

Top Management Attention to Innovation: The Role of Search Selection and Intensity in New Product Introductions¹

QIANG LI

The University of Maryland
Robert H. Smith School of Business
College Park, MD, 20742
Tel: (301) 795-5019
qli@rhsmith.umd.edu

PATRICK G. MAGGITTI

Villanova University
Villanova School of Business
800 Lancaster Avenue, Villanova, PA, 19085
Tel: (610) 519-6082
patrick.maggitti@villanova.edu

KEN G. SMITH

University of Rhode Island
College of Business Administration
322 Ballentine Hall, Kingston, RI, 02881
Tel: (401) 874-4354
kgsmith@mail.uri.edu

PAUL E. TESLUK

University at Buffalo, State University of New York
School of Management
260 Jacobs Management Center, Buffalo, NY, 14260
Tel: (716) 645-3246
ptesluk@buffalo.edu

RIITTA KATILA

Stanford University
Department of Management Science and Engineering
Stanford, CA, 94305
Tel: (650) 725-1632
rkatila@stanford.edu

¹ The first and second authors contributed equally to this article. This project was supported by the R.H. Smith School of Business at the University of Maryland, Stanford Technology Ventures Program, the Villanova School of Business, and the National Science Foundation (Grant # 0115147).

Top Management Attention to Innovation: The Role of Search Selection and Intensity in New Product Introductions²

ABSTRACT

We develop and test an attention-based theory of search by top management teams and the influence on firm innovativeness. Using an in-depth field study of 61 publicly-traded high-technology firms and their top executives, we find that the location selection and intensity of the search independently and jointly influence new product introductions. We have three important findings. First, in contrast to the portrait of managerial search as local, we find that teams that select locations that contain novel, vivid, and salient information introduce more new products. Next, rather than satisfice, a persistent search intensity increases new product introductions. Finally, the level of search intensity must fit the selected location of search to maximize new product introductions.

² The first and second authors contributed equally to this article. This project was supported by the R.H. Smith School of Business at the University of Maryland, Stanford Technology Ventures Program, the Villanova School of Business, and the National Science Foundation (Grant # 0115147).

New products and services are fundamental to organizational performance and survival (Damanpour, 1991; Smith, Collins & Clark, 2005). New product introductions increase the ability of firms to meet new market demands, and help them establish position in new technological generations. A key logic in the innovation literature is that the pace of new product introductions is a function of the search and identification of new knowledge and information (Maggitti, Smith, & Katila, 2013; March, 1991; Katila & Ahuja, 2002). Top management teams (TMT) serve a critical role in that search process. Indeed, a team that more effectively searches and acquires new knowledge and information is able to make better strategic decisions, innovate, and grow the firm (Cyert & March, 1963; Simon, 1955; Mintzberg, 1973; Katila, Chen & Piezunka, 2012).

Search is the controlled and proactive process of attending to, examining and evaluating new knowledge and information. A significant amount of research exists on how firms arrive at new products organically through search (Collins & Smith, 2006; Katila & Chen, 2008; Smith et al., 2005; Taylor & Greve, 2006). There are several insights. First, distant and unfamiliar search terrains are likely to be beneficial for innovation. That is, firms that search for information further away and unique from what they already know introduce new products at a faster rate (Katila, 2002). Another insight is that organizational search tends to be relatively simple-minded, problem-oriented, and local in nature (Cyert & March, 1963; Ahuja & Katila, 2004). Only when local and simple search efforts fail, will search be expanded and made more complex. Although search routines appear stable, researchers have also argued that search is idiosyncratic across firms (Nelson & Winter, 1982), varying in degree between search that exploits existing knowledge, and explores and identifies new knowledge (March 1991; Gupta, Smith & Shalley, 2006).

Despite long-standing acceptance of search as an important managerial function (Thompson, 1967), little research has examined the characteristics of the search process by executives and rather has focused on asking how organizations search (Ahuja, Lampert, & Tandon, 2008; Maggitti et al., 2013). This approach has limited our understanding of the underlying search process for at least two reasons. First, the search for new information and knowledge is a human capability. Although organizational systems, incentives, and processes can be designed to encourage managers to search, it is the managers and not the organization that is capable of searching. Second, while Gavetti and Levinthal (2000) suggested a cognitive search process, much of the existing empirical literature often ignores such processes (for an exception, see Maggitti et al., 2013). There is an opportunity to broaden the search literature to incorporate important insights from research on cognitive processes. These insights recognize humans as capable of developing strategies to overcome information processing limitations (Fiske & Taylor, 2008), and in general the capacity of humans to be curious and to pay particular attention to distinctively different, salient and novel information rather than old and familiar information (Berlyne, 1954). We address these issues by drawing from the literature on cognitive human attention to develop a theory of managerial search that explains the link between top management team search and subsequent new product introductions.

When managers search, they allocate attention to certain aspects of the environment and ignore others. Attention is a cognitive process that involves the noticing, interpretation, and focusing of time and effort on the acquisition of knowledge and information (James, 1890; Kahneman, 1973). Rather than a singular concept, research on attention has shown it to consist of interconnected processes (Driver, 2001; Ocasio, 2011; Posner & Rothbart, 2007). This view is

synonymous with Kahneman's (1973) theory of attention that included two underlying components: attention selection and attention intensity. As he notes (1973: 3):

There is more to attention than mere selection. In everyday language, the term "attention" also refers to an aspect of amount and intensity. The dictionary tells us that to attend is to apply oneself presumably to some task or activity. Selection is implied, because there are always alternative activities in which one could engage, but any schoolboy knows that applying oneself is a matter of degree.

Following this literature, our theory of search includes two components: *Search selection*, which focuses on the location managers select to direct their attention to during search; and *search intensity*, which emphasizes the cognitive effort and persistence managers use when searching. These two dimensions are relevant because attention can be wasted if much of what is encountered in search is irrelevant or redundant (search selection), or, if relevant knowledge is not recognized, perused, or elaborated upon for innovation (search intensity). We develop our theory and test the role of these two dimensions of TMT search on the level of new product introductions.

Our study is particularly important given that prior research has empirically demonstrated that a firm's top executives play an important role in new product introductions. Indeed, research supports the notion that TMT members gather new information and knowledge that can be used for new product development (Smith et al., 2005; Hitt, Nixon, Hoskisson, & Kochhar, 1999) and innovation (Bantel & Jackson, 1989; Sethi, Smith, & Park, 2001; Taylor & Greve, 2006). In particular, one meta-analysis found that senior managers' opportunity to talk with customers was positively related to new product performance (Szymanski & Henard, 2001). However, this research has not analyzed the process through which TMTs search and pay attention to information at a more granular level.

Our study of the relationship between TMT search and new product introductions makes several contributions by elucidating how variation in TMT search influences the novelty of ideas and information that top executives select and interpret. First, our paper develops and tests a more comprehensive model of search than has been recognized before. Specifically, although prior conceptualizations of search have focused primarily on the terrain (location) from which information is generated (e.g. Gavetti & Levinthal, 2000; Huber, 1991; Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001), cognitive research recognizes that performance is only in part determined by the selected target of attention; it also requires the study of one's attention intensity (Fiske & Taylor, 2008; Kahneman, 1973). Attention intensity captures the extent to which one allocates cognitive capacity to the attention process and is thus related to the amount of effort relative to other activities and the persistence allocated to the attention process (Kahneman, 1973; Ocasio, 2011). Although the importance of such factors has long been recognized in the attention literature, research is minimal (Ocasio, 2011) and these types of search process factors remain unexplored (Katila & Thatchenkery, 2014)³. Thus, in concert with Kahneman (1973), who argued that the intensiveness aspect of attention must be included in any analysis of attention, if we are to understand how individuals cognitively process information, we advance our understanding of the search process by studying the effect of TMT search intensity. This investigation is important since it sheds light on the valuable role of managerial

³There are several reasons why the search processes of TMTs remain unexplored. First, because top executives deal with sensitive information, their search for, and processing of, this information is typically shared only sparingly with outsiders. Second, top executives are difficult to reach and follow, especially over time, which makes their activities difficult to track. In order to overcome these hurdles, upper echelons theory, like much of existing search literature, typically uses distal demographic characteristics to proxy for important group processes enabling researchers to analyze how top executives work and to infer causes of their effectiveness (Hambrick & Mason, 1984; Pfeffer, 1983). Increasingly, researchers have advocated for more detailed fine-grained theories (Pettigrew, 1992; Priem, Lyon, & Dess, 1999; West & Schwenk, 1996) and found that the direct measurement of TMT processes offers more explanatory power over distal and static proxies (e.g. Knight et al., 1999; Pitcher & Smith, 2001; Simsek, Veiga, Lubatkin, & Dino, 2005; Smith, Smith, Olian, Sims, O'Bannon, & Scully, 1994).

attention capacity in detecting, developing, and deploying new products, and helps advance an attention-based theory of such search.

