, as reflected in “changes in the content of a firm’s strategy, defined by its scope, resource deployment, competitive advantage, and synergy” (Rajagopalan & Spreitzer, 1997: 49). Strategic change is a multifaceted construct that can be investigated by its magnitude, timing, likelihood, and direction (Zajac et al., 2000). Changes in strategy require resources and relationships that enable the firm to adapt and stay aligned with the environment. The magnitude of strategic change captures how much a strategy is altered and whether it affects one product line or the full mix of the products and markets in which a firm serves (Porter, 1980).

Scholars have investigated the way a firm’s internal environment influences change, investigating the effects of strategic leadership capabilities as antecedents of strategic change. A number of studies have found that executive succession, CEO pay, and top management team heterogeneity can increase the level and chances of change (Boeker, 1997a; Carpenter, 2000; Cho & Hambrick, 2006; Fondas & Wiersema, 1997; Goll, Johnson, & Rasheed, 2005; Tushman, Virany, & Romanelli, 1985; Wiersema & Bantel, 1992). CEOs with a similar prior job, a random career path, and higher levels of education are more likely to drive change because of past socialization that builds experience and knowledge (Fondas & Wiersema, 1997). In addition, some studies have investigated the influence of board dynamics and composition on strategic change (Geletkanycz & Hambrick, 1997; Goodstein, Gautam, & Boeker, 1994; Westphal & Frederickson, 2001). Interlocking directorates facilitate diffusion of strategic practices, resulting in strategic change for the focal firm (Geletkanycz & Hambrick, 1997).

Zammuto and Cameron (1985) said that lack of scanning by management results in organizational inertia.

While the extant literature suggests that the ability to deal with changing environments is important, many firms do not have the resources or capabilities to deal with the fast-paced environment. Resources and capabilities of the firm determine whether it can change strategies and remain nimble (Goll et al., 2005; Kraatz & Zajac, 2001; Zajac et al., 2000), and therefore, firms without these resources and capabilities are often unable to respond, resulting in strategic persistence and organizational failure. To combat this risk, learning perspectives on strategic change suggest that organizations can take actions and develop capabilities that increase their awareness of the external environment (Lant & Mezias, 1992), such as active monitoring or attention to the environment (Cho & Hambrick, 2006; Gersick, 1994; Hambrick, 1981), gathering of information (Calori & Atamer, 1990; Simons, 1994; Yetton, Johnston, & Craig, 1994), and search mechanisms (Lant & Mezias, 1992).

From these perspectives, I suggest several reasons why search, as a problem-solving routine, influences strategic change. First, search prompts strategic change because search reflects the firm's desire to understand the environment (Lant & Mezias, 1992). Under organizational learning perspectives, strategic change results from an iterative search process, whereby the firm takes "small steps designed to probe the environment and the organization" (Rajagopalan & Spreitzer, 1997: 56). For example, firms often search in geographically distant domains to gain foreign knowledge needed to adapt their products to local markets (Hankanson & Nobel, 1993). Shifts in the

external environment make search important because firms that fail to identify trends within their product markets do not recognize the need for change and eventually decline (Starbuck, Greve, & Hedberg, 1978). However as firms search in new geographic and technological domains, firms learn and become more aware of external changes in the environment. As subsidiaries are exposed through search to uncertain domains, change occurs (Shultz, 2001). Kuwada (1998) suggests that organizational learning helps firms to gain corporate-level knowledge consisting of basic assumptions about the firm's relationship with the environment, resulting in strategic change.

Second, because continued experience with the same knowledge or technology results in inertia, decreasing the ability to change, search into new domains generates greater change (Haveman, 1993). Exploratory search brings new knowledge into the firm that may be related to different markets through adjusting a firm's product offerings and processes into new markets (Brown & Eisenhardt, 1997). For example, Bierly and Chakrabarti (1996) found that pharmaceutical firms that had a technologically diverse search, measured through the R&D dispersion index, could combine knowledge and move into new therapeutic markets. This knowledge may reveal the need for new strategies and discredit old ones, and therefore search influences change (Boeker, 1997a; Greve & Taylor, 2000). Exploratory search often triggers acquisition of business-level knowledge about current and potential new products, markets, competitors, or consumer trends (Kuwada, 1998). Thus, change in product markets is highly influenced by the research and development within the firm (Boeker, 1997a). For example, Yetton, Johnston, and Craig (1994) said that organizational learning in new technical domains

results in changes in business strategy. While the firm cannot fully project the efficacy and benefits of distant knowledge, they can incorporate this knowledge into new business or a way to serve new markets.

Third, from a cognitive perspective, exploratory search may result in change in the firm's dominant logic and belief structures, impacting change (Lant & Mezias, 1992; Prahalad & Bettis, 1986; Prahalad & Hamel, 1990). Lant and Mezias (1992: 49) said that exploration of alternatives, routines, technologies, and rules "results from the realization that certain experiences cannot be interpreted within the current belief system" and "can lead to the recognition of new goals and means to achieve goals, new ways of assembling responses or connecting stimuli to responses, and the integration of new constructs into existing cognitive structures." Consequently, the ability to detect changes and pursue action in the environment is dependent upon cognitive frameworks and mental models (Bogner & Barr, 2000; Fiske & Taylor, 1991). Mental models that remain stagnant result in decline; whereas change in mental models often results in renewal through higher level learning and change in understanding of the problem space (Barr et al., 1992; Kuwada, 1998). Therefore, through exploratory search, firms are able to experience diverse technologies, markets that have new requirements, and rules that challenge established belief systems (Greve & Taylor, 2000; Kuwada, 1998; Prahalad & Bettis, 1986). For example, Thomas, Clark, and Gioia (1993) found that when organizations take measures to increase the use of external information, their cognitive interpretation of issues becomes positive, prompting strategic change. Changing cognition helps firms find creative ways to solve problems related to products and

process, influencing the development of new products for markets or altering existing products (Lei & Hitt, 1995; Prahalad & Hamel, 1990).

Fourth, exploratory search results in the development of new routines and capabilities that may influence strategic change. As firms learn through search, they are prompted to update their routines in accordance with their experiences (Lant & Mezias, 1992; Levitt & March, 1988). Product development involves incorporating new knowledge to develop new skills and routines. As firms search, they can reconfigure resources and capabilities to generate new routines, prompting strategic change (Fleming, 2001; Katila & Ahuja, 2002; Nelson & Winter, 1982). The amount of change is dependent upon the “intensity and direction of search” (Levitt & March, 1988: 321). Therefore, exploratory search grounded in double-loop learning leads to the discovery of new ways of allocating resources to achieve goals (Lant & Mezias, 1992). As a result, exploratory search in new technological or geographic domains allows new products to be created that serve the firm’s current or new markets and solve problems within the organization (Lei & Hitt, 1995; Prahalad & Hamel, 1990). As firms learn and apply new ways of doing things—new organizational routines—they often make changes in the products and markets they can serve.

However, the relationship between search and strategic change is dependent on the level of exploration because organizational operations require both stability of operations and variability to implement change (Burgelman, 1991; Meyer & Stensaker, 2006). Burgelman (1991) said that firms adapt best to the environment when they include both variation-reducing and variation-increasing strategic processes. Firms with



high exploratory search risk experimenting with new ideas without developing and integrating them within the firm, thwarting change (March, 1991). Firms with low exploratory search focus on exploiting current knowledge and risk developing core rigidities that impede change (Leonard-Barton, 1992; March, 1991). For example, Rothaermel and Deeds (2004) found that exploration alliances result in more products being discovered and invented rather than exploited (Rothaermel & Deeds, 2004). Exploitative behaviors in firms result in more products on the market; however, these products are usually line extensions that rarely promote large breaks from the firm's current strategy (Rothaermel & Deeds, 2004).

March (1991: 85) found that a balance of exploration and exploitation within the firm was “a primary factor in system survival and prosperity.” Managing the balance between exploration and exploitation lies at the heart of organizational renewal and change (Crossan, Lane, & White, 1999; McNamara & Baden-Fuller, 1999; Tushman & O'Reilly, 1996). The gains from moderate exploratory search may occur because exploitation of existing knowledge aids the firm in its search for new knowledge (Katila & Ahuja, 2002; Sidhu, Volberda, & Commandeur, 2004). For example, drug development in a pharmaceutical company requires extensive time and resources. Firms that introduce products in new areas often require more time and resources to develop technological competencies, increasing the risk of failure for the firm (Malerba & Orsenigo, 2002). Therefore, firms stabilized by moderate exploratory search generate steady returns to fund more experimental projects, enabling them to effectively create drugs that serve new product areas.

Firms are tasked with responding to many environmental changes, and therefore, they are able to make the greatest total change in a time period by moderately searching in distant areas. This is because organizational operations require both stability of operations and variability to implement change (Burgelman, 1991; Meyer & Stensaker, 2006). Because learning resulting from local search is proximal and interpretation is fast, enabling decision making, it leads to more frequent, yet incremental change, such as line extensions that increase sales in existing markets. However, these returns on incremental line extensions are small (Taylor & Greve, 2006). In contrast, exploration involves exposure to uncharted territory that increases the chance that firms will take a new direction in their product and service markets. However, as firms move into new terrains, the crucial feedback from search activities lengthens and the certainty of gains from search becomes more variable, which could lead to large gains or losses (March, 1991; Taylor & Greve, 2006). As a result, there are many failed attempts to create products or services that cater to new markets. Consequently, moderate exploration allows firms to reap the benefits of efficiency that provide resources for search and capitalize on incremental changes from local search while simultaneously adding variability to the firm that results in greater change.

Thus, exploratory search may be both helpful and problematic for strategic change. On the one hand, the increase in exploratory search builds new knowledge and challenges organizational mindsets, facilitating change. On the other hand, when there is too much search into distant areas, geographically and technologically, search may tax the firm's ability to integrate knowledge within the firm and translate this search into

new products or services (March, 1991). Therefore, these arguments suggest that the relationship between exploratory search and strategic change will be curvilinear, where initially the relationship is positive; however, at some point it becomes negative.

*Hypothesis 3: There is a curvilinear effect (inverted U) between exploratory search and strategic change.*

### **Mediating Effect of Exploratory Search**

Hypotheses 1 and 3 link the internationalization with exploratory search, and exploratory search with strategic change, suggesting that exploratory search mediates the direct relationship between internationalization and strategic change. In an analysis of diverse industries, Dass (2000) found a relationship between internationalization and strategic change, arguing internationalization may help firms develop new routines. As firms go abroad, search routines are formed that help them adapt to local markets and explore new knowledge to help them compete while encountering divergent cognitive frameworks that challenge local thinking (Luo, 2000; Luo, 2002). International expansion influences firms to change their strategy and structure as they learn and search for knowledge to adapt to foreign environments (Vermeulen & Barkema, 2002). As the firm expand abroad in patterns that enable learning, experiences with strategies and interaction with changing social values, demographics, regulations, and technologies promote search for new solutions and adaptive responses in the form of strategic change (Cyert & March, 1963; Lant & Mezias, 1992; Levitt & March, 1988), yet strategic change is also influenced by the top management team, board of directors, and environmental shocks (Boeker, 1997a, 1997b; Smith & Grimm, 1987; Westphal &

Frederickson, 2001). Consequently, I argue that exploratory search partially mediates the relationship between internationalization and strategic change.

*Hypothesis 4: Exploratory search partially mediates the relationship between internationalization and strategic change.*

### **Strategic Change and Firm Performance**

There is an enduring debate within the field of strategy and organizational theory over the adaptability of firms (Ansoff, 1965; Ginsberg, 1988). While some researchers hold a deterministic stance of organizational survival and actions because of the complexity of change (Aldrich, 1979; Hannan & Freeman, 1984), others suggest executives have choice in the actions firms can take and thus organizations are adaptive (Child, 1972). Consequently, many researchers have investigated the outcomes of change, particularly in strategic actions. As a result of adaptive views of firms, it has been suggested that firms are rewarded in the marketplace for their ability to respond to environmental changes (Teece et al., 1997). If firms do not learn, subsequent failure to drive toward change results in strategic persistence and decline.

However, the effects of strategic change on firm performance have been mixed. Some studies have found that strategic changes improve firm performance (Barr et al., 1992; Kraatz & Zajac, 2001; Meyer, 1982; Tushman et al., 1985; Zajac & Kraatz, 1993). For example, Zajac and Kraatz (1993) found a positive effect of restructuring activities on firm performance in the higher education industry. Yet others have found no relationship (Zajac & Kraatz, 1993) or a negative relationship between strategic change

and firm performance (Hill & Hansen, 1991; Mitchell, Shaver, & Yeung, 1992; Parnell, 1994; Tushman, 1977).

Due to these equivocal results, researchers have investigated the influence of firm resources and capabilities in moderating the strategic change–firm performance relationship (Kraatz & Zajac, 2001; Zajac et al., 2000). Resources are the stocks of factors leveraged by the firm, and capabilities are the routines used to deploy these resources (Amit & Schoemaker, 1993; Barney, 1991). Organizational capabilities are the firm-specific routines that may enable firms to introduce new products or expand into new markets (Amit & Schoemaker, 1993; Grant, 1991; Sirmon, Hitt, & Ireland, 2007). A firm’s resources and capabilities can be a source of competitive advantage especially in technology-intensive industries, and therefore may strengthen or weaken the effect of strategic change on firm performance (Barney, 1986; Grant, 1996a; Kraatz & Zajac, 2001; Wernerfelt, 1984; Zajac et al., 2000). For example, in their study of strategic change in liberal arts colleges, Kraatz and Zajac (2001) found support for the theory that a firm’s resource endowments may interact with strategic change to influence enrollment growth (firm performance); however, they did not specify which resources were likely to enhance the effects of strategic change. Thus, resources and capabilities may determine the growth and direction of the firm and can widen the firm’s opportunities to take actions, and therefore, they enhance the efficacy of response to environmental change and present opportunities and new directions for change (Kraatz & Zajac, 2001; Penrose, 1959; Wernerfelt, 1984). Another literature has focused on the role of organizational capabilities in helping firms adjust and gain a competitive

advantage in dynamic markets (Eisenhardt & Martin, 2000; Teece & Pisano, 1994). Capabilities should help the firm adjust to the changing environment and reflect the firm's reconfiguration of knowledge in response to this change (Knight & Cavasgil, 2004). Since all change is not equally beneficial (Zajac et al., 2000), capabilities may indicate that strategic change should positively impact performance because the firm has updated its knowledge set to address the environment.

Knowledge-based resources and capabilities play an important role in moderating this relationship because knowledge determines what a firm "can do and how," and it is the foundation of organizational capabilities (Grant, 1991, 1996b). Following this work, Bloodgood and Morrow (2003) said that knowledge-based resources affect the performance outcomes of strategic organizational change because they create and employ the firm's tacit knowledge. This question was later tested in a study by Morrow, Sirmon, Hitt, and Holcomb (2007) which found investors had positive expectations of declining firms that used strategic actions involving access to resources. Therefore, capabilities developed that reflect the firm's ability to create new knowledge through product development may enhance the effects of strategic change on firm performance.

### **Innovation Capabilities**

Innovation capabilities are especially important because they enhance the firm's competitiveness and performance, are difficult to imitate, reflect that new knowledge is taken within the firm, and indicate environmental responsiveness. They are defined as those set of routines that facilitate and support a firm's ability to create new products or services (Burgelman, 1996; Burgelman, Christensen, & Wheelwright, 2004). Innovation

capabilities allow the firm to gain market positions that allow them to be profitable as the firm generates unique knowledge and expands the abilities of the firm (Knight & Cavasgil, 2004; Lawless & Fisher, 1990). Thus, firms that develop innovative capabilities should perform better over time. This occurs because innovative capabilities are difficult to imitate because they reside within undetectable organizational routines (Dierickx & Cool, 1989; Goes & Park, 1997). Because there is heterogeneity in resources and capabilities between firms, especially when they are accompanied by isolating mechanisms that prevent duplication and transfer of resources and capabilities outside the firm, sustained competitive advantage may be achieved (Barney, 1991; Dierickx & Cool, 1989; Peteraf, 1993; Rumelt, 1984). Thus, strategic change made in conjunction with innovative capabilities may indicate that change might sustain the firm's market position.

