

## ABSTRACT

Title of Dissertation:           MANAGERIAL SEARCH AND THE PURSUIT OF OPPORTUNITY

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This dissertation explores the search behavior of CEOs and how this behavior relates to the opportunities they recognize and take action upon. Opportunities are defined in this dissertation as the perception of a novel and appropriate resource combination acted upon or seized for potential gain. As such, recognizing and acting upon opportunities is among the most important roles of a manager. This is particularly true for CEOs since they are most often tasked with setting the strategic direction of the firm. Despite the importance of managers recognizing opportunities, the literature has failed to fully address the behaviors that influence the novelty and appropriateness of the opportunities those individuals recognize. This dissertation examines those behaviors, known as search. I define search as individual behavior resulting in the acquisition of information and knowledge that can be used to recognize and seize opportunities to solve problems.

Search is categorized into two broad categories: Search terrain (where the search takes place) and search process (the manner in which the terrain is searched). Searches consists of both a terrain and a process. Search terrains are comprised of three dimensions: Distance, familiarity, and breadth of information sources. Search processes are comprised of 4 dimensions: Effort, exhaustiveness, iteration, and formality. Hypotheses are tested to determine the impact that search has on the novelty and appropriateness of opportunities acted upon by CEOs. The findings offer some valuable information about CEO search. First, with respect to opportunity novelty, CEOs appear to maximize novelty when they are effortful and exhaustive in searching a narrow and familiar terrain. On the other hand, CEOs appear to maximize appropriateness in two ways. First, when searching in distant terrains outside the organization, CEOs need to exhaustively explore that terrain but only focus on information outside the organization that is easily obtained and understood. Additionally, it seems helpful to be informal when undertaking the search – particularly among unfamiliar terrains.

MANAGERIAL SEARCH AND THE PURSUIT OF OPPORTUNITY

by

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## Preface

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## Dedication

To my wife Sara.

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# **MANAGERIAL SEARCH AND PURSUIT OF OPPORTUNITY**

## CHAPTER 1: INTRODUCTION

In today's extremely competitive environment, it is imperative that firms continuously recognize and seize new opportunities in order to develop or maintain an advantage vis-à-vis their current and potential competitors (D'Aveni, 1994; McNamara, Vaaler, & Devers, 2003). Gone are the days of stable and lasting competitive advantages that allow firms to garner consistently higher rents than the competition. In its place, the economics of today are characterized by hypercompetition, rapid change, technological innovation, and global competition (D'Aveni, 1994; Hitt & Keats, 1998).

It is these factors that make it necessary that, in order to produce high performance, those concerned with the strategic direction of the firm continuously search their environment for new opportunities that will allow them to stay ahead of the competition (Schendel, 1996). Specifically, search entails that managers seek to recognize, interpret, and process information to which they are exposed in order to seize upon that which they view as beneficial to their organization (Cyert & March, 1963; March & Simon, 1958). Through the information that is acquired during the search process, managers limit their exposure to uncertainty and ambiguity (Kotter, 1982; Mintzberg, 1973), adapt to their environment (Hayek, 1945), and recognize opportunities and threats, therein (Tushman, 1977). Failure to search effectively can lead to detrimental inertia, poor performance and, ultimately, firm failure (March & Levinthal, 1993). Clearly, the search for and recognition of opportunities is one of the most important activities with which managers are tasked to increase firm performance (Andrews, 1987;

Mintzberg, 1973). In fact, Thompson argued that failure to search and to keep abreast as changes occur in the environment can lead to failure in even the most robust organizations from every field including “education, medicine, industry, commerce, military, and government” (1967: 154).

Search and the recognition of opportunity is an important determinant of a firm’s ability to adapt and respond to change. Firms that seize high quality and timely opportunities will be likely to outperform their competitors. This view is somewhat in contrast to more rational views of competition. For example, in industrial organization economics, differences in performance are typically attributed to environmental factors that determine profits and performance (for a review see Scherer & Ross, 1990). On the other hand, resource-based view perspectives see performance differences among firms as the direct result of bundles of resources possessed by the firm and the degree to which these resources are valuable, rare, inimitable, and non-substitutable (Barney, 1991). These perspectives do not take into account the dynamic nature of today’s markets and the notion that organizations must take new actions that allow them to stay in front of the competition (D’Aveni, 1994; Schumpeter, 1934).

Despite the importance that search has for the opportunities managers recognize and act upon, research on the subject has been scarce. Instead, nearly all research that has been done on managerial information acquisition has been done on the concept of scanning. However, scanning research fails to recognize the purposeful activity of search as an information gathering activity. Whereas search is a targeted activity that is directed at a particular problem, scanning is not. Therefore, scanning research has entailed the study of knowledge acquisition that occurs through more random and undirected



behavior that leads individuals to sense internal and external environmental changes (e.g. Garg, Walters, & Priem, 2003; Hambrick, 1981).

Where search has been studied empirically, the research has relied on distal proxies that infer search such as new product introductions or firm research and development (R & D) expenditures (e.g. Gavetti & Levinthal, 2000; Rosenkopf & Nerkar, 2001). In addition, nearly all of this research has been done at the organizational level of analysis to the exclusion of the search performed by individual managers (Greve, 2003; Huber, 1991; Katila & Ahuja, 2002; Rosenkopf & Almeida, 2003). This is an unfortunate gap in the literature given the general acceptance of the importance that effective information gathering has for individual managers and executives (Kotter, 1982; Mintzberg, 1973). In support of this notion, there are numerous examples of studies that illustrate the positive effects that a manager's ability to gather information has on firm performance (e.g. Garg et al., 2003; Tushman, 1977). Again, however, these studies most often refer to undirected scanning efforts of these individuals.

Prior search studies have also failed to specifically investigate the opportunities managers recognize as a result of search. Instead, prior work has largely looked at search and its effect on innovations such as new product introductions (e.g. Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001). This work fails to separate the innovation process, or opportunity exploitation, from the concept of search and recognition of opportunity, assuming instead that they are inseparably linked (e.g. Khilstrom & Laffont, 1979). Search has been investigated in other specific contexts such as acquisition performance (Ahuja & Katila, 2001), location of exchange partners (Rangan, 2000), alliances (Rosenkopf & Almeida, 2001), and organizational design (Rivkin & Siggelkow, 2003;

Siggelkow & Rivkin, 2005). However, to my knowledge, the influence of search on more general opportunistic action has been unexplored. Finally, empirical study of search has specifically failed to examine actual search behaviors.

I intend to examine more fully search and opportunity recognition of top managers. Importantly, I view search as a separate, distinct, and purposeful activity in contrast to scanning. Further, I argue that the characteristics of the search processes used by individual managers will have an influence on the opportunities they recognize and undertake. More specifically, I seek to answer the question: *How do differing managerial search behaviors influence the opportunities recognized and seized upon by those managers?* Implicit in the recognition of opportunities, indeed in the root of the word *recognize* itself, is the occurrence of an unobservable cognitive event. Therefore, in order to answer this question, I draw on information processing literature in cognitive psychology. From this perspective, top managers will notice and attend to information that is new, novel, repeated, unusual, or prominent (Fiske & Taylor, 1991). Hence, they will seize differing types of opportunities based on the degree to which their search explores information with these characteristics.

In this dissertation, I define managerial search as individual behavior that can result in the acquisition of information and knowledge leading to the recognition of opportunities to solve a particular problem. Through search, managers essentially change the equilibrium balance of information that exists in the general “market for ideas.” That is, by searching, managers become exposed to information which, in turn, changes the knowledge they possess. It follows that information asymmetries are also created and changed as a result of the search. Information asymmetries can have a vast influence on

the opportunities seized by top managers and allow them to adapt organizational assets and capabilities to changing market conditions more effectively than the managers of other organizations (Hayek, 1945). From this perspective, managerial search can be viewed as an important behavior that can enable some managers to lead their firms to higher performance.

In the next chapter, I more fully review the multi-disciplinary literature on search. Using this literature, I develop a model of managerial search in Chapter 3. In Chapter 4, I present a number of hypotheses drawing on this search model. These hypotheses are intended to further explore the relationship between managerial search and the opportunities seized by managers. Chapter 5 illustrates the research methodology I utilized in order to test these hypotheses. The next chapter illustrates the results of my data analysis. In chapter 7, I discuss the implication of those results. Finally, in chapter 8, I present some limitation and future research possibilities.

## CHAPTER 2: LITERATURE REVIEW

### Overview

This dissertation investigates managerial search and the opportunities seized by those managers as a result. Therefore, the main purpose of this chapter is two-fold. In the first section of the chapter, I review the literature on search in general and compare search with several other related research topics. In the second section, I discuss work that has been done regarding opportunity recognition and the importance of taking action to seize opportunities.

### Search Literature

Academic work on the topic of search has spanned numerous disciplines and contexts. For example, Koopman (1954) modeled search theory in the context of finding enemy submarines and aircraft using a combination of resources including sonar, radar, and vision military operations in World War II. Koopman's later work (1979; 1986) examined the optimization of physical and visual searches for objects. Economists have elicited mathematical models that illustrate, among others, the degree to which individuals search for jobs (Lipman & McCall, 1976) and new technologies (e.g. Jensen, 1982; Reinganum, 1982). Some marketing research has also used economic and mathematical models to examine consumers' search within the context of problem solving for low prices on goods (e.g. Meyer, 1997; Miller, 1993). Management study of search can be roughly categorized into two streams of literature, both of which trace their roots to the work of March and Simon (1958). The first is largely a behavioral perspective and examines search as the generation of alternatives that is part of the

decision-making process. The second views search as a means of lessening organization performance gaps through the exploration of innovations. In this review section, I discuss both economic perspectives on search and managerial search along its two dimensions. Finally, I close the review with a section on search in other literatures.

### Economic Search Literature

Economic research has viewed search as a costly endeavor that is employed to find a solution to a problem. As such, this work has largely focused on modeling the ideal and most efficient conditions for search. One common way researchers in this area do this is by seeking to understand the rules that dictate the optimal amount of time that search should be undertaken in a given context. By investigating the marginal costs of additional search, they seek to determine the optimal stopping time for search.

Research from an economic perspective has investigated a number of different problem contexts along this vein. Lippman and McCall (1976a; 1976b) reviewed prior models of job search as well as employer search for employees. In this research, various assumptions and specifications are elicited in order to model situations that may be present. These assumptions include the amount of time available for search, the degree to which the outcome of the search is uncertain, the dynamism of the context, among others. The main thrust of this work demonstrated that there were diminishing returns to additional search because of the boundedness of the searcher and that each additional round of search had an associated cost.

Economists have also used game theoretic arguments to study search. For example, game theory frameworks have been used to demonstrate Nash equilibria in the

search for new product development (Reinganum, 1982). Other research has used similar methodologies to look at the search for new technology in uncertain environments (Lippman & McCardle, 1991).

Search has also been studied in economic literature as existing on a landscape. That is, searchers are viewed as beginning their search at a particular point on a theoretical landscape filled with peaks and valleys. In these models, the searcher is limited where he or she can search based on their current location. For example, if the searcher is in a valley (symbolizing a lack of knowledge of the context of that particular landscape) they will be limited in their ability to “see” too far into the distance. It is only when the search is at or near the top of a peak (symbolizing that the searcher possesses some knowledge of that particular landscape) that he or she will be able to “see” other peaks that may be of interest. Notable, to get to another peak means the searcher will have to leave the safety of their current knowledge/expertise and traverse new ground.

Landscapes have most often been used in this research to model technological positions of firms and to model where best the firm should search for new technological opportunity, i.e. in the area of their current expertise and knowledge or somewhere else (Gavetti & Levinthal, 2000; Kauffman, Lobo, & Macready, 2000). In general, these researchers argue that firms that are in a very technologically weak position should strive to reach the most distant and highest peak they think they can reach. Firms with a strong position should seek to limit their search to their immediate location and in order to capitalize on this position.

## Management Search Literature

As noted above, though management research on search draws on the same seminal work of March and Simon (1958), the literature can be broken into two broad categories. The first views search as an element of the decision-making process and, as such, typically endeavors to show search as a means of alternative generation leading to increased decision performance. The second perspective takes an organizational level point of view to explore search as it relates to organizational innovation, typically, vis-à-vis research and development. I will discuss each of these management search literatures in the next two sections.

Decision-Making. March and Simon (1958) referred to search as a major factor in the overall process of organizational problem solving. According to those authors, search activity includes physical elements, perceptual elements, and cognitive elements. That is, throughout the process, the searcher may encounter some concrete piece of information that directly applies to the problem at hand, they may perceive that some relatively unrelated piece of information can be of use to them, and/or they may utilize some piece of information that is stored in their memory.

Cyert and March (1963) also frame search as behavior that is problemistic or motivated by a problem. In addition, they outline three assumptions regarding search processes. The first assumption is that search is motivated by some problem. Again, this refers to their conceptualization of search as problemistic. In this case, the searcher is motivated to search because he or she is faced with a problem.

The second assumption, that search is simple-minded, refers to the tendency for searchers to develop simple models and to search locally, or near the hypothetical area of

the problem. A simple example of this assumption is when a person fails to get a promotion. The anecdotal tendency is for individuals to search very simply for reasons such as the boss not liking them or because they didn't attend the company Christmas party. However, they are less inclined to search for more complex and "distant" reasons such as their lack of formal education in a particular field or the fact that the person that received the promotion grew up in a foreign country and is fluent in that language.

Cyert and March's (1963) final assumption suggests that search is biased. In other words, searchers perceive the environment in ways that are influenced by their background and experience. This is clearly seen in academic research by the multitude of theoretical perspectives that are often used to explain the same phenomena. Given a particular phenomena, academics with a variety of theoretical orientations will search for explanations that are based in their domain area of interest. Dearborn and Simon (1955) provide another good example of the biased nature of individual search. In their study, managers, faced with the same problem, were more likely to look for a solution within their functional background than in other parts of the organization.

Consistent with March and Simon (1958), numerous authors have continued to conceptualize search as part of the decision-making process. Mintzberg et al (1976) viewed search as part of the decision-making process that varied to the extent to which the searcher exerted effort versus the extent to which the searcher depended on others to search. Similarly, Nutt (1984) characterized search as part of the decision making process. Nutt agreed with the assertion that search could be classified by the extent to which the searcher undertakes the search individually versus relying on others. In



addition, Nutt argues that search is either active or passive depending on the degree to which the searcher understands the problem at a hand.

While problemistic search has continued to dominate the study of search, Cyert and March (1963) indicated that search can occur in the absence of a problem. In their characterization, search could be started when firms have some slack resources that they may use to undertake initiatives that otherwise would be considered too uncertain to pursue. Similarly, Carter (1971) pointed out that opportunity-oriented search also occurs. That is, search can be driven by other factors besides organizational problems. For example, managers may search in order to reach particular goals that are not necessarily problem based. Other authors have alluded to this type of “problemless search” as “scanning within search” (Huber, 1991), and “opportunistic surveillance” (Thompson, 1967). For the purposes of this dissertation, I will focus on active search. Active search relates to search that is motivated by some type of problem stimulus and corresponds to “problemistic search” discussed by Cyert and March (1963) and March and Simon (1958).

Computer simulations and models have also been used to explore decision-making in an organizational context. Researchers in this area argue that optimal search characteristics are dependent upon the complexity of the environment in which the firm exists (Siggelkow & Rivkin, 2005) and the organizational design of the firm itself (Rivkin & Siggelkow, 2003).

Innovation. Since the work of Cyert and March (1963), the issue of search in an organizational context has often entailed discussions about the degree of search or exploration undertaken in a given context and the trade off between resources needed for

that search versus the payoff. In nearly all of this work, that payoff is some type of innovation. Nelson and Winter (1982) illustrate that the search for innovation and R & D within firms is largely dependent on the evolutionary and historical context of the focal organization. In other words, this evolutionary perspective proposes that the starting point and area for search is often based upon past search efforts. Under their assumption, search tends to be local and, as a result, most innovations are relatively minor.

In his seminal article on the topic, March (1991) argues that exploration of new possibilities needs to be balanced with exploitation of old certainties. In other words, in order for organizations to effectively search, they must not overextend their effort nor rely too much on what they already know. Similarly, Levinthal and March (1993) discuss the myopia of learning. They emphasize that the tendency of searchers is to focus on areas in which they have had success before and in which they are most comfortable as a result. Therefore, again, searchers tend to focus on local information when searching.

Gavetti and Levinthal (2000) push the topic of exploration and exploitation further. Utilizing computer simulated fitness landscapes, a tool used by economic research on search, these authors argue that search processes include both cognitively forward-looking and experientially based backward-looking learning. Searchers are somewhat constrained, because of their cognitive maps, in where they can move along the landscape. This type of local, or exploitative, search does not involve a high degree of risk but, typically, is not very rewarding. However, by actually changing their cognitive structures, searchers can explore distant areas on the landscape and make sense of what they find. Higher degrees of exploration may be rewarding but they are also quite risky.

In recent years there has been increasing empirical interest in the concept of search, particularly with respect to innovation. While these empirical studies have mainly focused on the search for technological innovation, they have enriched our understanding of search in a number of different contexts. For example, in a study of the Japanese semiconductor industry from 1978 to 1992, Stuart and Podolny (1996) showed that a firm's search is not only locally based on its own evolutionary context, but also on the networks and technology of other players in the industry.

Rosenkopf and Nerkar (2001) developed and tested a typology of search that considers the concept along two different dimensions: technological boundaries and organizational boundaries. These authors argue that local exploration spans neither of these boundaries while external boundary-spanning exploration spans the firm boundary only. Further, they contend, internal boundary-spanning exploration spans the technological boundary only and radical exploration spans both boundaries. Using patent data related to optical disc technology, they find that search that is localized within the organization does not generate technological innovation on optical disc technology. Exploration beyond organizational boundaries, but not technological boundaries, has the highest impact on optical disc technology. However, "radical" search, meaning search taking place beyond both organizational and technological boundaries, increases technological development beyond the optical disk domain.

Similarly, Katila and Ahuja (2002) examined search in two dimensions. These authors propose that search is not a one-dimensional concept that lies on a continuum from local to distant. Rather, search varies across two separate dimensions. The first, search depth, underscores the frequency with which a firm utilizes its existing

knowledge. Search scope, on the other hand, captures the degree to which the firm explores new knowledge. Utilizing patent data from a comprehensive sample of firms in the robotics industry, the study findings show that search depth is curvilinearly related to the number of new products introduced by the firm. In other words, local search within the organization is helpful, to a degree. In addition, search depth and search scope positively interact to increase the number of new products introduced by the firm. These findings show that more distant or exploratory search has a key role in knowledge creation providing completely new solutions, while more local search, within reason, has a role in combining existing solutions to generate new combinations (Schumpeter, 1934).

Utilizing the same data set as her previous study with Ahuja (2001), Katila (2002) examined how searching information of different ages can influence innovation. In essence, this study tests two competing propositions. The first view regards old information as outdated and useless and, for this reason, counterproductive for innovation. The alternative view proposes that older knowledge has gone through a legitimization that makes it more reliable and, therefore, better for innovation. Results of the study find that, while old intra-industry knowledge hurts, old extra-industry knowledge promotes innovation. Again, these findings show that search may be most effective when a balanced approach between local search, in this case searching old intra-industry knowledge, and more distant search, extra-industry knowledge search in this context.

Search has also recently been investigated within alliances. Using patent data in the semiconductor industry, Rosenkopf and Almeida (2003) find that firms can overcome local search constraints by utilizing alliances and the mobility of investors. They

conclude that firms can increase the breadth of their technological knowledge by utilizing these mechanisms.

Finally, though not explicitly focused on innovation, Rothaermel and Deeds (2004) examine search in a sample of alliances in biotechnology. They argue that firms enter two different kinds of alliances at different times during the product development process. The first, exploration alliances, leads to the development of new products. Exploitation alliances, on the other hand, are used to help bring products to the marketplace. This framework illustrates that exploration generates new discoveries, while exploitation creates demand for these discoveries. From their perspective, exploitation follows exploratory search.

In general, findings from these studies indicate that “local” search behavior results in more incremental innovations or solutions to problems but that searching and exploring in far too unrelated or “distant” areas is also detrimental. The implication is that search is most effective when a balanced approach between exploration and exploitation is employed, vis-à-vis March (1991).

Literature related to search. Several other research topics are related to search in that they deal to some degree with information gathering or acquisition. Perhaps the most similar concept to search is that of scanning. There is generally agreement that scanning, and in particular, executive scanning, involves the sensing of internal and external environmental changes and conditions (Garg et al., 2003). Scanning has been viewed by some as a more general and wide ranging activity than search (Aguilar, 1967). However, others have conceptualized search as the broader construct under which scanning is classified (Huber, 1991). The latter viewpoint, based on a learning perspective, views

scanning as a passive activity. Search, on the other hand, is an active activity that is more directed toward a particular problem or issue that requires information gathering (Huber, 1991).

There is also a large literature that explores the networks and boundary spanning activity of individuals. This research examines the degree to which individuals can acquire information based on their network (e.g. Burt, 1992, 2000) or their ability to span organizational or technological boundaries (e.g. Rosenkopf & Nerkar, 2001; Tushman, 1977). In this literature, the information that is gathered by individuals results from their position in a network or their location relative to different types of boundaries. Search is a much more dynamic perspective of how individuals gather information in a more proactive fashion. Seeking out new network contacts or attempting to cross boundaries could be conceptualized as search activities. In fact, it may be the case that search is the mechanism through which networks are formed and boundaries are spanned.

Summary. Search has been studied as a component of the decision-making process. As such, it has not received significant attention in and of itself as a potential factor in the actions taken by managers. In fact, much of this work has been conceptual or qualitative in nature to the neglect of quantitative methodologies. The empirical research that has been done on search has focused on the organizational level and innovation outcomes. As informative as these prior studies of search have been, there is an issue in that they have typically only inferred search and knowledge acquisition through examination of distal proxies such as patent citations, geographic distance, or alliance partners to determine the extent to which search was undertaken. While this work has

been beneficial in bringing empirical rigor to the discussion of search, to my knowledge, there has been little investigation of the actual search *behaviors* of individuals.

## Opportunity Literature

### Opportunity Defined

Opportunities have been defined in numerous ways including an unfulfilled market need (O'Connor & Rice, 2001), the possibility to create a new business (Christensen, Madsen, & Peterson, 1989), a profit making insight (Venkataraman, 1997), and situations in which new goods, services, raw materials, markets, or organizing methods can be introduced through new means, ends, or means-ends relationships (Eckhardt & Shane, 2003). These definitions are typically related to entrepreneurial opportunities and innovations to the exclusion of less grand opportunities or imitation that can both result in positive outcomes for an organization.

I attempt to reconcile these various definitions by defining opportunity as the perception of a novel and appropriate resource combination acted upon or seized for potential gain. Opportunities can result in positive outcomes in two ways: 1) Through solving some problem or 2) introducing some new possibility for gain, in the absence of a problem. This definition seeks to include a broader range of opportunities than the entrepreneurship literature. Specifically, from my conceptualization, opportunities can include incremental changes to a current situation that provide some benefit. In addition, opportunity can exist through the imitation of the actions of others. For example, upon visiting a client with such devices, managers may recognize an opportunity to cut costs by installing motion-activated light switches throughout their office complex. In the

mainstream literature on opportunity, the installation of such devices would not be considered an opportunity because it is imitated from somewhere else, does not involve a new good, service, raw material, market, or organizing method, nor is this opportunity introduced through new means, ends, or means-ends relationship. It is my argument that, not only are these types of situations valid as opportunities, it is incumbent upon managers to recognize and act upon such opportunities.

### Prior Opportunity Research

Previous work in the area of opportunity has suffered from at least three shortcomings. First, the opportunity literature has almost entirely examined the process of opportunity exploitation or implementation; the time period after which the opportunity is initially acted upon, or seized. This research has assumed that the seizure of an opportunity and the implementation were inseparably linked (Khilstrom & Laffont, 1979). In this dissertation, I attempt to clearly decouple the seizure of opportunities from the implementation of those opportunities, the latter being more akin to innovation and dependent on different sets of processes beyond the action of seizing the opportunity. A common example may help make this point more clearly. Assume a manager becomes aware of an invention that enables one to type on a computer just by thinking about words. That manager believes an opportunity may exist to use this invention to develop a tool for paraplegics that are unable to type without assistive tools. As such, he or she seizes the opportunity by buying the rights to the technology – this is an act of opportunity seizure. However, taking the next step – developing a product that can actually be sold to end-users – requires the implementation of numerous activities that



may relate to production processes, engineering, designing, financing, etc. Clearly, these later activities, and whether or not someone is successful in doing them, are quite different than the original seizure of the opportunity.