Second, we contribute to the search literature by examining the interactive effect of search selection and search intensity on new product introductions. This approach is consistent with cognitive research that demonstrates that attention consists of interconnected components that may operate jointly to impact outcomes (Kahneman, 1973; Ocasio, 2011; Posner & Rothbard, 2007). Thus, in addition to examining the independent effects of selection and intensity, we theorize and test how TMT search selection and search intensity work together to influence search innovation outcomes. It is possible that the best innovation outcomes require a fit between the selection of certain search terrains and the intensity of attention directed to those terrains given that different terrains may require varying levels of attention to yield innovation. Overall, highlighting how search selection and search intensity work together allows for a more comprehensive understanding of the search processes of top management teams.

Third, our paper advances the new product development literature by explaining and providing evidence of how the TMT search behavior influences the process of new product introductions. Prior studies have identified mechanisms through which the TMT influences new product introductions including the detection of new information and knowledge, development of actual products and services, and the deployment of new products and services in customer markets (Yadav, Prabhu, & Chandy, 2007; Katila et al., 2012). However, how and where top managers search for new information and knowledge during the process of new product development has not been fully articulated or tested. Specifically, we argue that new product introductions are positively influenced by the novel information to which TMTs attend as a result of their unfamiliar, distant, and diverse search selection. We also theorize that new product

introductions will increase when TMTs undertake effortful and persistent searches because the intensity of the TMT's search behavior increases their capacity to process and make sense of information to which they are exposed. We test our theory with data gathered in an intensive field study of TMT search behaviors in 61 public U.S. high technology companies.

MANAGERIAL SEARCH AND NEW PRODUCT INNOVATION

Prior search literature has provided valuable insights on how firms search to find new information and knowledge that can be used in the creation of new products. In general, the more expansive the search terrain in which the search takes place, the greater the likelihood of finding new information and knowledge which leads to new product introductions (e.g. Katila & Ahuja, 2002; Knudsen & Levinthal, 2007). Although important, prior studies of search have relied on distal proxies such as patent citations (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001), international expansion decisions (Vermeulen & Barkema, 2001), or types of acquisitions (Baum, Li, & Usher, 2000) to infer search. By so doing, prior search studies largely anthropomorphize organizations as entities that can undertake search, and risk misattributing organizational actions for intentional managerial decisions and cognitions. Although these studies have offered valuable insights, our theory of search differs because we enlist a micro individual cognitive processing lens to directly examine TMT search selection and intensity.

It is well recognized that the top management of the organization is responsible for the firm's key strategic decisions (Child, 1972; Thompson, 1967). In particular, TMTs are directly involved in strategic decisions regarding innovation (Burgelman, 1991; Noda and Bower, 1996). Although process studies of the impact of TMTs on firm innovation are rare, Yadav and colleagues (2007) developed theory and empirically tested a model highlighting an important role of the TMT in the detection, development, and deployment of new products. Other research

has also connected TMTs to new products and services through their detection (Kotter, 1982; Luthans, Hodgetts, & Rosenkrantz, 1988, Srivastava and Lee, 2005) and direct development (Hitt et al., 1999; Hoffman & Hegarty, 1993). Missing from these studies is a more specific understanding of how TMTs actually search and how their attention shapes new product outcomes.

At the heart of new product development is the emergence of something new or novel (Witt, 2009). The identification of novel information and knowledge is a key input to new product development (Katila, 2002; Maggitti et al., 2013; Tidd & Bodley, 2002). Thus, search that directs attention toward new information and knowledge or enables the discovery of new ways to combine knowledge leads the searcher to develop new behaviors, interactions, strategies and processes that are useful in new product development.

Search Selection

In the search literature, search selection describes “where” managers look for new information and knowledge and thus determines the kind of information available for managers to notice and concentrate (Koput, 1997; Fiske & Taylor, 2008; Sullivan, 2010). Managers’ limited attentional capacity necessitates that they select parts of the terrain upon which to attend (Cyert & March, 1963; Dearborn & Simon, 1958; March & Simon, 1958). Prior research characterizes the searcher’s focus in terms of search that is local versus distant (Helfat, 1994; Martin & Mitchell, 1998; Stuart & Podolny, 1996), narrow versus broad (Katila & Ahuja, 2002), or familiar versus unfamiliar (Rosenkopf & Almeida, 2003). The key insight of this work is that distant and broad search is typically more challenging because it is difficult to focus attention on relevant items, but potentially also more productive. Overall, search selection reflects the

direction of a searcher's focus and is likely to influence the outcomes of search (Daft & Weick, 1984).

In the literature on attention, selective attention describes the process of selecting stimuli to which one will attend in contrast to other stimuli (Lavie, 1995; Ocasio, 2011). Selective attention theory suggests that novel, salient, and vivid information will attract the searchers' focus primarily because such information stands out relative to the immediate context. Thus, because novel, salient, and vivid information departs from expectations and norms (Crocker & McGraw, 1984; Heilman, 1980; McArthur & Post, 1977), it is more likely to enter the searchers' consciousness and affect subsequent actions (Daft & Weick, 1984; Fiske & Taylor, 2008; Kotter, 1982; Sullivan, 2010). Indeed, the ability of novel information to capture attention has been widely identified in the psychology literature as the *distinctiveness principle* (Nelson, 1979), *prominence effects* (Gardner, 1983), *environmental salience effects* (Taylor & Fiske, 1978), and the *novel popout effect* (Johnson, Hawley, Plewe, Elliott, & De Witt, 1990). For example, Dutton, Ashford, O'Neill, and Lawrence (2001) suggested that the more novel a subordinate portrays an issue, the more executives will pay attention to it. Overall, even when it is not as dramatic as other stimuli, novel information will more likely be attended to (Starbuck & Milliken, 1988). As a consequence, then, searching for novel information is beneficial not only because it provides new raw material for product innovation (Katila, 2002) but also because its distinctiveness makes the searchers more attentive to it.

Consistent with selective attention theory and based on prior search terrain literature (e.g. Katila & Ahuja, 2002; Martin & Mitchell, 1998; Rosenkopf & Almeida, 2003), we employ the notions of 'terrain unfamiliarity,' 'terrain distance,' and 'terrain source diversity' to suggest dimensions of search selection. Specifically, unfamiliar (relative to familiar), distant (relative to

local), and diverse (relative to narrow) terrains are more likely to contain novel, salient, and vivid information and thus more likely to capture the searchers' attention. Consequently, such new knowledge is more likely to enable searchers to detect insights and breakthroughs related to product innovation.

In addition to capturing the searchers' attention better, unfamiliar, distant, and diverse terrains are also more likely to yield new information, which helps searchers update their knowledge base and gain insights into the detection, development, and deployment of new products. There are several reasons for this. First, novel information enables TMTs to combine their existing knowledge in new ways. For example, Smith et al. (2005) found the rate of new product and service introduction to be a function of TMTs' and knowledge workers' ability to combine and exchange knowledge. Second, novel information enables TMTs to develop new ideas about how to allocate resources better, and how to coordinate and lead innovation efforts. Third, updates of both issues and answers not only bring novel information to the fore but also allow managers to discard obsolete knowledge (Hambrick, 1982). Updating is particularly important during deployment of new products since substituting obsolete knowledge with novel knowledge can help reduce the possibility that firms become trapped into behavior based on competencies they developed and used in the past - so-called competency traps (Levinthal & March, 1993; Levitt & March, 1988). TMTs not attending to novel information may be unaware of disconfirming evidence that indicates they need to take corrective or alternative actions based on market feedback. Taken together, opportunities to discover novel, salient, and vivid information and knowledge through unfamiliar, distant, and diverse search selection are important because searchers are more likely to pay attention to such information, use it to

discover new combinations, and to help replace obsolete knowledge in order to develop new products. We propose:

Hypothesis 1. (a) Unfamiliar, (b) distant, and (c) diverse TMT search selection will be positively related to the number of new product introductions.