In addition, innovation capabilities may represent the firm's ability to learn and adapt to the environment, facilitating strategic change. Innovation deepens the firm's technological capabilities as the firm takes in new knowledge within the firm (Burgelman et al., 2004). Thus, many researchers suggest innovation is a source of renewal for firms because it often triggered by managers' desire to respond to the environment (Archibui & Pianta, 1992; Dougherty, 1992; Teece et al., 1997). Scientific and technological advances, market demand, competition, societal needs, and government legislation are environmental conditions which prompt innovation in the pharmaceutical industry (Archibui & Pianta, 1992). As these environmental shifts occur, firms that learn and recombine and create new resources using their innovative

capabilities are able to adapt successfully (Danneels, 2002; Knight & Cavasgil, 2004). Because innovation intersects with areas of entrepreneurship, innovative capabilities are related to the firm's ability to alter its own and the industry's current way of doing business (Nelson & Winter, 1982). However, all innovation capabilities are not equal in their ability to impact firm performance because different types of innovation capabilities reflect differences in the degree and/or mode of organizational learning (Bierly & Chakrabarti, 1996; Sorescu, Chandy, & Prabhu, 2003). Thus, I investigate two types of innovation capabilities, which indicate new knowledge is created within the firm: novel innovation capabilities and internal innovation capabilities.

*Novel Innovation Capabilities.* Novel innovation capabilities reflect the degree to which the firm's innovations result from the use of new knowledge, verses reuse or recombination of existing knowledge (Anderson & Tushman, 1991). Novel innovation capabilities develop from the firm's knowledge strategy and are often viewed as an integrative capability that indicates the firm's ability to use resources and capabilities to support renewal (Bierly & Chakrabarti, 1996; Henderson & Cockburn, 1994; Yeoh & Roth, 1999). These capabilities are important to firm performance because it allows the firm to experiment, adapt, and create new capabilities within the firm during change, enhancing its performance effects. They demonstrate the firm's ability to learn new capabilities and expand the opportunities in the midst of change (Karim & Mitchell, 2000), and they may represent large investments in time and skills, which may act as isolating mechanisms, discouraging replication (Kraatz & Zajac, 2001; Rumelt, 1984). In addition, novel innovation capabilities introduce distinct knowledge into the firm,



which in time becomes tacit and a source of competitive advantage (Bloodgood & Morrow, 2003; Polanyi, 1962), while incremental innovation capabilities only focus on recombination of existing knowledge and resources, failing to introduce distinct and new knowledge. Thus, novel innovation capabilities developed during strategic change suggest superior firm performance because the firm has increased variance in organizational knowledge and routines to respond to the environment (Bierly & Chakrabarti, 1996; Danneels, 2002; Helfat & Raubitschek, 2000; March, 1991; McGrath, 2001). It increases the diversity of knowledge and options within the firm, strengthening the relationship between strategic change and firm performance.

*Hypothesis 5a: Novel innovation capabilities positively moderates the effect of strategic change on firm performance.*

*Internal Innovation Capabilities.* Internal innovation capabilities, routines used to internally develop products, are the route to superior profit returns in the pharmaceutical industry (Archibui & Pianta, 1992). They are a component capability that reflects the firm's ability to apply knowledge to support daily product development activities (Henderson & Cockburn, 1996; Yeoh & Roth, 1999). Instead of developing capabilities for innovating internally, some firms may develop external innovation capabilities through acquisitions and licensing often due to an emphasis on financial versus strategic controls (Hitt, Hoskisson, Johnson, & Moesel, 1996). Internal innovation resulting from strategic controls reflects managers' focus on strategy formulation rather than outcomes, strengthening the firm's dedication to innovation. External innovation may help firms move into new markets, yet it signals attention to

cost efficiencies, rather than long-term gains (Hitt et al., 1996; Hoskisson, Hitt, Johnson, & Grossman, 2002). In addition, external innovation capabilities cannot substitute for capabilities to develop products in-house because they do not facilitate experiential learning that cultivates tacit and close knowledge of the production process (Bierly & Chakrabarti, 1996; Hitt et al., 1996; Yeoh & Roth, 1999). Without internal innovation capabilities, the ability to sustain innovation over time is questionable because firms cannot continuously gain the knowledge to innovate without further acquisitions or licensing (Knight & Cavasgil, 2004; Nelson & Winter, 1982; Yeoh & Roth, 1999). Therefore, while external innovation through licensing or acquisition results in reduced development expenses, financial gains, and speed to market (Yeoh, 2004), it does not reflect the level and type of learning associated with internal innovation (Bierly & Chakrabarti, 1996). Within the pharmaceutical industry, the practice of acquiring the rights to sell drugs is common (Gassmann et al., 2004), yet it is less likely that these firms have the abilities to develop and manufacture new or existing drugs or independently create strategic options for the future (Yeoh, 2004; Yeoh & Roth, 1999). In fact, Bierly and Chakrabarti (1996) found that pharmaceutical firms with high internal innovation capabilities were among those with the highest performance, and Sapienza (1993) found that pharmaceutical firms that draw upon R&D from outside firms assigned fewer resources to internal innovation and learning. Thus, strategic change made in conjunction with internal innovation capabilities may signal the firm's internal stocks of knowledge, which may be leveraged to consistently respond to the environment, subsequently leading to high returns. Strategic changes made are a result

of a long-term orientation and internal dedication to innovation. As a result, internal innovation capabilities enhance the effects of strategic change on firm performance.

Thus, these arguments suggest the following:

*Hypothesis 5b: Internal innovation capabilities positively moderates the effect of strategic change on firm performance.*

### **Multiple Mediators of the Internationalization – Firm Performance Relationship**

Recent research in strategic management and international business has explored the effects of internationalization on firm performance, using organizational learning perspectives (Geringer et al., 2000; Gomes & Ramaswamy, 1999; Hitt et al., 1997; Tallman & Li, 1996). Both anecdotal evidence and recent research suggest that as firms internationalize, they develop capabilities that enhance performance as they learn from diverse cultures and institutions and adapt their actions to the local market (Luo, 2000; Zahra et al., 2000). International expansion represents a source of learning for firms that enables firms to search out new knowledge, and as this search helps them adjust their strategy, firm performance increases (Cantwell, Dunning, & Janne, 2004; Makino, Isobe, & Chan, 2004; McDougall & Oviatt, 1996; Vermeulen & Barkema, 2002). It has been suggested that the relationship between internationalization and firm performance exists due to organizational learning, change in dominant logic, exposure and search of new knowledge, and exploitation of current resources (Hitt et al., 1997; Vermeulen & Barkema, 2002). Therefore, exploratory search and strategic change partially mediate the relationship between internationalization and firm performance.

*Hypothesis 6: Exploratory search and strategic change partially mediate the relationship between internationalization and firm performance.*

## SUMMARY

The hypotheses developed in this dissertation are summarized in Table 1. I extend organizational learning and internationalization theory to empirically examine how the extent of international expansion in the pharmaceutical industry influences strategic changes through affecting exploratory search. I propose that internationalization influences exploratory search, and a relationship between exploratory search and strategic change, challenging the assumptions about the positive benefits of exploration on change. Finally, this research unites resource-based view, organizational learning, and entrepreneurship literature to examine the moderating influences of innovation capabilities on the relationship between strategic change and firm performance.

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

The hypotheses in the previous chapter propose relationships between internationalization, exploratory search, and strategic change. This chapter provides a description of the research methodology used to test these relationships. First, I outline the sample for this study, and second, I discuss the measures used in the study and statistical methods used to test the hypotheses.

#### **SAMPLE**

In order to evaluate these hypotheses, I evaluate a sample of firms from the pharmaceutical industry between the years of 1993 and 2006. The pharmaceutical industry was chosen for two reasons. First, the pharmaceutical industry is driven by the search for new drugs. Sourcing knowledge externally allows pharmaceutical firms greater opportunities to discover new compounds; therefore, these firms scan their environment and expand into other countries to tap local knowledge (Gambardella, 1995). Several authors have investigated search within the pharmaceutical industry, where firms undergo innumerable search patterns to seek out useful drugs (Malerba & Orsenigo, 2002; Nerkar & Roberts, 2004; Penner-Hahn & Shaver, 2005). Within this industry, patent data may be used as a key indicator of knowledge search, providing “more valid measures in this industry than other industries because of the enforceability of the patents and the lack of secrecy between firms” (Bierly & Chakrabarti, 1996: 126; Gambardella, 1995). Second, due to the knowledge-intensity and technological focus of the pharmaceutical industry, the market is highly dynamic, enduring a number of

environmental shifts which necessitate strategic change (Eisenhardt & Martin, 2000; Penner-Hahn, 1998). Environmental changes, such as the emergence of biotechnology, growing senior population, and new regulatory guidelines in treating diseases call for adaptive responses and flexibility from pharmaceutical firms (Gray, 2006; Lapuerta & Chen, 2002; Penner-Hahn, 1998; Richardson & Luchsinger, 2004). Dynamic environments require firms to constantly learn and integrate knowledge through altering the firm's product portfolio in order to survive (Gassmann et al., 2004; Gray, 2006).

Following previous studies, in order to be included in the sample, the firms must be publicly traded within the United States belonging to the pharmaceutical industry (SIC 2834) and have pharmaceutical sales that account for a majority of their sales (Bierly & Chakrabarti, 1996; Bogner, Thomas, & McGee, 1996). Pharmaceutical firms which serve the United States market, (i.e., those which are publically traded in the U.S.) lead the world in development of new drugs and generate nearly 25% of global pharmaceutical sales (IMS Health, 2005; Penner-Hahn, 1998; PHRMA, 2007b). Firms that solely produce generic drugs are excluded because the generic market is very different from ethical drugs (also referred to as prescription drugs) which are patent-protected and only dispensed by hospitals, physicians, and pharmacies (Gassmann et al., 2004). Pharmaprojects and Hoovers Online industry directory was used to identify firms that served the pharmaceutical market.

Rajagopalan and Spreitzer (1996) suggested that a reason for diversity in findings in the strategic change literature is the use of cross-sectional rather than longitudinal studies; therefore, longitudinal data are used from during five panels listed in Table 2.

Due to acquisitions and mergers, some firms may not be active within the whole time-frame, but each firm in the sample must be active within at least two of the five measurement periods because of the requirements for analysis of panel data within SAS. Therefore, two firms were dropped from the sample because they were only active for one panel. The final sample was 323 observations and 81 firms. The average firm was active for four panels. Eighteen of these firms were incorporated and headquartered outside the United States. Tables 3 and 4 provide a summary of measures and data sources for the dependent, independent, mediating, and control variables.

## DEPENDENT VARIABLES

### **Strategic Change**

Strategic change has largely been described in terms of the “content of strategy, i.e., the specifics of what was decided in terms of goals, scope, and/or competitive strategy, and in terms of the process of strategy-making” (Ginsberg, 1988: 560). Thus, it is often associated with business, corporate, or collective strategy (Rajagopalan & Spreitzer, 1997). The majority of studies have investigated strategic change as alteration of a firm’s product portfolio and related resource allocations (Ansoff, 1965; Ginsberg, 1988). For example, Goodstein and Boeker (1991) measured strategic change as the absolute change in the breadth of products or services offered by a firm.

Following previous single-industry studies (Greve & Taylor, 2000; Kraatz & Zajac, 2001; Smith & Grimm, 1987; Zajac & Kraatz, 1993; Zajac et al., 2000), I propose an industry-specific indicator of strategic change. I define strategic change in terms of change in the product markets in which a firm operates, measured using therapeutic

categories. Therapeutic categories—that is, what class of disease the drug treats—reflect markets within the pharmaceutical industry because each has a different economic size and customer base (Malerba & Orsenigo, 2002). Bogner, Thomas, and McGee (1996: 93) suggested that “substitution across therapeutic classes is not possible with pharmaceuticals. Therefore, a broadly balanced product line gives a firm a form of diversification against a breakthrough drug of a competitor.” Strategic change, measured by therapeutic categories, may also reflect a firm’s response to changes in landscape of a firm’s competitive environment since “being first in any therapeutic category is essential since this is a game where winner takes all (or almost all)” (Tapon & Thong, 1999: 220). Thus, therapeutic categories have been used to measure the diversification, product-market scope, mix, and market focus by previous studies (Bogner et al., 1996; Cool & Schendel, 1987; Henderson & Cockburn, 1994; McCutchen, 1993; Sorescu et al., 2003; Yeoh & Roth, 1999). As such, strategic change was operationalized as product diversification of drugs across 15 therapeutic categories (listed in the Appendix) that a firm seeks to target with its current product portfolio. I will use data from PJB Publications’ Pharmaprojects database, which describes the clinical histories of pharmaceutical companies. Product counts instead of sales in each therapeutic area was used because of the lengthy time from drug approval to market when creating a new drug. Product portfolios within the pharmaceutical industry are defined by the set of approved drugs, developed or produced. In Pharmaprojects this included all drugs that had a status of active or fully launched. Therefore, following previous research, product diversification, reflecting firm strategy, is measured using a



diversification index to reflect the dispersion of drugs across therapeutic categories (Bogner et al., 1996; McCutchen, 1993; Sorescu et al., 2003), and is calculated as

$$\text{Product Diversification, PD} = 1 - \sum_{i=1}^N S_i^2,$$

where  $PD$  is product diversification;  $S_i$  is the proportion of the firm's drugs in a therapeutic category,  $i$ , and  $N$  is the number of therapeutic categories in which a firm offers drugs.

Strategic change is measured as the variation in a firm's strategy, or product diversification, over time. The measurement of diversification is lagged extensively, given the average time it takes for firms to find a drug candidate and submit a new drug application with the FDA (Blau, Pekny, Varma, & Bunch, 2004; Kaitin & DiMasi, 2000; Nerkar & Roberts, 2004; PHRMA, 2007b). The average time for development and approval has declined, with average approval time declining from 1.8 years in 1994 to 1.1 in 1999 (DiMasi, 2000), and time in the clinical stage decreased from 7.6 years in 1995 to 4.8 years in 1999 (Kaitin & DiMasi, 2000). Strategic change may occur through discontinuing drugs, introduction of incrementally new drugs, or acquisition or licensing of drugs, which shorten the development time; therefore, product diversification is measured over a six-year time period after internationalization to reflect the time needed to change a pharmaceutical firm's portfolio of active products.

Measurement issues relating to strategic change are very important (Bergh & Fairbank, 2002; Hitt et al., 2004). Strategic change has often been operationalized as the difference between product diversification over time, yet it has been suggested that when

measuring change as the difference between component measures (simple differences), statistical errors may result because of the correlation between initial component scores and change score (Bergh & Fairbank, 2002; Edwards, 1994). This correlation causes firms with low (high) initial component scores to have higher (lower) changes scores (Allison, 1990; Cohen & Cohen, 1975: 380; Linn & Slinde, 1977), resulting in low reliability and validity. The simple difference approach may be reliable and valid, especially when the component variables are both reliable and have unequal variances (Allison, 1990; Bergh & Fairbank, 2002; Rogosa, 1988; Zimmerman, 1994). Alternate approaches to measuring change exist, such as residual change scores, component scores, and growth curves; however, researchers have suggested that residualized change scores do not truly measure change, but instead they measure predicted and potential change given the same initial component score and are often seen as unreliable (Bergh & Fairbank, 2002; Linn, 1981; Linn & Slinde, 1977; Rogosa, 1988); therefore, researchers suggest that growth curves are ideal when multiple waves of data can be collected; thereby not losing data on change over time (Bergh & Fairbank, 2002; Raykov, 1999; Rogosa, Brandt, & Zimowski, 1982). Multi-wave data are favorable when measuring change scores (Bergh & Fairbank, 2002), so six measures of firm strategy at time,  $t_0$  through  $t_5$ , measured as product diversification were collected to assess change using growth curves. In a latent growth curve model, change is modeled using the following equations:

$$y_{it} = \eta_{0i} + \eta_{1i}x_{it} + \varepsilon_{it}$$

$$\eta_{0i} = \alpha_0 + \gamma_0w_i + \zeta_{0i}$$

$$\eta_{1i} = \alpha_1 + \gamma_1 w_i + \zeta_{1i}$$

where  $y_{it}$  is the observed value of firm strategy for firm  $i$  at time  $t$ ,  $\eta_{0i}$  is the latent intercept (or initial level of firm strategy measured as product diversification), and  $\eta_{1i}$  is the latent slope or change in firm strategy between  $t_0$  and  $t_5$ , (or strategic change).  $\varepsilon_{it}$  is the residual term for the  $i$ th firm at time  $t$ . The measurement model for strategic change is captured in Figure 3. In this study, strategic change is the log of the absolute value of latent slope or change in firm strategy calculated in SAS using the proc mixed procedure.