Secondly, most authors follow neoclassical economic assumption that individuals are equally likely to seize opportunities but that some are more inclined to do so because of various personality attributes such as alertness (Kirzner, 1973), a need for achievement (McClelland, 1961) or attitudes such as risk tolerance (Khilstrom & Laffont, 1979) or tolerance for ambiguity (Begley & Boyd, 1987). I propose that other factors, such as the search behaviors of individuals, also influence the seizure of opportunities. In other words, I contend that search can have an influence on the recognition and seizure of opportunity above and beyond individual characteristics such as a high tolerance for risk. This is an important point because it could indicate that individuals may learn to be better at recognizing and seizing opportunity despite being “locked in” to personality traits and individual characteristics that are often credited with determining their ability to act on potential opportunities.

Finally, prior opportunity literature has narrowly focused on entrepreneurs and new market opportunities (e.g. Eckhardt & Shane, 2003; Shane, 2000; Venkataraman, 1997). I contend that the seizing of opportunity by top managers is also extremely important to the strategic well-being of existing organizations. As such, I will examine the recognition and seizure of opportunity, more broadly defined than new market opportunity, by top managers in established organizations.

Recognizing and Acting On Opportunity

It is important to note that the recognition of opportunities is a cognitive event that takes place in the mind of an individual. Indeed, the word “recognition” itself clearly indicates that a cognitive process is at work. Top manager search behavior will influence the information and knowledge available for recognition and thus, dictate the opportunities acted upon by that individual. It follows that the field of cognitive psychology can help explain the recognition of opportunities. Cognitive psychology is concerned with the information processing (cognition) of individuals (Fiske & Taylor, 1991). Cognitions can be thought of as information in the form of what individuals see, hear, read, think about, etc. passing through a system, namely, individuals’ minds. The information is then encoded and stored with varying degrees of accuracy and detail. Individuals continuously recall this information to evaluate knowledge based on new observations, comparing them with what they already know, and cognitively updating based on the new knowledge (Hayes-Roth, 1977).

In order for an individual to seize or act upon an opportunity, they must first recognize that an opportunity exists. However, top managers, like other individuals, are limited in their information processing capability and will, therefore, attend to and notice only some of the information to which they are exposed while searching. Ergo, what they attend to and notice will influence what they recognize and act upon.

More specifically, individuals pay attention to and notice stimuli that are salient to them (Fiske & Taylor, 1991). The degree to which something is salient to an individual affects the chance that the individual will notice the stimuli (Fiske & Taylor, 1991). Up to a certain point, stimuli will be more salient and noticed when it is prominent, repeated, novel, unusual, or unexpected (Fiske & Taylor, 1991; Starbuck & Milliken, 1988). This

cognitive perspective infers that top managers will be more likely to seize opportunities based on information when that information is new, novel, unusual, repeated, or prominent.

The degree to which information is new, novel, and unusual is dependent on the nature of that information relative to the individual. For example, what is new and novel to one individual may not be new and novel to another. Similarly, the same individual may not notice particular stimuli in one context but will attend to it in another. It is important to point out that the degree of newness, novelty, or unusualness of information is a characteristic of the information itself. However, the degree of repetition and prominence of information is a characteristic of the interaction that an individual has with the information. This is an important distinction because it illustrates that information can, for example, be unusual but still not be salient because it is not prominent or repeated. Therefore, the highest level of salience will occur when information is both highly new/novel/unusual and highly prominent/repeated.

Since the recognition of opportunity occurs cognitively within individuals, it is impossible to observe this event. Therefore, the recognition of opportunity is manifest in the outward behavior of individuals to seize or act upon those opportunities. The act of seizing opportunities is an example of a creative outcome (Grimm & Smith, 1997; Smith & DiGregorio, 2002). As such, it is similar to other creative outcomes as defined by Amabile (1996). That is, they may differ in terms of the degree to which they are novel and appropriate. The degree of novelty corresponds to the extent to which an opportunity differs from the existing situation, be it a technology, product, process, etc. The degree of appropriateness refers to the extent to which an opportunity is correct, useful, valuable, or

meaningful (Amabile, 1996). Like other creative outcomes, opportunities can be novel and not appropriate or vice-versa. For example, in 1993, Apple introduced one of the first personal digital assistants (PDA), the Apple Newton. Without question, the Newton was a novel product. However, it was not appropriate at that time because the market was not quite ready to adopt the product. Several years later, when the Palm PDA was introduced, it was not extremely novel because it was similar in so many ways to the Newton, but it was quite appropriate at the time and was a major market success.

Again, I propose to evaluate the influence of search on the opportunities recognized by managers as measured by the actions managers take to seize those opportunities. Overall, I take an information processing perspective in analyzing the search and opportunity recognition of top managers. That is, I argue that varying search terrains will expose particular types of information and that variation in search process will influence the degree to which searchers are exposed and repeatedly exposed to that information. These differences will affect the characteristics of the information that are salient and processed by the searcher and the opportunities they recognize and seize as a result. More specifically, I contend that top managers' search behavior will influence both the novelty of those opportunities and the appropriateness of those opportunities.

## CHAPTER 3: A MODEL OF MANAGERIAL SEARCH

### Overview

In this dissertation, I examine individual search behavior of top managers and the relationship between their search behaviors and the opportunities they recognize and seize. I define search broadly as individual behavior resulting in the acquisition of information and knowledge that can be used to recognize and seize opportunities to solve problems. This definition is consistent with early conceptualizations that view search as an active process that is directed toward and motivated by some problem (Cyert & March, 1963; March & Simon, 1958).

In this section, I propose a model of individual managerial search. This model has been developed almost entirely based on existing search literature. However, because this research delves into somewhat uncharted waters, I also referred to an earlier study that included four case studies designed to qualitatively examine the search process in four high technology companies (for details on the case studies see “Search Case Studies” in Appendix H). Additionally, in an effort to help assimilate information on search and provide a variety of perspectives on the issue, I participated in weekly discussions on the topic with a group of researchers over a period of three years.

### A Model of Search

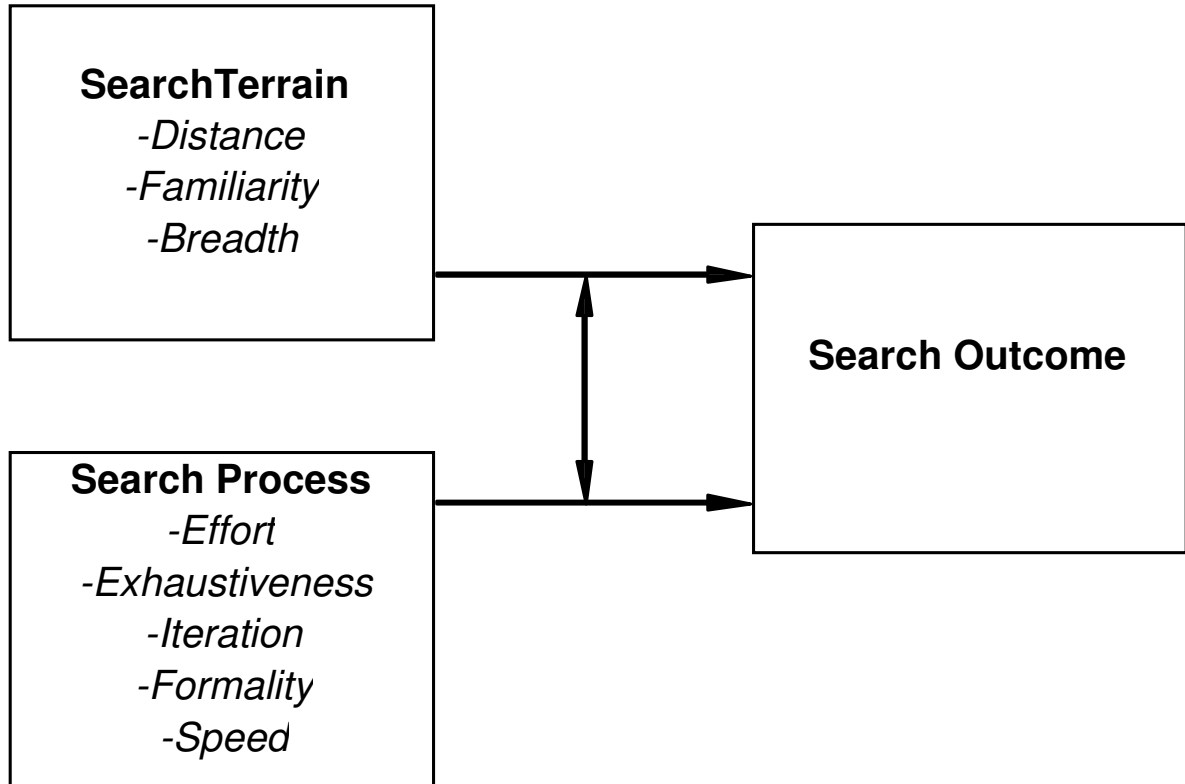
I define search as individual behavior resulting in the acquisition of information and knowledge that can be used to recognize and seize opportunities to solve problems. I characterize search using two overarching categories: Search terrain and search process. Search terrain determines the area in which search occurs. This area includes the sources

of information that are utilized in the search. While not explicitly referring to search terrain, prior studies of search have examined concepts that I consider part of the search terrain including the physical location of the search (Rosenkopf & Almeida, 2003; Rothaermel & Deeds, 2004), the search landscape (Gavetti & Levinthal, 2000), domain knowledge of search (Katila & Ahuja, 2002), and/or information sources of search (Rosenkopf & Nerkar, 2001). Similarly, search process, the manner in which the search terrain is searched, has been inferred by other studies. For example, several studies have explored the concept of comprehensiveness as it relates to the intensity of the process with which alternatives are considered, evaluated, and decisions are made by top managers (Frederickson, 1984; Frederickson & Mitchell, 1984).

Early work on search viewed it as a single dimension ranging from the amount of local search, or search that focused within the searchers existing knowledge base (Helfat, 1994; Stuart & Podolny, 1996), to the amount of exploration, or search that occurs further from the searchers existing knowledge base (March, 1991). My conceptualization of search is consistent with more recent empirical work that supports the notion that there are actually multiple dimensions of search (Katila, 2002; Katila & Ahuja, 2002; Rivkin & Siggelkow, 2003; Rosenkopf & Nerkar, 2001; Siggelkow & Rivkin, 2005). In addition, despite examples of research that touch upon search terrain (the location of the search) and search process (the manner in which the search location is searched), to my knowledge, there has been no research that conceptualizes the two categories together and fully investigates the concept in the context of individual search. In the following section, I will outline dimensions of each category of search in order to explain the model of search presented herein. It is important to note that, inherent in my conceptualization

of search is the notion that both search terrain and search process dimensions need to be present for search to occur. Intuitively, this means that a search consists both of the area to be searched (terrain) and a manner in which the area is searched (process). Search can not take place in the absence of one or the other (see Figure 1).

Figure 1: A Model of Search



### Search Terrain

Search terrain concerns the information sources that are utilized by the searcher and is conceptualized along three dimensions. First, the distance of the search area can be thought of as the distance at which the information sources used in the search are located from the searcher. Next, the breadth of the area in which the search takes place indicates the variety of sources the searcher utilizes within the search. The final dimension is familiarity, or relative newness to the searcher, of the information sources utilized in the search.

Distance. Search terrain distance refers to the relative location of information sources from the location of the searcher. As mentioned earlier, search distance has been



examined by a number of researchers (e.g. Gavetti & Levinthal, 2000; Rosenkopf & Nerkar, 2001). Typically, as a search terrain becomes more distant, information is uncovered that is more and more different, or novel, relative to what the searcher already knows.

Breadth. Search terrain breadth pertains to the variety and complexity of information sources utilized by the searcher. The variety of sources used has been shown in other research to influence the information gathering process (Dollinger, 1984; O'Reilly III, 1982). These sources include those that exist both within and outside the organization. In addition, these sources can be thought of as being personal, involving interpersonal communication, or impersonal, involving non-verbal sources of information. Based on research that has been done in decision-making, it is generally thought that a larger variety of information sources can provide diverse information allowing individuals to generate a larger variety of alternatives (O'Reilly III, 1982).

Familiarity. The final dimension of search terrain, familiarity, refers to the extent to which the searcher utilizes information sources that are new to them. Researchers in the innovation literature have examined information age and the balance between the legitimacy of old knowledge versus the novelty of new knowledge (Katila, 2002; Katila & Ahuja, 2002). March's (1991) seminal paper highlighted the pros and cons of old and new information. In general, old information is less uncertain and has, to some extent, been legitimized by standing the test of time. However, obviously, use of old information subjects a searcher to the possibility of using outdated information. New information, on the other hand, can represent the "state of the art." That is, it may allow the searcher to

draw inferences that would be impossible utilizing the current information. However, new information is risky in that it has not been vetted and qualified.

### Search Process

Search process refers to the manner in which the search terrain is searched and is conceptualized as consisting of five dimensions. First, search effort refers to the amount of effort put into the search. Second, search speed is the rate at which the search takes place. Next, search exhaustiveness is the extent to which the search continues until all relevant information is collected. Search iterativeness is the degree to which the searcher revisits terrain that has been previously searched. Finally, search formality is the extent to which the searcher follows a rigid search protocol throughout the search.

Effort. Search process effort is the degree to which the searcher spends time and energy in the search. This dimension is relative to the amount of effort the searcher, as an individual, is putting into other activities. To some extent, this dimension is similar to the search motivation as outlined by Cyert and March (1963). Those authors contend that the further the searcher is from their current goals, the more motivated they are to put effort into their search.

Exhaustiveness. Search process exhaustiveness refers to the extent to which the searcher continues to gather information in an attempt to be exhaustive. High levels of exhaustiveness can be thought of as being the antithesis of a heuristical approach in which one gathers lesser amounts of information and makes inferences based heavily on assumptions. Economic-based decision-making literature would contend that a more exhaustive approach is rational, will lead to more alternatives, and, subsequently, to

better performance. However, given that literature's focus on the diminishing returns of continued search and stopping search at the optimal point based on those costs (e.g. Lippman & McCall, 1976a; Reinganum, 1982), it is possible that the benefits of exhaustiveness decrease or disappear over prolonged time frames.

Duration. Search process duration is the time it takes for the search to take place. The implication is that a quick search will make it difficult to examine the terrain in detail. Therefore, it is assumed that a fast search process will, to some extent, be more "shallow" in the information it uncovers versus searches that are slower. It is important to note, however, that there is some evidence from decision-making research that faster processes actually are related to better performance and more information (Eisenhardt, 1989a).

Iterativeness. Search process iterativeness is the degree to which the searcher revisits terrain that had been previously searched, changes the way in which he or she searches, adds or deletes territory, or modifies the goals of the search based on experience derived from earlier steps in the search. That is, how amenable is the searcher to change the direction of the search based on new information that arises during the process? This dimension draws heavily on the concept of adaptiveness. Adaptiveness refers to the ability to alter a course of action in response to what is learned during the process of determining what action is best to take (Levinthal & March, 1981). Eisenhardt and Tabrizi (1995) found that adaptive processes aided in product development in the computer industry.

Formality. Search formality is the extent to which the searcher follows a rigid protocol, or a set of specific procedures or routines, in conducting the search of the

terrain. Some aspects of searcher bias (Cyert & March, 1963) can be inferred by the degree to which searchers are limited by a predetermined process structure. That is, a formal process may cause the searcher to be “locked in” to the locations in which he or she searches because of these formal process routines.

### Search Terrain Expansiveness and Search Process Extensiveness

Figure 1 presents a model of search using two overarching categories: Search terrain and search process. Search terrain determines the area in which search occurs and includes three dimensions: Terrain distance, terrain breadth, and terrain familiarity. Search process, the manner in which the search terrain is explored, is comprised of five dimensions: Process effort, process duration, process exhaustiveness, process iterativeness, and process formality. Implicit in this model of search is the interdependence of search terrain and search process. That is, neither exists without the other; searchers must always be searching some terrain “area” in some particular procedural “manner.” Together, these dimensions of search terrain and search process determine the characteristics of search and all are needed to develop a full understanding of search. In the next chapter I classify the underlying dimension of search terrain and search process in order to present a two dimensional conceptualization of individual search. Specifically, I argue that particular characteristics of the search terrain comprise search terrains that vary to the extent they are expansive. Characteristics of the search process, on the other hand, are used to show variations in the extent to which the search process is extensively undertaken.

## Summary

To summarize, I define search broadly as individual behavior resulting in the acquisition of information and knowledge that can be used to seize opportunities to solve problems. The importance of search is manifest in that the gathering of information has been argued to be one of the most important tasks required of managers (Mintzberg, 1973) and the recognition and seizure of opportunity a fundamental aspect of firm success (Grimm & Smith, 1997; Schumpeter, 1934; Smith, Grimm, & Gannon, 1992). To the extent that knowledge and information are necessary and valuable to the creation of new knowledge (Kogut & Zander, 1992), effective managerial search is a fundamental aspect of their success to do so.

An important determinant of managers' recognition and seizure of opportunities is their search behavior. Search behavior varies to the extent that the search terrain is expansive – meaning it is more distant, unfamiliar, and broad – and the extent to which the search process is extensive - meaning it is more effortful, more exhaustive, longer in duration, iterative, and less-formal. In the next chapter, I present a set of hypotheses regarding the relationship between these search behaviors and the opportunities recognized and acted upon by the individual searchers. In general, I predict that more expansive search terrains coupled with extensive search processes will lead to the recognition of both novel and appropriate opportunities. As explained earlier, the classification and categorization of search dimensions herein is quite different than what has been done in the past. Therefore, it is important to note that, although I have conceptually developed this typology and have generated hypotheses based on this

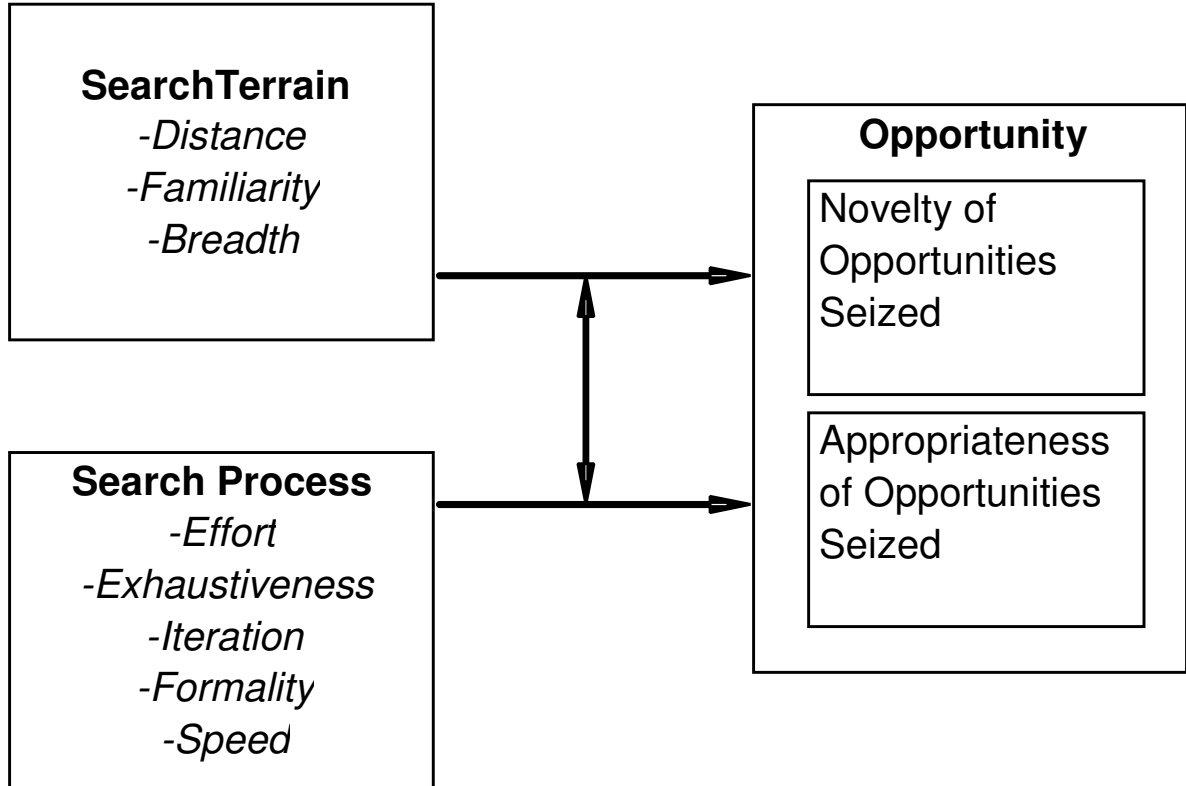
conceptualization of search, I intend to empirically explore and evaluate the validity of the full array of search dimensions and measures discussed above.

## CHAPTER 4: HYPOTHESES

### Overview

In general, I contend that information will be salient to top managers to the extent that it is new, novel, or unusual to them. This is consistent with literature in the area of cognitive psychology, a research area that examines how humans process information (for a review see Fiske & Taylor, 1991). Importantly, salient information will be more likely to be attended to, noticed, recognized, and acted upon by top managers. However, saliency is also determined by the degree to which an individual is exposed to information or the extent to which the information is repeated. Therefore, searches that expose top managers to high quantities of information that is new, novel, or unusual will lead them to recognize and act on opportunities that are more novel. However, given that human beings are bounded in their ability to process information (Simon, 1955), their ability to effectively understand and interpret this information is limited. Therefore, exposure to new, novel, and unusual information will lead to the recognition of novel opportunities but these opportunities will only be appropriate if the search process has been extensive enough to expose a sufficient amount and/or repetitive amounts of exposure to that information (see Figure 2).

Figure 2: The Influence of Search on Opportunity Seizure



### Search Terrain Expansiveness

Expansive search terrains are broad, unfamiliar, and distant. As such, they provide searchers with information that is new and novel to them. In this section, I outline the characteristics of the underlying dimensions of the search terrain that constitute an expansive search terrain and make predictions regarding the opportunities searchers recognize as a result.

Top managers are likely to come into contact with information that is new, novel, or unusual when they come into contact with information sources that are “distant” from their location. Specifically, information sources that are within the manager’s organization are considered more local terrains than sources outside their organization



(Kimberly & Evanisko, 1981). Likewise, information sources that originate outside the focal executive's industry will have a greater likelihood of containing information with which the executive has not had contact.

Similarly, the degree to which a searcher is familiar with an information source will influence the information that is uncovered from the source. Specifically, it is intuitive that a source with which a searcher is unfamiliar will lead to information that is new, novel, and can be located at a distance that is either near or far from the searcher and his or her organization. It is only the degree to which the searcher has utilized the source previously that determines the familiarity.

This concept is similar to that of boundary spanning which can occur across organizational or technological boundaries. In the latter case, information may be quite new and unfamiliar to an individual, even though it resides within that individual's organization. Studies have also shown that searching in unfamiliar, or new, areas can lead to higher performance (Katila & Ahuja, 2002).

In addition to search terrain distance and search terrain familiarity, the breadth of information sources also influences the extent to which the searcher comes into contact with new, novel, or unusual information. For example, it is more likely that an executive that searches sources both in the organization and out of the organization will be exposed to a higher level of new information than an executive that only searches outside the organization. The breadth of information used has been shown to have a positive impact on the performance of top managers (Hambrick, 1981).

Overall, I predict that search terrains that are more expansive in nature (those that consist of more distant sources of information, less familiar/newer sources, and cover a

broader range of sources) will expose the searcher to a greater amount of new, novel, and, unusual information. Again, according to the basic premises of information processing theory, this type of information is more likely to be noticed and attended to by the searcher and will result in the recognition and seizure of more novel opportunities.

H1: *Ceteris paribus*, expansive search terrains – a) distant, b) unfamiliar, c) broad – will be positively related to the novelty of opportunities seized by managers.