Search Intensity

In hypothesis 1 we proposed that TMT search selection would influence the number of new products introduced by the firm. Although search location is an important dimension characterizing attention selection, attention is well known to consist of more than a selection mechanism (Driver, 2001; Kahneman, 1973; Posner & Rothbart, 2007). Attention intensity (Kahneman, 1973), and related concepts such as engagement (Ocasio, 2011) and mindfulness (Weick & Sutcliffe, 2006) are also critical factors that determine the extent to which one allocates cognitive capacity to attention processes by exerting effort relative to other tasks and by persisting in the attention process over time (Kahneman, 1973; Ocasio, 2011). Thus, attention intensity is characterized by the level of effort and persistence exerted in the attention process and represents the level of cognitive capacity deployed to notice, interpret, and make sense of information and knowledge (Kahneman, 1973; Weick, 1995). Effortful and persistent attention will lead to relatively higher levels of cognitive capacity devoted to these cognitive processes. Accordingly, we refer to search intensity as the level of effort and persistence used in search.

Research finds that search intensity has an important influence on firm outcomes. For example, Dollinger (1984) found that intensity in information gathering by managers improves firm performance. Similarly, Cohen (1995) and Greve (2003) found that R&D intensity, a proxy for firm search intensity, has a positive relationship with firm innovation. Rerup (2009) further identified that sustained effort helps organizations identify weak cues (such as signs of danger)

and by doing so avoid unexpected crises. The importance of effort and persistence for managers' search behaviors can also be found in the literature. For example, effort is examined in studies of strategic decision-making effectiveness (Dean & Sharfman, 1996) and opportunity recognition (Gregoire, Barr, & Shepherd, 2010). Schwenk (1984) argued that if managers stop gathering information after they find a satisfactory alternative, in other words failing to be persistent, they may be ignorant of better alternatives and miss the chance to compare alternatives in a more rigorous manner. Less persistent top-level searchers will over-invest in a sub-optimal outcome resulting in competency traps (Levitt & March, 1988). In this regard, Nutt (1993) found that information gathering that stops after only one round is accompanied with lower rates of idea adoption.

We define search effort as the investment in search activities relative to other tasks and search persistence as the intensity of search with respect to the duration of search. Searches high in effort and persistence provide increased cognitive processing capacity. Specifically, in the context of developing new products, increases in search effort and persistence provide searchers with an increased capacity to notice, interpret, and make sense of information and knowledge in several ways that foster the detection, development, and deployment of new products. First, by exerting effort and persistence in a given terrain, searchers increase their capacity to notice and compare different sources of information and knowledge that are potential building blocks of new products (Bantel & Jackson, 1989; Hambrick & Mason, 1984; Smith et al., 2005). Though selective attention is largely concerned with the characteristics of stimuli that cause them to be noticed in contrast to others, we argue that attention intensity (search effort and persistence) increases the amount of information to which a searcher is exposed and increases the likelihood they will be able to notice, pick, and choose valuable knowledge needed for product

development. In other words, effortful and persistent searches enable more alternatives to be considered.

Second, effortful and persistent searches provide TMTs with additional capacity to interpret elements of the terrain along with their own knowledge thereby allowing them to categorize and re-categorize the new information and knowledge and make inferential connections between different bits of information, combine new information and knowledge in different ways and reach a deeper understanding of the information's usefulness. Cognitive theories of creativity suggest that searchers' interpretations of new information substantially determine creative outcomes (Shalley & Zhou, 2008). In their theory of cognitive creativity, for instance, Finke et al. (1992) suggested that cognitive processes including searching retrieved combinations for novel attributes, metaphorical implications, and the evaluation of combinations from different perspectives all lead to new and novel outcomes. Thus, as mentioned above, noticing new knowledge leads to increased innovation, however, the interpretation of knowledge and information in new ways that lead to new combinations – what is often described as creative insight – is no less valuable for the discovery of new information and knowledge useful in the development of new products.

Third, additional attentional intensity engendered by an effortful and persistent process can also increase the capability of TMTs to comprehend and make sense of their situation and environment, which may be especially important in the deployment of new products. Sensemaking is a cognitive process in which meaning is ascribed to knowledge and information (Weick, 1995). TMTs that have attentional capacity to adapt their cognitive representations are more likely to make accurate attributions about the value and meaning of dynamic and changing information and knowledge in the environment (Griffith, 1999). In this regard, increased

attentional capacity is directly beneficial to new product deployment because it improves TMTs' ability to understand customer feedback or disconfirming evidence that may warrant further investigation of product attributes and the potential need to take corrective actions.

Taken together, effortful and persistent search processes enable managers to better use their attentional capacity to notice, interpret, and make sense of information and knowledge and thus better equip TMTs to consider multiple alternative sources of knowledge, make new connections and recombinations, and detect market trends, competitive actions, new technologies, and other factors that are valuable to firm innovation. Thus, we predict that search effort and persistence will benefit new product introduction:

Hypothesis 2. (a) Effortful and (b) persistent TMT search intensity will be positively related to the number of new product introductions.

Joint Effects of Search Selection and Search Intensity

As argued above, we expect that search selection and search intensity will each independently influence new product introductions. However, it is also possible that search intensity moderates the relationship between search selection and new product introductions (see Figure 1 for our hypothesized model).

 Insert Figure 1 about here

As noted, attention theory suggests that attention intensity impacts outcomes by allocating more attentional capacity to notice, interpret, and make sense of information and knowledge (Fiske & Taylor, 2008; Taylor & Fiske, 1978). Drawing on cognitive psychology findings on search and attention allocation (e.g., Schneider & Shiffrin, 1977), more effortful and persistent search may also attenuate the burden of information overload on top managers by allocating more and better utilizing an individual's attentional capacity especially when top

managers need to interpret novel information generated in unfamiliar, distant, and diverse terrains.

Prior research has shown that attention intensity can have an enabling or a constraining effect by influencing an individual's information processing capacity and how that capacity is leveraged (Alexander, 1979; Dearborn & Simon, 1958; Mintzberg, Raisinghani, & Theoret, 1976). The notion of bounded rationality or limited information processing capacity is widely accepted and frequently serves as a basic premise in the decision making literature as it relates to individual information processing capacity and the behavioral theory of the firm (Argote, 1999; Cyert & March, 1963; March & Simon, 1958). However, this widely accepted literature remains largely disconnected from cognitive research on attention processes (Yadav et al., 2007). We suggest that attention intensity may be an important potential moderator of the influence that novel information and knowledge attended to from search selection has on new product introductions. In other words, relative to those that are familiar, local, and homogenous, searches that are unfamiliar, distant, and diverse directly contribute to increases in new products, as we suggested, because they are more likely to generate novel, salient, and vivid information which provides TMTs increased potential for making new combinations of information and knowledge useful for detecting, developing, and deploying new products. Realization of the extra benefit of novel information, however, may largely depend on a more intense search process of executives. In his classic book, titled *Attention and Effort*, Kahneman noted:

How hard we work, when we do, seems to depend primarily on the nature of the activity in which we choose to engage. The tentative conclusion, then, is that the performance of any activity is associated with the allocation of a certain amount of effort. This standard allocation does not yield errorless performance. Allocating less effort than the standard probably will cause a deterioration of performance. (1973; 15)

Kahneman described effort as excess capacity in the process of completing a task such as search and used the term interchangeably with intensity.

Research on creative cognition also suggests that attentional intensity may moderate the attention selection/outcome relationship. Specifically, Finke, Ward, and Smith (1992) suggest that the process of generating new knowledge and information from selection is interrelated to the processes used to interpret that knowledge and information. In other words, the two search components may interact in a dynamic and simultaneous manner. Indeed, failure to identify new information and knowledge in one location may prompt simultaneous effort to continue searching.

Therefore, if TMTs undertake unfamiliar, distant, and diverse search with low attentional intensity they will still have an increased probability of detecting, developing, and deploying new products, but they may not fully realize the relevant potential of this novel information and knowledge to the same extent as if they exerted more effort and persistence. That is, searches characterized as more effortful and persistent partially offset the information processing limitations and capacity of managers allowing them to more fully notice, interpret, and make sense of new knowledge and potential opportunities identified in unfamiliar, distant, and diverse locales. Thus, a highly effortful and persistent search process helps managers better understand and interpret novel information garnered through unfamiliar, distant, and diverse search to a maximum degree and can increase the likelihood that these top managers will both find new information and knowledge and use this information in detecting, developing, and deploying new products. Based on the above arguments, we predict:

Hypothesis 3a. Effortful TMT search intensity will enhance the positive relationship between unfamiliar TMT search selection and the number of new product introductions.

Hypothesis 3b. Effortful TMT search intensity will enhance the positive relationship between distant TMT search selection and the number of new product introductions.

Hypothesis 3c. Effortful TMT search intensity will enhance the positive relationship between diverse TMT search selection and the number of new product introductions.

Hypothesis 3d. Persistent TMT search intensity will enhance the positive relationship between unfamiliar TMT search selection and the number of new product introductions.