### **Firm Performance**

I measure firm performance using both accounting-based and market-based measures. Measures which place an emphasis on sales, such as return on sales (ROS) would be inappropriate because strategic change in product portfolio includes those drugs not currently marketed; therefore, return on assets (ROA) was used as a measure of the firm's previous performance, operationalized as net income divided by total assets. Several studies in strategic change use ROA to investigate the effect of strategic change on firm performance and it is also a standard measure in pharmaceutical industry research (DeCarolis, 2003; Tushman & Rosenkopf, 1996; Zajac et al., 2000). ROA may also be a "better measure than ROS for firms do not participate in all portions of the value chain" (Bierly, 1995: 109). I also use Tobin's Q, a market-based measure that provides an indication of the firm's future performance. I measure Tobin's Q as the ratio of the firm's market value to total assets, following Lee and Tompkin's (1999) operationalization of Chung and Pruitt's (1994) measure. Both ROA and Tobin's Q are

measured one year after strategic change, time  $t+1$ , using data from COMPUSTAT (Zajac et al., 2000).

## INDEPENDENT, MODERATING, AND MEDIATING VARIABLES

### **Internationalization**

International diversification reflects the firm's operations abroad (Hitt et al., 1997). Internationalization is measured by averaging the ratio of foreign sales to total sales, foreign assets to total assets, and foreign subsidiaries to total subsidiaries, based off of previous literature which uses a composite measure of internationalization to increase the validity of its measurement (Sanders & Carpenter, 1998; Sullivan, 1994; Tihanyi, Johnson, Hoskisson, & Hitt, 2003). Data on internationalization at time  $t-8$  was drawn from Worldscope and Compact Disclosure. When firms had missing values or zero measures of zero, data were validated with annual reports, public company documents, and COMPUSTAT segments data. The data were collected for years outside to measurement window to ensure regularity in reporting over time.

Foreign subsidiaries data were identified as all subsidiaries outside the country of incorporation listed in COMPUSTAT. The foreign subsidiaries were drawn from Compact D. Firm subsidiary data gathered from Compact D were validated with the data from Lexis Nexis Corporate Affiliations for Public and International Companies, an archived book series documenting subsidiaries and their geographic locations. If a firm had no subsidiaries recorded in Compact D or the Lexis Nexis Corporate Affiliations series, annual reports and other publically available company documents were used for validation.

### **International Experience**

International experience refers to specialized knowledge accumulated through international operations over time (Andersen, 1997; Johanson & Vahlne, 1977). It is reflected by the length of time a firm has operated in a foreign country and geographic area, developing internationalization and institutional knowledge (Barkema et al., 1996; Eriksson et al., 1997; Johanson & Vahlne, 1977; Kogut, 1985). Internationalization experience reflects learning from the process of expanding abroad, regardless of its location, while institutional experience results from the accumulation of experience over time operating abroad in a specific country (Barkema et al., 1996). Therefore, two measures of internationalization were used to reflect both types of knowledge gained. Internationalization experience was measured as the number of years of foreign subsidiary operations across all countries between 1987 and time  $t-8$  from Compact D. Institutional experience was measured as the average number of years of subsidiary operations in all countries in which a firm operates between 1987 and time  $t-8$  from Compact D. International experience was left-censored at 1987 because it is a starting point of internationalization, the year that marked one of the largest increases in both foreign sales and change in foreign sales in the U.S. pharmaceutical industry (PHRMA, 2007b). Because of the high intercorrelation between the two variables (0.94), they were combined into a single factor, international experience.

### **Speed of Internationalization**

Speed is the pace of expansion, as measured by the number of foreign subsidiaries at time  $t-13$  subtracted from the number of foreign subsidiaries at time  $t-8$ ,

divided by 5. A five-year time period was chosen because to capture the effects of recent changes in internationalization. If a firm had no foreign subsidiaries in 1987, speed was calculated as the number of foreign subsidiaries during the first year of expansion subtracted from the number of foreign subsidiaries in time  $t-8$ , divided by the number of years since the first year of expansion. If the first year of expansion is the current year of expansion, speed was equal to the number of subsidiaries established in that year. The overall speed is logged.

### **Institutional Distance**

Kostova (1999) suggested that institutional distance, defined as the differences or similarities between the MNC home and host country institutions, affects knowledge flows within the firm. According to Hitt, Holmes, Miller, and Salmador (2008), the institutional environment is measured using four dimensions—regulatory control, monetary policy, institutional infrastructure, and political and human rights. Following Barkema and Vermeulen (1997) and Manev and Stevenson (2001), the factor scores generated from Hitt et al. (2007) are used to create distance score, equal to the Euclidean distance between the home country and foreign subsidiary institutional environment. The firm's total institutional distance across all foreign countries in which the firm operations for a given year was measured as the average distance between the firm and all its foreign subsidiaries on each dimension, weighted by the number of subsidiaries in each country at time  $t-8$ . Distance measures exist for 50 countries, and therefore some subsidiaries did not have distance data. Overall, 87% of the subsidiaries had distance

data. Subsidiaries without institutional data were not included in the calculation of the institutional distance measure.

### **Exploratory Search**

Exploratory search is defined as actions taken by the firm to address problems using knowledge or routines distant from the firm's current and local knowledge-base (Katila & Ahuja, 2002; March, 1991). U.S. pharmaceutical firms alone spent \$30,969,000,000 in 2005 in the search for new drugs; therefore, search is a critical and important process, where firms compete to discover, develop, and market new drugs in a highly dynamic market with the desired outcome of these activities being patents to protect new drug discoveries (PHRMA, 2007b). In general, pharmaceutical companies are capable of 'screening' a large search space. The process of search occurs as pharmaceutical companies invest in searches for promising molecules that may provide the basis for development of new drugs (Gambardella, 1995; PHRMA, 2007a). Firms begin to search unexplored areas to varying degrees. There are numerous routes to discovery, and firms typically adopt a particular type of search process that may be characterized by the degree of exploration and domain of search. Exploratory search occurs when pharmaceutical companies begin to seek out new knowledge, whether by gaining it in diverse technological or geographic domains.

To measure exploratory search, I analyzed the knowledge on a firm's patents are based, which Jaffe et al. (1993) describe as a "paper trail" of a firm's knowledge flows. Patents represent a property right that may be owned by an inventor or a firm (Rosenkopf & Almeida, 2003) and disclose the knowledge used to create new drugs

(Gambardella, 1995). Within the pharmaceutical industry, organizational knowledge within the R&D process is highly codified and protected (Gambardella, 1995).

Therefore, patents provide evidence of the type and level of search within the firm. Prior studies have utilized patent citations to indicate a firm's search (Almeida & Kogut, 1999; Frost, 2001; Nerkar, 2003; Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001). Each patent has information about the company, its technology class, the inventor, and relevant citations.

A patent citation is a reference within a firm's patent made to another patent from which the firm has drawn knowledge. Within the pharmaceutical industry, patent citations are indicative of search because they capture the problem space that firms use to develop drugs. The citations made within a patent are "arrived at through a uniform and rigorous process applied by the patent examiner as a representative of the patent office" where "the patent applicant and his or her lawyer are obliged by law to specify in the application any and all 'the prior art' to which he or she is aware" (Rosenkopf & Almeida, 2003: 756). Thus, each patent is linked to its cited patents, from which the extent to which a firm explores distant knowledge across both geographical and technological domains can be assessed.

Because the U.S. pharmaceutical market is the largest in the world, U.S. patents are important for protecting the intellectual property of firms (Penner-Hahn, 1998). Therefore, I use patents as an indicator of a search at time  $t-8$ . The application date of the patent was used as the date of search (Almeida & Phene, 2004; Rosenkopf & Almeida, 2003). All pharmaceutical patents for a firm between January 1, 1995 and December 31,



1998 were gathered from Delphion, a database that tracks patents graded by the U.S. Patents and Trademark Office (USPTO). Then I identified pharmaceutical patents by checking the primary patent class assigned to each one. USPTO patent examiners assign each patent a class based upon its technology and function, and class numbers 424, 514, and 435 are those related to the pharmaceutical industry (Penner-Hahn, 1998; Phene, Fladmoe-Lindquist, & Marsh, 2006). Therefore, patents belonging to these classes are included in the dataset. All subsidiaries of a firm were included using the Lexis Nexis *Who Owns Whom* directory.

Exploratory search may reflect the pursuit of knowledge across technological domains that are new or distant to the firm. Patent classes identify the technological content of a patent and are designated by the USPTO examiner based upon the content of the patent (Almeida & Phene, 2004; Phene et al., 2006); therefore, investigating the patent class of the patents cited may indicate the “technological space” in which a firm searches (Griliches, 1990: 1702). McGrath (2001) suggested that due to the nature of the environment, firms must move beyond technologically local search in order to compete. As firms explore new technological domains, they are able to gain novel ideas and heterogeneous knowledge (Rosenkopf & Nerkar, 2001). Simply exploiting familiar technological knowledge restricts the firm’s future opportunities, failing to develop innovative products in new domains (Leonard-Barton, 1992; Phene et al., 2006). Exploring technologies in different domains furthers the research agendas of pharmaceutical firms by allowing knowledge flows within the firm (Henderson & Cockburn, 1996).

Several studies have used patent classes as measures of search across technological domains (Ahuja & Katila, 2004; Almeida & Kogut, 1999; Almeida & Phene, 2004; Jaffe et al., 1993; Nerkar & Roberts, 2004; Penner-Hahn, 1998; Phene et al., 2006). Following previous research, exploratory search across technological domains was measured as the proportion of a firm's cited patents at time  $t-6$  that do not belong to a class related to the pharmaceutical area, 424, 514, or 435 following Penner-Hahn (1998) and Phene et al., (2006). Firms with no patents during the year were assigned a zero for exploratory search.

### **Innovation Capabilities**

Organizational capabilities are the firm's "know-how" or the ability of the firm to repeatedly perform production tasks, frequently serving as a source of competitive advantage (Amit & Schoemaker, 1993; Grant, 1991). Innovation capabilities are those capabilities that facilitate the production of new products or services, which are important to the firm because they are based on knowledge within the firm, enable the firm to renew itself, and can lead to sustained competitive advantage (Amit & Schoemaker, 1993; Grant, 1991; Teece et al., 1997). Within the pharmaceutical industry, scholars have investigated innovation capabilities using R&D outputs, new drugs, as indicators (Yeoh & Roth, 1999); therefore, following previous research, innovation capabilities were measured by the firm's new products, identified as active or fully launched in Pharmaprojects.

*Novel Innovative Capabilities.* Novel innovation capabilities are those routines used to create products that are new, and not based upon combination of existing

products. In the pharmaceutical industry, the FDA designates whether the firm's new products or drugs are new molecular entities (NMEs). NMEs are drugs that have a unique chemical structure, having an "active ingredient that has never before been marketed in the United States in any form" (FDA, 2007), and therefore, NMEs have been used to past research to indicate the degree of novel innovation (Bierly, 1995; Cardinal, 2001; FDA, 2007; Yeoh & Roth, 1999). Thus, novel innovation capabilities were measured as the log of the total number of NMEs between time  $t-6$  and time  $t$ . These data were obtained from Pharmaprojects.

*Internal Innovation Capabilities.* Internal innovation capabilities are those routines to develop new products in-house, rather than through licensing or acquisitions (Yeoh & Roth, 1999). Acquired or licensed drugs are those that a firm has been granted rights to market and sell. Pharmaprojects records the origin of the firm's drugs as either licensed or self-originated. Internal innovation capabilities were measured as the log of the total number of all the firm's self-originated approved drugs between  $t-6$  and time  $t$  (Bierly & Chakrabarti, 1996; Yeoh & Roth, 1999).

## CONTROL VARIABLES

### **Firm Innovativeness**

Previous research suggests that the firm's search is influenced by its innovativeness (Patel & Pavitt, 19997; Rosenkopf & Almeida, 2003). Its endowment of knowledge enhances the firm's ability to learn and search out new knowledge

(Henderson & Cockburn, 1996). Thus, I controlled for the innovativeness<sup>1</sup>, measured as the number of pharmaceutical patents owned by a firm at time  $t-8$  and 3 years prior (Wadhwa & Kotha, 2001). Consistent with previous research, the 4-year time period prevents the yearly variability in a firm's patenting from influencing results (Rothaermel & Deeds, 2004; Stuart & Podolny, 1996). This variable was collected from Delphion's patent database and is logged.

### **Prior Performance**

Prior literature has suggested that prior performance triggers search in firms (Audia, Locke, & Smith, 2000; Cyert & March, 1963; Greve, 1998). As a firm's performance falls below its aspiration level, the firm may engage in more exploratory search (Cyert & March, 1963; Fiegenbaum & Thomas, 1988; Levinthal & March, 1981). To control for this, performance was measured as  $ROA_{t-8}$ .

Studies have also supported the idea that a firm's prior performance is related to strategic change. Some suggest a positive relationship, finding that higher performance endows firms with the ability to acquire resources to implement change, and poor performance increases organizational inertia and rigidity (Boeker, 1997b; Staw, Sandelands, & Dutton, 1981; Vicente-Lorente & Zuniga-Vicente, 2006). Other researchers suggested prior performance is negatively related to strategic change because

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<sup>1</sup> Because of the high correlation between innovativeness and R&D intensity, innovativeness was chosen as a control variable instead of R&D intensity which may also influence search behaviors (Ahuja & Katila, 2004).

poor performance prompts the need for change (Haveman, 1993; Lant & Mezias, 1990; Milliken & Lant, 1991). As such, I controlled for previous performance as  $ROA_{t-6}$ .

### **Firm Size**

While firm size is often seen as a proxy for organizational inertia, which is related to strategic change (Lant & Mezias, 1990), the results of previous studies have been inconclusive. Hannan and Freeman (1984) suggested that as organizations grow larger, they become inert over time, impeding change, and thus researchers have found that firm size is negatively related to strategic change (Delacroix & Swaminathan, 1991; Ruef, 1997; Vicente-Lorente & Zuniga-Vicente, 2006). However, others found that firm size enables strategic change through the resources and discretion that size provides (Boeker, 1997b; Dass, 2000; Westphal & Frederickson, 2001; Zajac & Kraatz, 1993). Therefore, I also controlled for firm size at time  $t-6$  in the relationship between search and strategic change (Boeker, 1997b; Dass, 2000). Firm size at time  $t$  was also used as a control variable, explaining the variance in firm performance (Yeoh, 2004).

### **CEO Succession**

Change in the managerial team, specifically the Chief Executive Officer (CEO), has been attributed with catalyzing change because new CEOs may be able to lessen the inertia and power of political factions (Barker & Duhaime, 1997; Barr et al., 1992; Boeker, 1997b; Fondas & Wiersema, 1997; Goodstein & Boeker, 1991; Lant, Milliken, & Bartra, 1992; Romanelli & Tushman, 1994; Vicente-Lorente & Zuniga-Vicente, 2006). A succession event occurs when the current CEO is different from the previous year's CEO. I used a dummy variable with values of 1 or 0, where 1 indicates that a

succession event occurred at time  $t-6$ . These data were obtained from COMPUSTAT Execucomp. Missing values were obtained through examining proxy statements and data from Board Analyst.

### **Market Share**

Firms with a greater share of the pharmaceutical market may be more inclined to make strategic changes in response to the environment and also more likely to achieve gains in firm performance as a result of change. I measured market share as firm pharmaceutical sales divided by total industry sales at time  $t-6$  and time  $t$ .

### **Exploitative Search**

Previous research suggests that a firm's exploitative search, measured by self-citations, may influence a firm to learn, innovate, and change (Almeida, 1996; Almeida & Kogut, 1999; Jaffe et al., 1993; Rosenkopf & Nerkar, 2001; Song et al., 2003). Therefore, I controlled for exploitative search in the relationship between search and strategic change, measured by the proportion of a firm's cited patents that are made to patents owned (assigned) to the firm or its own subsidiaries at time  $t-6$ .

### **Slack**

Literature suggests that financial resources influence the search for new products (Greve, 2003; Levinthal & March, 1981; March & Simon, 1958; Nohria & Gulati, 2003), and strategic change (Barker & Duhaime, 1997; Cho & Hambrick, 2006; Kraatz & Zajac, 2001). Therefore, I measured slack as the log of current assets divided by current liabilities at time  $t-6$  and  $t-8$ .