By definition, novel opportunities differ from the status quo. As such, it is entirely possible that the difference exists to such an extent that the novel opportunity is not appropriate at that point in time. In a business sense, for example, a new product may represent a significantly novel opportunity for a particular manufacturing firm. However, it may be the case that the product is so different from the firm's existing product line that the factory will need to be retooled or the firm does not even possess the necessary technical know-how to produce the product. Similarly, the new product may be so new and different that no consumer market exists in which to sell the item. In both cases, the new product is certainly novel. However, it is not appropriate within the particular context. On the other hand, continuing with the analogy of a new product, it would be much easier to introduce a new product that does not depart in any extreme way from existing products because it would require less retooling, fewer new resources and know-how, and could be sold within an existing market. In this case, the product represents an opportunity that is not extremely novel or new, relative to what the firm is currently selling. However, it is quite appropriate for both the current firm position and the current marketplace.

In addition, searching an unfamiliar, distant and broad terrain may prove to be too cognitively challenging for the limited information processing capabilities of individuals (Simon, 1955). Therefore, I predict that although distant, unfamiliar, and broad search terrains will lead to novel opportunities, it is more likely that these opportunities will be inappropriate and incorrect for the current environment in which the executive resides. Therefore, I argue that these same dimensions will be negatively related to the “appropriateness” of the opportunities seized by managers.

H2: *Ceteris paribus*, expansive search terrains – a) distant, b) unfamiliar, c) broad – will be negatively related to the appropriateness of opportunities seized by managers.

### Search Process Extensiveness

Extensive search processes are more effortful, more exhaustive, longer in duration, iterative, and less formal. As such, they allow individuals time to better comprehend and assimilate the information they uncover through the search. In this section, I outline the characteristics of the underlying dimensions of the search process that constitute an extensive search process and make predictions regarding the opportunities searchers recognize as a result.

As mentioned earlier, information is more likely to be salient to an individual if it is new, novel, or unusual. However, salience is also a function of the amount of exposure that an individual has with the information. In the context of search, this exposure is determined by the process through which the search takes place. Depending on the characteristics of the search process, the searcher is exposed to more or less information

given a particular search terrain. In addition, since the process dictates the manner in which the searcher traverses the terrain, it determines the extent to which the searcher is repeatedly exposed to the same information and the degree to which the searcher comes into contact with that information in the first place. As mentioned above, an individual is more likely to notice and attend to information that is prominent and repeated.

Effortful search processes are those in which the searcher invests higher degrees of time and energy. Decision-making research has shown that more effortful processes result in higher performance (Dollinger, 1984). It follows that, given a search terrain, an individual that exerts higher levels of energy in search will uncover more information and, again due to the higher level of effort, will be able to make sense of this information to a larger extent than other individuals. Higher levels of effort also increase the probability that the searcher will encounter information of salience. Also, to the extent that the searcher is motivated and exerts effort in the search as a result, he or she will find more information (Cyert & March, 1963).

Exhaustiveness in search represents the extent to which the search continues until all relevant information is collected (versus whether the searcher satisfices with limited information collection). In other words, individuals persist in an attempt to explore all possible avenues in the terrain. For this reason, exhaustive searches are likely to result in the exposure of the searcher to higher levels of information and help overcome or alleviate some of the bias (Cyert & March, 1963) that individuals may have.

Similarly, searches that are slow or long in duration will allow searchers ample time to uncover and cognitively process the information to which they are exposed. Therefore, they are more likely to make sense of this information and fit it into their

current cognitive representations. In addition, as mentioned earlier, a larger amount of information uncovered by the top manager increases the likelihood that he or she will encounter information that is salient to their current context.

Iterative search processes are those in which the searcher revisits terrain that had been previously searched, changes the way in which they search, modifies the terrain in which the search occurs, or modifies the goals of the search based on earlier search results. Search iterativeness is akin to adaptiveness. Adaptive searchers are more likely to follow search paths that end at or follow salient new information (Nutt, 1993). In addition, an iterative process allows the searcher to re-visit and re-encounter information uncovered earlier. This repeated exposure increases the chances that the information becomes salient to the searcher as well as increases the chances that the searcher can make sense of that information.

Search process formality is the extent to which the searcher follows a rigid protocol, or a set of specific procedures or routines, in conducting the search of the terrain. Formal search processes can increase the degree to which the search is biased because it may limit the choices the searcher has during the search process. Formal process may cause the searcher to be “locked in” to the locations in which he or she searches because of these formal process routines. Like search iterativeness, a less formal search will allow the searcher to remain flexible and make adaptive changes based on the results of the search itself (Barrick & Spilker, 2003). Essentially, a less formal search process allows the searcher to iterate and re-visit and re-encounter information uncovered earlier. This repeated exposure increases the chances that the information becomes salient

to the searcher, as well as increases the chances that the searcher can make sense of that information.

Overall, I propose that search processes that are more procedurally extensive, meaning they are more effortful, more exhaustive, longer in duration, iterative, and less formal, allow individuals time to better comprehend the information they uncover. That is, searchers can better make sense and gain a deeper understanding of the information and how it fits into their current world. Therefore, it follows that executives undertaking searches with these characteristics will use this information to act upon opportunities that are more appropriate given their current situation.

H3: *Ceteris paribus*, extensive search processes – a) effortful, b) exhaustive, c) informal, d) iterative, e) longer in duration – will be positively related to the appropriateness of opportunities seized by managers.

Although a procedurally extensive search process allows the searcher to gain insight and understanding into the information they uncover, it does not, in and of itself, expose the searcher to new or novel information. In fact, the characteristics of exploratory search process actually may hinder the seizure of novel opportunities for several reasons. First, these types of search are long in duration, increasing the chance that someone else will act on opportunities that are novel and eclipse the “newness” of the opportunities seized by the focal searcher. In addition, individuals undertaking these extensive search processes may be subject to what is popularly known as “analysis paralysis.” In other words, individuals in this condition are often unable to act for fear that they may need some more information. Third, inasmuch as iterative processes allow

individuals to gain a deeper understanding of information they encounter, it also is the case that some of the information is repeated or redundant and, therefore, known to the searcher. Again, this runs counter to the seizure of novel opportunities. For these reasons, I propose that procedurally extensive search processes will be negatively related to the novelty of the opportunities seized by top managers.

H4: *Ceteris paribus*, extensive search processes – a) effortful, b) exhaustive, c) informal, d) iterative, e) longer in duration – will be negatively related to the novelty of opportunities seized by managers

#### The Interaction of Search Terrain and Search Process

As mentioned earlier, search necessarily consists of both a terrain and a process dimension. While it was valuable to relax this assumption in the preceding hypotheses to better understand influence that each dimension has on opportunities that managers recognize, it is important to examine the interaction of these two concepts, as well (see Figure 3).

Opportunities can be judged in two major ways. First, they may differ in terms of the degree to which they are novel. The degree of novelty corresponds to the extent to which an opportunity differs from the existing situation, be it a technology, product, process, etc. The degree of appropriateness refers to the extent to which an opportunity is correct, useful, valuable, or meaningful (Amabile, 1996). Opportunities that are an appropriate fit with the level and types of resources possessed by the firm and/or are viable in the marketplace. A clear example of an inappropriate opportunity can be seen when firms discontinue products because no demand exists. The products may indeed be

very novel and the firm might perceive high sales, however the lack of demand can indicate that they are not correct for the marketplace.

Based on the arguments presented above, search terrains that are more expansive in nature, meaning they are more distant, unfamiliar, and broad, lead to the seizure of novel but less appropriate opportunities. Conversely, search processes that are procedurally extensive, meaning they are more effortful, more exhaustive, longer in duration, iterative, and less formal, lead to more appropriately seized but less novel opportunities. I now argue that these two dimensions interact in such a way that the initial relationships of each dimension above are contingent on the nature of the relationship between the search terrain and search process.

Searches low in either search terrain expansiveness or search process extensiveness, yet high on the other dimension, will be characterized by the attributes of the dimension that is more highly exploratory. That is, if a search terrain is highly expansive, the search will be likely to uncover new, novel, and unusual information and undertake novel opportunities as a result. However, a low level of process extensive behavior will make it unlikely that the searcher will be able to fully understand or make sense of the new information and will seize opportunities that are less appropriate for the given situation. Alternatively, searchers that utilize highly extensive processes and search terrains that are not expansive, will not uncover new information but will be more adept at making sense of the information at hand. Therefore, the opportunities seized by these individuals will be appropriate but not novel.

H5: Searches consisting of a high degree of search terrain expansiveness and a low degree of search process extensiveness will be more positively related to the



novelty of opportunities seized by managers than searches consisting of a low degree of search terrain expansiveness and a high degree of search process.

H6: Searches consisting of a high degree of search terrain expansiveness and a low degree of search process extensiveness will be more negatively related to the appropriateness of opportunities seized by managers than searches consisting of a low degree of search terrain expansiveness and a high degree of search process extensiveness.

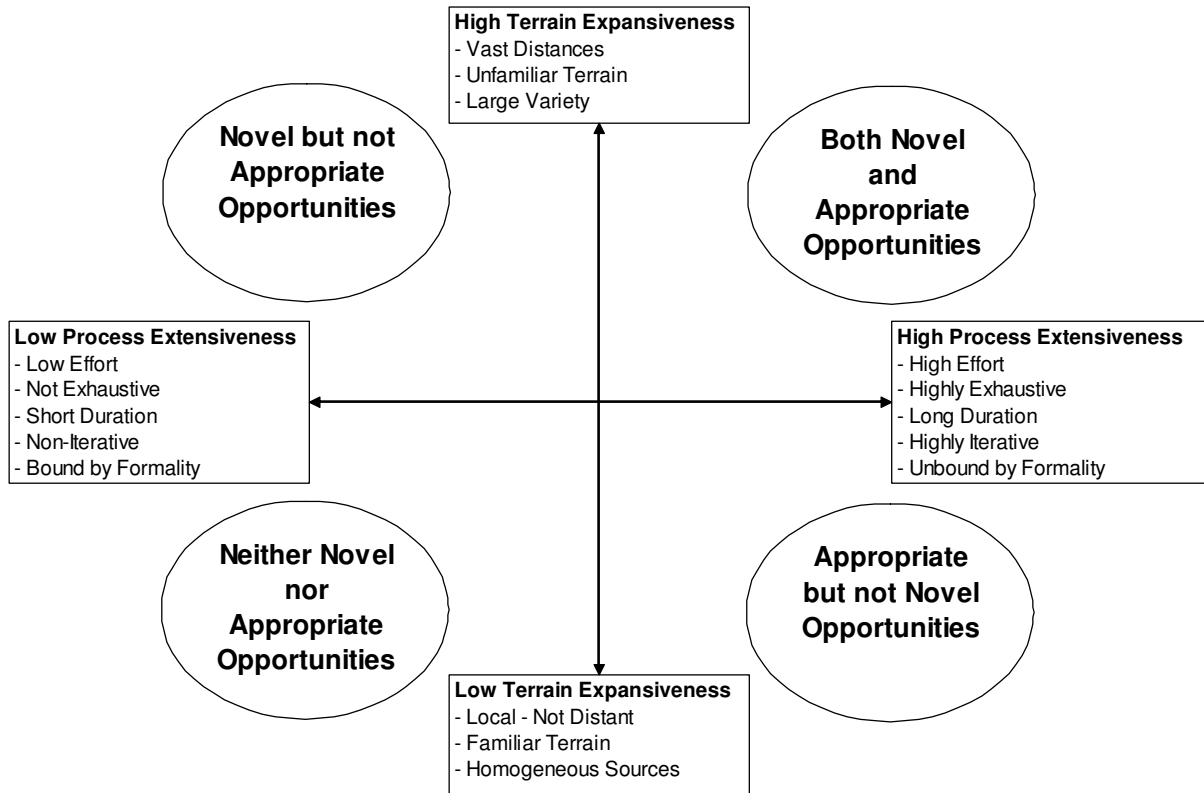
When searchers exhibit a high degree of both terrain expansiveness and procedurally extensive behavior, they will uncover new, novel, and unusual information because of the distance, unfamiliarity, and breadth of the terrain. In addition, the extensive search process allows for a much deeper understanding of this new information and how it can be applied effectively. Therefore, in this condition, executives will seize upon opportunities that are both novel and appropriate.

On the other hand, searches that are low in both terrain expansiveness and process extensiveness will not uncover new, novel, or unusual information because the terrain is local, familiar, and narrow. In addition, low search process extensiveness will make it difficult for the searcher to make complete sense of any information that is uncovered in the terrain. I propose that the result of this low terrain expansiveness/low process extensiveness condition will be low levels of both novelty and appropriateness in the opportunities seized by executives using such a search strategy.

H7: Searches consisting of a high degree of both search terrain expansiveness and search process extensiveness will be more positively related to both the a) novelty and b) appropriateness of opportunities seized by managers than searches

consisting of either a low degree of search terrain expansiveness or search process extensiveness or a low degree of both.

Figure 3: Hypothesized Interactions of Search Terrain and Process



## CHAPTER 5: RESEARCH SAMPLE AND METHODOLOGY

### Overview

This research was done as part of a larger project examining search and discovery in organizations. The project is sponsored by the National Science Foundation and undertaken through the coordinated efforts of doctoral students and faculty from the University of Maryland and Stanford University. As part of this larger project, an in-depth field study was performed in high-technology firms. The following methodology will outline that portion of the study pertaining to this dissertation. This design involved extensive interaction, including site visits, and contact with the top managers of all the participating firms. This multi-method design required data from multiple respondents within each firm and the use of alternative data collection sources. Data was collected from three key sources: 1) a structured interview with the CEO of each firm; 2) detailed questionnaires completed by members of the top management team; and 3) archival data from COMPUSTAT and company records.

It is important to collect data on the search behavior of CEOs because there is general agreement that these individuals are most responsible for setting the strategic and tactical direction that eventually results in the framework of policies and procedures that lower level managers implement (Chandler, 1962). Therefore, the seizure of opportunities is a key aspect of the role of executives, particularly CEOs (Schendel, 1996). Top management team members are also critical employees because they are closely involved with the decisions that the CEO takes and the opportunities he or she acts upon.

## Sample

### Companies

The sample for this study consists of 61 high technology firms. I chose high technology firms as the focus for this study because it is generally the case that high technology firms exist in industries that are characterized by rapid changes on a number of fronts including, among many others, product technology, manufacturing processes, design standards, and market demand (Kleingartner & Anderson, 1987). In such cases, it is extremely important for managers to consider ways in which they can gather information that will have an influence on the decisions they make about the strategic direction of their firms (Thompson, 1967). While one of the premises of this dissertation is that opportunity identification in all firms is of utmost importance, the dynamic nature of high technology industries ensures that opportunity identification in these environments is particularly important. In fact, it is often the case that the survival of these firms is dependent on their ability to find creative solutions to problems (D'Aveni, 1994).

Sample firms were selected for the study based on three criteria. Again, the first of these pertains to their characterization as “high technology” firms. High technology firms were defined as those that “emphasize innovation and invention in their business strategy, deploy a significant percentage of their financial resources to R & D, employ or utilize a relatively high percentage of scientists and engineers in their workforce, and compete in short life-cycle markets (Milkovich, 1987: p. 80). Two SIC-based categorizations based on this definition were then used to identify potential sample firms. A final check of was performed to ensure that the firms identified through SIC were,

indeed, high tech. Specifically, based on Hoover's Online company database, firms whose primary or secondary businesses were in the following industries were included: Aerospace & Defense, Chemicals, Computer Hardware, Computer Services, Computer Software, Consumer Electronics, Photographic & Optical Equipment/Supplies Manufacturers, Electronics, Industrial Automation & Industrial Control Products Manufacturing, Audiovisual Equipment Rentals, Sales & Services, CD, CD-ROM & DVD Manufacturing & Distribution, Motion Picture Equipment, Information Collection & Delivery, Internet Content Providers, Internet Searching Services & Portals, Pharmaceuticals, Telecommunications Equipment, Telecommunications Services, Alternative Energy Sources, Oil & Gas Exploration & Production, Medical Devices, Medical Equipment & Supplies, and Medical Laboratories & Research.

Secondly, due to budget and time constraints, sample firms in a limited geographical area were included in the study. This geographical area included firms within a 4 hour drive of the University of Maryland and extended from Northern Virginia through Washington, DC, Baltimore, MD, Wilmington DE, and Philadelphia, PA regions.

Finally, public firms were preferred for the study because of the availability of information available for such firms including CEO and TMT names and addresses. Therefore, sample firms were initially drawn from public firms that met the study criteria. An initial set of 358 companies met the sample criteria outlined above, 31 of which were disqualified at the time data collection began (e.g. no longer in operation, headquarters located outside of region, etc.). Of the remaining 327 companies, 92 CEOs agreed to be interviewed, a participation rate of 28.1%.

Of the 91 viable companies (the death of one of these CEOs reduced that sample size by an additional company), at least one TMT survey and the CEO survey were returned for 61 of these companies (67% participation). An independent samples t-test for the equality of means was used to compare the 61 completed companies and the 30 incomplete companies. Based on that analysis, the sample of complete companies is not significantly different from incomplete companies in terms of number of employees, net sales, total assets, or size of the top management team.

#### Contact Protocol

In order to increase participation in the study, a comprehensive protocol was used to contact the CEOs of firms meeting the study criteria. Prior to contacting any individual CEOs, an application for approval of the research was submitted and approved by the University of Maryland's Institutional Review Board. A copy of the approved application and informed consent form given to all subjects is included in Appendix A. Similar protocols have been used successfully in the past to gain access to firms (Collins & Clark, 2003; Smith, Mitchell, & Summer, 1985). First, an introduction packet was mailed to each CEO. These packets were sent out in groups of 20 per week in order to maintain tight control of the process. The packet contained two letters. The first letter was signed by the researchers, introduced the study, and requested an interview with the CEO (Appendix B). The second letter was signed by the Howard Frank, Dean of the R. H. Smith School at the University of Maryland (Appendix C). The letter from Dean Frank encouraged CEO participation, endorsed the study, and explained the importance of the study.

Next, a phone call was placed to request and schedule an interview with each CEO that received an introduction packet. The call was made approximately 5 - 8 business days after the introduction packet was mailed. CEOs were called on a repeated basis until an interview was scheduled or they declined to participate in the study.

## Research Method

### Overview

The primary study methodology consisted of interviews and surveys of each CEO and an evaluation of the novelty and appropriateness of the CEO's actions by members of the top management team. The CEO interviews were performed to acquire background information on the CEO, their firm, and to gain access to others in the firm. CEO surveys were used primarily to collect information about the manner in which CEOs search. Top management team members were asked to complete a number of scaled questions designed to evaluate the novelty and appropriateness of the CEOs actions.

### CEO Interview

Interviews with the CEO of each participating firm are important for several reasons (Appendix D). First, the interview enable me to gain the CEO's support and consent for full participation in the study. Second, CEOs were asked to identify all the members of their top management team. In addition, the CEOs were asked to sign and send a letter of support to each identified employee along with the questionnaire. Finally, CEOs were given a survey to complete and return to the researchers within a week following the interview.

Firm participation. Brief interviews were arranged with CEOs in order to establish a relationship that can be leveraged for firm participation. This method has been used successfully in other studies (Collins & Clark, 2003). In addition, it has been my experience that it is more difficult for individuals to deny participation in a study when they are face-to-face with the person that is making the request of their time. It is my belief that this approach allowed me to benefit from the “foot-in-the-door” phenomenon and lead to a higher participation rate. In this case, of the 94 interviews that were performed, 61 firms (65%) participated in the study

CEOs were asked to identify the members of their top management team and sign a letter of endorsement that was then sent to those individuals along with surveys for them to fill out. This letter was intended to provide some legitimacy to the study and encourage top managers to participate. In addition, firm participation also included a survey that the CEO would fill out at his or her convenience at a later date.

CEOs were not told that TMT members would be asked to rate the opportunities acted upon by the CEO. This was done in an effort to reduce the possibility that CEOs would identify only those members of the TMT that would provide them with favorable ratings. In addition, in order to reduce the possibility that CEOs would only provide a subset of the TMT, they were first asked the number of individuals that are involved with decisions regarding the strategy of the firm. It was only after this question that the CEO was then asked to identify those individuals by name.

Sponsorship and support of project. Since the CEO is more than likely the highest-ranking employee in the organization, it was assumed that he or she exhibited a high degree of influence with other organizational members. CEOs were asked to sponsor



and support the project in order to ensure a high participation of top management team members. This was done in two ways. First, a form letter was drafted from the CEO to the members of the top management team requesting that they participate in the study (Appendix E). Secondly, the surveys used to rate the CEO that were sent to the top management team members were routed through the firm's corporate mail system in an effort to validate that this request had come directly through the CEO's office and not secondhand through an outside concern.

#### CEO Survey

The CEO was asked to complete a survey, at their convenience, and return it to the researchers within one week of the interview (Appendix F). The survey consists of a hypothetical problem scenario that required them to consider how they would search for information in response. Using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree" the CEOs were asked to assess how well the scenario, "presents a situation in which they would typically search for information." The mean response of 4.30 to this question appears to indicate that the scenario does largely reflect a situation that would precipitate CEO search.

The survey also included scaled items used to capture individual characteristics of the CEO that may have an impact on the characteristics of the business opportunities they seize. This data was used to provide a richer understanding of the factors that might influence CEO opportunity recognition.

#### TMT Evaluation of CEO Opportunity Novelty and Appropriateness

Top management team members were asked to respond to scaled questions that were then used to assess aspects of the CEO's ability to seize opportunities and the characteristics of those opportunities (Appendix G).

## Measurement

### Dependent Variables

The dependent variables in this dissertation are the novelty and appropriateness of the opportunities acted upon by CEOs. Novelty of opportunity is defined as the degree to which a CEO seizes opportunities that are new and different from actions they have taken in the past. Appropriateness, on the other hand, is the degree to which the CEO seizes opportunities that are correct and useful to the organization. Both variables were calculated from 5-point Likert scales ranging from "strongly disagree" to "strongly agree."

Specifically, these measures were obtained from the averages of two, three-item scales developed during the pre-testing phase of the study (see Table 1). In both scales, the average is taken of the top management group members' assessment of the opportunities seized by the CEO of their organization. To my knowledge, these measures have not been used before and, therefore, it is important to test for evidence of their convergent and discriminant validity (Schwab, 1980). Convergent validity, which measures the extent to which different operationalizations of the same construct produce similar results, was assessed by correlating the assessments of top managers with each other in order to determine if top managers consistently rate the CEO on the novelty and appropriateness of the opportunities on which they act. Discriminant validity, on the other

hand, measures the extent to which different operationalizations of measures that are intended to be different are, in fact, different.

Table 1: Top Manager’s Assessment of CEO’s Actions

The following questions concern <b>actions by your CEO to seize opportunities</b> in order to increase your firm’s health and performance. These actions can be intended to improve internal performance (e.g., cutting costs, improving quality, developing new products, etc), external performance (e.g. extending existing products or services into new markets, responding to customer needs with better products or services) or both, (e.g. creating new products or services for new markets).					
<b>Our CEO...</b>					
1. ... is continuously getting this organization to take new actions.	1	2	3	4	5
2. ... is very creative in inventing new actions.	1	2	3	4	5
3. ... generally repeats old actions instead of initiating new actions.	1	2	3	4	5
4. ... takes actions that fit the conditions of the problem at hand.	1	2	3	4	5
5. ... takes actions that are often just right given the demands of the situation.	1	2	3	4	5
6. ... takes actions that are rarely appropriate for the circumstances we face at the moment.	1	2	3	4	5

Principle components analysis using varimax rotation confirmed the existence of the two distinct factors, indicating discriminant validity of the variables (see Table 2).

Table 2: Factor Analysis of Novelty and Appropriateness of Opportunities using Principal Components Analysis with Varimax Rotation

Variable	Factor 1	Factor 2
Novelty 1	0.91571	
Novelty 2	0.91223	
Novelty 3	0.79375	
Appropriateness 1		0.84830
Appropriateness 2		0.93695
Appropriateness 3		0.75560

Both scales also appear to have acceptable reliability. The first scale ( $\alpha=.86$ ), novelty of opportunities, measures the degree to which the CEO seizes opportunities that are new and different from actions taken in the past (The CEO of this organization ... is continuously getting this organization to take new actions, is very creative in inventing new actions, generally repeats old actions instead of initiating new actions). The second scale ( $\alpha=.83$ ), appropriateness of opportunities, assesses the degree to which the CEO seizes opportunities that are correct and useful to the organization (The CEO of this organization ... takes actions that fit the conditions of the problem at hand, takes actions that are often just right given the demands of the situation, takes actions that are rarely appropriate for the circumstances we face at the moment).