Hypothesis 3e. Persistent TMT search intensity will enhance the positive relationship between distant TMT search selection and the number of new product introductions.

Hypothesis 3f. Persistent TMT search intensity will enhance the positive relationship between diverse TMT search selection and the number of new product introductions.

METHOD

Sample

We utilized multiple approaches to collect data including CEO interviews, in-depth field study, and archival analysis. The sample for our study was TMTs in 61 public, high-technology companies located in the mid-Atlantic region of the U.S. We used two main criteria for selecting firms. First, due to the need to conduct interviews with company CEOs, firms' headquarters needed to be located within a three-hour drive from our location. Second, in order to have a focused sample of companies which face a dynamic environment in which managerial search is important (Weiss & Heide, 1993), we specifically selected high-technology companies, defined as "firms that emphasize invention and innovation in their business strategy, deploy a significant percentage of their financial resources to R&D, employ a relatively high percentage of scientists and engineers in their workforce, and compete in worldwide, short-life-cycle product markets" (Milkovich, 1987: 80). This high-technology industry sample provides a good context to study managerial search and innovation.

An initial set of 358 public companies was identified using Hoover's online service and 3-digit SIC codes for high technology industries including biotechnology, semiconductor,

computer software, Internet, and electronics as shown in Acs, Anselin, and Varga (2002). After disqualifying 31 firms for various reasons, (e.g. no longer in operation, headquarters located outside the region, etc.), we sent a letter to the CEO of 327 companies to explain the purpose of the study and requested an interview. Ninety-two CEOs agreed to be interviewed, a participation rate of 28.1%.

During the interview, the CEO was asked to identify members of the TMT with the most responsibility for and involvement with strategic decisions and information processing related to new products. The CEO was then asked to support the study by signing a letter of endorsement and granting permission to include this letter in a survey packet delivered to each of these top managers. Finally, the CEO was asked to fill out one of the surveys. Of the 92 companies that participated in the interviews, at least one TMT survey and the CEO survey were returned for a final sample size of 61 (66% participation). The 61 completed firms were not significantly different from the 31 incomplete firms in terms of number of employees, net sales, total assets, or TMT size.

A number of important steps were taken to develop the TMT survey instrument used to capture search selection and search intensity. Because of the limited prior research on the micro dimensions of search in organizational settings, we first conducted four case studies of high technology companies that were not part of the final study. The goal of this research was to identify and understand how and where executives search for new information and knowledge. In each of these four companies, the CEO and other key top executives and knowledge workers were interviewed to discuss the content and process of search and innovation in their companies. Common themes and patterns of search were extracted from interviews to identify the underlying dimensions of search and the various search behaviors exhibited within these companies. These

case studies were conducted over eleven months, and involved regular meetings of the research team in which active discussion of the results in comparison to the search literature led to the specification of the selection (for example, we learned that TMTs often search for information outside of their industry) and intensity dimensions of search (we learned that search processes often involve an effortful and persistent process of updating information and knowledge).

Second, we conducted an extensive review of various literatures to identify additional characteristics of information gathering behaviors that had a parallel in a search context, such as decision making, information processing, boundary spanning, etc. This review further helped to refine and distinguish the search constructs identified in the case study phase. Together, the literature review and case studies led to the development of the search selection and search intensity constructs and measures.

The case studies and the literature review also suggested that where and how executives search is largely a function of a specific stimulus or problem. Thus, it became apparent that a hypothetical scenario would be necessary to assess search selection and intensity by providing a standardized point of comparison across respondents. This approach would be preferred to asking respondents to reflect on past search because a retroactive method would likely introduce variance based on inter-firm and inter-personal differences in the search stimuli, organizational routines and contexts. The scenario (see Appendix A) was designed to be general but representative of a situation that TMTs would actually face and conveyed a sense of urgency, while not specifying a desired timeframe. Before the formal research, we conducted two pretests on the scenario and search survey. First, three doctoral students highly trained in research methodology and each with significant managerial experience were asked to go through the search instrument and ‘think aloud’ as they responded to the questions (Forsyth & Lessler,

1991). This procedure allowed the researchers to assess the understandability of the search questions, the amount of effort required by respondents to interpret the questions, and any confusion that could potentially arise with the items (Jarvenpaa, 1989). After revisions, the search instrument was given to three MBA students with managerial experience and four CEOs (not participating in the final sample) to complete. Comments and responses from these subjects allowed for further refinement of the search instrument. To validate the scenario we asked a number of questions pertaining to the scenario's realism and importance to managers. Specifically, 5-point Likert scaled questions (see Appendix A) were included in the survey to assess if respondents found the scenario to be realistic ($\alpha = 0.84$). The mean response per respondent was 4.03 out of five (median = 4.2), indicating that executives indeed found the scenario to be realistic and important.

Finally, we collected publicly available archival data on each company. Since all identified firms were public firms, financial data were available and obtained from *COMPUSTAT*. In addition to firm characteristics, we conducted a separate content analysis of archival news data to collect new product/service innovation data for the firms in years 2005-2008.

The use of three methods (the CEO interview, the TMT survey, and archival data collection) contributes to the strength of our study, allowing use of the most appropriate means for measuring study variables, overcoming common methods biases, and validating our data. The CEO interview enabled us to identify and contact the appropriate TMT members and collect background company data. The search survey enabled us to obtain primary data on the search behaviors of TMTs in terms of search selection and search intensity. Content analysis of archival articles allowed us to capture the number of new product introductions in years 2005-2008.

Dependent Variable: New products

Consistent with prior research (Smith et al., 2005; Katila, 2002), we adopted new product introductions as our dependent variable. Specifically, we measured new product introductions in two different time frames: the total number of new product introductions for each firm in 2006, the year following our collection of the independent variables, and the average number of new product introductions for each firm in 2006-2008, that is, one to three years after the actual search data were collected respectively. In a meta-analysis of innovation studies, Damanpour (1991) found that these types of counts provide a robust measure of innovation over a wide range of research settings. To collect data on the dependent variable, we conducted a content analysis of articles in the public press (e.g. Miller & Chen, 1994; Smith, Grimm, Gannon, & Chen, 1991). Specifically, we searched for relevant articles by using the combination of keywords (e.g., new product, new service, introduce, announce, launch, offer, debut, roll out, unveil, etc.) and the name of the firms in our sample using the *Lexis-Nexis* database to identify the relevant new product activities for each firm. We carefully read each article to eliminate duplicates. Per Derfus et al. (2008), a second author of this paper independently coded data for 10% of the firms in the sample and had 97.21% inter-rater reliability suggesting accuracy of the coding. Thus, the measure of number of new products is derived from objective public information sources. We collected new product data for the year 2005 the same way. To further provide evidence that new products are a valid measure of innovation, we examined its relationship to other measures of firm R&D and innovation processes available to us. We found that the number of product introductions in 2006 was positively and significantly correlated with the number of product introductions in 2005 ($r = 0.38$; $p < 0.01$), the number of scientists ($r = .34$; $p < .05$), and the number of R&D personnel ($r = .32$; $p < .05$) in each sample firm.

Independent Variables: Search Selection and Search Intensity

As noted above, we define search as the controlled and proactive process of attending to, examining, and evaluating new knowledge and information. Search selection refers to the location “where” managerial search takes place. We developed, measured, and examined three dimensions of search selection (terrain unfamiliarity, distance, and diversity), and two dimensions of search intensity (search effort and persistence). We measured search selection variables by using point allocation tables. This method eliminates the chances of respondents simply checking off a list of information sources and offers them an opportunity to compare the relative importance of various information sources, given the scenario (Choudhury & Sampler, 1997; Smith, Mitchell, & Summer, 1985).

Terrain unfamiliarity. Terrain unfamiliarity refers to the extent to which search by members of a TMT focus on unfamiliar information. Respondents were asked to indicate the extent to which they search unfamiliar information (information to which they have never been exposed, information that is different from other information which has been used in the past) as opposed to familiar information (information that had been used in the past, or revisiting information that was once known) by assigning 100 points across both of these categories. The extent of the team’s terrain unfamiliarity was calculated as the average of the point allocation to unfamiliar information for all TMT members. To validate terrain unfamiliarity, we used one scaled questionnaire item (not used in the analysis) in which each team member was required to rate “when searching for information, I would concentrate on obtaining/utilizing information with which I am already familiar” (reverse coded). We found that this item and our measure were significantly correlated ($r = -.32; p < 0.05$) providing evidence of convergent validity.