## ANALYTICAL APPROACH

The hypotheses in this dissertation examine the relationships between internationalization, exploratory search, strategic change, and firm performance. Data to test these hypotheses were taken from 1993 to 2006. Longitudinal data is important because it provides for more power to detect causal relationships (Bergh, 1993; Bergh & Holbein, 1997). Mitchell and James (2001) noted that evaluating the stability or change of relationship over time is an important way to integrate time into theory and strengthen causal inferences. Relationships that exist in cross-sectional studies may not exist longitudinally because of the possibility of spurious relationships; therefore, longitudinal studies can be used to show how variables co-vary (Hitt et al., 1998). Using a sample of firms over time controls for unobserved unit heterogeneity (Baltagi, 1995; Hitt, Gimeno, & Hoskisson, 1998), increases the sample size (Kmenta, 1986), and decreases the collinearity between variables (Certo & Semadeni, 2006), improving overall estimates. In addition, longitudinal models are generally more effective in establishing mediating effects (Hoyle & Robinson, 2003).

However, analyzing longitudinal data using ordinary least squares (OLS) regression is not the preferred method to analyze the results because panel data may violate assumptions of OLS regression that require that the random errors be independent, normally distributed, and have constant variance (Bergh & Holbein, 1997; Certo & Semadeni, 2006). Because longitudinal or panel data investigates firms over multiple years, the error terms are heteroskedastic; that is, the variance of the error term is not constant, which introduces bias into the standard error of the slope, increasing the

chance of a Type I error although the estimates are still unbiased (Bergh, 1993; Bergh & Holbein, 1997). In addition, autocorrelation may occur, whereby non-independence of observations causes the error terms to be correlated, resulting in a bias in the standard error. Fixed- and random-effects models are the recommended method for analysis because they can produce unbiased estimates that account for heterogeneity within units over time. Fixed effects models investigate differences in the intercepts, holding the slopes and constant fixed across groups, while random-effects models investigate differences in the error variances, holding the intercepts and slopes constant.

First, I used the Hausman specification test to evaluate whether a fixed- or random-effects models is needed (Hausman, 1978). Comparing fixed and random-effects, it tests the null hypothesis that individual effects and other covariates are uncorrelated. When the null hypothesis is rejected, a fixed-effects model should be used. This study satisfies the requirements for a fixed-effects model, having more than two measurements on the dependent variable and values on the independent variable that change over time. However, in this study, random-effects models may be more appropriate because it is probable that the error terms change over time and all members of the group are not in the sample (Certo & Semadeni, 2006). The Hausman (1978) test revealed random effects to be a better choice ( $p > 0.05$ ) except in each of the models with strategic change as the dependent variable ( $p < 0.05$ ). The analysis was performed in SAS using the `tscsreg` procedure which can handle both fixed- and random-effects models.

To avoid problems with multicollinearity when testing interactions, variables were centered at the grand mean (Aiken & West, 1991). Curvilinear effects of observed



variables were tested using the product terms of that predictor variable. Mediation hypotheses were tested using the commonly used procedure outlined by Baron and Kenny (1986). According to Baron and Kenny (1986), testing for mediation consists of four critical steps. First, the independent variable must influence the dependent variable (path c in Figure 4). Second, the independent variable must influence the presumed mediator (path a). Third, the mediator must influence the dependent variable while controlling for the independent variable (path b). Finally, a previously significant relationship between the independent and dependent variables must be reduced in the presence of the mediator (path c').

#### SUMMARY

The present chapter provides information on the methodology used to test the hypotheses in Chapter II. Data were collected as described in the sample and measures section. The statistical analysis used was fixed and random effects modeling.

## CHAPTER IV

### RESULTS

This chapter presents the results of the hypotheses expressed in chapter II. First, descriptive statistics of the variables and correlations are presented. Next, the results of the hypotheses are discussed.

Means, standard deviations, and pairwise Pearson correlations between all variables are shown in Table 5. The normality and skewness of all variables were analyzed, and variables were transformed as outlined in the methods section.

#### INTERNATIONALIZATION MAIN EFFECT AND MODERATORS

I proposed a positive relationship between internationalization and exploratory search. The results are shown in Model 2 of Table 6. The results suggest that the relationship between internationalization and exploratory search is not statistically significant ( $B=0.045$ ,  $p>0.10$ ). Thus, these results do not support Hypothesis 1.

Although no a priori hypothesis is presented to predict a curvilinear relationship between internationalization and exploratory search, it is likely that negative as well as positive effects of internationalization on exploratory search exist depending on the level of internationalization. Therefore, another model was examined including the first-order centered effect of internationalization and the second-order effect. Model 3 of Table 6 shows a marginally significant second-order term of internationalization ( $B= 0.622$ ,  $p<0.10$ ). The curvilinear effect is graphed in Figure 5, showing the relationship between internationalization and exploratory search is negative at low levels of internationalization but becomes positive at high levels of internationalization.

Hypothesis 2A states that international experience will positively moderate the relationship between internationalization and exploratory search. The main effects of international experience and internationalization were entered in Model 4 of Table 7. Next, in Model 5 the interaction term (moderator) was entered in the model, and the results shown in Models 4 and 5 illustrate that the variance explained increases. The moderator is negative and statistically significant ( $B = -0.142, p < 0.05$ ). Figure 6 plots the significant interaction (Aiken & West, 1991), demonstrating that when international experience is low, the relationship between internationalization and exploratory search is positive. However, when international experience is high, the relationship between internationalization and exploratory search is negative. Therefore, Hypotheses 2A is not supported by these results.

Hypothesis 2B states that speed of internationalization negatively moderates the relationship between internationalization and exploratory search. Model 7 of Table 8 shows that the moderator, speed of internationalization, has a negative and statistically significant effect on exploratory search ( $B = -1.800, p < 0.01$ ). The interaction effect is graphed in Figure 7. It shows that at a high speed of internationalization, the relationship between internationalization and exploratory search is negative. However, at low speeds of internationalization, the relationship between internationalization and exploratory search is positive. Therefore, these results support Hypothesis 2B.

Hypothesis 2C predicts that institutional distance negatively moderates the relationship between internationalization and exploratory search. In Model 8 of Table 8, the main effects are added to the model where institutional distance has a positive and

statistically significant effect ( $B=0.017$ ,  $p<0.05$ ). In Model 9, the moderator is added to the model. The moderating effect of institutional distance is not statistically significant ( $B= -0.033$ ,  $p=0.09$ ); therefore, Hypothesis 2C does not receive support.

#### CURVILINEAR EFFECT OF EXPLORATORY SEARCH ON STRATEGIC CHANGE

Hypothesis 3 states that an inverted U-shaped, curvilinear relationship exists between exploratory search and strategic change. Following Aiken and West (1991), in Model 11 of Table 9, the first-order term of exploratory search is entered. The first-order term is not statistically significant. Next, in Model 12, the second-order squared term is added to the model. The second-order term of exploratory search is negative and statistically significant ( $B= -1.383$ ,  $p<0.05$ ). The curvilinear effect is graphed in Figure 8, showing that at low and high levels of exploratory search, strategic change is low; however, strategic change is highest under moderate levels of exploratory search. Therefore, Hypothesis 3 receives support.

Hypothesis 4 suggests that exploratory search mediates the relationship between internationalization and strategic change. Baron and Kenny (1986) suggest that mediation is established given a statistically significant relationship between the independent variable and the dependent, the independent variable and mediator, and the mediator and the dependent variable in which the previous significant relationship of the independent variable and dependent variable is reduced. Because there was no statistically significant relationship found between internationalization and exploratory

search in Hypothesis 1, no mediation can be established. Therefore, Hypothesis 4 receives no support.

#### INNOVATION CAPABILITIES AS MODERATORS OF THE STRATEGIC CHANGE-FIRM PERFORMANCE RELATIONSHIP

Hypotheses 5A and 5B investigate the moderating effect of innovation capabilities on firm performance. Two measures of performance are explored: ROA and Tobin's Q. Table 10 displays the results using ROA, and Table 11 displays the results using Tobin's Q.

Hypothesis 5A suggests that novel innovation capabilities positively moderate the effect of strategic change on firm performance. Model 15 of Table 10 shows that the moderating effect is negative and not statistically significant ( $B = -0.168$ ,  $p = 0.09$ ). The effect is graphed in Figure 9. It shows that strategic change is positively related to firm performance (ROA) for firms with low in novel innovation capabilities and is negatively related to firm performance (ROA) for firms with high novel innovation capabilities. Model 20 of Table 11 also shows that the moderator effect of novel innovation capabilities is not statistically significant in relation to Tobin's Q ( $B = -0.671$ ,  $p > 0.10$ ). Therefore, Hypothesis 5A receives no support<sup>2</sup>.

Hypothesis 5B suggests that internal innovation capabilities positively moderate the effect of strategic change on firm performance. Model 17 of Table 10 shows that

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<sup>2</sup> Firm size is highly correlated with novel innovation capabilities; however, support for the hypothesis did not change when firm size is excluded from the model.

this moderating effect on ROA is also negative and statistically significant ( $B = -0.352$ ,  $p < 0.001$ ). Similarly, figure 10 illustrates that when internal innovation capabilities are low, strategic change is positively related to firm performance (ROA). However, when internal innovation capabilities are high, strategic change is negatively related to firm performance. Model 22 of Table 11 also shows that the moderator is not significantly related to Tobin's Q ( $B = 0.198$ ,  $p > 0.10$ ). Therefore, Hypothesis 5B receives no support.

Hypothesis 6 predicts that exploratory search and strategic change partially mediate the relationship between internationalization and firm performance. Multiple mediators may be modeled individually as long as they are conceptually distinct (Kenny, Kashy, & Bolger, 1998); therefore, exploratory search and strategic change are analyzed individually as mediators. First, exploratory search is tested as a mediator of the relationship between internationalization and firm performance. However, because the results for Hypothesis 1 showed no statistically significant relationship between internationalization and exploratory search, there can be no support for exploratory search as a mediator, given no relationship between the independent variable and the mediator exists (Baron & Kenny, 1986). Next, strategic change is examined as a mediator of the effect of internationalization on firm performance. Model 24 of Table 12 shows that the relationship between internationalization and strategic change was not statistically significant ( $B = -0.137$ ,  $p > 0.10$ ). Because there is no relationship between the independent variable and the mediator, no mediating effect exists. Therefore, Hypothesis 6 receives no support.

## POST HOC ANALYSIS

While this study examined the effect of speed of internationalization, finding that exploratory search is affected by pressures to learn over time, there remains an important question related to the importance and timeliness of knowledge re-use. Acknowledging the limits to learning, Huber (1991) suggests that it is possible for knowledge to depreciate over time. Having a consistent rhythm of internationalization, or regularity in international expansion, ensures that capabilities are used often (Vermeulen & Barkema, 2002). An irregular rhythm may be associated with knowledge and capability atrophy or problems in absorbing knowledge. As a consequence of time compression diseconomies, Eisenhardt and Martin (2000:1115) write that “infrequent experience can lead to forgetting what was learned previously and so result in little knowledge accumulation as well.” Because capabilities are path dependent (Teece et al., 1997), the building of knowledge over time the firm affects the firm (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998). Consequently, the rhythm of internationalization may determine whether foundational knowledge and capabilities are retained and used in a timely manner to provide the base for more complex learning and knowledge accumulation (Brown & Eisenhardt, 1997; Eisenhardt & Martin, 2000). In addition, irregular rhythms should lead to less codification of learning if there is little expectation to re-use the knowledge (Hayward, 2002). Thus, irregularity of rhythm should negatively moderate the internationalization – exploratory search relationship.

Therefore, in post-hoc analysis a new variable, irregularity of international expansion, was measured. Following Vermeulen and Barkema (2002), this variable was

calculated as the kurtosis or irregularity in the number of foreign subsidiaries of a firm over a six-year time period. Higher irregularity suggests infrequent or huge leaps in international expansion, while lower numbers represent a consistency of international expansion. Model 26 of Table 13 shows that irregularity of international expansion is a significant and negative moderator of the relationship between internationalization and exploratory search ( $B=-0.031$ ,  $p<0.05$ ). Figure 11 shows that when the rhythm of international expansion is highly irregular, the relationship between internationalization and exploratory search is negative. However, when the rhythm of international expansion is more regular (low irregularity), the relationship between internationalization and exploratory search is positive.

#### SENSITIVITY ANALYSIS

To examine the robustness of the findings, models were estimated using a new measure of exploratory search, measured as the proportion of a firm's cited patents that do not belong to 424 and 514, leaving out the biotechnology technology class code, 435. Although Penner-Hahn (1998) and Phene et al. (2006) use 435 within their measures of search because of the strong ties between pharmaceutical and biotechnology firms, exploratory search was measured as percentage of patents outside of 424 and 514 only to assess the sensitivity of results. Models using the new measure of exploratory search without 435 supported the findings above.

An alternative firm innovativeness measure was used and estimated in the model because a significant relationship was not found between firm innovativeness and exploratory search. In the findings above, innovativeness is measured as number of



patents accumulated over four years to avoid problems of variability in patenting following Wadhwa & Kotha (2001). When using a 1-year window for patents, a significant and positive relationship is found between innovativeness and exploratory search ( $B=0.047$ ,  $p<0.001$ ). The inclusion of this significant control variable did not change the results of the hypothesized relationships.

To further examine the robustness of the findings, estimated models for the international expansion path moderators were examined where the composite internationalization variable was replaced by foreign sales to total sales (FSTS) and foreign assets to total assets (FATA), the two most commonly used measures of internationalization. Although a composite measure is preferred because one-dimensional measures have been criticized for having insufficient content and construct validity (Sullivan, 1994), the results were highly similar for both FSTS and FATA, except for the moderating effect of speed of internationalization on the relationship between FATA and exploratory search, which was negative, but not significant ( $B=-0.003$ ,  $p>0.10$ ). The moderating effect of speed of internationalization was significant and negative when measuring internationalization using FSTS ( $B=-0.010$ ,  $p<0.01$ ), supporting the results.

While international experience is calculated as a composite score of internationalization and institutional experience because of the high correlation between the two variables, the two variables are analyzed separately to investigate the sensitivity of results. The estimation results for both variables were similar to the findings above. Both institutional experience and internationalization experience were significant and

negative moderators of the relationship between internationalization and exploratory search ( $B=-0.378$ ,  $p<0.05$ ;  $B=-0.353$ ,  $p<0.05$ , respectively).

Alternative innovation capabilities measures were also used in a new model, where novel and internal innovation capabilities were measured as the percentage of drugs that are NMEs or developed in-house respectively. These results yielded highly similar findings. Internal innovation capabilities negatively and significantly moderate the relationship between strategic change and ROA ( $B=-0.592$ ,  $p<0.05$ ). Novel innovation capabilities were a negative but not significant moderator of the strategic change-ROA relationship ( $B=-0.450$ ,  $p>0.10$ ). These findings further support the results.

## SUMMARY

The preceding sections have provided empirical evidence to evaluate the relationship between internationalization, search, and change. In the next chapter, I discuss these results and how they contribute to the strategic management, international business, and organizational learning literature.

## CHAPTER V

### DISCUSSION AND CONCLUSION

Over the last twenty years, scholars have acknowledged that internationalization plays an important role in the acquisition and exploitation of firms' knowledge. The purpose of this study has been to investigate empirically the effects of internationalization on exploratory search for knowledge and the consequences of this search for strategic change. The results of this study provide information to help us better understand the effects of internationalization and search on firm performance. The first section discusses the findings of the study, summarized in Table 14, the second section examines the conclusions and implications, and the third section discusses the limitations and areas of future research.

#### DISCUSSION

##### **Main Effect of Internationalization on Exploratory Search**

This research hypothesized a positive relationship between internationalization and exploratory search. Based on studies showing that firms experience technological, social, and market learning from internationalization, this study posited that internationalization leads to search. The hypothesis is based on the argument that increasing exposure to diverse knowledge sets encourages new combinations of knowledge (Chang, 1995; Yeoh, 2004; Zahra et al., 2000). In addition, subsidiaries may search as a way to adapt and understand the local market. The multinational firm then integrates knowledge gained from subsidiaries, triggering exploratory search.