In both cases, novelty and appropriateness also appear to be justifiably aggregated. Specifically, mean  $r_{wg}$  values for the variables were .93 for novelty and .88 for appropriateness. These values are well above .70 and, therefore, indicate agreement (James, 1982). In addition, with ICC(1) values of .21 for novelty and .19 for appropriateness, all teams exhibited substantial between-group variance in excess of the threshold value of .12 that is often cited as sufficient for testing hypotheses based on team aggregated measures (Bliese & Halverson, 1998; James, 1982). ICC(2) scores provide evidence of reliability of group means. Since ICC(2) is a function of ICC(1) and team size, it is not unusual to have lower ICC(2) values in studies with small team size (e.g. Hoffman & Jones, 2005; Morgeson, 2005; Salanova, Agut, & Peiro, 2005). However, in this study, both novelty (.60) and appropriateness (.61) had ICC(2) values that matched or exceeded the .60 standard (Bliese, 2000; Glick, 1985). Therefore, it appears that aggregation of these measures to the team level is justifiable.

A major aspect of this dissertation study is the characterization of the dependent variable. Unlike measures used in earlier studies of search, such as new product introductions, this measure was intended be a broad representation of the actions of individual CEOs. While the measure itself was reliable and valid, statistically speaking, it is still a challenge of this dissertation to provide detail regarding what this measure pertains to. What follows is an attempt to do so.

First, I attempted to reconcile various definitions of opportunity by defining opportunities as the perception of a novel and appropriate resource combination acted upon or seized for potential gain. I argue that opportunities can result in positive outcomes in two ways: Through solving some problem or introducing some new possibility for gain, in the absence of a problem. This definition seeks to include a broader range of opportunities than the entrepreneurship literature. Specifically, from my conceptualization, opportunities can include incremental changes to a current situation that provide some benefit. In addition, opportunity can exist through the imitation of the actions of others. Earlier in this manuscript, I provided an example of a manager that visits a client that is using motion-activated light switches throughout their office complex. The manager may recognize this as an opportunity to for them to cut costs by installing motion-activated light switches throughout their own office complex. In the mainstream literature on opportunity, the installation of such devices would not be considered an opportunity because it is imitated from somewhere else, does not involve a new good, service, raw material, market, or organizing method, nor is this opportunity introduced through new means, ends, or means-ends relationship. It is my argument that,

not only are these types of situations valid as opportunities, it is incumbent upon managers to recognize and act upon such opportunities.

As mentioned earlier, top managers were asked scaled questions to rate their CEOs abilities to seize opportunities. In an attempt to ensure some level of understanding about what exactly was meant by an “opportunity,” I provided several examples. The written instructions to the managers are seen in Table 1. The fact that the responses of top managers were justifiable aggregated to the team level is an indication that managers viewed this concept of opportunities similarly.

In an effort to better understand this dependent variable, I also examined the characteristics of four outlier groups. Specifically, I chose outliers that were high on novelty, high on appropriateness, and low on each. While this procedure did not provide rigorous statistical data analysis, there do exist some differences between the groups that might provide more description of these firms and their CEOs. First, CEOs of highly novel firms appeared to be younger on average (mean = 45.3 years) versus those low in novelty (mean = 57.5 years). Perhaps relatedly, the CEOs rated lowest on novelty have worked in more industries (mean = 5.8) than the CEOs that are rated high on novelty (mean = 2.0).

With respect to opportunity appropriateness, it is interesting to note that firms with CEOs that rated highest appear have had far few years in their current position (mean = 4.42 years) versus CEOs rated low on appropriateness (mean = 10.3 years)

Independent Variables - Dimensions of search

Search is defined as an individual behavior resulting in the acquisition of information and knowledge that can be used to recognize and seize opportunities to solve problems. As described above, search is conceptualized and measured along eight dimensions, three terrain and 5 process.

Search terrain. Search terrain is the location in which the search takes place. It consists of three dimension, familiarity, distance, and breadth. The three search terrain dimensions were derived by asking respondents questions about the relative amount of emphasis they would search in various locations for information pertaining to the scenario. Each terrain dimension was calculated based on their responses,.

Specifically, search familiarity was measured by asking the respondent the percentage of time, given the scenario, he/she would spend searching “information you have used in the past, revisiting information you once knew” versus “information to which you have never been exposed, information that is different from other information you have used in the past.” A higher score on this measure indicates a greater degree of unfamiliar sources of information in the search. This measure of familiarity/unfamiliarity was also validated through the use of two simple scaled questions using a 5-point Likert scale ranging from “strongly disagree” to “strongly agree.” Both the first item, “when searching for information in response to this scenario, I would emphasize sources I have gone to before for information” and the second item, “when searching for information in response to this scenario, I would emphasize seeking new sources of information,” resulted in significant correlations (-.426 and .261, respectively) that appeared to validate and corroborate the forced distribution score. These scaled items were not used elsewhere in this study. A final check of validity was based on CEO responses to a question

regarding how much time they spend thinking about the past versus thinking about the future. In this case, the past can be viewed as familiar terrain. Responses to this question were highly correlated with the measure of unfamiliar ( $r = -.294$ ) providing additional validity for the measure.

Similarly, search distance was scored based on the relative distribution the respondent indicated for their emphasis “searching for internal information (e.g. information regarding firm resources, employees, etc.)” versus “searching for external information (e.g. information about customers markets, competitors, etc.)” A higher score on this measure indicates a greater degree of external sources of information in the search. In similar fashion to search familiarity, the distance measure was validated through the use of two simple scaled questions using a 5-point Likert scale ranging from “strongly disagree” to “strongly agree.” Both the first item, “when searching for information in response to this scenario, I would concentrate on information sources inside my own organization” and the second item, “when searching for information in response to this scenario, I would concentrate my search efforts on information available from outside my organization,” resulted in significant correlations ( $-.314$  and  $.381$ , respectively) that appeared to validate and corroborate the forced distribution score. These scaled items were not used elsewhere in this study.

Search breadth was calculated as a reverse-herfindahl based on the relative percentage of time respondents indicated they would spend searching for information in each of 7 functional areas, operations/engineering, R&D, marketing/sales, finance/accounting, HR/personnel, administrative/legal, and other. Scores for this measure could range from a low of 1 to high of 7 with high scores representing a broader



terrain of sources explored in the search. For example, if a respondent indicated he or she spent 100 percent of their time searching within R & D, their score would equal 1. A respondent that spent an equal amount of time in all 7 areas would have a breadth score of 7. In order to provide additional validity, CEOs were also asked to indicate the relative amount of time they spend on any given day in various functional areas of their business. After calculating the breadth of the time they spend in these functional areas, I found it highly correlated with the breadth measure calculated from the CEOs response to the scenario ( $r = .243$ ). The correlation provides additional support for the validity of the measure.

Search process. Search process refers to the manner in which a searcher searches the search terrain. The process consists of five dimensions, effort, exhaustiveness, iteration, formality, and speed. In order to measure the five process dimensions of search, scaled questions were developed for each dimension to reflect the manner in which individuals would utilize search processes, in response to a given scenario, with the accompanying characteristic. The variables were calculated from 5-point Likert scales ranging from “strongly disagree” to “strongly agree.” Table 3 lists the items used for each process dimension.

Search dimensions were pre-tested with 4 Ph.D. students who were asked to talk aloud while reading questions based on the eight dimensions of search. Through this process, the “effort” dimension and a dimension initially labeled “persistence” were viewed to be similar to one another. However, this issue appeared to be driven largely based on the labels that were assigned to them because the participants viewed the dimensions as separate and distinct upon explanation of the underlying definitions.

Therefore, the decision was made to change the variable name from persistence to “exhaustiveness” since this label appears to be a much clearer description of this particular search process dimension.

Table 3: Search Process Dimensions Questionnaire Items

<p><i>Search effort relative to other job-related activities that demand your attention:</i></p> <p><b>When searching for information in response to the above scenario, I would...</b></p> <ol style="list-style-type: none"><li>1. ... make looking for new information a top priority for how I would spend my time.</li><li>2. ... devote a large percentage of my time to searching for information.</li><li>3. ... invest a great deal of personal effort into gathering potentially valuable information.</li><li>4. ... go out of my way to find information sources that may have relevant information.</li><li>5. ... let things emerge instead of continuously searching.</li></ol> <p><i>Level of exhaustiveness in search:</i></p> <p><b>When searching for information in response to the above scenario, I would...</b></p> <ol style="list-style-type: none"><li>1. ... continue searching until I was satisfied that I had identified all relevant information.</li><li>2. ... stop searching as soon as a potential solution was identified.</li><li>3. ... exhaustively search and study every possibility.</li><li>4. ... persist until I found all the information pertaining to this problem.</li><li>5. ... take as much time as needed to identify all available information.</li></ol> <p><i>General iteration in the search process:</i></p> <p><b>When searching for information in response to the above scenario, I would...</b></p> <ol style="list-style-type: none"><li>1. ... revisit information sources several times as my search for information becomes clearer.</li><li>2. ... change the direction of the search process as I learn new things.</li><li>3. ... base each new decision on where to search next on what I just found.</li><li>4. ... adjust my search process as I become more familiar with the available information.</li><li>5. ... change the sources utilized in my search as I learn new things.</li><li>6. ... periodically reflect on what direction my efforts are taking me.</li><li>7. ... spend time tracing relationships between disparate ideas and facts.</li><li>8. ... try to draw parallels between this situation and others that I have solved before.</li><li>9. ... spend time exploring how information could be combined to derive new ideas.</li></ol> <p><i>Speed of search:</i></p> <p><b>When searching for information in response to the above scenario, I would...</b></p> <ol style="list-style-type: none"><li>1. ... move rapidly from one source of information to another.</li><li>2. ... take my time examining each source of information utilized.</li><li>3. ... quickly assess the relevance of all information examined.</li><li>4. ... try to complete the entire search process as quickly as possible.</li></ol> <p><i>Formality/structure in the search process:</i></p> <p><b>When searching for information in response to the above scenario, I would...</b></p> <ol style="list-style-type: none"><li>1. ... want to have a clear structure for conducting my search before I start.</li><li>2. ... methodically utilize various interpersonal contacts and written media.</li><li>3. ... follow an organized process of search.</li><li>4. ... approach the search process in a systematic fashion.</li></ol>
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Since my search dimensions were largely developed for this study, I performed a principle components analysis using varimax rotation to explore the validity of my constructs and the items from which they were calculated. This analysis indicated that

four factors existed (see Table 4). Items that did not load onto any variables or that cross loaded onto more than one factor were dropped. The remaining items were used to calculate the process variables of effort, exhaustiveness, iteration, and formality.

Table 4: Factor Analysis of Search Process Dimensions using Principal Components  
Analysis with Varimax Rotation

Variable	Factor 1	Factor 2	Factor 3	Factor 4
Effort 1	0.54870			
Effort 2	0.60938			
Effort 3	0.64864			
Effort 4	0.69282			
Effort 5	0.42445			
Exhaustiveness 1				
Exhaustiveness 2	0.40098			
Exhaustiveness 3				0.63244
Exhaustiveness 4				0.72599
Exhaustiveness 5				0.53645
Iteration 1				
Iteration 2				
Iteration 3				
Iteration 4			0.44863	
Iteration 5			0.48018	
Iteration 6	0.42261			
Iteration 7				
Iteration 8			0.42876	
Iteration 9				
Speed 1			0.56420	
Speed 2				
Speed 3			0.46331	
Speed 4			0.43085	
Formality 1		-0.70508		
Formality 2		-0.50880		
Formality 3		-0.78254		
Formality 4		-0.79762		

Search process effort was calculated based on the average of a 7-item scale used to assess the amount of time respondents indicated they would allocate to searching for

information based on the scenario relative to other job activities ( $\alpha = .74$ ). This measure was also highly correlated with the amount of time CEOs indicated that they worked ( $r = .255$ ) in a given week. This correlation provides some additional support for the validity of the measure.

Search process exhaustiveness is based on the average of a 3-item scale that assesses the extent to which a CEO indicated he or she would attempt to be exhaustive in a search for information in response to the scenario ( $\alpha = .74$ ). As further support for the validity of this measure, there is a high correlation between it and the exhaustiveness of the activities CEOs indicated they undertook in a given workweek ( $r = .301$ ).

Search process iteration was calculated from the average score respondents indicated on 6-item scale ( $\alpha = .61$ ). Three of the items on this scale were originally conceptualized to pertain to iteration. Three additional items originally designed to capture search process speed loaded on the same factor. Upon closer inspection, it appears that the original process speed items are substantially similar to the concept of iteration as it applies to moving from one source to another. For example, search process speed item 1 was, "I would move rapidly from one source of information to another." Therefore, I included these items in the iteration scale.

Search formality was based on the average score of a 4-item scale that assessed the extent to which a CEO uses a formal process to undertake search ( $\alpha = .80$ ).

## CHAPTER 6: RESULTS

Means, standard deviations, and correlations appear in Table 5. I used regression analysis to test the relationships proposed in Hypotheses 1 through 7. Regressions for Hypotheses 1 through 7 include direct effects of search terrain dimensions and search process dimensions on the dependent variables, novelty of opportunities and appropriateness of opportunities. Interaction terms will be included in the regression models in order to test the proposed relationships presented in Hypotheses 5 through 7.

The Cook-Weisberg test for heteroskedasticity indicated that the residuals of ordinary least squares regressions of the variables in this study were heteroskedastic. That is, the variance of the residuals were not equal. Additionally, the Smirnov-Kolmogorov test of normality determined that the residuals for both novelty and appropriateness variables were also non-normally distributed. Since both of these conditions run counter to the assumptions of OLS regression, robust regression models were used.

### Direct Terrain Effects

Hypotheses 1 predicted that expansive search terrain – a) distant, b) unfamiliar, c) broad – would have a positive effect on the novelty of opportunities acted upon by the CEO. Table 6 shows that, while there were no significant findings with respect to search distance (H1a) and familiarity (H1b), search breadth has a negative and significant influence on opportunity novelty ( $B = -.181, p < .05$ ), counter to the hypothesis. That is, the broader the search terrain, the less novel the resulting opportunities.

Table 5: Means, Standard Deviations, and Correlations

	Mean	Standard Deviation	Novelty	Appropriateness	Unfamiliar	Distance	Breadth	Effort	Exhaustiveness	Iteration	Formality	Distance <sup>2</sup>	Unfamiliar <sup>2</sup>	Breadth <sup>2</sup>	Effort <sup>2</sup>	Exhaustiveness <sup>2</sup>
Novelty	3.73	0.79	1.00													
Appropriateness	3.91	0.61	.33	1.00												
Unfamiliar	0.15	0.39	.00	.08	1.00											
Distance	65.73	15.73	-.03	.27	.09	1.00										
Breadth	3.63	1.09	-.24	-.08	.12	-.12	1.00									
Effort	3.70	0.54	-.20	.00	.14	-.10	.06	1.00								
Exhaustiveness	3.03	0.97	-.11	.02	.15	.01	.24	.37	1.00							
Iteration	3.83	0.46	.27	.00	.10	-.06	-.06	.05	-.09	1.00						
Formality	3.59	0.82	-.22	.06	.23	-.04	.41	.18	.35	.06	1.00					
Distance <sup>2</sup>	4563.31	1957.05	-.02	.26	.11	.99	-.11	-.09	.01	-.06	-.04	1.00				
Unfamiliar <sup>2</sup>	0.18	0.18	-.14	.16	.50	-.08	.18	.09	.09	.00	.34	-.03	1.00			
Breadth <sup>2</sup>	14.36	8.11	-.23	-.13	.08	-.13	.98	.01	.24	-.08	.36	-.12	.12	1.00		
Effort <sup>2</sup>	14.01	3.94	-.18	-.01	.14	-.13	.03	.99	.35	.04	.16	-.12	.07	-.01	1.00	
Exhaustiveness <sup>2</sup>	10.12	5.76	-.12	.01	.14	-.01	.22	.33	.98	-.06	.34	.00	.14	.23	.31	1.00
Iteration <sup>2</sup>	14.90	3.53	.26	.00	.11	-.05	-.07	.06	-.09	1.00	.06	-.05	-.01	-.09	.05	-.06
Formality <sup>2</sup>	13.51	5.55	-.23	.08	.26	-.05	.40	.18	.35	.06	.99	-.05	.36	.35	.16	.35
EffortXDistance	242.39	65.46	-.14	.22	.15	.86	-.08	.41	.19	-.02	.04	.85	-.05	-.11	.38	.16
ExhaustivenessXDistance	199.21	80.61	-.08	.20	.12	.61	.05	.21	.78	-.12	.22	.60	-.01	.05	.18	.75
IterationXDistance	251.24	67.35	.09	.24	.12	.88	-.12	-.06	-.04	.41	-.01	.86	-.08	-.14	-.08	-.04
FormalityXDistance	234.94	77.29	-.16	.25	.24	.71	.19	.03	.22	.00	.66	.69	.17	.15	.00	.21
EffortXUnfamiliar	0.58	1.49	-.03	.07	.99	.07	.10	.20	.16	.11	.22	.09	.49	.06	.20	.16
ExhaustivenessXUnfamiliar	0.51	1.30	-.09	.02	.94	.01	.15	.17	.23	.11	.27	.05	.50	.11	.18	.22
IterationXUnfamiliar	0.59	1.52	.01	.07	.99	.08	.11	.15	.15	.16	.23	.11	.51	.07	.15	.15
FormalityXUnfamiliar	0.61	1.55	-.05	.06	.98	.10	.12	.11	.17	.09	.31	.12	.53	.08	.12	.18
EffortXBreadth	13.51	4.40	-.31	-.06	.16	-.16	.91	.45	.34	-.03	.43	-.15	.19	.87	.43	.32
ExhaustivenessXBreadth	11.20	5.44	-.21	-.08	.19	-.13	.77	.21	.77	-.12	.45	-.13	.16	.78	.19	.76
IterationXBreadth	13.88	4.35	-.12	-.06	.16	-.12	.92	.08	.18	.31	.41	-.11	.18	.89	.05	.17
FormalityXBreadth	13.45	5.58	-.29	-.03	.19	-.08	.88	.11	.33	-.01	.77	-.08	.29	.85	.08	.32
Expansiveness	0.00	0.60	-.15	.17	.68	.55	.56	.06	.23	.00	.35	.56	.35	.52	.03	.21
Extensiveness	0.00	0.47	.09	-.02	.08	-.06	-.09	.66	.50	.48	-.22	-.05	-.09	-.10	.65	.49
ExpansiveXextensive	-0.01	0.28	.04	-.04	-.27	-.16	-.18	-.12	-.13	.09	-.15	-.14	-.17	-.18	-.11	.09

	Iteration <sup>2</sup>	Formality <sup>2</sup>	EffortXDistance	ExhaustivenessXDistance	IterationXDistance	FormalityXDistance	EffortXUnfamiliar	ExhaustivenessXUnfamiliar	IterationXUnfamiliar	FormalityXUnfamiliar	EffortXBreadth	ExhaustivenessXBreadth	IterationXBreadth	FormalityXBreadth	Expansiveness	Extensiveness
Iteration <sup>2</sup>	1.00															
Formality <sup>2</sup>	.06	1.00														
EffortXDistance	.01	.04	1.00													
ExhaustivenessXDistance	-.11	.22	.66	1.00												
IterationXDistance	.42	-.01	.78	.50	1.00											
FormalityXDistance	.01	.65	.66	.59	.65	1.00										
EffortXUnfamiliar	.12	.24	.16	.13	.11	.22	1.00									
ExhaustivenessXUnfamiliar	.12	.30	.09	.15	.06	.20	.95	1.00								
IterationXUnfamiliar	.17	.26	.15	.12	.14	.24	.99	.93	1.00							
FormalityXUnfamiliar	.10	.34	.14	.15	.13	.31	.97	.95	.97	1.00						
EffortXBreadth	-.03	.42	.07	.11	-.14	.16	.17	.20	.15	.14	1.00					
ExhaustivenessXBreadth	-.12	.46	-.01	.48	-.17	.20	.20	.29	.19	.21	.77	1.00				
IterationXBreadth	.30	.40	-.08	.00	.05	.19	.14	.18	.17	.15	.85	.68	1.00			
FormalityXBreadth	-.02	.77	-.03	.16	-.07	.46	.17	.24	.18	.24	.83	.76	.83	1.00		
Expansiveness	.01	.36	.53	.46	.51	.66	.66	.62	.67	.68	.50	.46	.53	.55	1.00	
Extensiveness	.49	-.21	.29	.35	.17	-.22	.14	.13	.12	.03	.19	.23	.09	-.18	-.03	1.00
ExpansiveXextensive	.10	-.18	-.18	-.13	-.08	-.24	-.21	-.11	-.24	-.27	-.13	-.13	-.10	-.21	-.34	.00

Values greater than .21 are significant at p<.10



Table 6: Regression of Direct Search Terrain Effects

	(1)	(2)
	Novel	Appropriate
Unfamiliar	.067	.113
	(.241)	(.166)
Distance	-.003	.010**
	(.006)	(.005)
Breadth	-.181*	-.030
	(.091)	(.101)
Constant	4.573**	3.310**
	(.452)	(.464)
Observations	59	59
R-squared	.062	.087

Robust SE values in parentheses; one-tailed test of significance;  
 † significant at 10%; \* significant at 5%; \*\* significant at 1%

Recall in hypothesis 2 I argued that expansive terrains – a) distant, b) unfamiliar, c) broad – would be negatively related to the appropriateness of opportunities. The results in Table 6 show that, counter to hypotheses 2a, search distance has a positive and significant influence on the appropriateness of opportunities ( $B = .010, p < .01$ ). Therefore, as search takes place in more distant locales, opportunity appropriateness increases. Search familiarity (H2b) and search breadth (H2c) did not present any significant results with respect to appropriateness of opportunities.

#### Direct Process Effects

Hypotheses 3 and 4 predicted the effects of search process on the novelty and appropriateness of opportunities acted upon by the CEO. In the case of hypothesis 3, I proposed that extensive search processes – a) effortful, b) exhaustive, c) informal, and d) iterative – would be positively related to opportunity appropriateness. As shown in model 2 of Table 7, there were no significant findings to indicate the effect of search process on the appropriateness of opportunities.

With respect to hypothesis 4, I argued search process that were a) effortful, b) exhaustive, c) informal, and d) iterative would be negatively related to the novelty of opportunities acted upon by the CEO. As shown in Table 7, there is some support for this hypothesis. Specifically, search formality (H4c) has a significant and negative influence on opportunity novelty ( $B = -.222, p < .05$ ). However, counter to the hypothesis, search iteration (H4d) has a negative and significant influence ( $B = .528, p < .01$ ). Therefore, it appears a formal search process decreases the novelty of the resulting opportunities that are seized while a process that is iterative has a positive influence on novelty. It is also noteworthy that search effort (H4a) has a marginally significant negative influence on opportunity novelty ( $B = -.272, p < .10$ ). There were no significant finds with respect to the effect of exhaustiveness on novelty (H4b).

Table 7: Regression of Direct Search Process Effects

	(1)	(2)
	Novel	Appropriate
Effort	-.272†	-.008
	(.175)	(.181)
Exhaustiveness	.043	-.001
	(.107)	(.087)
Iteration	.528**	-.007
	(.223)	(.173)
Formality	-.222*	.047
	(.121)	(.096)
Constant	3.365**	3.793**
	(.948)	(1.066)
Observations	59	59
R-squared	.163	.004

Robust SE values in parentheses; one-tailed test of significance;  
 † significant at 10%; \* significant at 5%; \*\* significant at 1%

## Interactions

While the above analysis of direct effects is empirically important for establishing the relationship between individual CEO search and opportunity, I maintain that search necessarily consists of both a terrain and a process – one does not and can not exist without the other. Therefore, in hypotheses 5 through 7, I hypothesized and examined the interactions of search terrain with search process.

In hypothesis 5, I argued that high search terrain expansiveness (distant, unfamiliar, broad) searches coupled with low search process extensiveness (low effort, low exhaustiveness, informal, non-iterative) would have a greater impact on the novelty of the opportunities acted upon by CEOs than would searches low in terrain expansiveness and high in process extensiveness. As shown in Table 8, there were two terrain X process interaction findings with respect to this hypothesis. Specifically, exhaustiveness X unfamiliar is negative and significant on novelty ( $B = -.497, p < .01$ ). Figure 4 of this interaction illustrates how this finding supports the hypothesis. That is, highly unfamiliar terrain coupled with low exhaustiveness results in more novel opportunities than familiar and exhaustive searches. The interaction of search effort and search breadth is marginally significant and negative on novelty ( $B = -.235, p < .10$ ). As shown in the interaction plot of Figure 5, this relationship appears to run counter to the hypothesis. Namely, searches that are narrow and involve high effort lead to more novel opportunities than broad and low effort searches.