Terrain distance. Terrain distance refers to the extent to which search by members of the TMT focus on information outside the organization when searching. Respondents allocated a total of 100 points across three different types of information sources: inside (within organization), intra-industry, and outside industry. We then calculated terrain distance as the average number of points allocated by the members of the TMT to intra-industry and outside industry information sources. Higher values of this variable indicate more distant information sources utilized by the TMT. The calculation method is the same as the one used in calculating terrain unfamiliarity. We validated this variable by finding it significantly correlated ($r = .31; p < 0.01$) with a scaled questionnaire item (not used in the analysis) asking each team member to rate “when searching for information, I would concentrate on information outside my own organization.”

Terrain source diversity. Terrain source diversity refers to the range of sources utilized by the TMT to acquire information. This measure is adopted from prior research (e.g. Beal, 2000; Daft, Sormunen, & Parks, 1988) and is broken down into twelve categories as follows: TMT members, managers not part of the TMT, non-managers, consultants, suppliers, customers, alliance partners, competitors, government, university, investors, and other sources outside the

industry. Terrain source diversity is calculated using the following formula: $1 - \sum_b \left(\sum_n S_{bn} / n \right)^2$,

where S_{bn} is the share or proportion of search conducted in the b th information source category by the n th member; n is the number of TMT members. A higher value indicates greater diversity in the information sources utilized across members of the TMT. We validated this variable by finding it significantly correlated ($r = .21; p < 0.05$) with a measure of TMT functional diversity, measured as the range of functional areas from which the TMT members have experience and

information, such as marketing, finance, R&D, etc. We found this measure to be correlated to our measure of terrain source diversity.

Search effort. The two search intensity variables (i.e., effort and persistence) were measured using 5-point multi-item Likert scales based on the scenario ranging from 1, “strongly disagree” to 5, “strongly agree.” Search effort is the extent to which the members of a TMT devote time and energy to search versus other activities. Search effort is based on a 4-item scale ($\alpha = 0.81$). Items included “I would invest a great deal of personal effort into gathering potentially valuable information,” “I would devote a large percentage of my time to searching for information,” “when searching for information, I would make looking for new information a top priority for how I would spend my time,” and “I would go out of my way to find information sources that may have relevant information.” Higher values of search effort reflect more effortful search.

Search persistence. Search persistence is defined as the extent to which, on average, members of a TMT continue to gather information despite the number of alternatives that have been found, in order to be exhaustive in determining the optimal outcome. A 4-item scale ($\alpha = 0.75$) was used, with higher values reflecting greater TMT search persistence. Items included “when searching for information, I would continue searching until I was satisfied that I had identified all relevant information,” “persist until I found all the information pertaining to this problem,” “take as much time as needed to identify all available information,” and “I would exhaustively search and study every possibility.”

We conducted a confirmatory factor analysis (CFA) with the two search intensity constructs (search effort and search persistence). The CFA results (CFI = .90, RMSEA = .06, SRMR = .08) indicate that the measurement model fits the data reasonably well, therefore

confirming the unidimensionality of each search process construct in the model (Gerbing & Anderson, 1988; Hu & Bentler, 1999). All the standardized factor loadings in the model were above the commonly accepted value of .40 and significantly loaded on their respective factors. Two search intensity variables distinctly emerged providing convergent validity confirmation for the search intensity factors (Anderson, 1987; Bagozzi & Phillips, 1982). Discriminant validity can be confirmed when pairwise construct correlations are significantly different from 1 (Gerbing & Anderson, 1988). Table 1 shows that the construct measures met this requirement. We also adopted a more stringent criterion of discriminant validity requiring the average variance extracted for each construct to be greater than the squared correlation between a pair of constructs (Fornell & Larcker, 1981). The average variance extracted for search effort (.58) and search persistence (.53) are above the cutoff suggested by Fornell & Larcker (1981) and bigger than the squared correlation (.21), indicating good discriminant validity. Search effort ($\alpha = 0.81$) and search persistence ($\alpha = 0.75$) have high reliability, indicating a high internal consistency. The composite reliability of search effort (.85) and search persistence (.81) are above the cutoff suggested by Bagozzi and Yi (1988) and provided further evidence of internal consistency.

Because items were assessed at the individual level, we aggregated these variables to the team level by calculating the average value of each variable. To evaluate appropriate aggregation (George & James, 1993), we employed both within-group agreement (r_{wg}) to assess consistency among members of a group (James, Demaree, & Wolf, 1993) and the intraclass correlation coefficient (ICC), which represents the degree to which variance in individual responses is a function of organization membership (Shrout & Fleiss, 1979). In all cases, aggregation appeared justifiable given r_{wg} above .70 indicating agreement, ICC (1) values 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), and ICC (2) values above .50 providing evidence that the group means are reliable and that group-level relationships will be detected (Bliese, 2000).

Control Variables

Team size. Top management team size has been argued to “parsimoniously represent a team’s structural and compositional context” (Amason & Sapienza, 1997: 32). Larger teams have been argued to contain greater diversity of opinions and interests therefore promoting innovation, but also to have more problems with conflict and information exchange. We measured team size as the number of executives in the team, provided by the CEO during the interview.

Team heterogeneity. Because top management team heterogeneity may bring more creativity to problem solving and product development, even though the results of prior work have been mixed (Ancona & Caldwell, 1992: 321; Bantel & Jackson, 1989), we controlled for functional diversity in the team. We measured functional heterogeneity using Blau’s (1977) heterogeneity index: $1 - \sum_t f_t^2$, where f is the proportion of top managers in the f th functional category and t is the number of functions. Functional data were collected from the CEO and include operations/engineering, R&D, marketing/sales, finance/accounting, HR/personnel, administrative/legal, and other functions.

Firm size. We included firm size as a control because numerous studies have found a relationship between organizational size and innovation (e.g. Bantel & Jackson, 1989; Damanpour, 1991; Kimberly & Evanisko, 1981). We measured firm size as the logged value of the number of employees as reported by the CEO during the interview.

R&D intensity. Because prior studies often utilize R&D intensity as a proxy for a firm’s search activities and inputs into innovation efforts (e.g. Greve, 2003; Katila, 2002; Katila & Ahuja, 2002), we control for it. We measured R&D intensity by the ratio of a firm’s R&D

expense to its sales. R&D expense and sales data were collected through *COMPUSTAT*. Missing R&D expense data for 18 firms were obtained from the CEO interviews. Data from the CEO interviews were positively and significantly correlated with the data from *COMPUSTAT* ($r = 0.84, p < 0.001$).

Slack. Previous literature suggests that organizational slack is an important predictor of innovation (Cyert & March, 1963; Thompson, 1967) because firms with more slack have more financial resources, employees, and possibly more advanced technologies. Following prior research (Bromiley, 1991; Chen, 2008; Greve, 2003; Iyer & Miller, 2008), we used the equity/debt ratio divided by 1000 to measure organizational slack. Higher values of the ratio indicate higher levels of slack. The data were collected from *COMPUSTAT*.

Analysis

We used negative binomial regression analyses to test our hypotheses because our count-based dependent variable (sum of new product introductions) was not normally distributed, violating a key assumption of generalized least squares (GLS) regression analysis and over-dispersed, meaning the variance of the counts exceeds their means (Derfus et al., 2008). A likelihood-ratio test of over-dispersion also indicated that negative binomial regression was an appropriate choice. Negative binomial regression overcomes distribution problems and estimates an additional parameter that corrects for over-dispersion (Frome, Kutner, & Beauchamp, 1973). We first entered the control variables to assess the baseline model and then included the main predictor variables followed by the interaction terms. We mean-centered the independent variables before creating the interaction terms.

RESULTS

Table 1 shows the descriptive statistics and correlations for all variables. The correlations among the independent variables are relatively low. We also tested for multicollinearity but found that it did not pose a threat to the results that we report.

 Insert Table 1 about here

Table 2 shows the regression results used to test the hypotheses. We used new product introductions in 2006 as the dependent variable in Models 1-3 to test our hypotheses, one full year after the collection of the search data. Model 1 includes the control variables and is used as a baseline model. Models 4-6 are similar but the dependent variable is averaged over three years (2006-2008).

 Insert Table 2 about here

In H1, we argue that unfamiliar (H1a), distant (H1b), and diverse (H1c) search selection result in more new product introductions. To test H1, we examine the coefficients of search selection in Model 2. We find all three coefficients of search selection are positive, and terrain unfamiliarity (H1a) is significant ($\beta = .03$; $p < .05$), terrain distance (H1b) is moderately significant ($\beta = .04$; $p < .10$); and terrain source diversity (H1c) is significant ($\beta = 23.46$; $p < .01$). Together, these results confirm that unfamiliar, distant, and diverse search selection lead to more new product introductions. Similarly, we test H2 by examining the coefficients of search intensity in Model 2 and find that search persistence (H2b) is positive and significant ($\beta = .64$; $p < .05$) while search effort (H2a) is negative and significant ($\beta = -2.82$; $p < .001$). These results show that search persistence can result in more new product introduction while search effort decreases the number of new product introductions.