The results of this study, however, found no support for the linear effect of internationalization on exploratory search. This finding suggests that the level of foreign involvement may not be as important as the type of foreign operations performed in the country. Some firms may use international operations for R&D while others use it for distribution and manufacturing. Differences in the operations performed by the subsidiaries of firms may determine the relationship between internationalization and exploratory search because they may influence the access to technological knowledge and the opportunity and motivation to search and acquire this knowledge. This business situation is especially pronounced in the pharmaceutical industry where firms enter new countries to extend product lifecycles and to capitalize on the cost of innovation by reselling drugs to new markets. This motive for internationalization has little focus on acquiring knowledge from foreign countries; therefore, its relationship with search may be negligible. Nachum and Zaheer (2005) discuss this motivation as market-seeking and efficiency-seeking, but add resource-seeking, export-seeking, and knowledge-seeking as additional motives for internationalization, each of which value performance and organizational learning outcomes differently. This is similar to research that found that the motivation for acquisition influences the impact of acquisitions on the firm (Ahuja & Katila, 2001). Therefore, the type of internationalization as an indicator of the firm's motive may explain this finding.

More importantly, as explored in the post-hoc analyses, internationalization has a curvilinear effect on search. As firms first begin to internationalize, they face a number of risks that place limits on their ability to search. At low levels of internationalization,

firms are learning to deal with the liabilities of foreignness in order to operate effectively in foreign environments. As such, they must become skilled at managing foreign operations. As a result, the available managerial resources to oversee search decreases, and both exploration and exploitation must compete for scarce resources (Ruigrok & Wagner, 2003). Because exploitative search is characterized by quicker feedback and more certain returns, it increases and exploratory search declines as firms attempt to deal with increasing ambiguity (March, 1991). Therefore, at low levels of internationalization, the relationship between internationalization and exploratory search is negative. However, as the level of internationalization increases, firms learn to manage international operations and develop knowledge and capabilities that allow them to capitalize on internationalization and explore for new knowledge; therefore, the relationship is positive. Taken together, it appears that the relationship between internationalization and exploratory search is more complex than hypothesized, and we conclude that a curvilinear relationship exists due to a negative relationship as when internationalization is low and firms deal with the initial governance costs and learning effects. Then, the relationship becomes positive as firms develop capabilities to operate effectively in international markets.

### **Internationalization Moderators**

This dissertation examined several characteristics of the international expansion path that influence organizational learning and search. Only a handful of studies have examined the effects of contextual and temporal aspects of internationalization (Vermeulen & Barkema, 2002; Wagner, 2004; Zahra et al., 2000), yet they play an

important role in search because they influence organizational learning. The trajectory of search is influenced by learning investments over time and access to diverse information; therefore, I examined international experience, speed of internationalization, and institutional distance as important moderators of the relationship between internationalization and exploratory search.

### **International Experience**

This research hypothesized that international experience positively moderates the relationship between internationalization and exploratory search. Firms may build internationalization experience through expansion into foreign countries or institutional experience through subsidiary operations over time within the same country. Frequent experiences within the same institutional setting promote learning and build absorptive capacity, thereby triggering search (Zahra and George, 2002). Therefore, the effect of international experience was tested using a composite index of internationalization experience and institutional experience.

This study found negative moderation; thus, no support was found for the hypothesis. While international experience had a positive effect on the internationalization-exploratory search relationship at low levels of international experience, at high levels, the effect of internationalization experience on the internationalization-exploratory search relationship was negative. One possible reason for this finding is that specialization or diversification into one country or repeated experience can also result in core rigidities with less attention dedicated to exploring new areas (Leonard-Barton, 1992). In addition, when the firm has high levels of

internationalization, previous performance can produce overconfidence that underestimates the newness of international experiences and impedes awareness and identification of learning opportunities that facilitate exploration. For example, Hayward (2002) found that acquisition experience negatively affected acquisition performance. He also found that high similarity of prior acquisition experience could negatively affect firm performance when at high levels. This finding may also support literature, which suggests that over time the utility of prior experience diminishes (Ingram & Baum, 1997). Thus, high international experience, marked by years of international subsidiary operations, may become a liability for the firm. As such, this study found that when internationalization and international experience were high, exploratory search was hindered. Thus, an explanation for the interaction effect of international experience may be due to overconfidence, which disregards new opportunities for learning.

### **Speed of Internationalization**

This research hypothesized that speed of internationalization negatively moderates the relationship between internationalization and exploratory search. This is premised on the notion that the ability to search is contingent on a firm's absorption of knowledge; yet, fast expansion can create ambiguity in the learning process, preventing knowledge accumulation. Fast international expansion thwarts absorption of knowledge resulting in information overload for executives and the organization.

The results show that speed of internationalization negatively moderates the relationship between internationalization and exploratory search. Thus, establishing a

large number of subsidiaries in a short amount of time taxes learning in the organization that prevents exploratory search. The new experiences and flexibilities associated with lower speeds of internationalization thus increase the firm's absorptive capacity facilitating exploratory search.

### **Institutional Distance**

This study proposed that institutional distance negatively moderates the relationship between internationalization and exploratory search. Institutional distance hinders the flow of information to the firm as they face challenges to legitimacy due to differences in laws, regulations, economies, and informal rules. This hypothesized relationship is premised on the fact that these differences present challenges to learning and transferring organizational practices, which impede exploratory search. Institutional distance also is assumed to produce more complexity and ambiguity, which hinders search.

However, there was no support for international distance as a moderator. Instead, a direct positive effect was found. This may be because international distance reflects the variety in contexts of expansion, which are based on diverse political, economic, social, customer, and competitor environments that provide learning opportunities for executives and allow some to overcome their local myopia (Carpenter & Fredrickson, 2001; Zahra et al., 2000; Tallman & Li, 1996). High international distance may invalidate local knowledge, thereby decreasing the fruitfulness of local search.

In addition, because countries have become more specialized technologically over time (Archibui & Pianta, 1992), international distance allows firms to gain from



subsidiaries' search and to capitalize on technologically and geographically diverse knowledge (Cantwell, 1993). Thus, high international distance may provide a greater opportunity for learning and potential for knowledge acquisition, facilitating exploration, rather than exploitation. Consequently, benefits of new and different knowledge contexts and the invalidation of local knowledge result in the positive direct effect of institutional distance on exploratory search.

### **Curvilinear Effect of Exploratory Search on Strategic Change**

In this study, a curvilinear relationship between exploratory search and strategic change is proposed. I suggest that as firms search, they are better able to detect changes in their environment, acquire new knowledge, change the firm's dominant logic, and update ingrained organizational routines, all of which enable strategic change. However, because search may be either exploratory or exploitative, there are trade-offs between the degree of learning and efficiencies within the firm. Firms balance stability and variability, and at high levels of exploration, firms risk experimenting with new ideas that are difficult to integrate within the firm and at more risk of failure. Thus, firms can create the greatest change by a moderate level of exploratory search. The results provide strong support for this hypothesis. The findings are in line with research suggesting that exploratory search is helpful because it builds knowledge and challenges the dominant logic; however, high exploratory search may tax the firm, thereby making change difficult to achieve.

## **Innovation Capabilities as Moderators of the Strategic Change-Firm Performance Relationship**

Previous research found equivocal results regarding the relationship between strategic change and firm performance; therefore, this study investigates whether resource moderators might affect the influence of strategic changes on firm performance (Rajagopalan & Spreitzer, 1996). For example, holding organizational resources increases the effects this relationship because they are stocks of factors, which may be leveraged during change, enhancing the effectiveness of the strategic change.

Innovation capabilities represent the knowledge held within the firm and the ability of the firm to perform well over time. This study proposed that innovation capabilities positively moderate the relationship between strategic change and firm performance.

Novel innovation capabilities reflect the firm's use of new knowledge to innovate, rather than re-use of old knowledge. They enable learning, introducing new knowledge within the firm often needed by the firm during change. Thus, firms employing novel innovation capabilities during change enhance their performance, and it is hypothesized that novel innovation capabilities positively moderate the relationship between strategic change and firm performance. Internal innovation capabilities reflect the firm's ability to innovate using in-house knowledge rather than through licensing or acquisition, and it is hypothesized that they positively moderate the relationship between strategic change and firm performance.

There was no support for novel innovation capabilities as a positive moderator of the relationship between strategic change and firm performance or for internal

innovation capabilities as a positive moderator of the relationship between strategic change and firm performance. While it was theorized that innovation capabilities would act as positive moderators, this study found that when innovation capabilities are high, the relationship between strategic change and firm performance (ROA) is negative. When innovation capabilities were low, the relationship between strategic change and firm performance is positive.

This may be because innovation capabilities require a high level of managerial and knowledge resources, which disallow their use to effectively manage strategic change. Managing both high innovation and high strategic change may be too burdensome for the firm because they both require strategic resources; therefore, high innovation capabilities lead to high performance only when strategic change is low. Licensing innovation from other firms has become a lucrative strategy for many pharmaceutical firms, also weakening this relationship. Therefore, it can be concluded that capabilities to internally innovate may have countervailing effects. In addition, the cost of developing blockbuster NMEs has become a risky strategy for many pharmaceutical firms. Thus, utilizing innovative capabilities deepens the firm's technological knowledge; however, it also competes with strategic change initiatives for needed resources.

### **Mediating Effects**

Two mediating effects were proposed in this study. First, it was hypothesized that exploratory search partially mediates the relationship between internationalization and strategic change. This hypothesis is based on the premise that internationalization

influences firms to make changes in their strategy as they search for knowledge abroad and incorporate this new knowledge within the firm. Thus, as firms internationalize, they encounter new environments that promote search for new solutions, triggering strategic change. However, no support was found for this mediating effect.

Next, it was proposed that exploratory search and strategic change mediate the effect between internationalization and firm performance. As firms internationalize, they develop capabilities that enable them to search for and discover new knowledge. This search helps them to make changes, and the changes lead to firm performance increases. No support was found for the multiple mediation hypothesis; however, no linear relationship existed between internationalization and exploratory search. In addition, there was no relationship between internationalization and strategic change.

For both mediation hypotheses, the temporal design of the study created challenges for analyzing mediation. There was an eight and nine-year lag between measuring the independent and dependent variables to analyze Hypothesis 4 and 6, respectively, which may make the mediating effect more difficult to detect. Shrout and Bolger (2002: 429) suggested that:

As the causal process becomes more distal, the size of the effect typically gets smaller because the more distal an effect becomes, the more likely it is (a) transmitted through additional links in a causal chain, (b) affected by competing causes, and (c) affected by random factors.

In addition, Hoyle and Robinson (2003) suggest that the power to test mediation is hindered when the mediator is temporally closer to the independent variable than the

dependent variable as in this study. Therefore, the long lag time between variables may have influenced the results.

## CONCLUSIONS AND IMPLICATIONS

The findings of this study suggest several important conclusions and implications. First, the study explores the important knowledge-seeking motive of internationalization. While previous research has established that firms often expand abroad to exploit their resources and knowledge, little research has examined the ability of firms to gain knowledge from internationalization. However, more recent studies have underscored the role of organizational learning in international expansion (Hitt et al., 1997; Kogut, 1991; Shan & Song, 1997; Zahra et al., 2000).

The results of this study suggest that exploratory search is influenced by a firm's internationalization. Post-hoc analysis showed that at low levels of internationalization, there is less search due to early governance costs, but learning begins to occur and local subsidiaries help the firm search in new domains as internationalization increases. The results suggest firms are likely to benefit from the knowledge gained from internationalization, at least at moderate and higher levels of internationalization. Early, firms may suffer in their search as they learn to internationalize.

The second contribution of this study relates to the importance of understanding international expansion paths. While some prior research has solely captured internationalization at a fixed time point and has often failed to understand the effects of the context of internationalization, these characteristics of internationalization are very important (Andersen, 1997; Sharma & Blomstermo, 2003). The internationalization

expansion path is significant because organizational learning is history-dependent and constrained by absorptive capacity. The finding that international experience interacts with internationalization to influence search suggests that firms should be careful to value their experiences when reaching high levels of international experience. Top management teams should continue to be aggressive in their search processes during these times to avoid overconfidence that results in missed opportunities to learn and search new areas. Overall, firms should realize learning traps may be associated with international experience.

This study finds that internationalizing at high speeds can harm the firm, negatively moderating the relationship between internationalization and exploratory search. Therefore, firms should moderately pace their expansion plan to capitalize on the knowledge learned. In addition, firms benefit in their search from a regular rhythm of international expansion, keeping organizational capabilities in use and promoting codification of learning. Firms should expand abroad regularly to facilitate knowledge re-use, disallowing existing knowledge and capabilities to atrophy. This research also found that institutional distance had a direct and positive effect on exploratory search. Thus, the challenge of diverse institutional settings likely triggers search across new domains, and firms should look for new and diverse institutional environments in which to expand.

A third contribution of this study to the strategic management literature is a better understanding of strategic outcomes of exploratory search. There has been much literature predicting antecedents of search, yet little research has investigated strategic

outcomes other than innovation. Exploratory search prompts double-loop learning, enabling firms to detect changes in their environment, acquire new knowledge, change their dominant logic, and revise or change ingrained (and largely inert) organizational routines. However, after some point, higher levels of exploratory search hinder strategic change because of the difficulties of integrating learning. Therefore, firms seeking to change should understand the dual effects of search and should likely limit exploratory search to moderate levels. They need to try to identify the inflection point past which search has negative effects.

A fourth contribution of this research is investigating resource moderators of the relationship between strategic change and firm performance. Organizational conditions that moderate the strategic change-firm performance relationship have become more important as prior research on the direct relationship has been mixed. The finding that novel innovation capabilities negatively moderate the relationship between strategic change and firm performance suggests that firms do not benefit from changing their product portfolio with introductions of new products, rather than line extensions that only offer an incremental improvement over existing products. This study also found evidence of a negative interaction effect of strategic change and internal innovation capabilities. At low levels of internal innovation capabilities, strategic change has a positive effect on firm performance; however, at high levels of internal innovation capabilities strategic change negatively affects firm performance. Thus, when undergoing substantial strategic change, firms may need to curtail the use of innovation capabilities and substitute development with licensing or acquisition or incremental

innovation in order to maintain high performance. These findings suggest that firms should balance strategies that tax internal resources, such as innovation and strategic change.

#### LIMITATIONS AND FUTURE AREAS OF RESEARCH

There are some limitations to this study that provide avenues of future research. While this study investigates search using patent data and the technological exploration of knowledge within these patents, there could be other types of knowledge search. Search is a proxy for the knowledge of the firm, and this search could be conducted across geographical domains. In fact, it has recently been recognized that multinational corporations are often able to respond to local markets by searching in geographically and technologically distant spaces (Almeida, 1996; Frost, 2001). Thus, there could be other ways to conceptualize exploratory search such as citations made to patents whose inventor is outside the parent firm's home country, citations made to patents across time, and citations made to patents owned by other firms.

A second limitation of this study pertains to the study of ambidexterity. Tushman and O'Reilly define ambidexterity as the "ability to simultaneously pursue both incremental and discontinuous innovation and change" (1996:24). This study measures exploratory search and its effects on strategic change and finds some evidence of the countervailing effects of exploration that underlies theoretical work on ambidexterity. However, the construct of ambidexterity, a separate yet important question in strategy research, was not measured. Described as a dynamic capability, ambidexterity requires firms to engage simultaneously in incremental learning while



searching out new areas. Firms must respond to many environmental changes, and therefore, they are able to perform at the highest levels by exploitation and making small changes that create stability within the firm while also practicing exploration whereby larger additions to the firm's knowledge base occur. Balancing exploratory and exploitative search provides firms with stable organizational routines, enabling change while ensuring enough variability in knowledge to spark change. Thus, ambidexterity allows firms to balance needs for efficiency and needs for change. The curvilinear relationship between exploratory search and strategic change found in this study offers some support for the ambidexterity hypothesis; however, the current study did not examine the interaction effect of exploitative search and exploration. Therefore, a more comprehensive study of ambidexterity and its influence on strategy is a potential area for future research. To extend this study, future research should investigate exploration and exploitation as co-existing processes as done by He and Wong (2004), whereby firms may have high exploration and exploitation, rather than trade-offs in overall amount where a firm cannot have high exploration and exploitation.