Table 8: Regression of Interactions between Search Terrain and Search Process

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Novel	Approp	Novel	Approp	Novel	Approp	Novel	Approp
Distance	.039 (.039)	.099** (.049)	-.022 (.020)	-.017 (.015)	-.009 (.044)	.029 (.050)	-.013 (.025)	-.003 (.027)
Unfamiliar	.219 (1.841)	-.026 (1.796)	1.621** (.547)	.590† (.438)	-1.286 (3.115)	.278 (2.320)	.763 (1.162)	1.823† (1.147)
Breadth	.652 (.559)	-.510 (.702)	-.482* (.275)	.101 (.242)	-.399 (.783)	-.622 (.764)	.166 (.550)	-.596 (.571)
Effort	1.202 (.969)	1.011 (1.018)						
Exhaustiveness			-.765† (.587)	-.440 (.471)				
Iteration					.017 (.980)	-.207 (.924)		
Formality							-.007 (.707)	-.603 (.470)
EffortXDistance	-.012 (.011)	-.023* (.013)						
EffortXUnfamiliar	-.031 (.522)	.035 (.488)						
EffortXBreadth	-.235† (.166)	.133 (.199)						
ExhaustivenessXDistance			.006 (.007)	.009* (.005)				
ExhaustivenessXUnfamiliar			-.497** (.199)	-.131 (.152)				
ExhaustivenessXBreadth			.110 (.105)	-.031 (.087)				
IterationXDistance					.002 (.011)	-.005 (.013)		
IterationXUnfamiliar					.340 (.820)	-.043 (.618)		
IterationXBreadth					.063 (.214)	.158 (.203)		
FormalityXDistance							.003 (.007)	.004 (.007)
FormalityXUnfamiliar							-.176 (.318)	-.455† (.298)
FormalityXBreadth							-.090 (.170)	.150 (.145)
Constant	.375 (3.402)	-.658 (3.697)	6.811** (1.439)	4.627** (1.283)	4.363 (3.799)	4.074 (3.568)	4.510* (2.362)	5.555** (1.787)
Observations	59	59	59	59	59	59	59	59
R-squared	.141	.174	.137	.130	.129	.109	.102	.135

Robust SE values in parentheses; one-tailed test of significance;  
 † significant at 10%; \* significant at 5%; \*\* significant at 1%

Figure 4: Familiarity X Exhaustiveness on Novelty

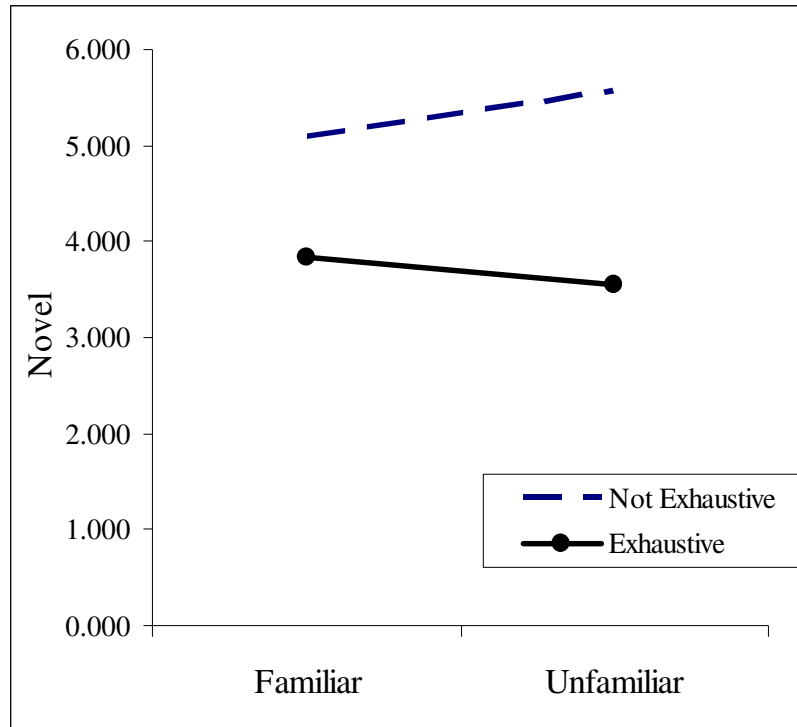
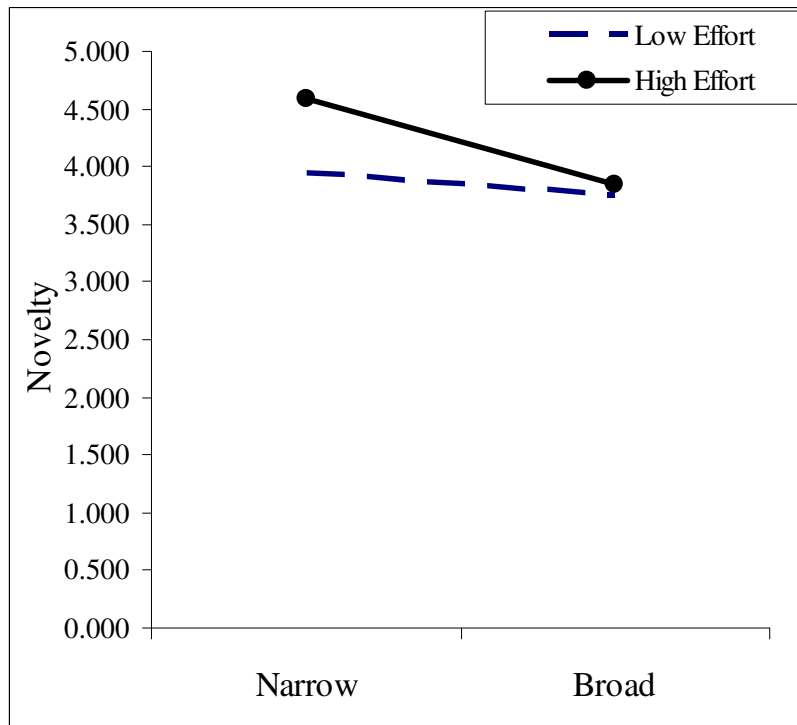


Figure 5: Breadth X Effort on Novelty



My contention in hypothesis 6 was that searches that did not utilize expansive terrains (local, familiar, narrow) but were done using extensive processes (effortful, exhaustive, informal, iterative) would result in more appropriate opportunities than would searches high in expansiveness and low in extensiveness. As shown in Table 8, there were three terrain X process interaction findings with respect to this hypothesis, as follows.

The interaction between effort and distance is significantly and negatively related to appropriateness ( $B = -.023$ ,  $p < .05$ ). As the plot of this interaction in Figure 6 shows, this result runs counter to the hypothesis. That is, searches low in distance (local) and highly effortful do not lead CEOs to more appropriate opportunities than do search for a plot of this interaction.

The interaction between search exhaustiveness and search distance is positive and significant on appropriateness ( $B = .009$ ,  $p < .05$ ). This result, shown in Figure 7, is in agreement with the hypothesis. In other words, local and exhaustive searches lead to higher levels of opportunity appropriateness than distant searches that are low in exhaustiveness.

Finally, there is a marginally negative finding for the interaction of formality and unfamiliarity on opportunity appropriateness ( $B = -.455$ ,  $p < .10$ ). The plot shown in figure 8 appears to indicate support for the hypothesis. That is, informal searches of familiar terrain lead to higher levels of opportunity appropriateness than searches that are done in unfamiliar terrain with a formal process.

Figure 6: Distance X Effort on Appropriateness

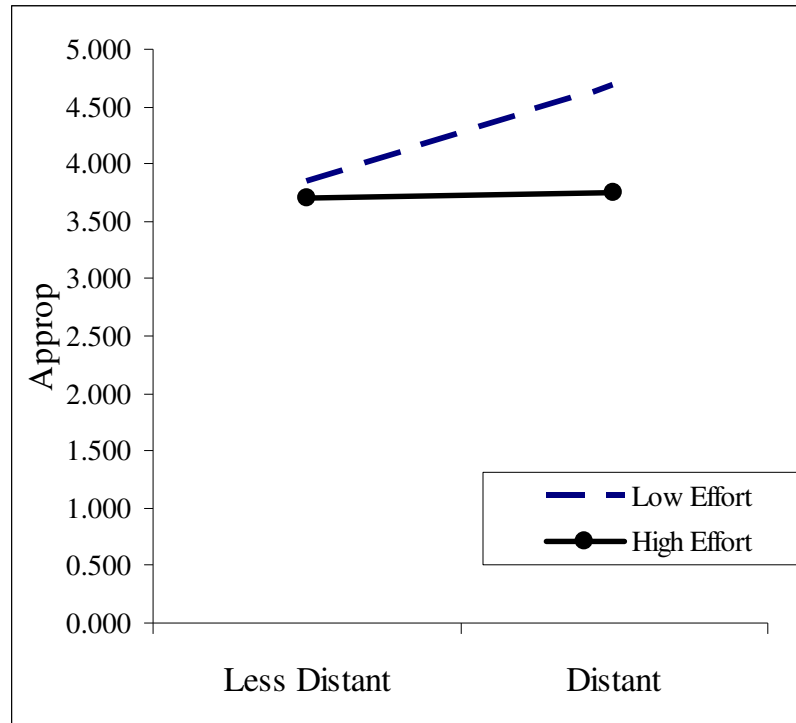


Figure 7: Distance X Exhaustiveness on Appropriateness

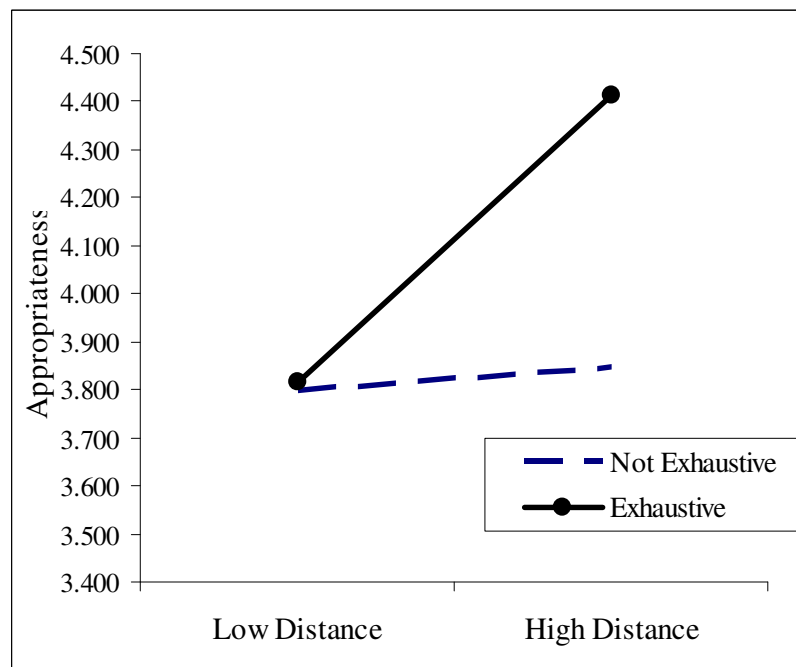
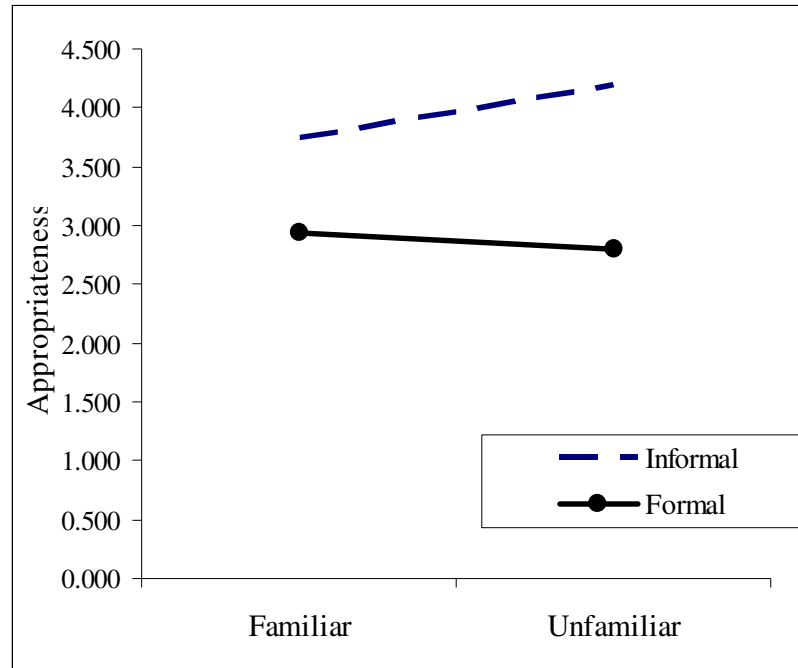


Figure 8: Familiarity X Formality on Appropriateness



The final hypothesis, H7, predicted that searches with high levels of both search terrain expansiveness (distant, unfamiliar, broad) searches and search process extensiveness (effortful, exhaustive, informal, iterative) would lead to the most highly novel (H7a) and appropriate opportunities (H7b). Referring to the three significant interaction findings plotted in Figures 4 through 8, it appears with respect to the interaction between familiarity and exhaustiveness and its relationship with opportunity novelty (H7a) this hypothesis is not supported. That is, searches that are both highly unfamiliar and highly exhaustive do not appear to lead to the highest levels of opportunity novelty. Rather, the findings indicate that novelty is maximized when a search is non-exhaustive and takes place in unfamiliar terrain.

In the case of opportunity appropriateness (H7b), the findings are mixed. Specifically, the interaction between search distance and search exhaustiveness appears



to support the hypothesis that contended distant and exhaustive searches would lead to the highest levels of opportunity appropriateness. However, the interaction between search distance and search effort did not support the hypothesis. It appears that searches low in effort and highly distant lead to the most appropriate opportunities.

## Post Hoc Analyses

### Curvilinear Effects

While not originally hypothesized, the possibility exists that there are some curvilinear effects present in this dissertation. That is, it may be the case that some dimensions of search exhibit a particular effect on novelty and appropriateness up to some inflection point at which the effect is reversed.

The results in Table 9 indicate that this type of effect may be present in several circumstances exploring both opportunity novelty and appropriateness. In the case of opportunity novelty, the regression results indicated a marginally significant and negative influence for unfamiliarity<sup>2</sup> ( $B = -.962, p < .10$ ) and a positive and significant relationship between effort<sup>2</sup> and novelty ( $B = .392, p < .05$ ). These curvilinear results are shown graphically in Figures 9 and 10, respectively. Based on these graphs, it appears that, with respect to novelty, searching unfamiliar terrain may be helpful, up to a point (see Figure 9). After this point is reached, however, unfamiliar terrain decreases the novelty of opportunities that are acted upon. The opposite effect appears to occur with respect to effort. That is, an effortful search process decreases opportunity novelty up to a point at which increased effort actually increases novelty (see Figure 10).

Figure 9: The Curvilinear Effect of Unfamiliarity on Novelty

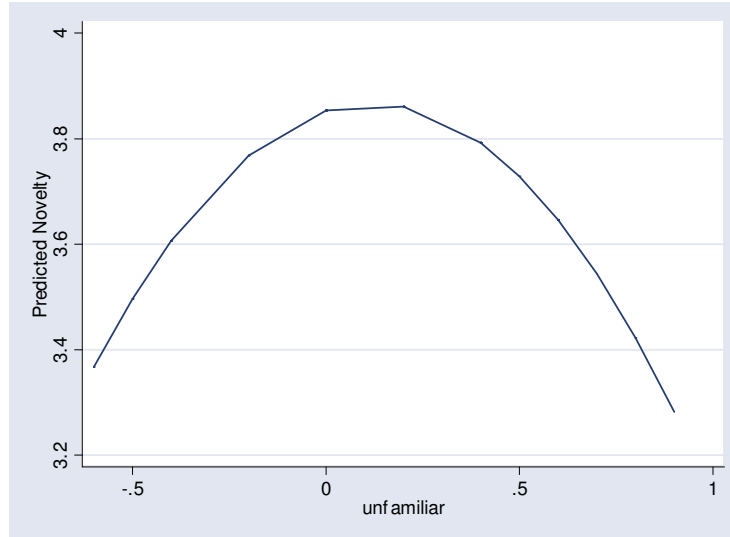


Figure 10: The Curvilinear Effect of Effort on Novelty

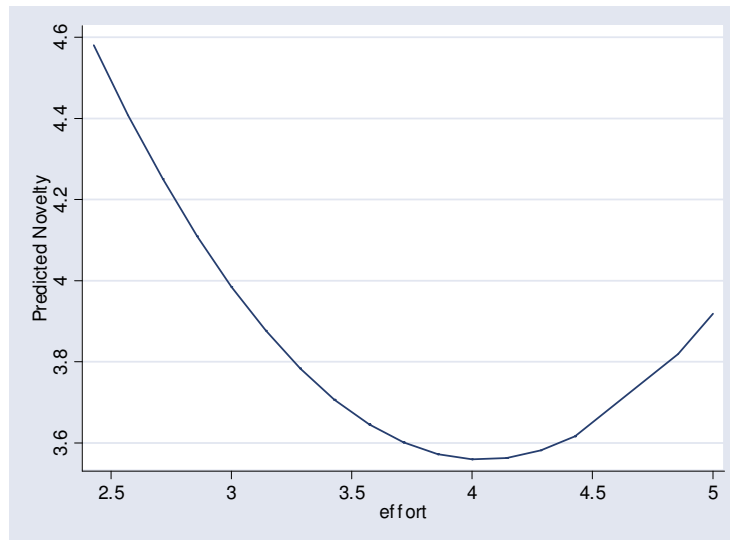


Table 9: Regression of Curvilinear Effects of Search Terrain and Search Process

	(1)	(2)	(3)	(4)
	Novel	Appropriate	Novel	Appropriate
Unfamiliar	.232	-.069		
	(.254)	(.211)		
Distance	-.041	.009		
	(.033)	(.021)		
Breadth	.002	.693†		
	(.426)	(.453)		
Unfamiliar <sup>2</sup>	-.962†	.391		
	(.687)	(.469)		
Distance <sup>2</sup>	.000	.000		
	(.000)	(.000)		
Breadth <sup>2</sup>	-.023	-.100†		
	(.062)	(.065)		
Effort			-3.173**	1.355
			(1.457)	(1.621)
Exhaustiveness			.607	.104
			(.499)	(.463)
Iteration			3.201	-.341
			(3.132)	(2.639)
Formality			.571	-.737†
			(.901)	(.458)
Effort <sup>2</sup>			.392*	-.185
			(.204)	(.221)
Exhaustiveness <sup>2</sup>			-.091	-.021
			(.091)	(.077)
Iteration <sup>2</sup>			-.339	.042
			(.401)	(.347)
Formality <sup>2</sup>			-.112	.115†
			(.141)	(.071)
Constant	5.505**	2.109**	1.285	3.150
	(1.118)	(1.013)	(6.857)	(5.212)
Observations	59	59	59	59
R-squared	.098	.164	.238	.039

Robust SE values in parentheses; one-tailed test of significance;

† significant at 10%; \* significant at 5%; \*\* significant at 1%

Table 9 also reveals the result for curvilinear effects of search dimensions on opportunity appropriateness. Specifically, there are marginal findings with respect to the influence of both breadth<sup>2</sup> and formality<sup>2</sup> on appropriateness. In the case of breadth<sup>2</sup>, the relationship is negative (B = -.100, p < .10). A positive relationship was found between formality<sup>2</sup> and appropriateness (B = .115, p < .10). Referring to Figures 11 and 12, it appears that, in terms of appropriateness of opportunities, broad terrains are helpful until

an inflection point is reached. After the inflection point is reached, broader terrains actually decrease opportunity appropriateness (see Figure 11). Conversely, formal search processes, while harmful initially, can increase appropriateness at higher levels (see Figure 12).

Figure 11: The Curvilinear Effect of Breadth on Appropriateness

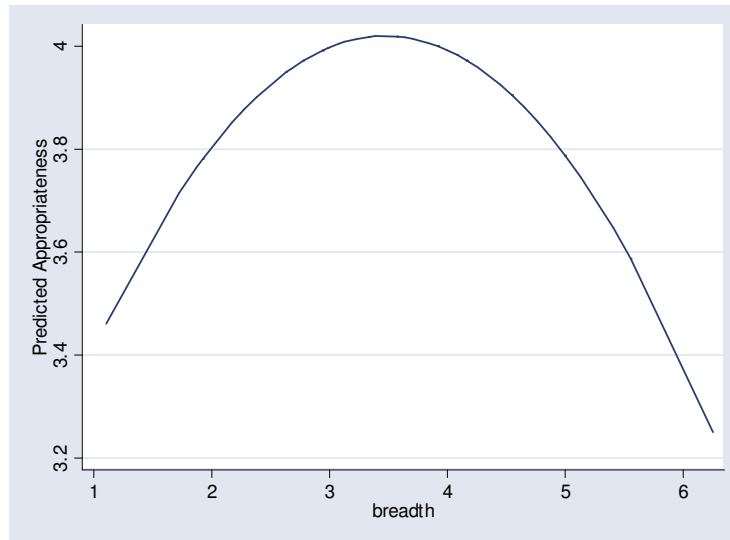
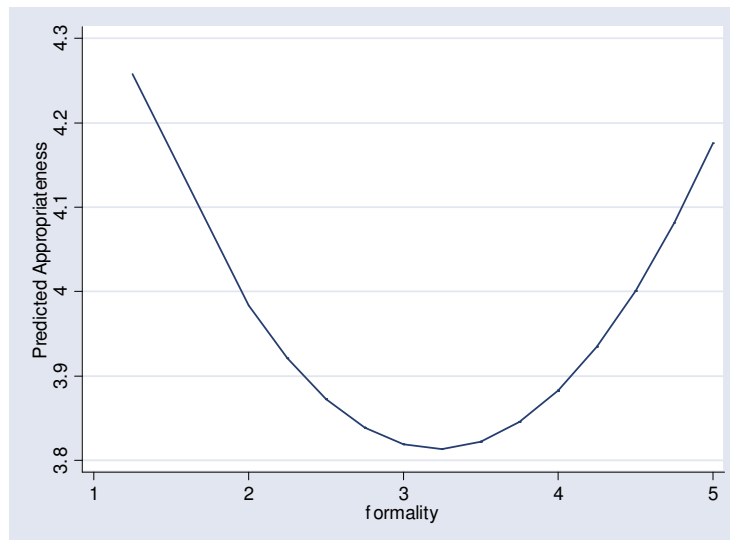


Figure 12: The Curvilinear Effect of Formality on Appropriateness



## Control Variables

A number of potential control variables were inserted into the regression models in an effort to explore the robustness of the results. Specifically, three types of controls were examined. The first related to the demographic characteristics of the CEO (CEO age, CEO tenure with the firm, and CEO post-secondary education). The second set of variables explored group processes and interactions of the top management team (integration of information, consensus, conflict, and procedural fairness). Finally, an attempt was made to control for industry by inserting dummy variables for industry based on the SIC codes of the firms. Overall, these robustness checks indicated that these variables had very little impact on the initial regressions results presented earlier. Therefore, I decided to continue to omit the use of controls in favor of the higher number of degrees of freedom.

## CHAPTER 7: DISCUSSION

The purpose of this dissertation was to gain a better understanding about how the individual search characteristics of managers – CEOs in particular – impact the novelty and appropriateness of the opportunities they act upon. Finding such opportunities is among the most important functions with which individual managers, in particular CEOs, are charged (Schendel, 1996).

Dating at least as far back as March and Simon (1958), the notion of search has been discussed and alluded to but, to my knowledge, it has not been expressly measured and quantified at the individual level of analysis. Rather, work that has been done has largely focused on search at the organizational level of analysis (e.g. Katila, 2002; Rosenkopf & Nerkar, 2001). Many of these studies have been based on computer simulations and modeling (e.g Rivkin & Siggelkow, 2003; Siggelkow & Rivkin, 2005), distal proxies of search, such as organizational R & D expenditures (e.g Gavetti & Levinthal, 2000), and specific outcomes such as new product introductions (e.g Ahuja & Katila, 2001) to infer search and the results of search. My intention, therefore, has been to begin to understand individual search in terms of a variety of dimensions and to link variations in those dimensions of search to an outcome measure that would broadly capture the general effectiveness of CEOs to act upon opportunities that are novel and appropriate.