In Hypothesis 3, we predicted that search intensity positively moderates the relationship between search selection and new product introductions. In order to test H3a through H3f, we included the interaction of each selection variable and each intensity variable in Model 3 of Table 2 and found significant results for three of the six interactions: terrain distance and search effort ($\beta = -.23$; $p < .01$); terrain source diversity and search effort ($\beta = 144.34$; $p < .001$); terrain source diversity and search persistence ($\beta = -76.78$; $p < .01$). All three of these interactions are plotted and shown in Figures 2, 3, and 4. In summary, the plots run contrary to our expectations in H3b, H3c, and H3f and we did not have significant findings for H3a, H3d, and H3e. We return to these interesting results in the discussion section.

Insert Figures 2 through 4 about here

We conducted several additional analyses to check the robustness of our results. First, as shown in Models 4-6 of Table 2, the results are similar when we use the average yearly new product introductions from 2006 to 2008 as our dependent variable, except that the interaction of terrain source diversity and search persistence becomes insignificant. Second, since new product introductions may be influenced by unobserved firm heterogeneity we adopted a pre-sample approach (Blundell, Griffith, & Van Reenen, 1995). In the pre-sample approach, unobserved heterogeneity is modeled as an additional covariate in the model. This covariate is constructed of the dependent variable values in the periods immediately preceding the study period. We used the mean of new product introductions in years 2003 and 2004 to construct a pre-sample variable, and the results were consistent with those reported earlier. In addition, we controlled for unobserved heterogeneity by adding the lagged values of the dependent variable, in our case new product introductions in 2005, as a control (Heckman & Borjas, 1980; Helfat, 1994). The results

of these regressions again were similar to our original findings, that is, the significant main effects and three significant interaction effects of interest remain significant. Next, since patent data are frequently used to proxy for firm search (e.g., Katila & Ahuja, 2002) and thus can serve as an instrument to capture unobserved heterogeneity affecting firm innovations, we replaced the lagged values of the dependent variables with each firm's patents in 2005. Again, these results were broadly similar to those that we originally reported. Third, we ran all original regressions using Poisson models and found virtually identical results. We also ran Poisson regression with presample, lagged dependent variables, and patent data separately finding significant main effects (except search persistence) and three interaction effects graphed remain significant.

DISCUSSION

We developed theory to investigate TMT search for new information and knowledge, long-recognized as an important function of managers (Thompson, 1967). Drawing on cognitive attention theory, we advanced hypotheses about the relationship between TMT search and new product innovation. The theory explains how TMT members' choices about search selection and search intensity influence the firm's capability to detect, develop, and deploy new products in the market. Overall, we find that both the selection and intensity of search significantly affect the number of new product introductions. We further find that search intensity and search selection work together to affect new product introductions, although in unexpected ways. This finding suggests that achieving high levels of innovation requires TMTs to find an appropriate fit of selection and intensity of search.

Building on and extending theories of attention and cognitive processing, this research enhances our understanding of managerial search by employing the notion of human attention to study how TMTs search. Using attention theory, we highlight cognitive logics underlying

managerial search by identifying two separate attention components: Search selection and search intensity. By focusing on two dimensions of search we extend our understanding of the concept of search, to include search intensity as an important component. In doing so, we provide a more complete conceptualization of managerial search than has been recognized in prior innovation studies. In addition, we provide empirical evidence to support the importance of search intensity and its joint effect with search selection thus advancing the literature on top management information processing and innovation (Yadev et al., 2007). Further, by investigating search as an individual process functioning at the TMT level, we provide a micro foundation for other more outcome-based or end-state indicators of search such as patent citations (Katila & Chen, 2008; Rosenkopf & Nerkar, 2001), international expansion decisions (Vermeulen & Barkema, 2001), and types of acquisitions (Baum et al., 2000).

With respect to our specific results, as predicted, each search selection dimension, terrain unfamiliarity, distance (marginal), and source diversity, has a significantly positive relationship with new product introductions. These findings support our argument that the identification of novel knowledge and information is the key ingredient to the introduction of new products. Our unique insight was that because unfamiliar, distant, and diverse searches are more likely to contain novel, vivid, and salient information and knowledge, they are more likely to capture the attention of top management as they search their environment.

Our results also highlight the significant effect of search intensity on new product introductions. This is potentially important because prior research has focused on search selection to the exclusion of its intensity. Controlling for variation in search selection, our results suggest that engaging in a persistent search process can increase the number of new products. To a large extent, this finding resonates with arguments in the decision making literature

demonstrating that processes are important to decision outcomes (Fredrickson, 1984; Nutt, 1986). Although some prior literature has argued that managers use satisficing information gathering approaches (Cyert & March, 1963), our findings, in contrast, suggest that a persistent search process can influence managers' cognitive capacities in noticing, interpreting, and making sense of new information and knowledge that may in turn, lead to enhanced number of new products. The result also implies that development of new products requires discovery of a greater amount or in-depth information achieved through increased search persistence. Although post hoc analysis found no support for a mediation model between search selection and intensity, future research can explore the interrelatedness of search selection and persistence. Specifically, it would be interesting to examine if search persistence motivates search selection or vice-versa.

Interestingly, and opposite to our hypothesis, we found that when TMTs engage in effortful search, fewer new products get introduced. The rationale behind our original hypothesis is that putting more energy and hard work into the search process allocates more cognitive capacity to search and hence increases the new information and knowledge searchers process and in turn increases new product introductions. One potential explanation for this unexpected finding may be related to our conceptualization of search effort as the extent to which the members of a TMT devote energy and cognitive resources to search *versus other activities*. Perhaps high levels of search effort indicate over-investment of TMT members' limited cognitive and time resources in information gathering activities at the expense of other important top management functions related to new products (e.g., building organizational capabilities for pursuing new innovations). Although we described the TMTs' role in new product development as a complex processes including detection, development, and deployment (Yadav et al., 2007) and drew connections between those mechanisms and search, activities other than search are also

likely to influence the detection, development, and deployment process. For example, prior research has demonstrated the positive influence of planning, implementation, and team coordination (Brown & Eisenhardt, 1995; Cooper, 1979; Cooper & Kleinschmidt, 1987; Nutt, 1986). Thus, perhaps when TMT members are over-committed to information search, they may not be able to undertake sufficient predevelopment planning (Dwyer & Mellor, 1991) or they may weaken the effort they place on directly managing the new product deployment or development process (Cooper & Kleinschmidt, 1987). Additionally, since TMT attention is a scarce firm resource (Simon, 1973), TMT attention to search competes with these other important activities, which may also require TMT attention (Hambrick & Abrahamson, 1995; Hambrick & Mason, 1984; Smith & Tushman, 2005). Interesting potential exists for future research to explore the allocation of TMT attention across a range of activities, including whether and how extensive search effort for new information and knowledge comes at the expense of other important new product activities.

Another possible explanation for the negative influence of effort might be related to the TMT's delegation of search to others in the organization. Perhaps TMTs delegate the search intensity task to others once potential new knowledge and information is identified. This possibility seems to fit the negative correlation between search effort and R&D intensity (see Table 1). That is, R&D may be utilized in a bid to ensure that the TMT is not overly consumed with the effort involved in search. From this perspective, low effort is not what is causing innovation, it is that the responsibility for effort may be delegated away from the TMT and to another group within the firm. Hence, we think future research that explores how TMTs expand and delegate their initial search effort to include others in the process would be an interesting avenue for future research. Specifically, it would be appealing to explore the relationship

between the search effort of top managers and other scientists and R&D employees within the firm.

Our study makes another important contribution by examining the joint effect of search selection and search intensity. Given the importance of search selection in prior innovation research (e.g. Katila & Ahuja, 2002), as well the main selection effects we find, it is important to understand how search selection and search intensity are linked to one another. Even though contrary to our expectations, Figures 2 through 4 reveal an important fit explanation with respect to these relationships. First, while we noted a negative direct effect of search effort, it appears particularly problematic to expend additional energy when search selection is narrow and distant. Specifically, the bottom-right quadrant of Figure 2 suggests that TMTs that exert energy to search for information and knowledge in tightly defined domains do so with damage to new product introductions. In fact, the upper-right quadrant of the Figure 2 reveals that high effort fits far better with a diverse search location. Since we argue that searches low in diversity contain less novel information and knowledge, it may be that the marginal benefit of spending additional energy attending to such terrains is low and the opportunity cost of that effort is large. That is, the more attention focused on homogenous terrains, the more other activities related to the detection, development, and deployment of new products may be left undone, not carried out in proper manner, or suffer due to lack of direct attention.