A third limitation of this study pertains to the sample. The study may not be generalizable to all industries; however, it is believed that high technology and knowledge-intensive industries are likely to share many of the same relationships. Some differences between industries may be due to environmental changes, such as regulations, industry concentration, and rapidity of the environmental changes (e.g., dynamism), which are a potential area for future research. Studies using organizational learning perspectives of strategic change have investigated how dynamic environments

prompt organizations to employ search mechanisms that increase the degree of change (Lant & Mezias, 1991; Rajagoplan & Spreitzer, 1996). In addition, the dynamic capabilities perspective suggests that characteristics of dynamic capabilities differ between dynamic and more stable environments (Eisenhardt & Martin, 2000). Firms in highly dynamic environments are likely to have greater exploratory search capabilities to reposition themselves and survive in challenging environments (Eisenhardt & Martin, 2000). Future studies should compare search activities between industries and their effects on strategic change, innovation, and firm performance, accounting for industry characteristics that influence these relationships.

Fourth, while this study theoretically builds arguments that internationalization affects the cognitive beliefs within the firm, the cognitions of executives and decision makers are not empirically examined. Cognitive perspectives describe the managerial search, application, and interpretation of information from the environment. Strategic change literature has linked cognitive structure to the likelihood, extent, and need for change. As executives focus more attention on the environment, the likelihood of strategic change increases (Gordon, Stewart, Sweo, & Luker, 2000). However, when executive cognitions become more inert, the executive's desire and ability to induce strategic change decreases. Thus, research might explore the influence of internationalization on cognitive reorientation, which is the change of an executive's environmental perceptions over time. While, measuring executive cognition is a complex and difficult task for researchers, future research might use shareholder letters to understand questions such as: How do organizational actions, such as

internationalization, affect cognitive reorientation in executives? Does institutional distance influence cognitive reorientation? Does cognitive reorientation influence search and strategic change in firms?

Another limitation of this study is the research design where long lags exist between variables, creating challenges for analyzing mediating effects. Because the idea of product development in the pharmaceutical industry underlined idea of strategic change, there was a need to use a six-year lag between exploratory search and strategic change; however, future research might be conducted in other industries in which smaller lag times are needed. This research is needed to further understand the indirect effects of internationalization on strategic change and firm performance.

The counter-intuitive results of Hypothesis 2a raised questions about the usefulness of prior experience. The findings of organization learning literature on the utility of prior experience has been mixed as in this study, and this should lead researchers to further investigate how different kinds of prior experience influence the firm. For example, Hayward (2002) found that prior acquisition experience was only helpful in situations when prior experience was moderately related to the focal acquisition, suggesting that the quality rather than quantity of prior experience is important. This study points to the need to understand what kind of prior experiences help the firm. High institutional distance of a firm's prior international experience may enable firms to search as firms discover new knowledge bases, and low institutional distance of a firm's prior international experience may help firms become more specialized knowledge about a set of countries that builds the firms current absorptive

capacity, enabling search. Further understanding the quality of a firm's international experience and its effect on the firm is a fruitful area for research.

Future research might also examine whether the sequence in the location of international expansion allows firms to reduce uncertainty associated with expansion and incrementally build capabilities over time (Johanson & Vahlne, 1977; Root, 1987). Barkema and colleagues (1996: 153) suggest that “[i]n order to reduce uncertainty regarding local habits, preferences, market structure, and ways of approaching customers, the sequential steps are small. Lacking routines for the solution of such problems, managers search in the neighborhood of their past experience.” As a result, firms gradually expand into more institutionally distant countries. This pattern was identified in case study by Fina and Rugman (1996) on Upjohn, a large pharmaceutical company, that began expanding internationally primarily to nearby countries before moving to more distant locations. Therefore, understanding the sequence as a reoccurring pattern of institutional distance over time may shed light on how institutional distance positively affects search. It is possible that firms with forward sequences expanding into distant markets increasingly over time accumulate knowledge about the internationalization process, technological knowledge, and institutional differences, allowing them to synthesize and extend knowledge. Firms that gradually increase institutional distance over time have a base of knowledge that allows them to explore. Because the development of knowledge is dependent on a firm's absorptive capacity, it is important that the areas in which the firm seeks to learn is similar to their

prior knowledge (Cohen & Levinthal, 1990). Therefore, the institutional, geographical, and cultural sequence of international expansion is an important area for future research.

Future research should also investigate the impact of resources on strategic change efforts. This research reveals that strategic change may compete with other strategic efforts for resources. Kraatz and Zajac (2001: 653) discuss how some resources may result from commitments of the firm representing “irreversible choices and deliberate persistence.” This study found support for this hypothesis, whereby, when firms had high innovation capabilities, the relationship between strategic change and firm performance was negative. It is possible that innovation capabilities required many of the relevant technical, financial, and human resources that are necessary for effective strategic change. More work is needed to identify resources that may inhibit or facilitate change and the different conditions under which they may compete with the firm’s desire to change or influence the effects of strategic change.

## SUMMARY

The new competitive landscape in which businesses must operate places importance on organizational learning and change, making search for new knowledge across boundaries critical for firm survival and success. Thus, it is important to understand how exploratory search affects the firm’s ability to change and how strategic experiences, such as internationalization, influence the firm’s ability to search successfully. The results of this study inform these issues in line with the words of famous philosopher, Alfred North Whitehead, who said, “The art of progress is to preserve order amid change.” No change or performance outcome is induced in a

vacuum, but firms must consider all commitments that affect variability and stability within the firm. Understanding the dualities of learning and change that exist when examining the benefits of innovation capabilities, exploration, and internationalization may allow firms to achieve the greatest performance.

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**APPENDIX A****TABLES**

TABLE 1  
Summary of Hypotheses

No.	HYPOTHESES
1	Internationalization is positively related to exploratory search.
2A	International experience positively moderates the relationship between internationalization and exploratory search.
2B	Speed of internationalization negatively moderates the relationship between internationalization and exploratory search.
2C	Institutional distance negatively moderates the relationship between internationalization and exploratory search.
3	There is a curvilinear effect (inverted U) between exploratory search and strategic change.
4	Exploratory search partially mediates the relationship between internationalization and strategic change.
5A	Novel innovation capabilities positively moderates the effect of strategic change on firm performance.
5B	Internal innovation capabilities positively moderates the effect of strategic change on firm performance.
6	Exploratory search and strategic change partially mediate the relationship between internationalization and firm performance.

TABLE 2

## Panels of Data and Time Period of Measures

PANEL	TIME FRAME	EXPANSION PATH	EXPLORATORY SEARCH	STRATEGIC CHANGE	FIRM PERFORMANCE
0	1993-2002	1993	1995	1995-2001	2002
1	1994-2003	1994	1996	1996-2002	2003
2	1995-2004	1995	1997	1997-2003	2004
3	1996-2005	1996	1998	1998-2004	2005
4	1997-2006	1997	1999	1999-2005	2006

TABLE 3

## Operationalization of Dependent, Independent, and Mediating Variables

VARIABLE	MEASUREMENT	SOURCE
Strategic change	Logged absolute value of the latent slope or change in firm strategy over six years	Pharmaprojects
Firm Performance - ROA	Net income/Total assets	COMPUSTAT
Firm Performance - Tobin's Q	Ratio of the firm's market value to total assets	COMPUSTAT
Internationalization	FATA, FSTS, Fsub/Tsub	Compact D Worldscope
Internationalization experience	Log of the number of consecutive years of foreign subsidiary operations since 1986.	Compact D
Institutional experience	Log of the number of years of foreign subsidiary operations across all countries	Compact D
Speed of internationalization	Log of the change in number of subsidiaries over five years or since the first year of expansion divided by the change in number of years	Compact D
Institutional Distance	Average Euclidian distance of four institutional dimensions, measured between a firm's subsidiaries and parent firm location, weighted by the number of subsidiaries in each country	Hitt et al. (2007), Compact D
Exploratory search	The proportion of a firm's cited patents that do not belong to pharmaceutical class (424,514, and 435)	Delphion
Novel innovation capabilities	Log of the total number of NMEs	Pharmaprojects
Internal innovation capabilities	Log of the total number of self-originated drugs	Pharmaprojects

TABLE 4

## Operationalization of Control Variables

VARIABLE	MEASUREMENT	SOURCE
Firm innovativeness	Log of the number of patents accumulated by the firm over 4 years	Delphion
Prior performance (ROA)	Net income/Total assets	COMPUSTAT
Firm size	Log of the number of employees	COMPUSTAT
CEO succession	1 if the current CEO is different than the CEO from the previous year, 0 if the same	Board Analyst
Slack	Log of current assets divided by current Liabilities	COMPUSTAT
Market share	Pharmaceutical sales/Total sales	Pharmaprojects; COMPUSTAT
Exploitative search	Proportion of a firm's cited patents that are owned by the firm or its subsidiaries	Delphion



TABLE 5

Means, Standard Deviations, and Pairwise Pearson Correlations <sup>a</sup>

	Variable	Mean	s.d	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Tobin's Q	2.77	4.06																		
2	ROA (year t+1)	-0.21	1.10	-0.47																	
3	Strategic Change	-2.20	0.67	0.12	-0.05																
4	Internal Innovation Capabilities	1.57	0.74	0.02	0.19	-0.02															
5	Novel Innovation Capabilities	1.32	0.88	-0.03	0.19	-0.13	0.87														
6	Exploratory Search	0.08	0.14	-0.07	0.06	0.02	0.12	0.10													
7	Internationalization	0.14	0.19	-0.08	0.15	-0.17	0.42	0.47	0.06												
8	Institutional Distance	1.00	1.30	-0.01	0.13	-0.21	0.42	0.46	0.12	0.45											
9	Speed of Internationalization	0.73	0.19	-0.04	0.08	-0.20	0.34	0.41	0.05	0.34	0.41										
10	International Experience	0.00	1.01	-0.05	0.17	-0.24	0.28	0.37	0.02	0.54	0.82	0.42									
11	Slack (year t-8)	0.24	0.16	-0.16	0.12	-0.16	0.02	0.04	0.02	0.32	0.25	0.15	0.35								
12	Firm Performance (year t-8)	-0.12	0.34	-0.29	0.21	-0.24	0.19	0.27	-0.01	0.34	0.23	0.20	0.31	0.27							
13	Innovativeness	0.76	1.10	0.01	0.12	-0.19	0.39	0.44	0.15	0.32	0.45	0.25	0.42	0.23	0.22						
14	Firm Size (Year t-6)	-0.21	1.10	-0.11	0.21	-0.37	0.62	0.73	0.11	0.60	0.56	0.50	0.57	0.36	0.51	0.59					
15	CEO Succession	0.09	0.29	-0.03	0.05	-0.12	-0.02	0.02	0.02	0.11	0.00	0.05	0.04	0.07	0.04	0.07	0.11				
16	Firm Performance (year t-6)	-0.14	0.44	-0.20	0.41	-0.25	0.17	0.19	0.06	0.28	0.22	0.17	0.27	0.26	0.52	0.13	0.42	0.07			
17	Slack (year t-6)	0.25	0.16	-0.13	0.05	-0.27	0.03	0.10	-0.07	0.33	0.22	0.16	0.31	0.68	0.34	0.18	0.42	0.14	0.23		
18	Market Share	0.93	0.16	0.06	-0.09	0.05	-0.17	-0.14	-0.07	-0.25	-0.22	-0.17	-0.30	-0.12	-0.24	-0.32	-0.40	-0.06	-0.20	-0.17	
19	Firm Size (Year t)	-0.05	1.14	-0.10	0.27	-0.34	0.66	0.76	0.03	0.54	0.54	0.47	0.52	0.30	0.50	0.55	0.94	0.10	0.41	0.34	-0.27

<sup>a</sup> N=322; All correlations >0.1056 are significant at p<0.05

TABLE 6

## Main Effect of Internationalization on Exploratory Search

<i>Variables</i>	<i>Exploratory Search</i>		
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
Intercept	0.081 (0.020)	0.077 (0.020)	0.057 (0.026)
Slack	-0.044 (0.061)	-0.049 (0.062)	-0.046 (0.063)
Prior Performance	-0.011 (0.025)	-0.016 (0.026)	-0.013 (0.026)
Innovativeness	0.012 (0.010)	0.011 (0.010)	0.015 (0.010)
Internationalization		0.045 (0.058)	-0.100 (0.106)
Internationalization <sup>2</sup>			0.622† (0.372)
R <sup>2</sup>	0.006	0.008	0.016

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 7

## Moderating Effects of International Experience on Exploratory Search

<i>Variables</i>	<i>Exploratory Search</i>	
	<i>Model 4</i>	<i>Model 5</i>
Intercept	0.080 (0.020)	0.092 (0.021)
Slack	-0.042 (0.062)	-0.036 (0.061)
Prior Performance	-0.014 (0.026)	-0.020 (0.026)
Innovativeness	0.012 (0.010)	0.014 (0.010)
Internationalization	0.056 (0.063)	0.088 (0.064)
International Experience	-0.007 (0.014)	-0.002 (0.014)
Internationalization x International Experience		-0.142* (0.061)
R <sup>2</sup>	0.009	0.026

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 8

Moderating Effects of Speed of Internationalization and Institutional Distance on Exploratory Search

<i>Variables</i>	<i>Exploratory Search</i>			
	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>
Intercept	0.083 (0.020)	0.106 (0.021)	0.089 (0.020)	0.092 (0.020)
Slack	-0.048 (0.062)	-0.054 (0.061)	-0.052 (0.061)	-0.052 (0.061)
Prior Performance	-0.016 (0.026)	-0.022 (0.026)	-0.018 (0.026)	-0.017 (0.026)
Innovativeness	0.010 (0.010)	0.011 (0.010)	0.005 (0.010)	0.006 (0.010)
Internationalization	0.039 (0.059)	-0.005 (0.060)	0.016 (0.059)	0.023 (0.059)
Speed of Internationalization	0.026 (0.055)	0.354** (0.115)		
Institutional Distance			0.017* (0.008)	0.018* (0.008)
Internationalization x Speed of Internationalization		-1.800** (0.556)		
Internationalization x Institutional Distance				-0.033 (0.038)
R <sup>2</sup>	0.009	0.041	0.022	0.024

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 9

## Curvilinear Effect of Exploratory Search on Strategic Change

<i>Variables</i>	<i>Strategic Change</i>		
	<i>Model 10</i>	<i>Model 11</i>	<i>Model 12</i>
Intercept	-2.529 (0.437)	-2.566 (0.439)	-2.560 (0.435)
Firm Size	-0.062 (0.180)	-0.062 (0.180)	-0.055 (0.179)
CEO Succession	-0.059 (0.093)	-0.062 (0.093)	-0.070 (0.092)
Prior Performance	-0.109 (0.086)	-0.113 (0.086)	-0.125 (0.085)
Slack	-0.910** (0.315)	-0.892** (0.316)	-0.913** (0.314)
Market Share	0.246	0.271 (0.332)	0.330 (0.331)
Exploratory Search		0.200 (0.242)	0.958* (0.429)
Exploratory Search <sup>2</sup>			-1.383* (0.649)
R <sup>2</sup>	0.712	0.713	0.719

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 10

## Moderating Effects of Innovation Capabilities on ROA

<i>Variables</i>	<i>Return on Assets</i>				
	<i>Model 13</i>	<i>Model 14</i>	<i>Model 15</i>	<i>Model 16</i>	<i>Model 17</i>
Intercept	-0.144 (0.402)	-0.125 (0.401)	-0.139 (0.401)	-0.131 (0.400)	0.086 (0.399)
Firm Size	0.292** (0.088)	0.324** (0.120)	0.340** (0.122)	0.301** (0.106)	0.321** (0.109)
Market Share	-0.057 (0.417)	-0.079 (0.416)	-0.076 (0.416)	-0.072 (0.417)	-0.127 (0.413)
Strategic Change		0.163† (0.087)	0.135 (0.089)	0.159† (0.088)	0.125 (0.088)
Novel Innovation Capabilities		-0.012 (0.159)	-0.081 (0.168)		
Internal Innovation Capabilities				0.037 (0.163)	-0.132 (0.179)
Strategic Change X Novel Innovation Capabilities			-0.168† (0.101)		
Strategic Change X Internal Innovation Capabilities					-0.352** (0.125)
R <sup>2</sup>	0.035	0.046	0.053	0.047	0.068

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 11

## Moderating Effects of Innovation Capabilities on Tobin's Q

<i>Variables</i>	<i>Tobin's Q</i>				
	<i>Model 18</i>	<i>Model 19</i>	<i>Model 20</i>	<i>Model 21</i>	<i>Model 22</i>
Intercept	1.958 (1.593)	2.209 (2.126)	2.272 (2.118)	1.896 (1.504)	1.914 (1.496)
Firm Size	-0.269 (0.278)	1.082 (0.738)	1.182 (0.738)	-0.545 (0.338)	-0.547 (0.336)
Market Share	0.799 (1.683)	0.490 (2.065)	0.379 (2.062)	0.870 (1.593)	0.855 (1.585)
Strategic Change		-0.132 (0.417)	-0.234 (0.481)	0.181 (0.379)	0.224 (0.389)
Novel Innovation Capabilities		-3.182** (1.103)	-3.451** (1.118)		
Internal Innovation Capabilities				0.702 (0.489)	0.795 (0.549)
Strategic Change X Novel Innovation Capabilities			-0.671 (0.481)		
Strategic Change X Internal Innovation Capabilities					0.198 (0.556)
R <sup>2</sup>	0.005	0.027	0.032	0.015	0.016

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses. †  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 12  
Effect of Internationalization on Strategic Change

<i>Variables</i>	<i>Strategic Change</i>	
	<i>Model 23</i>	<i>Model 24</i>
Intercept	-2.529 (0.437)	-2.472 (0.461)
Firm Size	-0.062 (0.180)	-0.050 (0.183)
CEO Succession	-0.059 (0.093)	-0.061 (0.093)
Prior Performance	-0.109 (0.086)	-0.112 (0.086)
Slack	-0.910** (0.315)	-0.928** (0.319)
Market Share	0.246 (0.331)	0.237 (0.332)
Internationalization		-0.137 (0.355)
R <sup>2</sup>	0.712	0.713

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$



TABLE 13

The Moderating Effect of Irregularity of International Expansion on the Relationship  
between Internationalization and Exploratory Search

<i>Variables</i>	<i>Exploratory Search</i>	
	<i>Model 25</i>	<i>Model 26</i>
Intercept	0.079 (0.021)	0.074 (0.020)
Slack	-0.047 (0.062)	-0.060 (0.062)
Prior Performance	-0.016 (0.026)	-0.012 (0.026)
Innovativeness	0.012 (0.010)	0.013 (0.010)
Internationalization	0.050 (0.059)	0.119† (0.064)
Irregularity of International Expansion	-0.002 (0.002)	0.00003 (0.003)
Internationalization X Irregularity of International Expansion		-0.031* (0.012)
R <sup>2</sup>	0.010	0.031

Unstandardized coefficients. Two-tailed tests reported. Standard errors in parentheses.