### CEO Search and the Pursuit of Opportunity

I began this dissertation with an appreciation for prior research that that has highlighted the importance of search and a basic belief that search is a concept of great

importance as it relates to the types of opportunities seized by CEOs. In general, I argued that searches that exposed CEOs to information that was new, novel, and/or unusual and would result in higher levels of novelty in the opportunities seized by those CEOs while searches that were extensively performed would ensure a deep level of understanding of the information at hand and would lead to opportunities that were very appropriate for the situation, possibly at the expense of novelty. As summarized in Table 11, the results of this dissertation reaffirm my belief in the importance of search. However, several of the findings related to opportunities run counter to my initial hypotheses. In the following sections, I will discuss these findings.

Table 10: Summary of Hypotheses and Results

HYPOTHESIS	RESULTS
H1: Expansive search terrains – a) distant, b) unfamiliar, c) broad – will be positively related to the novelty of opportunities seized by managers.	Distance: NS Unfamiliar: NS Breadth: Negative
H2: Expansive search terrains – a) distant, b) unfamiliar, c) broad – will be negatively related to the appropriateness of opportunities seized by managers.	Distance: Positive Unfamiliar: NS Breadth: NS
H3: Extensive search processes – a) effortful, b) exhaustive, c) informal, d) iterative – will be positively related to the appropriateness of opportunities seized by managers.	Effort: NS Exhaustiveness: NS Formality: NS Iterativeness: NS
H4: Extensive search processes – a) effortful, b) exhaustive, c) informal, d) iterative – will be negatively related to the novelty of opportunities seized by managers	Effort: Negative (Marginal) Exhaustiveness: NS Formality: Negative Iterativeness: Positive
H5: Searches consisting of a high degree of search terrain expansiveness and a low degree of search process extensiveness will be more positively related to the novelty of opportunities seized by managers than searches consisting of a low degree of search terrain expansiveness and a high degree of search process.	ExhaustivenessXUnfamiliar: Significant and Supportive  EffortXBreadth: Marginal and Not Supportive
H6: Searches consisting of a high degree of search terrain expansiveness and a low degree of search process extensiveness will be more negatively related to the appropriateness of opportunities seized by managers than searches consisting of a low degree of search terrain expansiveness and a high degree of search process extensiveness.	EffortXDistance: Significant but Not Supportive  ExhaustivenessXDistance: Significant and Supportive  FormalityXUnfamiliar: Marginal and Supportive
H7a: Searches consisting of a high degree of both search terrain expansiveness and search process extensiveness will be more positively related to the novelty of opportunities seized by managers than searches consisting of either a low degree of search terrain expansiveness or search process extensiveness or a low degree of both.	ExhaustivenessXUnfamiliar: Significant and Not Supportive
H7b: Searches consisting of a high degree of both search terrain expansiveness and search process extensiveness will be more positively related to the appropriateness of opportunities seized by managers than searches consisting of either a low degree of search terrain expansiveness or search process extensiveness or a low degree of both.	ExhaustivenessXDistance: Significant and Supportive  EffortXDistance: Significant but Not Supportive

### Search Terrain

First, with respect to search terrain, I argued in the first hypothesis that searchers with terrains consisting of highly distant, unfamiliar, and broad sources of information would seize more novel opportunities. The results did not support this notion and, in terms of search breadth and novelty, ran counter to this argument. Specifically, it appears



that broad searches can be detrimental to novelty and distance can actually increase the level of novelty.

These terrain results run counter to earlier research that has shown that breadth of search leads organizations to more innovation (e.g. Katila & Ahuja, 2002) and arguments from Hambrick (1981) that breadth of information leads to higher managerial performance. In retrospect, perhaps the findings of the current study can be explained to differ from this prior work for two reasons. First, it is possible that broader search terrains are too cognitively challenging for individual searchers. In earlier studies, as mentioned above, breadth of search has been examined at the organizational level of analysis. In those situations, information from a broad set of sources can be analyzed and evaluated by a number of organizational members. Members of an organization can split the task of interpreting the information as well as rely on individuals with particular knowledge or expertise to handle information that is specialized. The boundedly rational individual search, on the other hand, might be overloaded by such a diverse set of information sources and, instead of benefiting from the variety, become “bogged down” and unable to interpret and utilize it effectively.

Similarly, the results ran contrary to my arguments in hypothesis 2, that the relationship between expansive search terrain expansiveness (terrains that are distant, unfamiliar, and broad) and appropriateness of opportunity would be negative. That is, the findings of the dissertation indicate that as search distance increases, so too does opportunity appropriateness. This finding has caused me to reconsider the logic of my original arguments. Again, I framed distant searches as having a negative impact on appropriateness. Perhaps this perspective placed too much of a negative connotation on

the concept of appropriateness. In fact, it is probably the case that the actions deemed appropriate by observers of CEOs are to some degree forward-looking and novel. While novelty and appropriateness of opportunity do represent two discriminant factors, their relatively high correlation ( $r = .33$ ) provides some empirical evidence this is the case. Therefore, distant searches might be needed to be undertaken by CEOs in order to come up with opportunities that will allow them to compete effectively and take actions that are relatively novel but perhaps not radically so.

Post-hoc analysis indicated that several search dimensions appeared to have a curvilinear relationship with opportunities acted upon by CEOs. That is, it may be the case that some dimensions of search exhibit a particular effect on novelty and appropriateness up to some inflection point at which the effect is reversed.

Though marginally significant, it appears that searching unfamiliar terrain may be helpful in finding novel opportunities, up to a point. After this point is reached, unfamiliar terrain decreases the novelty of opportunities that are acted upon. One explanation for this finding could be rooted in the cognitive and information processing limitation of individuals (Fiske & Taylor, 1991). That is, exposure to somewhat new and unfamiliar information provides an individual an opportunity to integrate and understand that knowledge in conjunction with what he or she already knows. Straying into too unfamiliar terrain might leave that individual unable to interpret and understand the information or how this information might relate to their current situation. Therefore, an individual should have some knowledge about the terrain in which he or she is searching or they will not be able to make sense nor utilize that information.

With respect to the post hoc analysis results, breadth of search had a negative and marginal curvilinear relationships with respect to appropriateness of opportunities. This relationship could indicate that, in terms of appropriateness of opportunities, broad terrains are helpful until an inflection point is reached. After the inflection point is reached, broader terrains actually decrease opportunity appropriateness. Katila and Ahuja (2002) predicted this relationship existed with respect to a broad search leading to new product introductions. While they did not find a significant relationship at the organizational level, this dissertation indicates that, at the individual level, they were correct.

#### Search Process

There were no findings with regards to the impact of search process on appropriateness, failing to support my hypothesis 3, that effortful, exhaustive, informal, and iterative search processes would lead to more appropriate opportunities. The results with respect to the hypothesis 4 predicting a negative impact of search effort, exhaustiveness, informality, and iterativeness on opportunity novelty were largely in keeping with the hypothesis. Specifically, I found a significant negative relationship between search formality and novelty and a positive and significant relationship between search iterativeness and novelty. Thus it appears that, as hypothesized, searchers can increase the novelty of the opportunities they recognize by allowing themselves to be iterative and adaptive during the search by revisiting terrain that had been previously searched, changing the way in which they search, modifying the terrain in which the search occurs, or modifying the goals of the search based on earlier search results. As

mentioned earlier, search iterativeness is akin to adaptiveness. Adaptive searchers are more likely to follow search paths that end at or follow salient new information (Nutt, 1993). In addition, an iterative process allows the searcher to re-visit and re-encounter information uncovered earlier. This repeated exposure increases the chances that the information becomes salient to the searcher as well as increases the chances that the searcher can make sense of that information and utilize it to discovery novel opportunities.

Like search iterativeness, a less formal or informal search appears to allow the searcher to remain flexible and make adaptive changes based on the results of the search itself (Barrick & Spilker, 2003; Eisenhardt & Tabrizi, 1995). Informal searchers do not follow a rigid protocol, or a set of specific procedures or routines, in conducting the search of the terrain. The results indicate that informal search processes enhance a searchers ability to explore the terrain without being locked into the locations in which he or she searches as a result of a formal process routines. Essentially, a less formal search process allows the searcher to iterate and re-visit and re-encounter information uncovered earlier.

The non-findings with respect to search process might also be an interesting area on which to speculate. Specifically, it may be the case that these results indicate that the search terrain dimensions, where a search takes place, is a more important in terms of appropriateness of opportunities than is the process of how that terrain is searched by an individual.

The post hoc analysis results indicate that there is a positive and significant relationship between effort<sup>2</sup> and novelty. Based on these results it appears that expending

a large amount of effort, relative to other tasks, decreases opportunity novelty up to a point at which increased effort actually increases novelty. In similar fashion to other findings in this dissertation, this result seems to infer that intense effort is required to arrive at novel opportunities. An approach that is less effortful or middling can actually decrease novelty to a greater extent than would be the case if little or no effort was employed and recognition of novelty was left to chance or serendipity.

A positive relationship was found between formality<sup>2</sup> and appropriateness. That is, formal search processes, while harmful initially, appear to increase appropriateness at higher levels. This finding seems to indicate that, in terms of opportunity appropriateness, loosely formal search processes are worse than both complete informality and very strictly formal search processes. The prescription would seem to be that, unless you are going to follow a very strict regimented and formal search process, it might be best to think openly and freely during search.

#### Search Terrain and Search Process Interaction

Implicit in my model of search is the interdependence of search terrain and search process. That is, neither exists without the other; searchers must always be searching some terrain “area” in some particular procedural “manner.” Together, I argue, these dimensions of search terrain and search process determine the characteristics of search and all are needed to develop a full understanding of search. As such, I explored the interaction of search terrain dimensions and search process dimensions in hypotheses 5 through 7.

Overall, these interaction results appear to show that putting forth too much effort in a far off terrain will result in inappropriate opportunities. However, if a searcher is able to be exhaustive in his/her search – considering all possibilities – the result will be more appropriate. If a search is taking place in very unfamiliar terrain, it is not a good idea to attempt to be exhaustive in that terrain when searching for novel opportunities. To a lesser extent (marginal findings), these results might indicate that effortful and broad searches could decrease opportunity novelty. Likewise, a formal process across an unfamiliar terrain may lead to less appropriate opportunities.

Consideration of the graphical representations of these interactions, shown in Figures 4 through 8, may enable us to make some further speculation about the importance of these findings.

Breadth X effort on novelty. As shown in Figure 5 and table 7, it appears that the interaction of breadth and effort have a negative effect on opportunity novelty. Though this finding is only marginal, it is interesting to speculate about this relationship. Recall that breadth of search had a negative effect on opportunity novelty. I suggested that the reason for this was limited information processing capability of individual human beings prevented them from understanding a broad array of information. Coupled with this interaction finding, it appears that, not only does breadth negatively influence novelty but individuals need to spend high levels of effort in very narrow terrains in order to be effective in recognizing novel opportunities. This leads me to believe that the depth of understanding that is needed by an individual of a particular knowledge domain in order to recognize truly novel opportunities is so high that one must intensively spend time in

that particular area in order to effectively interpret and understand the information in that terrain area.

Familiarity X exhaustiveness on novelty. Figure 6 and Table 7 illustrate the negative and significant results of the interaction between familiarity and exhaustiveness on opportunity novelty. Again, this finding, like the two interactions related to effort, is contrary to my hypothesis that highly expansive terrains, such as unfamiliar terrains, and highly extensive processes, such as highly exhaustive processes, would increase novelty. Similar logic applied to this finding can also offer an explanation for this finding. That is, a high level of exhaustiveness appears to be most helpful when searching in more familiar terrains. In this case, it may only be a waste of the CEOs time to attempt to be exhaustive when searching in unfamiliar terrains. In addition, he or she may not have enough knowledge to understand the vast amounts of unfamiliar information available.

Distance X effort on appropriateness. Figure 4 shows the interaction between distance and effort and its impact on opportunity appropriateness. This finding appears to indicate that lower amounts of effort enhance appropriateness, especially in more distant terrains. One possible interpretation of this finding is that when searching for appropriate opportunities in areas outside the organizations, CEOs should pay particular attention to the “low hanging fruit.” That is, information that is easily obtained, without much effort, might be most applicable to their own organization. Further, it may be that spending too much time focused on information located in distant terrains is a distraction for CEOs and diminishes the amount of time they could be searching for otherwise appropriate opportunities.

Distance X exhaustiveness on appropriateness. Unlike the previous case involving the negative relationship of the interaction of exhaustiveness and familiarity of search on novelty, the interaction between exhaustiveness and distance has a positive and significant relationship on the appropriateness of opportunities seized by CEOs, as shown in Figure 7 and Table 7. In this case, there appears to be a sizable boost in the appropriateness of the opportunities seized when CEOs attempt exhaustively search information that is located outside their organization.

Familiarity X formality on appropriateness. The findings with respect to the interaction between familiarity and formality shown in Table 7 and Figure 8 are noteworthy in that they are marginally and negatively related to opportunity appropriateness. These results indicate that, in order to arrive at appropriate opportunities, it is important to follow an informal search process when undertaking searches of unfamiliar terrains. Intuitively, this would seem to make sense on the grounds that it would be difficult to establish formal search rules a priori for a search that will take place in an unknown terrain.

Summary of interaction findings. The findings with respect to the interaction of search terrain and search process, though mixed, offer some valuable information about the searches of CEOs. First, with respect to opportunity novelty, CEOs appear to maximize novelty when searching unfamiliar terrain by not attempting to be exhaustive in the process. In addition, it is best they spend their maximum effort searching in a narrow domain in order to increase novelty.

CEOs appear to maximize appropriateness of opportunities in two ways. First, when searching in distant terrains – those outside the organization – CEOs need to



exhaustively explore information in that terrain without being exceedingly effortful by focusing only focus on the “low hanging fruit.” That being, information outside the organization that is easily obtained and understood. Additionally, it seems helpful to be informal when undertaking the search – particularly among unfamiliar terrains.

## Conclusion

This dissertation explored the search behavior of CEOs and how this behavior relates to the opportunities they recognize and take action upon. Opportunities are defined in this dissertation as the perception of a novel and appropriate resource combination acted upon or seized for potential gain. As such, recognizing and acting upon opportunities is among the most important roles of a manager. This is particularly true for CEOs since they are most often tasked with setting the strategic direction of the firm. Despite the importance of managers recognizing opportunities, the literature has failed to fully address the behaviors that influence the novelty and appropriateness of the opportunities those individuals recognize. This dissertation examines those behaviors, known as search. I define search as individual behavior resulting in the acquisition of information and knowledge that can be used to recognize and seize opportunities to solve problems.

The findings offer some valuable information about CEO search. First, with respect to opportunity novelty, CEOs appear to maximize novelty when they are effortful and exhaustive in searching a narrow and familiar terrain. On the other hand, CEOs appear to maximize appropriateness in two ways. First, when searching in distant terrains outside the organization, CEOs need to exhaustively explore that terrain but only focus

on information outside the organization that is easily obtained and understood.

Additionally, it seems helpful to be informal when undertaking the search – particularly among unfamiliar terrains.

While the findings of this dissertation may leave many questions unanswered, I believe it is clear that individual level search, particularly that of the CEO is an important factor for consideration in establishing the effectiveness of those CEOs and the fit of those CEOs to a particular organization or industry. To the extent that search is an individual level characteristic, differs among individuals, and is enduring, it could prove to be very valuable for individuals to have knowledge of their search patterns and knowledge of search patterns that are most effective given a desired outcome. In addition, the various constituencies involved with selection and hiring of CEOs might be better equipped to perform this task with a greater understanding of this individual difference.

## CHAPTER 8: LIMITATIONS AND FUTURE RESEARCH

To my knowledge, this is the first attempt to use field based research methods to study individual search behaviors of top managers. As discussed in the methodology chapter of this dissertation, there are numerous reasons field based study is desirable. However, as will all research methods, there are a some shortcomings.

While a large sample is often very desirable in management research, the intensive field based methodology employed in this dissertation provided detailed and rich data than could practically be gathered in much larger samples. As such, I believe that the sample is actually one of the majors strengths of this dissertation.

I also chose to focus on publicly traded firms and CEOs in high-technology industries in this dissertation. While this may limit the generalizability of my findings, I believe this decision gave me some control over environmental factors that might influence search.

As is always the case with survey research, there is the possibility of respondent bias. In this dissertation, there is also a potential problem with using respondents to rate themselves on their search behavior. It is possible that respondents will not answer questions truthfully or will be subject to bias that will lead them to answer in ways they think the researchers desire. In either case, it is entirely possible that some of the data could be biased. On the upside, the dependent variable in this study is provided by a different set of respondents than the CEO. This portion of my methodology helps to offset problems that can be associated with common methods bias.

This dissertation and the research on the topic of search that has been done in conjunction with it, have provided a more fine-grained analysis of the topic than I am

aware has previously been done. I believe that this topic provides us with fertile ground for future study in a number of areas that I will now briefly outline.

One question left unanswered by the current study is the impact of motivational factors on search and search effectiveness. For example, do individuals that are intrinsically motivated to search have any inherent advantage in searching for information toward some end? Along the same lines of reasoning, it would be interesting to study whether an individual can be motivated to search more effectively if given extrinsic rewards to do so.

Other motivational concepts such as self-efficacy and goal specificity could also be related to search effectiveness. These factors have been shown to have a significant impact on individual performance in many other contexts.

A laboratory study could also provide needed confirmation and validity to aspects of this dissertation. Specifically, it would be valuable to explore the dimensionality of search and the validity of my conceptualization of opportunities in a controlled environment with a significantly larger sample size.

Finally, based on preliminary data analysis, another avenue worth exploration is the impact of passive search on individual CEO outcomes including innovation and opportunity recognition. This type of search may hold the key to a better understanding of the importance of how managers spend their time in these types of outcomes.

APPENDIX A: INSTITUTIONAL REVIEW BOARD APPLICATION AND  
INFORMED CONSENT FORM

APPROVED 4/28/04; VALID UNTIL 4/30/07

Name of Principal Investigator or Project Faculty Advisor Paul Tesluk Tel. No. 405-4968  
*(NOT a student or fellow; must be UMD employee)*

Name of Co-Investigator Ken Smith Tel. No. 405-2250

Administering Department of Project Management & Organization, R.H.Smith

E-Mail Address of P.I. ptesluk@rhsmith.umd.edu E-Mail Address of Co-I. kgsmith@rhsmith.umd.edu

Where should IRB send approval letter? Paul Tesluk Rm 4542 Van Munching Hall

Name of Student Investigator Patrick Maggitti Tel. No. 410-688-1274

Student Identification No. & E-Mail Address 204-60-0046 pmaggitt@rhsmith.umd.edu

Name of Student's Advisor (if different from above)	<u>Ken Smith</u>
Signature of Student's Advisor	_____

Project Duration (mo/yr – mo/yr) 05/04 -- 05/05

Project Title Search, Discovery and Organizational Innovation

Sponsored Project Data	Funding Agency <u>National Science Foundation</u>	ORAA Proposal ID Number _____
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*(PLEASE NOTE: Failure to include data above may result in delay of processing sponsored research award at ORAA.)*

CONFLICT OF INTEREST: Investigators  do  do not have a real or potential COI. See question #7 on page 2.  
MEMBERS OF HEALTH CENTER: Investigators  are  are not members of Health Center. See question #8 on page 2.

For initial application, please attach a copy of your responses to question 1 - 8 of the instructions on page 2 of this document, including all related documents (such as questionnaires, interview questions, surveys).

**OPTIONAL:** Complete appropriate box below to indicate whether you are requesting an exemption from further human subjects review and to list the number of any exemption categories (described on page 4 of this document) which you believe applies to your project:  Exempt---List Exemption Category Numbers 2, 4 *Or*  Non-Exempt

If exempt, please briefly describe the reason(s) for exemption. Your notation is simply a suggestion to the HSRC.

Date \_\_\_\_\_ Signature of Principal Investigator or Faculty Advisor *(PLEASE NOTE: Person signing above accepts responsibility for project, even when data collection is performed by other investigators)*

Date \_\_\_\_\_ Signature of Co-Principal Investigator

Date \_\_\_\_\_ Signature of Student Investigator

Date \_\_\_\_\_ Signature of Human Subjects Review Committee Chairperson or Designee.  
*(Please also print name of person signing above)*  
**(PLEASE NOTE: When HSRC Chairperson is also a project investigator or the Student Investigator's advisor, this line should be signed by another member of the HSRC.)**

## Initial Application

### **1. Abstract**

The proposed research aims to better understand what cognitive, personality, and experience characteristics of managers and employees explain how they engage in search and discovery of new business opportunities and innovations. Drawing from behavioral research on individual-level innovativeness and search literature on organization-level innovation, we identify the characteristics of the search and discovery process, and, ask, for example, how intrinsically motivated employees use this process to come up with innovations. We also examine whether the differences in motivation can explain the ability to come up with more radical business opportunities and innovations. We intend to answer explore this question in high-technology firms through interviews with CEOs and surveys with individuals in the organization. All survey responses will be strictly confidential, requiring less than 1 hour of each respondents time.

### **2. Subject Selection**

#### **a. Who will be the subjects?**

The sample for the study will be drawn from the population of high technology organizations located in Mid-Atlantic region of the United States as identified through *Hoovers Online*, a leading source of consolidated data on businesses. For each company, participants will include the CEO (structured interview) and the top management team and the core innovation team workers (each will be asked to complete a questionnaire). Based on past research with this same sample of firms, we anticipate that approximately 50-80 firms will participate in the study and that we will be surveying approximately 10-20 employees at each firm. Participation in the study will be solicited through direct contact with the CEO's in each firm, who will be asked to endorse a letter supporting the study to be distributed to individuals within the organization.

#### **b. Will the Subjects be selected for special characteristics?**

Subjects in the study will be selected based purely on their involvement and roles in the innovation process in high technology companies. No special characteristics will be considered in recruiting subjects.

#### **c. State why the selection will be made on the basis of bases given in 2(b).**

Subjects will not be selected based on special characteristics.

### **3. Procedures**

A letter (Appendix B) requesting participation in a study on organizational innovation will be sent to CEOs of high technology organizations located in the mid-Atlantic region, as described above. For each company, we will begin by completing a semi-structured interview with the CEO (Appendix C). During the interview, CEOs will be asked to provide contact information (either directly or through the Human Resources Director) for the top-managers and core knowledge workers in the firm (defined in terms of the engineers, scientists, marketing specialists, and project managers who work on project development and marketing teams). The core knowledge workers and top managers in each firm will then be sent a letter that will describe the purpose of the study and how and why they were selected for participation and will emphasize that their participation in the study by completing the survey will be voluntary. Along with the letter will be a questionnaire (Appendix D) that will contain items measuring:

- (1) The search strategies used by individuals;
- (2) respondent's level of task motivation using well accepted measures of motivation (e.g., Amabile, Hill, Hennessey, & Tighe, 1994).
- (3) each individual's network of relations (e.g., advice networks) adapting instruments developed in our prior work (e.g., Smith, Collins, Clark & Stevens, 2001); and
- (4) each respondent's human capital (domain knowledge) as well as education and work experience.

The dependent variables, business opportunity recognition and organizational innovation, will be measured from the interviews with the CEO and the subsequent surveys. The search measures collected from the survey, and aggregated to the firm level, will also be compared to alternative, archival measures of innovation search using publicly available patent data for the sample firms (measures developed in Katila, 2000).

#### **4. Risks and Benefits**

The risk to participants is minimal. No personally sensitive or revealing information will be collected during the study. Furthermore, the information that we will be gathering as part of the field study has a very low likelihood that it might somehow be used to endanger participants' employment status. However, risks, even though remote, are still present (e.g., an engineer might mention or indicate that he/she experiences pressure from managers to get new products to market before all the necessary technical development is complete). To guard against these potential risks, we will not be gathering participants' names as part of the data collection procedure, all data will be held strictly confidential, and we will only be reporting findings to the sponsoring organizations in summary form only. No specific individual level or team level data or findings will be reported at any point during the study.