With respect to the interaction of terrain distance and search effort in Figure 3, we note the particularly detrimental impact of high effort in distant terrains shown in the lower-right quadrant. Consistent with the previous interaction between terrain source diversity and search effort, we believe this finding suggests that high levels of energy and hard work used by TMTs undertaking distant searches are exerted at the risk of wasting that effort, relative to other tasks

or attention to other activities that may also be important to new product introductions. It may be that when TMT members are less familiar with the information in distant terrains they need to exert additional attentional effort in order to gain an understanding and make sense of that information. That is to say, TMT members may need to divert their attention from other important activities when they search in distant terrains. Again the fit between terrain distance and search effort appears important. We speculate that the two preceding search effort interactions suggest a cohesive story with respect to the relationship between search selection and search effort. In both cases, the benefit of spending additional attentional capacity is decreased when the level of novel information and knowledge is low or because the interpretation of information requires too much attentional capacity. Perhaps when TMTs allocate more attentional capacity in such terrains, less attentional capacity and time is available for other important activities useful in the detection, development, and deployment of new products. These two interaction effects beg for additional research between search selection and intensity and especially on the role of attention allocation.

The interaction between terrain source diversity and search persistence is also interesting. Though the direct effect of search persistence on new products is positive, the upper-left quadrant of Figure 4 reveals that when a highly diverse terrain is selected, high search persistence is not desirable. On the other hand, TMTs undertaking narrow search enjoy a benefit through more persistence. We believe this is again about fit between search selection and intensity. In our study, search persistence refers to the extent to which TMT members attempt to be exhaustive in seeking new knowledge and information. Thus, it seems that attempting to search exhaustively in vastly diverse locales is an overwhelming task and trying to accomplish both has a negative impact on the TMTs' ability to perform in other ways. From this perspective,

the findings may again have to do with the impact of selection versus intensity and fit between the two. That is, just as we speculated when discussing interactions with search effort, future research examining the tradeoffs that might occur between search persistence and selection could be important.

Taken together, our search effort and persistence interaction findings highlight the importance of understanding limited attentional capacity and efficiency and especially raise questions about how TMTs should allocate their limited attention to *different* tasks and activities. High search effort and perhaps accompanying low search efficiency may impede managers from taking advantage of novel information and knowledge identified through diverse and distant terrains. Therefore, putting less effort and persistence into searching locations in which information is likely to be particularly salient and easily noticed can perhaps free cognitive and intellectual capacities of top managers to enable them to attend to other important organizational responsibilities. These findings have two major implications for new product development and attention theory. First, new product introduction is a complex process including a variety of important activities related to their detection, development, and deployment. It may be that these activities all compete for TMT attentional capacity. Over-allocation of TMT attentional capacity to one activity may inevitably reduce time and energy spent directly undertaking other activities as well as reducing attentional capacity toward those activities. The resulting outcome may ultimately have a negative impact on new product introduction. Although novel information and knowledge appear important for new product development, TMTs may need to effectively manage and allocate their attention to multiple activities. Second, it may be that the marginal benefits of attention intensity differ based on the context. Specifically, the marginal benefits may be reduced when searches contain little novel information and knowledge and thus extra

attention fails to result in any residual benefit. Ultimately, both of these implications suggest top managers should carefully manage their attention intensity when carrying out search for new information and knowledge. Specifically, top managers should recognize the importance of the fit between search terrains and search intensity and their relationship to new products.

In summary, our search selection and intensity interaction results provide very interesting avenues for future research. While the current research has focused on how TMT search selection and intensity individually and jointly affect the development of new products, future research might examine the predictors of variation in TMT search. For example, the upper echelon literature has suggested the TMT demographic background would predict attention patterns of executives (Cho & Hambrick, 2006). In this regard, Table 1 suggests that team size and functional diversity are correlated with search effort and that team size is related to terrain source diversity. These correlations suggest that the study of TMT demography may offer insights into the predictors of executive search and/or act as moderators to search outcomes. TMT psychological attributes and characteristics may also prove impactful in search and could represent rich future research potential.

Furthermore, Ocasio (1997) theorized that the organization's attentional focus would be predicted by organizational variables such as culture, context, and economic resources. Given the importance attributed to search in the organization literature, we think it would be very important to study these and other organizational predictors of search and how these organizational variables moderate search outcomes.

While the current study offers a number of insights, like all research, it carries limitations. First, we focus on search in the context of TMTs, where the concept has been described as fundamental (Mintzberg et al., 1976). Interestingly, our research on search suggests

that search intensity is a characteristic of the TMT and is linear in nature. It would be interesting to explore whether this holds and if firms intentionally develop search protocols for their executives to follow and whether such protocols are desirable or not. In addition, it is quite possible that the relationship between TMT search and new products will vary if one were to study search selection and intensity among scientists or other R&D personnel within the technical core. We made a significant effort to control for other firm level sources of new products in our empirical models, such as firm size, slack, and R&D intensity, and our results are robust; however, future research needs to better articulate how TMTs work with others in the firm, including research scientists and R&D employees, who are also likely to have an effect on new product development.

Second, our sample focused on high technology firms. While this sample is particularly appropriate for studying innovative outcomes, it may be that the role of executive search would vary in different industries and with different outcome measures. Therefore, it is interesting to envision how future research may extend the study of search to other industries and study the effect of executive search on other important outcomes.

Primary data obtained directly from CEOs and other top managers are difficult to obtain and not frequently used in studies of this type. While they therefore represent a significant strength of our study, this methodology results in a relatively small sample size. On average, the public firms in our sample also have fewer assets, employees, and lower sales than the original 358 public firms we contacted. Thus, the implications of our study may generalize more to smaller public firms. While it may be difficult to obtain larger samples of executives to study search selection and intensity in the same manner as the present research, it is possible that future

research can utilize other creative ways of inferring the search of executives from archival data such as, their written accounts, documents, and public announcements.

By conceptualizing managerial search as search selection and search intensity, we provide a more complete picture of TMT search, advancing the search literature linking TMTs to innovation. Our research suggests that in order to increase the number of new products in high technology industries, TMT members might consider conducting search in unfamiliar, distant, and diverse terrains and employ a persistent yet less effortful and perhaps more efficient processes. By empirically linking search selection and search intensity to firm new products, we have demonstrated that, along with search selection, search intensity is also important in affecting firm new products. Finally, by examining the joint effect of search selection and search intensity, we demonstrate that these notions of search are complex and in need of additional research.

REFERENCES

- Acs, Z. J., Anselin, L., & Varga, A. 2002. Patents and innovation counts as measures of regional production of new knowledge. *Research Policy*, 31(7): 1069-1085.
- Ahuja, G., & Katila, R. 2004. Where do resources come from? The role of idiosyncratic situations. *Strategic Management Journal*, 25(8-9): 887-907.
- Ahuja, G., Lampert, C. M., & Tandon, V. 2008. Chapter 1: Moving beyond schumpeter: management research on the determinants of technological innovation. *Academy of Management Annals*, 2(1): 1-98.
- Alexander, E. R. 1979. The design of alternatives in organizational contexts: A pilot study. *Administrative Science Quarterly*, 24(3): 382-404.
- Amason, A. C., & Sapienza, H. J. 1997. The effects of top management team size and interaction norms on cognitive and affective conflict. *Journal of Management*, 23(4): 495-516.
- Ancona, D. G., & Caldwell, D. F. 1992. Demography and design: Predictors of new product team performance. *Organization Science*, 3(3): 321-341.
- Anderson, J. C. 1987. An approach for confirmatory measurement and structural equation modeling of organizational properties. *Management Science*, 33(4): 525-541.
- Argote, L. 1999. *Organizational learning: Creating, retaining, and transferring knowledge*. Boston, MA: Kluwer Academic.
- Bagozzi, R. P., & Phillips, L. W. 1982. Representing and testing organizational theories: A holistic construal. *Administrative Science Quarterly*, 27(3): 459-489.
- Bagozzi, R., & Yi, Y. 1988. On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1): 74-94.
- Bantel, K. A., & Jackson, S. E. 1989. Top management and innovations in banking: Does the composition of the top team make a difference? *Strategic Management Journal*, 10(S1): 107-124.
- Baum, J. A. C., Li, S. X., & Usher, J. M. 2000. Making the next move: How experiential and vicarious learning shape the locations of chains' acquisitions. *Administrative Science Quarterly*, 45(4): 766-801.
- Beal, R. M. 2000. Competing effectively: Environmental scanning, competitive strategy, and organizational performance in small manufacturing firms. *Journal of Small Business Management*, 38(1): 27-47.
- Berlyne, D. E. 1954. A theory of human curiosity. *British Journal of Psychology*, 45: 180-191.