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

TABLE 14  
Summary of Results

No.	HYPOTHESES	RESULT	FINDING
1	Internationalization is positively related to exploratory search.	Not Supported	Curvilinear relationship
2A	International experience positively moderates the relationship between internationalization and exploratory search.	Not Supported	Negative moderating effect
2B	Speed of internationalization negatively moderates the relationship between internationalization and exploratory search.	Supported	Negative moderating effect
2C	Institutional distance negatively moderates the relationship between internationalization and exploratory search.	Not Supported	Positive direct effect
3	There is a curvilinear effect (inverted U) between exploratory search and strategic change.	Supported	Curvilinear effect (Inverted U)
4	Exploratory search partially mediates the relationship between internationalization and strategic change.	Not Supported	No significant indirect effect
5A	Novel innovation capabilities positively moderates the effect of strategic change on firm performance.	Not Supported	No significant moderating effect
5B	Internal innovation capabilities positively moderates the effect of strategic change on firm performance.	Not Supported	Negative moderating effect
6	Exploratory search and strategic change partially mediate the relationship between internationalization and firm performance.	Not Supported	No significant indirect effects

**APPENDIX B**

**FIGURES**

FIGURE 1

Proposed Model of International Expansion Paths, Search, Strategic Change, and Firm Performance

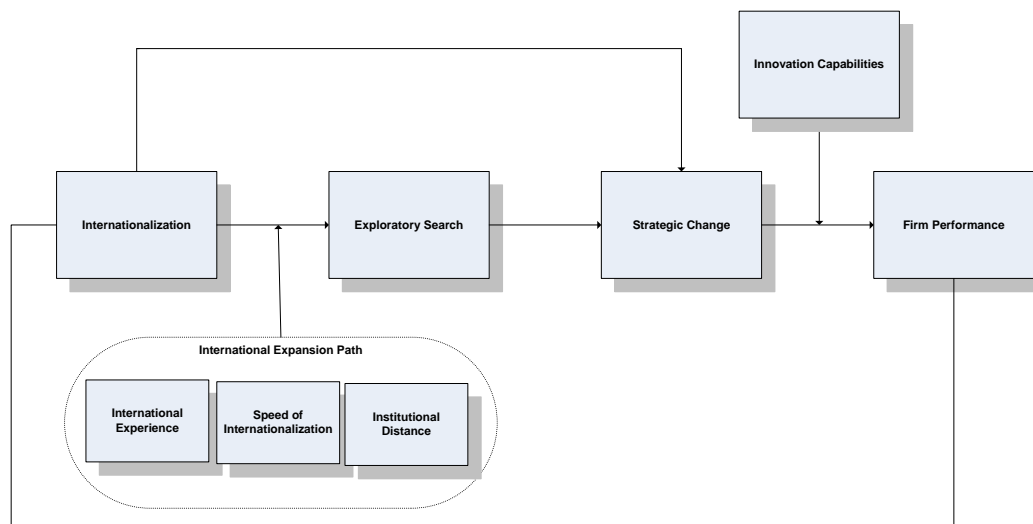


FIGURE 2

## Antecedents of Exploratory Search

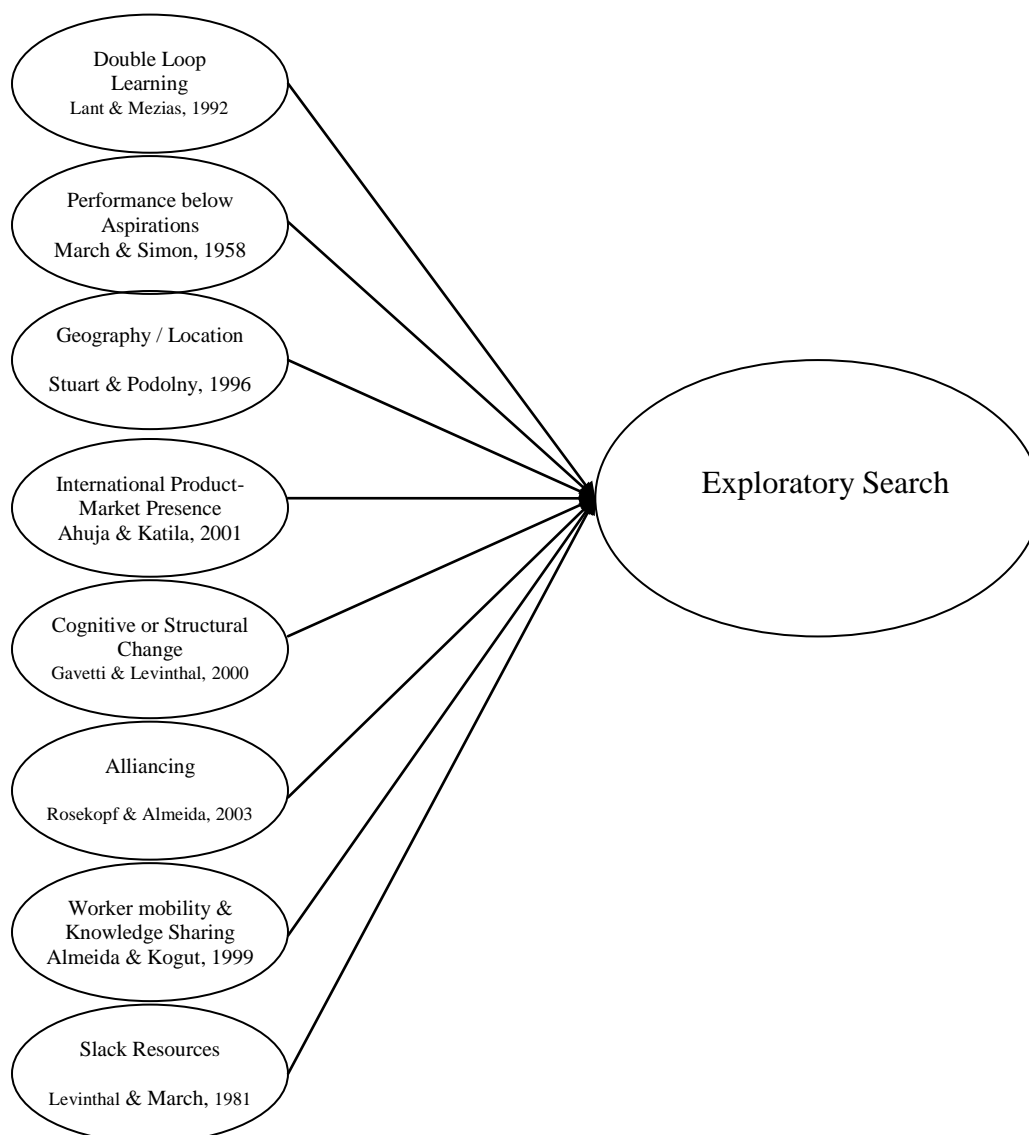


FIGURE 3

A Growth Curve Model for Studying Change

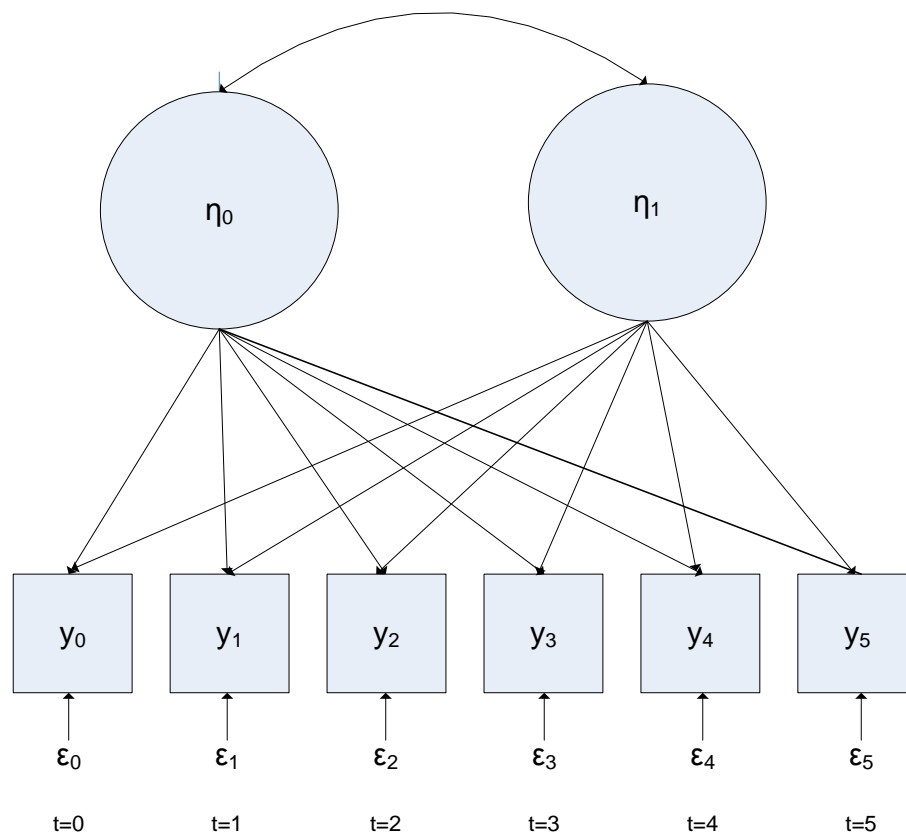


FIGURE 4

## A Partially Mediated Model

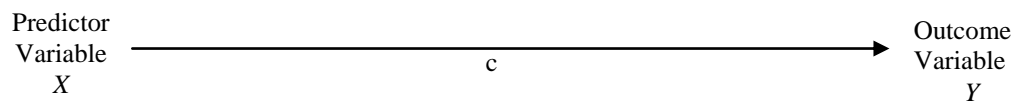
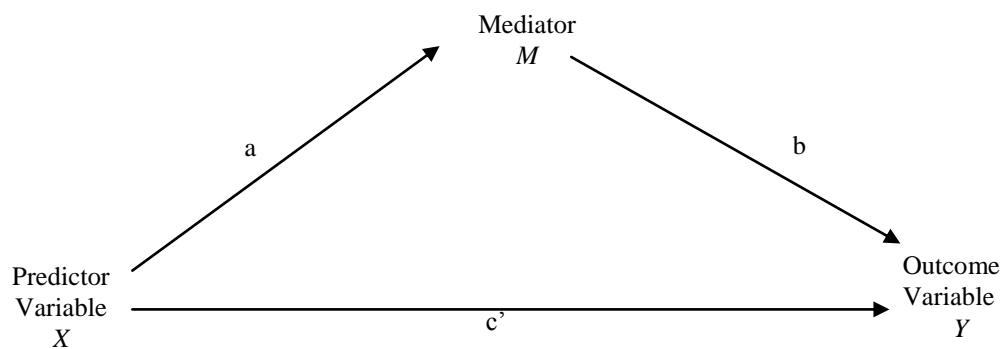


FIGURE 5

The Curvilinear Effect of Internationalization on Exploratory Search

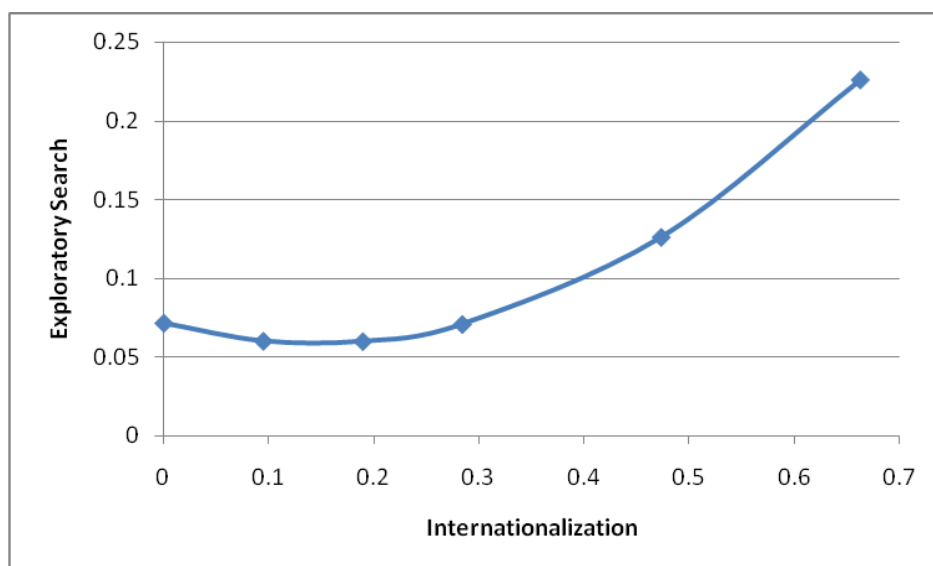




FIGURE 6

The Moderating Effect of International Experience on the Relationship between Internationalization and Exploratory Search