The benefits for assuming these minimal risks will come from a more comprehensive understanding of how new business ideas and innovations are born. From a practical standpoint, the research is valuable for managers and scientists responsible for search and discovery, such as those who will be participating in this research. The expected results will show how firms can better explore to develop radical business opportunities and innovations.

#### **5. Confidentiality**

Several steps will be taken to protect the privacy of participants and to maintain the confidentiality of identifiable information. Members of the research team will themselves type the notes collected during the CEO interviews and these notes will be kept in a secure office location at the University of Maryland (not at the research site). Furthermore, data collected during the

interview and in subsequent surveys will only be accessible to and viewed by members of the research team. All survey data will be coded and computerized. After data entry has been completed and within 6 months of collection, all surveys will be shredded. Finally, summary findings to the participating organizations will only be reported in summary form. At no point will any individual or team level identifying information be reported.

## **6. Information and Consent Forms**

All potential CEO participants will initially be sent a letter detailing the study. The letter will be followed with a phone call in which an interview is scheduled and any further questions or concerns are addressed. The semi-structured interview protocol (Appendix C) along with a copy of the informed consent form that will be given to all participants (Appendix A) are attached for review. Prior to the start of the actual interview, the researchers will again explain the study and have the interviewee read and sign the informed consent form. The voluntary nature of their participation and steps to protect participants' confidentiality will be thoroughly explained.

The surveys sent to top managers and knowledge workers in the firm will be accompanied by a copy of the informed consent form as well as a detailed explanation of the study

## **7. Conflict of Interest**

The investigators are unaware of any existing or potential conflicts of interest with respect to the study.

## **8. HIPAA Compliance**

This study is not health related and does not fall under the HIPAA requirements.



## **INFORMED CONSENT FORM**

<b>Identification of Project/ Title</b>	<b>Search, Discovery and Organizational Innovation</b>
<b>Statement of Age of Subject (Please note: Parental consent always needed for minors.)</b>	<i>I state that I am over 18 years of age and wish to participate in a program of research being conducted by Paul Tesluk, Ph.D. and Ken Smith, Ph.D. in the Department of Management and Organization at the University of Maryland, College Park.</i>
<b>Purpose</b>	<i>The purpose of this research is to examine how individuals search for and discovery business opportunities and innovations.</i>
<b>Procedures</b>	<i>The procedure involves completion of a survey that will take approximately 45 minutes to complete. In addition, CEOs will be interviewed for approximately 45 minutes. The purpose of the interviews and surveys is to examine the search processes and characteristics of individuals and how they may explain the type of business opportunities they discover. Typical questions ask you to rate the extent to which you; enjoy finding information to solve problems; are good at finding information to solve complex problems; or devote a large percentage of your time searching for information.</i>
<b>Confidentiality</b>	<i>All information collected in this study is confidential to the extent permitted by law. I understand that the data I provide will only be accessed and viewed by members of the research team. All data will be kept in a secure office location at the University of Maryland until coded and computerized. After data entry has been completed (within 6 months of collection) all surveys will be shredded. Finally, summary findings provided to participating organizations will only be reported in summary form. At no point will any individual or team level identifying information be reported.</i>
<b>Risks</b>	<i>I understand that there is a minimal risk that participation in this study will influence my employment status. While these risks exist, they are extremely small and relate to inadvertent loss of confidentiality. To guard against these potential risks, the researchers will not gather participants' names as part of the data collection procedure, all data will be held strictly confidential, and will be reporting findings to the sponsoring organizations in summary form only. No specific individual level or team level data or findings will be reported at any point during the study.</i>
<b>Benefits, Freedom to Withdraw, &amp; Ability to Ask Questions</b>	<i>The experiment is not designed to help me personally, but to help the investigator learn more about the search and discovery of business opportunities. I am free to ask questions, refuse to answer any questions, and/or withdraw from participation at any time, without penalty.</i>
<b>Contact Information Of Investigators</b>	<i>Paul Tesluk, Ph.D. ptesluk@rhsmith.umd.edu; Telephone: 301-405-4968 4542 Van Munching Hall, University of Maryland, College Park Ken Smith, Ph.D kgsmith@rhsmith.umd.edu; Telephone: 301-405-2250 4530 Van Munching Hall, University of Maryland, College Park</i>
<b>Contact Information of Institutional Review Board</b>	<i>If you have questions about your rights as a research subject or wish to report a research-related injury, please contact: <b>Institutional Review Board Office, University of Maryland, College Park, Maryland, 20742; (e-mail) irb@deans.umd.edu; (telephone) 301-405-4212</b></i>
<b>Please print your name, sign, and date.</b>	<b>NAME OF SUBJECT</b>
	<b>SIGNATURE OF SUBJECT</b>
	<b>DATE</b>

## APPENDIX B

### Letter of Introduction

Dear Mr. CEO:

I am writing to seek your help in a project conducted by the University of Maryland's Robert H. Smith School of Business, Stanford University's School of Engineering, and funded by the National Science Foundation. I firmly believe that the issues under investigation will be of great interest to you.

The study targets a select group of high-technology companies in the Baltimore, Washington, Philadelphia, and Silicon Valley regions and will pose questions about the characteristics of the search and discovery behaviors that executives use to identify new business opportunities. As you know, in today's competitive environment, new business opportunities are the building blocks for future success. By developing a deeper understanding of this process, we hope to help companies like yours improve their adaptability and performance.

All results from the study will be strictly confidential. Only overall results will be published and no company or individual will be able to be identified. The time commitment we request is minimal and, in exchange for your participation, we will provide you with a detailed summary describing your company's position relative to other high-technology companies in our sample. This feedback could potentially be very valuable because it will allow you to benchmark your firm's characteristics and performance against that of similar organizations.

We would like to talk more with you about the aims of the project and to ascertain your interest in participating. Accordingly, one of our team will contact you by telephone in the next few days to set up an interview of approximately 45 minutes. Thank you for your time and we hope to talk to you soon.

Sincerely,

Dax Basdeo  
301-314-9119

Patrick Maggitti  
410-688-1274

Dr. Ken G. Smith  
301-405-2250

Dr. Paul Tesluk  
301-405-4968

## APPENDIX C

### Letter from Dean Howard Frank to CEOs

Dear Mr. CEO,

As you may know, the Robert H. Smith School of Business is one of the world's leading research business schools. A team of researchers here at the Robert H. Smith School of Business has initiated a study to understand the drivers of competitive advantage in high technology industries. The study will investigate the reasons why certain firms are more successful than others in the discovery of new innovations. The core area of investigation is the acquisition of knowledge within top management teams and its impact on new innovation discovery. This could be a wonderful opportunity for you to learn more about the drivers of competitive advantage in your industry and the capabilities of your organization in identifying new opportunities for gaining competitive advantage.

Having been the CEO of several technology organizations, I believe that the types of insights this research can be extremely valuable. Therefore, participating in this research effort may offer you insights into your own firm's competitive advantages and disadvantages. The research will explore key relationships between characteristics of executives problem-solving behavior and new innovation opportunities, as well as questions about how best to leverage these skills so that the *firm* benefits.

With this letter, I am asking you to participate in this study. The researchers are very aware of the constraints on your time and have worked diligently to reduce the effort required from your organization. Data collection techniques are in the form of questionnaires plus a short interview with you. These questionnaires do not take very much time to complete. In exchange for your participation, you will receive detailed summary reports that may allow you to benchmark your firm against others in your industry segment. All data will be ***strictly confidential***, only consolidated results will be published, and no individual company information will be identified.

In the next few days, a member of the research team will contact you by telephone to answer any questions that you might have, and to schedule an appointment for the on-site interview. In the meantime, if you have any questions or concerns, please contact the research team at 301-xxx-xxxx. Finally, thank you for your time and we look forward to working with you here at the Robert H. Smith School of Business.

Best Regards,

Howard Frank  
Dean, Robert H. Smith School of Business  
University of Maryland

APPENDIX D

CEO Interview

**CEO INTERVIEW SCRIPT**

**(TO BE PRINTED OUT BEFORE EACH INTERVIEW)**

**COMPANY:** \_\_\_\_\_

**CODE (3-digits):** \_\_\_\_\_

**INTERVIEWER:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**CEO NAME:** \_\_\_\_\_

**CONTACT:** \_\_\_\_\_

**To Carry to an Interview**

1. CEO interview (1)
2. Three sets of surveys:
  - a. CEO (1)
  - b. TMT (10)
  - c. KW (10)
3. Scenario inserts:
  - a. CEO (1)
  - b. TMT (10)
  - c. KW (10)
4. CEO endorsement letter (1)
5. Informed Consent form (21)
6. Return Envelope – small (21)
7. Packet Envelope with R.H. Smith Labels (21)

## OVERVIEW FOR CEO

Thank you for taking time out of your busy schedule for meeting with me today. I know you are very busy so I will make this as quick as possible – no more than 45 minutes.

As we mentioned in our letter, we are conducting a study to explore the ways in which executives search for information and how their search relates to the new business opportunities they act upon. We believe that, by developing a deeper understanding of this process, we can help executives like you improve your performance by providing you with suggestions to increase both your adaptability and efficiency.

The study really is on the cutting edge of management research. Both the University of Maryland's Robert H. Smith School of Business and the Stanford University are considered top-10 in the world for this type of research. In addition, the project has been selected from among hundreds of applications, for three full years of funding by the National Science Foundation.

We are targeting a select group of high-technology companies in the Baltimore, Washington, Philadelphia, and Silicon Valley regions for participation - your company is one of those. Executives that choose to participate will be provided with a detailed summary describing your company's position relative to other high-technology companies in our sample. This feedback could potentially be very valuable because it will allow you to benchmark your firm's characteristics and performance against that of similar organizations.

On a personal level, I will truly appreciate your participation because it will provide me with data for my doctoral dissertation. Without help from individuals like you, I will be unable to complete my doctoral studies.

The time commitment for participating executives is minimal and *strictly* confidential. In addition to this interview, participation will require:

1. You to fill out a 30 minute survey, anytime within the next week.
2. Members of your top management and some other key members of your firm will also need to fill out a similar survey in the next week.

That's all that is required for participation. Again, in return, you will receive our customized feedback and the knowledge that you are helping several doctoral students finish their studies.

If you agree, we can continue with the interview.

## INTERVIEW QUESTIONS

**WARM-UP:** Can you please describe a typical innovation in your company?

### **1. COMPANY SIZE: (Fill in data before interview if available)**

- a. # of full-time employees in 2004: \_\_\_\_\_
- b. # of full-time employees in 2003: \_\_\_\_\_
- c. # of full-time employees in 2002: \_\_\_\_\_

**2. INNOVATION:** Does your firm innovate mainly: products / services / markets / internal processes?

#### **If Products:**

- a. **Total # of products** developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_.
- b. **# of completely new products** developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_.
- c. **Percentage of ideas/concepts** from old products that are used **in new** products?  
\_\_\_\_\_
- d. Average **cycle time** for each product from beginning to end? \_\_\_\_\_
- e. Average **dollar investment** in each innovation? \_\_\_\_\_
- f. **Dollars spent on R&D:** \_\_\_\_\_ (only ask if not available)
- g. **Spending** to keep employees **up-to-date** on current industry knowledge/technology:  
\_\_\_\_\_ (y/n) ; Estimated spending: \$ \_\_\_\_\_.
- h. **# of personnel assigned** to R&D: \_\_\_\_\_
- i. **# of scientists:** \_\_\_\_\_
- j. **# of patents** in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_

#### **If Services:**

- a. **Total # of services** developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_.
- b. **# of completely new services** developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_.
- c. **Percentage of ideas/concepts** from old service that are **used in new service**?  
\_\_\_\_\_

- d. Average **cycle time** for each new service from beginning to end? \_\_\_\_\_
- e. Average **dollar investment** in each service innovation? \_\_\_\_\_
- f. **Dollars spent** for development of new services: \_\_\_\_\_
- g. **Spending** to keep employees **up-to-date** on current industry knowledge/technology: \_\_\_\_\_(y/n) ; Estimated spending: \$ \_\_\_\_\_.
- h. **# personnel assigned** to new service development: \_\_\_\_\_

If **Markets:**

- a. **Total number** of markets entered/developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_.
- b. # of completely **new** markets entered/developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_.
- c. Percentage of new market that involves extension of existing products and services versus completely new products or services. \_\_\_\_\_
- d. **Dollars spent on new market development:** \_\_\_\_\_
- e. # personnel assigned to development of new markets: \_\_\_\_\_

If **Internal Processes:**

- a. # of completely new processes developed in the last year: \_\_\_\_\_, 3 years: \_\_\_\_\_
- b. Dollars spent on internal process innovations: \_\_\_\_\_
- c. # personnel assigned to development of internal process innovations: \_\_\_\_\_

**3. OPEN-ENDED QUESTIONS ON INNOVATION**

- a. Could you please describe **a recent innovation**?

\_\_\_\_\_

- b. When did this occur?

\_\_\_\_\_

- c. How was the innovation discovered?

\_\_\_\_\_

- d. How long did it take (cycle time from beginning to end)?

\_\_\_\_\_

e. How much did it cost (investment)?

---

f. How many people were assigned to this project?

---

g. Briefly, what was the process? \_\_\_\_\_

---

---

h. Typically, what is the impact of the introduction of your organization's innovations on your firm's market share?

---

---

i. How radical would you consider your firm's innovations to be in comparison to those of your competitors?

---

---

j. Are there any professional associations or research centers with which your organization has contact that have some impact on your organization's innovation activities? \_\_\_\_\_

---

---

**What % of your business falls in each of the following categories?**

	Existing Products/ Services	New Products/ Services
Existing Customers		
New Customers		



**4. PERFORMANCE (OPTIONAL):**

- a. What is **the proper way to evaluate** your firm's performance (your objective), and why?:

---

- b. How does your firm compare to the industry average on this measure?

---

- c. Please provide the most up-to-date figures for the last calendar year; And for the year prior, for the following:

---

## IDENTIFYING OTHER INDIVIDUALS TO BE SURVEYED

We are now done the interview questions and would like to wrap-up by asking you to help us identify the other people in your company that should receive a survey.

First, can you tell me the names of the members of your **top management group**? **Top management group members** consist of those individuals that make or are involved with decisions affecting your company's strategy. At the extreme, the team could include all employees. However, we only want to tap the **very top-level** members, perhaps the top 5 or 6 most important employees.

*FILL INFO IN ON NEXT PAGE*

Next, we would like the names of the individuals in the company that you would consider **key knowledge workers**.

**Key knowledge workers** are those individuals that are not top managers but are typically responsible for innovations that occur within the company. At the extreme, the key knowledge workers could include all employees. However, we only want to tap the **most key knowledge workers**, perhaps the top 5 or 6 most important employees – when it comes to innovation.

*FILL INFO IN ON NEXT PAGE*

Finally, we ask that you sign or initial this letter to the individuals in the company that you just identified. The letter indicates your desire for them to complete the questionnaire in the next seven days. I will include the letter in a special envelope for each participant.

I will return in two weeks for the completed questionnaires. If you don't mind, can you give me the name of a **contact person** (\_\_\_\_\_) who can hold the sealed envelopes containing the completed questionnaires until I return?

### Wrap-Up

Once again, we truly thank you for agreeing to participate in our study. Please do not hesitate to call if you have any questions or concerns.

Before I leave, is there an **area in which I can make photocopies** of your endorsement letter and prepare the survey packets?

## INTERVIEWER CHECKLIST

*During CEO Interview:*

\_\_\_\_\_ Names of TMG members  
\_\_\_\_\_ Names of Knowledge Workers Employees

\_\_\_\_\_ Name of distribution/collection person: \_\_\_\_\_ Phone: \_\_\_\_\_  
 \_\_\_\_\_ CEO Signature on Endorsement memo

***From Administrative Assistant:***

\_\_\_\_\_ How to distribute  
 \_\_\_\_\_ Photocopies of Endorsement Memo

***On-site at work area:***

\_\_\_\_\_ Fill in code #s (below)respond by date, and who to respond to on surveys.  
 \_\_\_\_\_ On surveys: Fill respond by date and who to respond to on surveys.  
 \_\_\_\_\_ Write TMT members names into CEO survey  
 \_\_\_\_\_ Put Endorsement memo, coded survey, and return envelope in each packet  
 (be sure to write respondent name on outside).

<b>COMPANY:</b>			
<b>Circle One</b>	<b>NAME</b>	<b>SURVEY NUMBER</b>	<b>DATE for Survey Return</b>
CEO			
TMG / KW			
TMG / KW			
TMG / KW			
TMG / KW			
TMG / KW			
TMG / KW			
TMG / KW			
TMG / KW			
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TMG / KW			
TMG / KW			
TMG / KW			
TMG / KW			

APPENDIX E

Internal Memo from CEO to Other Employees

MEMORANDUM

To:

From:

Date:

Subject: Completing the Attached Survey

I have decided to participate in a study being conducted by the University of Maryland. I believe that we will benefit from helping to provide the information requested and from being able to obtain the study results which will include other high-technology companies. Our involvement requires the completion of questionnaires by selected members of our management stag, including myself. Completion of the survey will take approximately 45 minutes of your time. Responses will only be available to the research team, and results will not identify any individual or particular company.

I am asking you to complete the survey by \_\_\_\_\_ and return it to \_\_\_\_\_, sealed in the envelope provided. Please be sure to return the survey by this date because the research team will be coming back to pick them up.

Thank you for your help.

XXX

## APPENDIX F

### Complete CEO Survey

#### GENERAL INSTRUCTIONS — CEO SURVEY

This survey is designed to obtain information about top management teams and the search for new opportunities and innovations. We are confident that the results of this study will benefit your organization and will provide important insights into ways of organizing work to support innovation. It is through your participation in studies like this one that we can advance our understanding of how organizations adapt and respond to key opportunities and threats and their environment. We think you will find this survey to be both stimulating and interesting.

This is a strictly confidential survey. ***Under no circumstances will your individual responses be made available to anyone in your organization (or other organizations).*** The surveys will be taken back to the university for data analysis. Information from the survey will be compiled into overall research reports consisting of aggregated results from many companies. The results may be published at a later time in aggregate form only. Please remember, individual responses will ***not*** be a part of these reports and will not be available to anyone except the research team.

We estimate that it will take less than 45 minutes to complete this survey and suggest that you move through the survey quickly—your first response usually will be the most accurate. At the same time, please try to answer the questions as honestly and as candidly as possible. There are no right or wrong responses to the items, so please be as open in responding as possible. Also, you will probably find some redundancy in the questions. This is deliberate and is done for ensuring reliability in our measures. Please respond to all the items even if they seem similar to ones you have already answered; you do not need to go back to the previous items.

In advance, we thank you for your participation in this study. Please complete the survey within the next week, place it in the attached envelope and ***seal***. Return the sealed envelope to \_\_\_\_\_ who is the contact person in your organization. The researchers will be returning to pick up the surveys on \_\_\_\_\_. Alternatively, you may send your survey back to the researchers using the attached preaddressed envelope by the date listed above.

If you have any questions, please contact one of the research directors at the Robert H. Smith School of Business at the University of Maryland at 301-405-0553, or by email:

Dr. Ken G. Smith  
[kgsmith@rhsmith.umd.edu](mailto:kgsmith@rhsmith.umd.edu)

Dr. Paul Tesluk  
[ptesluk@rhsmith.umd.edu](mailto:ptesluk@rhsmith.umd.edu)

Dax Basdeo  
[dbasdeo@rhsmith.umd.edu](mailto:dbasdeo@rhsmith.umd.edu)

Patrick Maggitti  
[pmaggitt@rhsmith.umd.edu](mailto:pmaggitt@rhsmith.umd.edu)

## Personal Search and Information Gathering

**Please read the following scenario in order to answer the questions in this section.**

Assume that your firm has competitive advantages (for example, advantages in know-how, technological expertise, patents, low cost plant and equipment, etc.) over other firms in your industry and that its products/services are in high demand by customers. However, a new competitor has recently entered your industry with a new product/service and a new and different set of competitive advantages. This new competitor will definitely undermine your existing products/services and may even threaten your firm's survival.

Assume that, as the CEO, you have the responsibility (i.e., this is NOT a task that you will delegate to a team) of actively searching and identifying strategic alternatives or opportunities so that your organization can effectively respond to this new challenge. Time is short, however, and so you have decided that you must be able to complete your search to identify strategic alternatives or opportunities very soon.

Managers can choose to search for information in many ways. For example, they can differ with respect to where they search for information (e.g. within their organization, within their industry, outside their industry, etc.), how they search for information (e.g. through interpersonal contact with others, working alone, etc.), and what types of information they seek (e.g. familiar information versus unfamiliar information, information about their firm versus information about the marketplace etc). This section of the survey is designed to further understand how managers may search for information. Please answer the questions in this section, based on the above scenario. An insert containing the above scenario has also been included for your convenience.

**\*\*\*\*\*PLEASE ANSWER ALL QUESTIONS IN PART B BASED ON THE ABOVE SCENARIO\*\*\*\*\***

Given this scenario, for each of the following questions, please **distribute 100 points** to indicate the relative amount of time you would allocate to searching in the areas indicated. Note that **each row must total 100**.

Internal vs. External		
<b>Searching <u>internal</u> information</b> (e.g. information regarding firm resources, employees, etc.)	<b>Searching <u>external</u> information</b> (e.g. information about customers, markets, competitors, etc.)	<b>TOTAL</b>
		<b>=100</b>
Familiar vs. Unfamiliar		
<b>Searching <u>familiar</u> information</b> (e.g. information you have used in the past, revisiting information you once knew, etc.)	<b>Searching <u>unfamiliar</u> information</b> (e.g. information with which you have never been exposed, information that is different from other information you have used in the past, etc.)	<b>TOTAL</b>
		<b>=100</b>

Please indicate the relative amount of time you would allocate to searching for information from sources in each of the following **functional areas**.

Operations/ Engineering	R&D	Marketing / Sales	Finance/ Accounting	HR/Personnel	Administration	Other	<b>TOTAL</b>
							<b>= 100</b>

For all of the following questions, please **circle** the number showing how much you agree with each statement, using the following numbers: **1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree**

**Strongly  
Disagree**      **Strongly  
Agree**

*Search effort relative to other job-related activities that demand your attention:*

<b>When searching for information in response to the above scenario, I would...</b>	1	2	3	4	5
... make looking for new information a top priority for how I would spend my time.	1	2	3	4	5
... devote a large percentage of my time to searching for information.	1	2	3	4	5
... invest a great deal of personal effort into gathering potentially valuable information.	1	2	3	4	5
... go out of my way to find information sources that may have relevant information.	1	2	3	4	5
... let things emerge instead of continuously searching.	1	2	3	4	5

*Level of exhaustiveness in search:*

<b>When searching for information in response to the above scenario, I would...</b>	1	2	3	4	5
... continue searching until I was satisfied that I had identified all relevant information.	1	2	3	4	5
... stop searching as soon as a potential solution was identified.	1	2	3	4	5
... exhaustively search and study every possibility.	1	2	3	4	5
... persist until I found all the information pertaining to this problem.	1	2	3	4	5
... take as much time as needed to identify all available information.	1	2	3	4	5

For all of the following questions, please **circle** the number showing how much you agree with each statement, using the following numbers: **1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree**

**Strongly  
Disagree**      **Strongly  
Agree**

*Iteration in the search process:*

<b>When searching for information in response to the above scenario, I would...</b>	1	2	3	4	5
... revisit information sources several times as my search for information becomes clearer.	1	2	3	4	5
... change the direction of the search process as I learn new things.	1	2	3	4	5
... base each new decision on where to search next on what I just found.	1	2	3	4	5
... adjust my search process as I become more familiar with the available information.	1	2	3	4	5
... change the sources utilized in my search as I learn new things.	1	2	3	4	5

*Formality/structure in the search process:*

<b>When searching for information in response to the above scenario, I would...</b>	1	2	3	4	5
... want to have a clear structure for conducting my search before I start.	1	2	3	4	5
... methodically utilize various interpersonal contacts and written media.	1	2	3	4	5
... be certain to adhere to a strict timeline in terms of what is to be accomplished and by when.	1	2	3	4	5
... follow an organized process of search.	1	2	3	4	5
... approach the search process in a systematic fashion.	1	2	3	4	5

**Information processing:**

When searching for information in response to the above scenario, I would...	1	2	3	4	5
... periodically reflect on what direction my efforts are taking me.	1	2	3	4	5
... spend time tracing relationships between disparate ideas and facts.	1	2	3	4	5
... try to draw parallels between this situation and others that I have solved before.	1	2	3	4	5
... spend time exploring how information could be combined to derive new ideas.	1	2	3	4	5

**Speed of search:**

When searching for information in response to the above scenario, I would...	1	2	3	4	5
... move rapidly from one source of information to another.	1	2	3	4	5
... take my time examining each source of information utilized.	1	2	3	4	5
... quickly assess the relevance of all information examined.	1	2	3	4	5
... try to complete the entire search process as quickly as possible.	1	2	3	4	5

**Typical Activity**

Managers often find opportunities for improving their organization's current situation when they are not actively searching. That is, an idea for improvement can be identified by a manager at various times and places. For example, a manager may identify an opportunity to sell a product in a new market after reading an article on a completely unrelated subject. Similarly, a discussion with an employee may cause a manager to "see" a way to lower costs in another part of the firm. Based on this logic, we believe it is important to understand how managers spend their time and what kinds of opportunities they identify as a result.