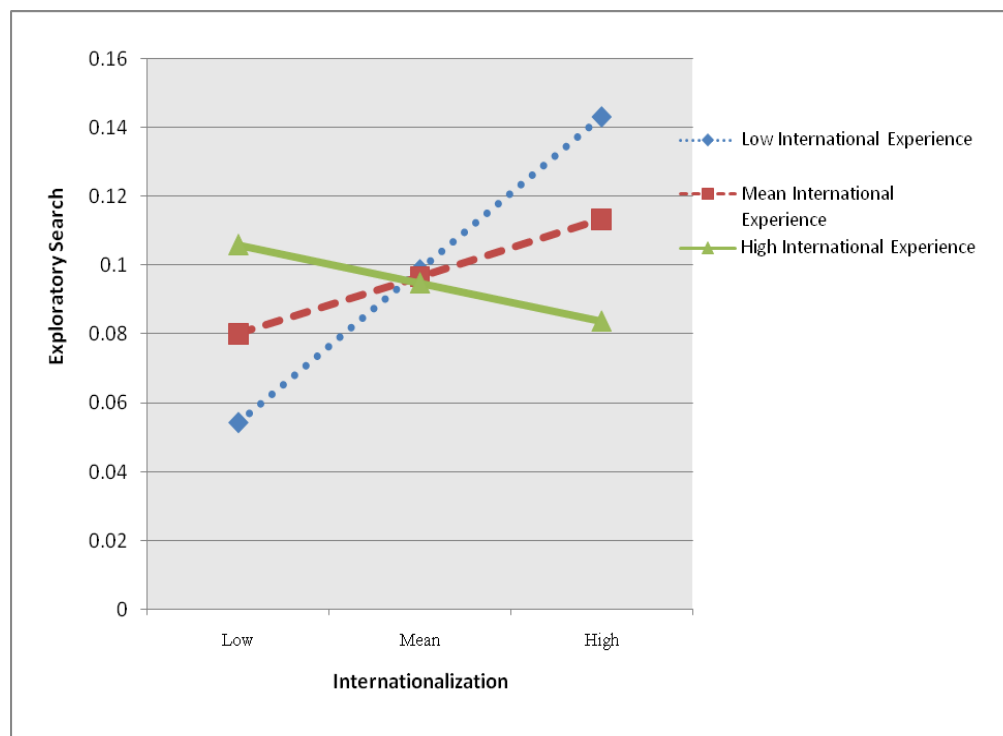


FIGURE 7

The Moderating Effect of Speed of Internationalization on the Relationship between Internationalization and Exploratory Search

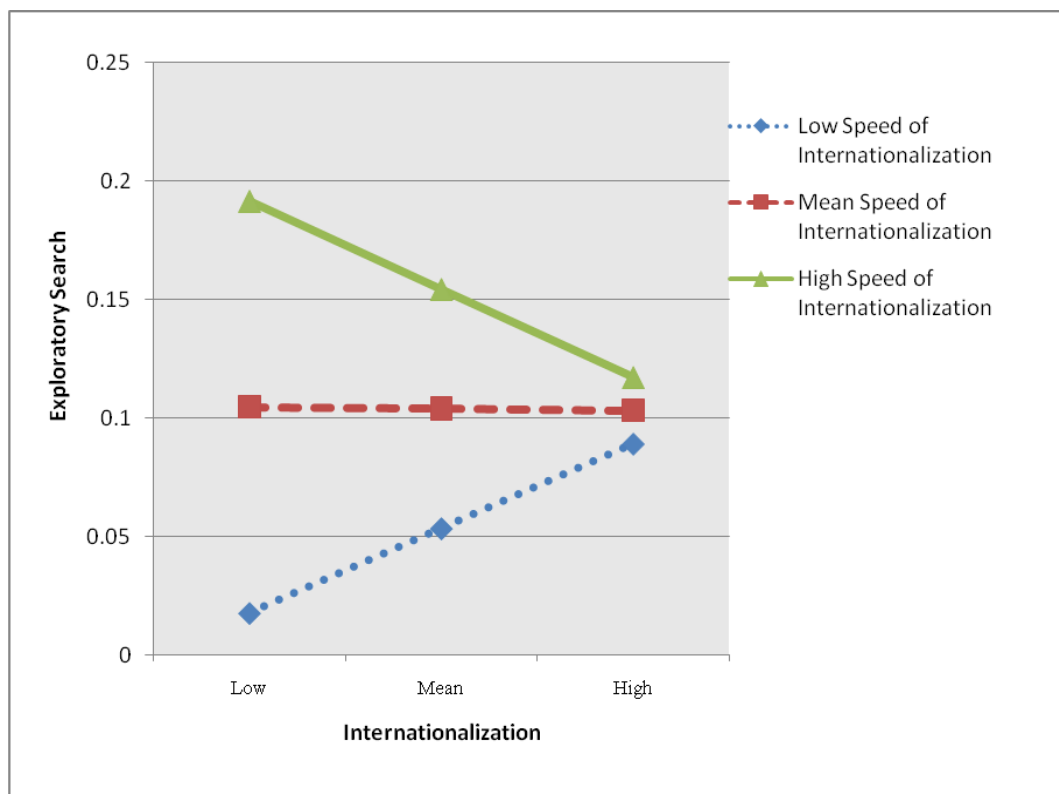
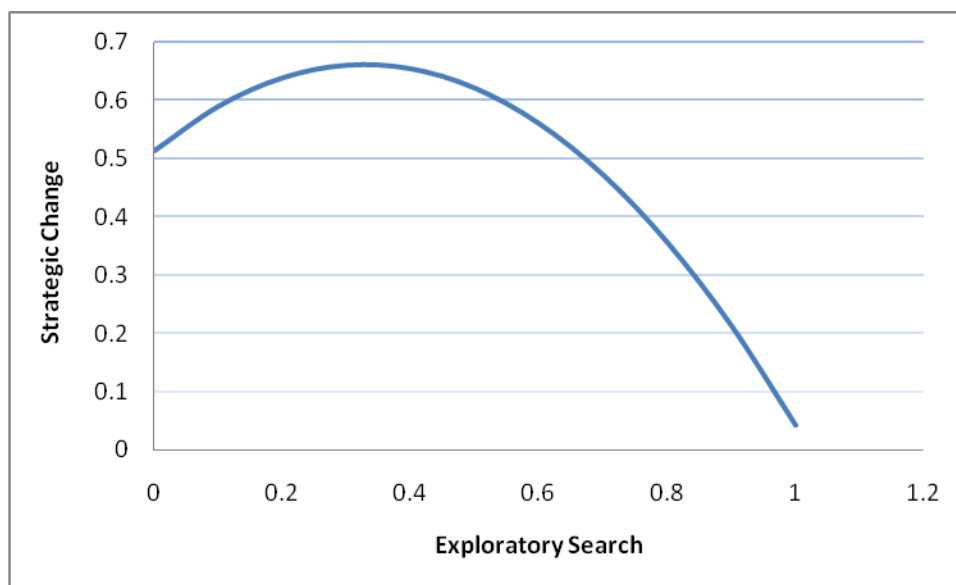


FIGURE 8

The Curvilinear Relationship between Exploratory Search and Strategic Change<sup>3</sup>



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<sup>3</sup> Note. Strategic change values in the above table represent log-transformed change slopes that have been increased by a value of three to represent meaningful values.

FIGURE 9

The Moderating Effect of Novel Innovation Capabilities on the Relationship between Strategic Change and Firm Performance (ROA)

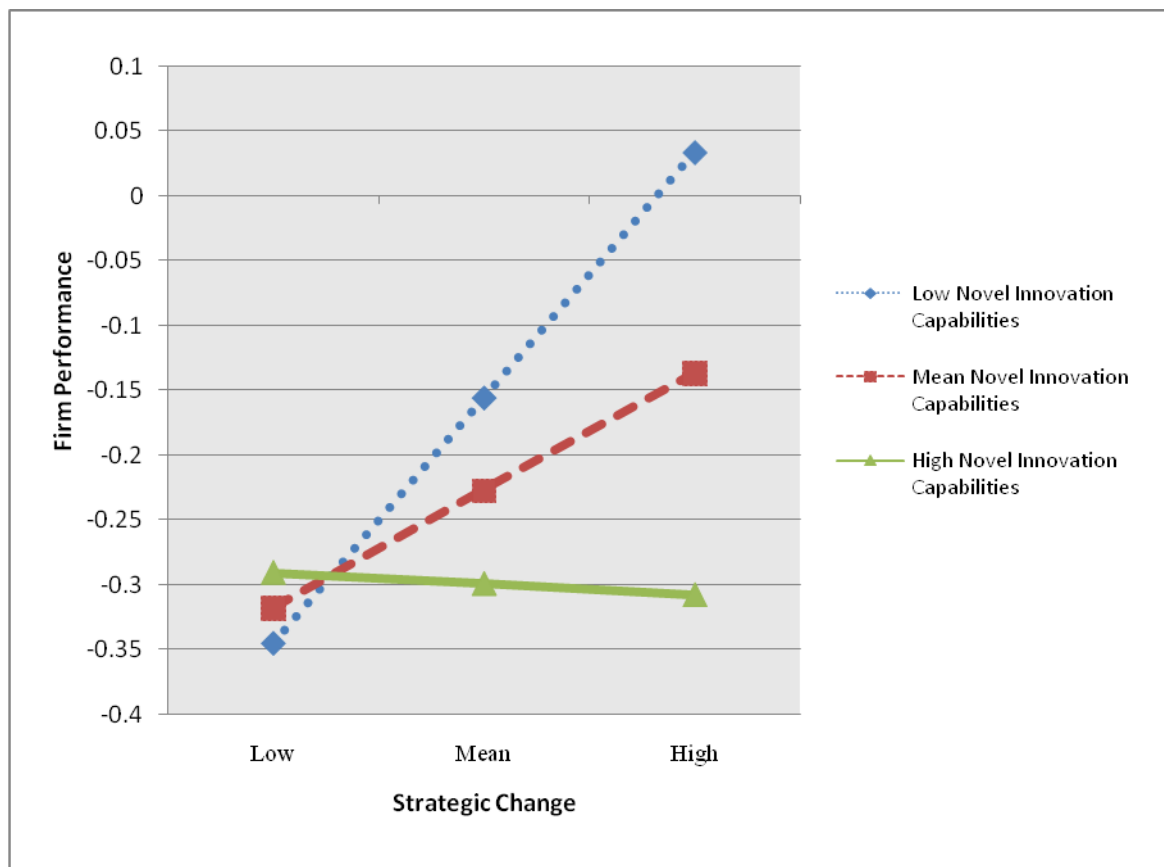


FIGURE 10

The Moderating Effect of Internal Innovation Capabilities on the Relationship between Strategic Change and Firm Performance (ROA)

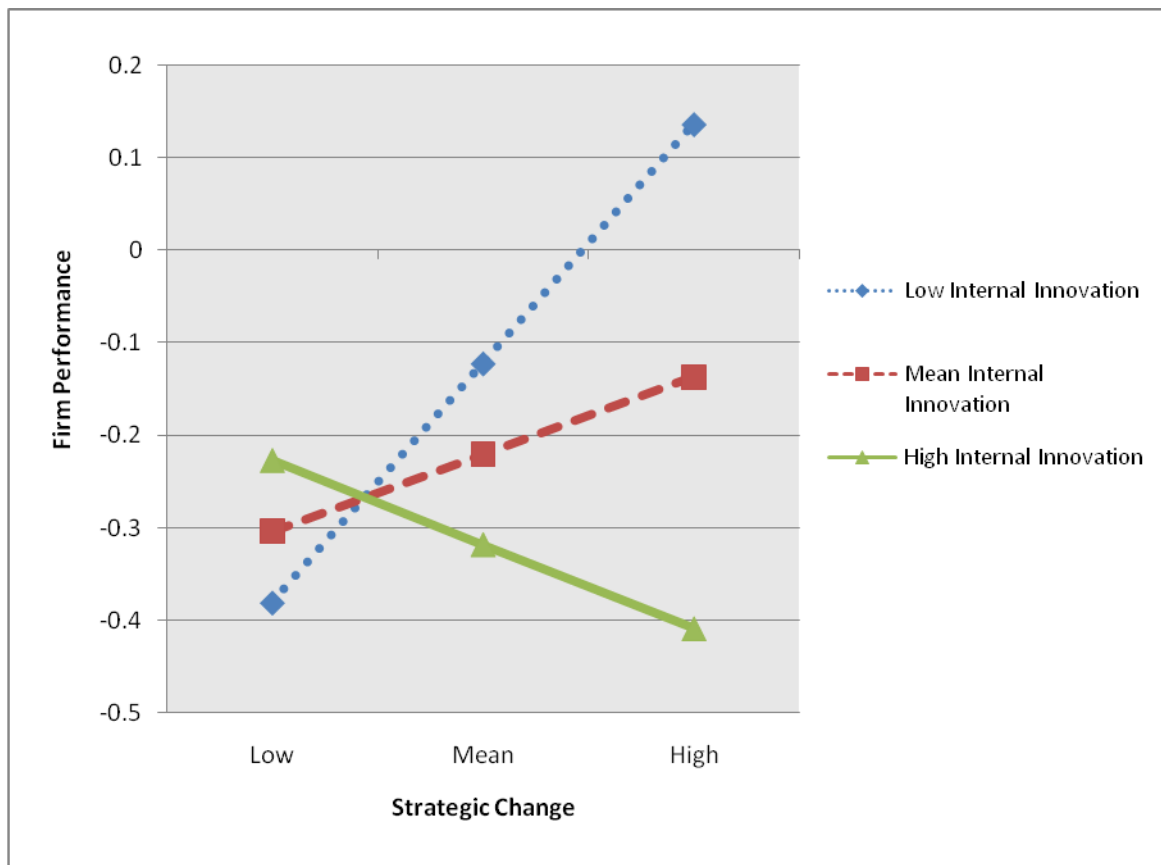
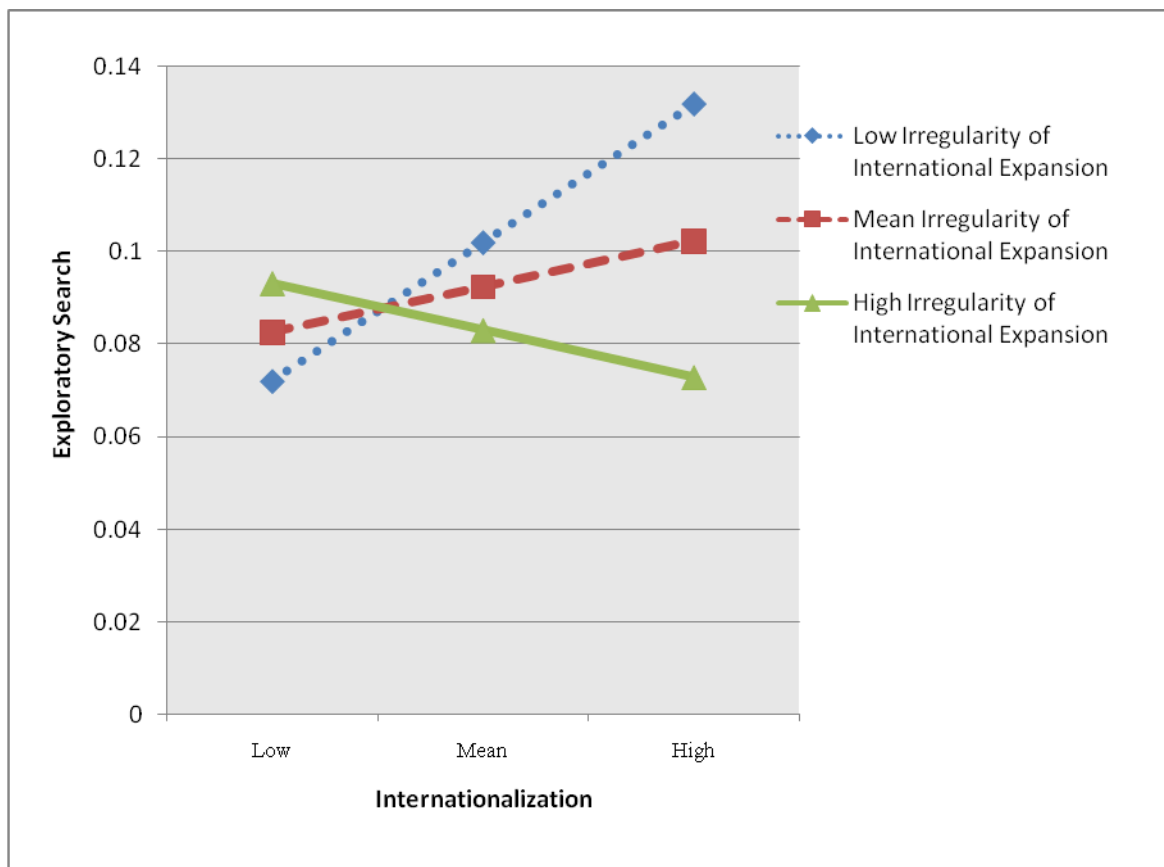


FIGURE 11

The Moderating Effect of Irregularity of International Expansion on the Relationship  
between Internationalization and Exploratory Search



**APPENDIX C**  
**LIST OF THERAPEUTIC CATEGORIES**

## List of Therapeutic Categories

Alimentary  
Blood and Clotting  
Cardiovascular  
Dermatology  
Genitourinary  
Hormonal  
Immunology  
Anti-infective  
Cancer  
Musculoskeletal  
Neurology  
Sensory  
Imaging



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