Therefore, this section of the survey is designed to gain a better understanding of how top managers spend their time on a daily basis and, more specifically, **who** they spend their time with, **what** they are doing during that time, and **where** they are doing it.

In a typical week, how many hours do you work? \_\_\_\_\_.

How many days per week do you typically work? \_\_\_\_\_.

Do you work on non-work days? Yes / No

If yes, on a typical non-work day, how many hours do you work or think about work? \_\_\_\_\_.

<b>WHERE DO YOU TYPICALLY SPEND YOUR TIME?</b>			
Please <b>distribute 100 points</b> to indicate the relative amount of the time, during your typical workday, that you <b>physically spend</b> in each category listed below. Note that the row <b>must total 100</b> .			
<b>Within your organization</b> (e.g. in your office, in organizational members' offices, in conference rooms, etc.)	<b>Outside your organization but inside your industry group</b> (e.g. at the facilities of customers, suppliers, alliance partners, etc.)	<b>Outside your industry</b> (e.g. at the facilities of governmental contacts, university contacts, investors, etc.)	<b>TOTAL</b>
			<b>= 100</b>



Within the facilities/locations of different functional areas in your organization						
Operations /Engineering	R&D	Marketing /Sales	Finance /Accounting	HR/Personnel	Administration /Legal	<b>TOTAL</b>
						= 100

WHAT DO YOU TYPICALLY SPEND YOUR TIME DOING?				
Please <b>distribute 100 points</b> to indicate the relative amount of time, during your typical workday, you doing or are engaged in each of the following. Note that <b>each row must total 100</b> .				
<b>Working interpersonally with others</b> (e.g. conversations, email, letters, etc)		<b>Working alone</b> (e.g. reading published material, surfing the internet, thinking etc)		<b>TOTAL</b>
				=100
<b>Solving problems</b>		<b>Identifying new opportunities</b>		<b>TOTAL</b>
				=100
<b>Reading</b>	<b>Writing</b>	<b>Studying</b>	<b>Thinking and reflecting</b>	<b>TOTAL</b>
				=100
<b>Thinking about the past</b>	<b>Thinking about your current situation</b>	<b>Thinking about the future</b>	<b>Thinking about ways to combine information from the past, present, and/or future</b>	<b>TOTAL</b>
				= 100

## APPENDIX G: TOP MANAGEMENT ASSESSMENT OF CEO'S ACTIONS

### CEO's Actions to Seize Opportunities

The following questions concern **actions by your CEO to seize opportunities** in order to increase your firm's health and performance. These actions can be intended to improve internal performance (e.g., cutting costs, improving quality, developing new products, etc), external performance (e.g. extending existing products or services into new markets, responding to customer needs with better products or services) or both, (e.g. creating new products or services for new markets).

<b>Our CEO...</b>					
1. ... is continuously getting this organization to take new actions.	1	2	3	4	5
2. ... is very creative in inventing new actions.	1	2	3	4	5
3. ... generally repeats old actions instead of initiating new actions.	1	2	3	4	5
4. ... takes actions that fit the conditions of the problem at hand.	1	2	3	4	5
5. ... takes actions that are often just right given the demands of the situation.	1	2	3	4	5
6. ... takes actions that are rarely appropriate for the circumstances we face at the moment.	1	2	3	4	5

## APPENDIX H

### Search Case Studies

Prior to the main study, four exploratory case studies were used in order to comprehensively investigate the search and discovery process. This multiple case design allows the use of a replication logic, whereby each case is treated as a series of experiments serving to confirm or disconfirm the inferences drawn from the other (Eisenhardt, 1989b). The four cases were split into two groups. Group 1 was comprised of two early-stage companies involved in developing technology-based products, and was selected from a technology incubator in Maryland. Group 2 was comprised of two publicly traded companies in the pharmaceutical industry. The companies were selected on the basis of firm age and size in order to increase the variance between the two groups. Utilizing Yin's (1984) replication strategy, similar levels of size and experience for both firms in each pair acted as a "control" for firm background, which enabled us to focus on search.

Over an eleven month period, there was intensive investigation into the search and discovery processes at these four companies. Data from three main sources in each company were pursued: (1) Interviews with member(s) of the top management team (TMT - e.g. CEO, VP Research); (2) semi-structured interviews with core workers involved in the search and discovery process; and (3) secondary sources. These sources are outlined below, and a complete interview protocol may be found in Appendix G.

Top management interviews. As the initial point of contact, top management team members in a company should be able to provide an overview of the innovation process in their respective organizations. As a first step, preliminary interviews were conducted to

allow the research team to become familiar with the climate in each firm, and to identify specific examples of innovations for further study. For each innovation identified, the TMT member was asked to identify the core workers involved with the innovation, and thus the most relevant people to discuss the process of search and discovery within the organization. These interviews further provided both an overview of specific processes resulting in an innovation, and a guide for structuring interviews with core workers.

Core worker interviews. As the key agents involved in innovation, core workers are the main source for insights into the search and discovery process in each organization. A series of individual meetings were conducted with the core workers identified by the TMT contact in each company. These interviews were semi-structured in nature to facilitate judgments regarding complex process variables (Bartholomew, Henderson & Marcia, 2000). On average, each interview lasted 1 hour.

#### Interview Protocol from Qualitative Study

1. How did this new creative project get started? How long did it take?
2. What was your role in the process? How has it changed? Who else was involved?
3. Could you please walk us through the different steps in the process. What was the first step? When did it occur? After the first step, did you return to the same step again? What other steps followed? How much time on each step?
4. Was there a need to manage time during the project? How did you do it? What criteria/formal rules did you use to decide to stop the process – who said “we are done”? How did you decide it was time to stop, and move on to the next step?
5. If you think about the project, what motivated you in the beginning? How about later? If you had to place you and your team in a continuum from “need to develop cool

- new things/make a difference” (intrinsic) to “translate a new idea into a profitable venture” (extrinsic) where would you fall? Can you think of recent examples/occasions where one of these aspects was especially salient? What motivation was driving this process?
6. What was/is your typical day like when working on this project?
  7. What was the role of brainstorming meetings in this project? Please describe what happens during a typical meeting.
  8. When you think about the different parts of the project, what kind of knowledge turned out to be (not/)useful in each phase? Can you think of specific examples of the types of internal/external information you used? Where did you go to search for information? What were the most frequent sources? What was the most credible source? What was the most efficient search process? How was the knowledge you used different from what other researchers generally used? How/did you process (organize) the knowledge you gathered?
  9. Who did you talk to during the process? Has this changed over time? How did you find these people? What external contacts did you make? How many people (approximately) did you contact? Whose word was the most influential?
  10. You probably encountered several roadblocks during the development – how did you deal with them? (who did you talk to, what more information gathered...) Can you think of specific examples?
  11. Did you ever run into a situation where you could have proceeded using 2-3 different approaches and had to make a choice on how to proceed? How did you make this

- decision (who...)? Can you think of recent examples? Was it possible to proceed down two or three paths at the same time? How did you manage this?
12. If you think about the goals (process) you set or perceived for this project when you first became involved, how have those changed along the way? If you were originally set out to solve a specific problem, did that change?
  13. Did some things surprise you (positively?) during the process? How did these affect the process?
  14. It's notoriously difficult to evaluate and reward R&D workers. What/when were the types of motivators or rewards used in this project? How did you motivate yourself? How did others motivate you? Did they work in your opinion?
  15. If you had to compare this process with your previous R&D project (*pick previous company x, previous project y from CV*), how would you say this project was different? How successful / good was the process in comparison with x? Was the climate for innovation different/similar? How about the technological and market prospects?
  16. If you could restart this project, what would be the things that you would do differently?
  17. What were the main **constraints** that affected you or your team and how did they affect your motivation and your work? What were the main **facilitators**? How did the context or the setting in which you went through this process affect the process and outcome (e.g., the organizational context, industry, financial, the people constraints, etc.)?

18. Can you draw a picture of the steps involved in this process and how you iterated through these steps? How much time with each step? Who was involved when?

Secondary sources and other data. Archival data sources were also used to corroborate the data collected from interviews (Yin, 1984), and included items such as business plans, funding proposals, company annual reports and other published material, as well as news reports and press releases.

Data analysis. Data for each interview was recorded primarily with a tape recorder, but was supplemented with note-taking by the members of the research team. Note-taking serves several purposes. First, it makes the informant feel that the researcher is interested and helps to build rapport. Second, it allows the researcher to record things that the tape recorder will miss, such as visual behavior by the informant and researcher impressions. Third, note-taking provides an excuse for deliberate silences between questions that allow the informant to fully complete thoughts and comments and prevents a tiring barrage of questions that may exhaust the informant. Finally, the interviewer can make “probe notes” concerning issues that should be addressed later in the interview.

In conducting each case study, transcripts of all interviews were prepared from the tape media. These transcripts were sent to the corresponding respondent to allow for checks on the accuracy of the transcription as well as to provide respondents to provide any follow-up comments.

Following each interview, several rules were followed (Eisenhardt, 1989b). First, the “24-hour rule” requires that detailed interview notes and impressions be recorded within one day of the interview. Second, all information collected during the interview was included in the notes, regardless of their apparent importance at the time of the

interview. In addition to the interview transcripts, recording of these details formed the basis for the four case study databases.

For each case study a logic model (Yin, 1998) was developed and used for analysis. This allowed a combination of a pattern-matching approach to the case analysis (where patterns in the observed data are matched with the theoretical model) with a time-series analysis. This approach facilitated the modeling of complex chains of events leading to an innovation. For example, we examined whether the patterns of search behaviors and their outcomes that the informants described in practice, and those drawn from archival records, were consistent with those that would be predicted based on existing theory. Combined with detailed data on the timing and duration of events, this approach allowed for the development of a model that took into account the potential non-linearity in the search and discovery process.



## REFERENCES

- Aguilar, F. J. 1967. *Scanning and the business environment*. New York: Macmillan.
- Ahuja, G. & Katila, R. 2001. Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. *Strategic Management Journal*, 22(3): 197.
- Amabile, T. M. 1996. *Creativity in context*. Boulder, Co: Westview Press, Inc.
- Andrews, K. R. 1987. *The concept of corporate strategy*. New York: McGraw-Hill.
- Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17: 99-120.
- Barrick, J. A. & Spilker, B. C. 2003. The relations between knowledge, search strategy, and performance in unaided and aided information search. *Organizational Behavior and Human Decision Processes*, 90: 1-18.
- Begley, T. & Boyd, D. 1987. Psychological characteristics associated with performance in entrepreneurial firms and smaller businesses. *Journal of Business Venturing*, 2: 79-93.
- Bliese, P. D. & Halverson, R. R. 1998. Group consensus and psychological well-being: A large field study. *Journal of Applied Social Psychology*, 28: 563-580.
- Bliese, P. D. 2000. Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein (Ed.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions*: 349-381. San Francisco: Jossey-Bass.
- Burt, R. 1992. *Structural holes*. Cambridge, MA: Harvard University Press.
- Burt, R. 2000. The network structure of social capital. *Research in Organizational Behavior*, 22: 345-423.
- Carter, E. E. 1971. The behavior theory of the firm and top-level corporate decisions. *Administrative Science Quarterly*: 413-428.
- Chandler, A. D. 1962. *Strategy and structure: Chapters in the history of the american industrial enterprise* (20th ed.). Cambridge, MA: The MIT Press.

- Christensen, P. S., Madsen, O. O., & Peterson, R. 1989. *Opportunity identification: The contribution of entrepreneurship to strategic management*. Denmark: Aarhus University Institute of Management.
- Collins, C. J. & Clark, K. D. 2003. Strategic human resources practices, top management team social networks, and firm performance: The role of human resource practices in creating organizational advantage. *Academy of Management Journal*, 46(6): 740-752.
- Coughlan, P., Harbison, A., Dromgoole, T., & Duff, D. 2001. Continuous improvement through collaborative action learning. *International Journal of Technology Management*, 22(4): 285-302.
- Cyert, R. & March, J. 1963. *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.
- D'Aveni, R. A. 1994. *Hyper competition: Managing the dynamics of strategic maneuvering*. New York: Free Press.
- Dearborn, D. C. & Simon, H. A. 1955. Selective perception: A note on the departmental identifications of executives. *Sociometry*, 21: 140-144.
- Dollinger, M. J. 1984. Environmental boundary spanning and information processing effects on organizational performance. *Academy of Management Journal*, 27(2): 351-368.
- Eckhardt, J. T. & Shane, S. A. 2003. Opportunities and entrepreneurship. *Journal of Management*, 29(3): 333-349.
- Eisenhardt, K. M. 1989a. Making fast strategic decisions in high-velocity environments. *Academy of Management Journal*, 32(543-576).
- Eisenhardt, K. M. 1989b. Building theories from case study research. *Academy of Management Review*, 14: 488-511.
- Eisenhardt, K. M. & Tabrizi, B. N. 1995. Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative Science Quarterly*, 40(1): 84-110.
- Fiske, S. T. & Taylor, S. E. 1991. *Social cognition* (Second ed.). New York: McGraw-Hill, Inc.

Frederickson, J. W. 1984. The comprehensiveness of strategic decision processes: Extensions, observations, future directions. *Academy of Management Journal*, 27: 445-466.

Frederickson, J. W. & Mitchell, T. R. 1984. Strategic decision processes: Comprehensiveness and performance in an industry with an unstable environment. *Academy of Management Journal*, 27: 399-423.

Garg, V. K., Walters, B. A., & Priem, R. L. 2003. Chief executive scanning emphasis, environmental dynamism, and manufacturing performance. *Academy of Management Journal*, 24: 725-744.

Gavetti, G. & Levinthal, D. 2000. Looking forward and looking backward: Cognitive and experiential search. *Administrative Science Quarterly*, 45: 113-137.

Glick, W. H. 1985. Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. *Academy of Management Review*, 10: 601-616.

Greve, H. R. 2003. A behavioral theory of r&d expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal*, 46(6): 685-702.

Grimm, C. M. & Smith, K. G. 1997. *Strategy as action: Industry rivalry and coordination*. Cincinnati, OH: South-Western College Publishing.

Hambrick, D. C. 1981. Specialization of environmental scanning activities among upper level executives. *Journal of Management Studies*, 18(3): 299-320.

Hayek, F. 1945. The use of knowledge in society. *American Economic Review*, 35(4): 519-530.

Hayes-Roth, B. 1977. Evolution of cognitive structures and process. *Psychological Review*, 84: 260-278.

Helfat, C. E. 1994. *Firm-specificity in corporate applied r&d.*, Organization Science: A Journal of the Institute of Management Sciences, Vol. 5: 173: INFORMS: Institute for Operations Research.

Hitt, M. A. & Keats, B. W. 1998. Navigating in the new competitive landscape: Building strategic flexibility and competitive advantage in the 21st century. *Academy of Management Executive*, 12: 22-42.

Hoffman, D. A. & Jones, L. M. 2005. Leadership, collective personality, and performance. *Journal of Applied Psychology*, 90(3): 509-522.

- Huber, G. P. 1991. *Organizational learning: The contributing processes and the literatures.*, Organization Science: A Journal of the Institute of Management Sciences, Vol. 2: 88: INFORMS: Institute for Operations Research.
- James, L. R. 1982. Aggregation bias in estimates of perceptual agreement. *Journal of Applied Psychology*, 67: 219-229.
- Jensen, R. 1982. *Adoption and diffusion of an innovation of uncertain profitability.*, Journal of Economic Theory, Vol. 27: 182.
- Katila, R. 2002. New product search overtime: Past ideas in their prime? *Academy of Management Journal*, 45(5): 995-1010.
- Katila, R. & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, 45(6): 1183-1194.
- Kauffman, S., Lobo, J., & Macready, W. G. 2000. Optimal search on a technology landscape. *Journal of Economic Behavior & Organization*, 43(2): 141-166.
- Khilstrom, R. & Laffont, J. 1979. A general equilibrium entrepreneurial theory of firm formation based on risk aversion. *Journal of Political Economics*, 87(4): 719-748.
- Kimberly, J. R. & Evanisko, M. J. 1981. Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(4): 689-713.
- Kirzner, I. 1973. *Competition and entrepreneurship*. Chicago, IL: University of Chicago Press.
- Kleingartner, A. & Anderson, C. S. 1987. *Human resource management in high technology firms*. Lexington, MA: Lexington Books.
- Kogut, B. & Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3): 383-397.
- Koopman, B. O. 1954. The theory of search and its applications. *Journal of the Operations Research Society of America*, 2(1): 77-77.
- Koopman, B. O. 1979. Search and its optimization. *American Mathematical Monthly*, 86(7): 527-540.

- Koopman, B. O. 1986. An empirical-formula for visual-search. *Operations Research*, 34(3): 377-383.
- Kotter, J. P. 1982. What effective general managers really do. *Harvard Business Review*, 60(6): 156-167.
- Levinthal, D. A. & March, J. 1981. A model of adaptive organizational search. *Journal of Economic Behavior & Organization*, 2: 307-333.
- Lipman, B. & McCall, J. 1976. The economics of job search. A survey. *Economic Inquiry*, 14: 155-187.
- Lippman, S. A. & McCall, J. J. 1976a. The economics of job search: A survey. *Economic Inquiry*, 14(3): 347-350.
- Lippman, S. A. & McCall, J. J. 1976b. *Job search in a dynamic economy.*: Academic Press Inc.
- Lippman, S. A. & McCardle, K. F. 1991. Uncertain search: A model of search among technologies of uncertain values. *Management Science*, 37(11): 1474.
- March, J. & Simon, H. 1958. *Organizations* (Second ed.). Cambridge, MA: Blackwell Publishers.
- March, J. & Levinthal, D. 1993. The myopia of learning. *Strategic Management Journal*, 14: 95-112.
- March, J. G. 1991. *Exploration and exploitation in organizational learning.*, Organization Science: A Journal of the Institute of Management Sciences, Vol. 2: 71: INFORMS: Institute for Operations Research.
- McClelland, D. 1961. *The achieving society*. Princeton, NJ: D. Van Nostrand.
- McNamara, G., Vaaler, P. M., & Devers, C. 2003. Same as it ever was: The search for evidence of increasing competition. *Strategic Management Journal*, 24: 261-278.
- Meyer, R. J. 1997. *The effect of set composition on stopping behavior in a finite search among assortments.*, Marketing Letters, Vol. 8: 131.
- Milkovich, G. T. 1987. Compensation systems in high technology companies. In L. R. Gomez-Mejia (Ed.), *New perspectives on compensation*. Englewood Cliffs, NJ: Prentice-Hall.

- Miller, H. J. 1993. Consumer search and retail analysis. *Journal of Retailing*, 69(2): 160-192.
- Mintzberg, H. 1973. *The nature of managerial work*. New York: Harper & Row.
- Mintzberg, H., Raisinghani, D., & Theoret, A. 1976. Structure of unstructured decision-processes. *Administrative Science Quarterly*, 21(2): 246-275.
- Morgeson, F. P. 2005. The external leadership of self-managing teams: Intervening in the context of novel and disruptive events. *Journal of Applied Psychology*, 90(3): 497-508.
- Nelson, R. R. & Winter, S. G. 1982. *An evolutionary theory of economic change*. Cambridge, MA: The Belknap Press of Harvard University Press.
- Nutt, P. C. 1984. Types of organizational decision-processes. *Administrative Science Quarterly*, 29(3): 414-450.
- Nutt, P. C. 1993. The identification of solution ideas during organizational decision-making. *Management Science*, 39(9): 1071-1085.
- O'Connor, G. C. & Rice, M. P. 2001. Opportunity recognition and breakthrough innovation in large established firms. *California Management Review*, 43(2): 95-116.
- O'Reilly III, C. A. 1982. Variations in decision makers' use of information sources: The impact of quality and accessibility of information. *Academy of Management Journal*, 25(4): 756-771.
- Rangan, S. 2000. The problem of search and deliberation in economic action: When social networks really matter. *Academy of Management Review*, 25(4): 813-833.
- Reinganum, J. F. 1982. Strategic search theory. *International Economic Review*, 23(1): 1-17.
- Rivkin, J. W. & Siggelkow, N. 2003. Balancing search and stability: Interdependencies among elements of organizational design. *Management Science*, 49(3): 290-311.
- Rosenkopf, L. & Almeida, P. 2001. Who's building on whom? Overcoming localization biases through alliances and mobility. Paper presented at the Academy of Management, Washington, DC.
- Rosenkopf, L. & Nerkar, A. 2001. Beyond local search: Boundary spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, 22: 287-306.

- Rosenkopf, L. & Almeida, P. 2003. *Overcoming local search through alliances and mobility.*, Management Science, Vol. 49: 751: INFORMS: Institute for Operations Research.
- Rothaermel, F. T. & Deeds, D. L. 2004. Exploration and exploitation alliances in biotechnology: A system of new product development. *Strategic Management Journal*, 25(3): 201-221.
- Salanova, M. S., Agut, S., & Peiro, J. M. 2005. Linking organizational resources and work engagement to employee performance and customer loyalty: The mediation of service climate. *Journal of Applied Psychology*, 90(6): 1217-1227.
- Schendel, D. 1996. Evolutionary perspectives on strategy. *Strategic Management Journal*, 17: 1-4.
- Scherer, F. M. & Ross, D. 1990. *Industrial market structure and economic performance*. Boston: Houghton-Miller.
- Schumpeter, J. 1934. *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Schwab, D. P. 1980. Construct validity in organizational behavior. In L. L. Cummings (Ed.), *Research in organizational behavior*, Vol. 2: 3-43. Greenwich, Conn.: JAI Press Inc.
- Shane, S. 2000. Prior knowledge, and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4): 448-469.
- Siggelkow, N. & Rivkin, J. W. 2005. Speed and search: Designing organizations for turbulence and complexity. *Organization Science*, 16(2): 101-122.
- Simon, H. 1955. A behavioral model of rational choice. *Quarterly Journal of Economics*, 69: 99-118.
- Smith, K. G., Mitchell, T. R., & Summer, C. E. 1985. Top level management priorities in different stages of the organizational life cycle. *Academy of Management Journal*, 28(4): 799-820.
- Smith, K. G., Grimm, C. M., & Gannon, M. J. 1992. *Dynamics of competitive strategy*. London: Sage Publications.

Smith, K. G. & DiGregorio, D. 2002. Explaining entrepreneurial action. In M. Hitt & D. Ireland & M. Camp & D. Sexton (Eds.), *Strategic entrepreneurship: Creating a new integrated mindset*. Oxford: Blackwell and Strategic Management Society.

Starbuck, W. H. & Milliken, F. J. 1988. Executives' perceptual filters: What they notice and how they make sense. In D. C. Hambrick (Ed.), *The executive effect: Concepts and methods for studying top managers*. Greenwich, CT: JAI Press, Inc.

Stuart, T. E. & Podolny, J. M. 1996. *Local search and the evolution of technological capabilities.*, Strategic Management Journal, Vol. 17: 21.

Thompson. 1967. *Organizations in action*. New York: McGraw Hill.

Tushman, M. L. 1977. Special boundary roles in the innovation process. *Administrative Science Quarterly*, 22: 587-605.

Venkataraman, s. 1997. The distinctive domain of entrepreneurship research: An editor's perspective. In R. Brockhaus (Ed.), *Advances in entrepreneurship, firm emergence, and growth*, Vol. 3: 119-138. Greenwich, CT: JAI Press.

Yin, R. 1984. *Case study research: Design and methods*. Beverly Hills, CA: Sage.