- Blau, P. M. 1977. *Inequality and heterogeneity: A primitive theory of social structure*. New York: Free Press.
- Bliese, P. D. 2000. Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Ed.), *Multilevel theory, research, and methods on organizations*: 349-381. San Francisco: Jossey-Bass.
- Bliese, P. D., & Halverson, R. R. 1998. Group consensus and psychological well-being: A large field study. *Journal of Applied Social Psychology*, 28(7): 563-580.
- Blundell, R., Griffith, R., & Reenen, J. V. 1995. Dynamic count data models of technological innovation. *The Economic Journal*, 105(429): 333-344.
- Bromiley, P. 1991. Testing a causal model of corporate risk taking and performance. *Academy of Management Journal*, 34(1): 37-59.
- Brown, S. L., & Eisenhardt, K. M. 1995. Product development: Past research, present findings, and future directions. *Academy of Management Review*, 20(2): 343-378.
- Burgelman, R. A. 1991. Intraorganizational ecology of strategy making and organizational adaptation: Theory and field research. *Organization Science*, 2(3): 239-262.
- Chen, W.-R. 2008. Determinants of firms' backward- and forward-looking R&D search behavior. *Organization Science*, 19(4): 609-622.
- Child, J. 1972. Organization structure and strategies of control: A replication of the Aston study. *Administrative Science Quarterly*, 17(2): 163-177.
- Cho, T. S., & Hambrick, D. C. 2006. Attention as the mediator between top management team characteristics and strategic change: The case of airline deregulation. *Organization Science*, 17(4): 453-469.
- Choudhury, V., & Sampler, J. L. 1997. Information specificity and environmental scanning: An economic perspective. *MIS Quarterly*, 21(1): 25-53.
- Cohen, W. M., & Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1): 128-152.
- Cohen, W. 1995. Empirical studies of innovative activity. In P. Stoneman (Ed.), *Handbook of the economics of innovations and technological change*: 182-264. Oxford, England: Blackwell.
- Collins, C. J., & Smith, K. G. 2006. Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. *Academy of Management Journal*, 49(3): 544-560.
- Crocker, J., & McGraw, K. M. 1984. What's good for the goose is not good for the gander. *American Behavioral Scientist*, 27(3): 357-369.

- Cyert, R. M., & March, J. G. 1963. *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Daft, R. L., & Weick, K. E. 1984. Toward a model of organizations as interpretation systems. *Academy of Management Review*, 9(2): 284-295.
- Daft, R. L., Sormunen, J., & Parks, D. 1988. Chief executive scanning, environmental characteristics, and company performance: An empirical study. *Strategic Management Journal*, 9(2): 123-139.
- Damanpour, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3): 555-590.
- Dean, J. W. Jr., & Sharfman, M. P. 1996. Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, 39(2): 368-396.
- Dearborn, D. C., & Simon, H. A. 1958. Selective perception: A note on the departmental identifications of executives. *Sociometry*, 21(2): 140-144.
- Derfus, P. J., Maggitti, P. G., Grimm, C. M., & Smith, K. G. 2008. The red queen effect: Competitive actions and firm performance. *Academy of Management Journal*, 51(1): 61-80.
- Dollinger, M. J. 1984. Environmental boundary spanning and information processing effects on organizational performance. *Academy of Management Journal*, 27(2): 351-368.
- Driver, J. 2001. A selective review of selective attention research from the past century. *British Journal of Psychology*, 92: 53-79.
- Dutton, J. E., Ashford, S. J., O'Neill, R. M., & Lawrence, K. A. 2001. Moves that matter: Issue selling and organizational change. *Academy of Management Journal*, 44(4): 716-736.
- Fiske, S. T., & Taylor, S. E. 2008. *Social cognition: from brains to culture*. New York: McGraw Hill.
- Finke, R. A., Ward, T. B., & Smith, S. M. 1992. *Creative Cognition: Theory, Research, and Applications*, Cambridge, MA: MIT Press.
- Fornell, C., & Larcker, D. F. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1): 39-50.
- Forsyth, B. H., & Lessler, J. 1991. Cognitive laboratory methods: A taxonomy. In P. Biemer, Groves, R., Lyberg, L., Mathiowetz, N., & Sudman, S. (Ed.), *Measurement Errors in Surveys*: 393-418. New York: John Wiley.
- Fredrickson, J. W. 1984. The comprehensiveness of strategic decision processes: Extension, observations, future directions. *Academy of Management Journal*, 27(3): 445-466.

- Frome, E. L., Kutner, M. H., & Beauchamp, J. J. 1973. Regression analysis of poisson-distributed data. *Journal of the American Statistical Association*, 68(344): 935-940.
- Gardner, M. P. 1983. Advertising effects on attributes recalled and criteria used for brand evaluations. *Journal of Consumer Research*, 10: 310-318.
- Gavetti, G., & Levinthal, D. 2000. Looking forward and looking backward: Cognitive and experiential search. *Administrative Science Quarterly*, 45(1): 113-137.
- George, J. M., & James, L. R. 1993. Personality, affect, and behavior in groups revisited: Comment on aggregation, levels of analysis, and a recent application of within and between analysis. *Journal of Applied Psychology*, 78(5): 798-804.
- Gerbing, D. W., & Anderson, J. C. 1988. An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research*, 25(2): 186-192.
- Gregoire, D. A., Barr, P. S., & Shepherd, D. A. 2010. Cognitive processes of opportunity recognition: The role of structural alignment. *Organization Science*, 21(2): 413-431.
- Greve, H. R. 2003. A behavioral theory of R&D expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal*, 46(6): 685-702.
- Griffith, T. L. 1999. Technology features as triggers for sensemaking. *Academy of Management Review*, 24: 472-488.
- Gupta, A. K., Smith, K. G., & Shalley, C. E. 2006. The interplay between exploration and exploitation. *Academy of Management Journal*, 49(4): 693-706.
- Hambrick, D. C. 1982. Environmental scanning and organizational strategy. *Strategic Management Journal*, 3(2): 159-174.
- Hambrick, D. C., & Mason, P. A. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9(2): 193-206.
- Heckman, J. J., & Borjas, G. J. 1980. Does unemployment cause future unemployment? Definitions, questions and answers from a continuous time model of heterogeneity and state dependence. *Economica*, 47(187): 247-283.
- Heilman, M. E. 1980. The impact of situational factors on personnel decisions concerning women: Varying the sex composition of the applicant pool. *Organizational Behavior and Human Performance*, 26(3): 386-395.
- Helfat, C. E. 1994. Evolutionary trajectories in petroleum firm R&D. *Management Science*, 40(12): 1720-1747.

- Hitt, M. A., Nixon, R. D., Hoskisson, R. F., & Kochhar, R. 1999. Corporate entrepreneurship and cross-functional fertilization: Activation, process and disintegration of a new product design team. *Entrepreneurship: Theory & Practice*, 23(3): 145-167.
- Hoffman, R. C., & Hegarty, W. H. 1993. Top management influence on innovations: Effects of executive characteristics and social culture. *Journal of Management*, 19(3): 549.
- Hu, L.-T., & Bentler, P. M. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1): 1-55.
- Huber, G. P. 1991. Organizational learning: The contributing processes and the literatures. *Organization Science*, 2(1): 88-115.
- Iyer, D. N., & Miller, K. D. 2008. Performance feedback, slack, and the timing of acquisitions. *Academy of Management Journal*, 51(4): 808-822.
- James, W. 1890. *Principles of Psychology*. New York: Holt.
- James, L. R., Demaree, R. G., & Wolf, G. 1993. r_{wg} : An assessment of within-group interrater agreement. *Journal of Applied Psychology*, 78(2): 306-309.
- Jarvenpaa, S. L. 1989. The effect of task demands and graphical format on information processing strategies. *Management Science*, 35(3): 285-303.
- Johnson, W. A., Hawley, K. J., Plewe, S. H., Elliott, J. M. G., & De Witt, M. J. 1990. Attention capture by novel stimuli. *Journal of Experimental Psychology: General*, 119: 397-411.
- Kahneman, D. 1973. *Attention and Effort*. Englewood Cliffs, NJ: Prentice-Hall.
- Katila, R. 2002. New product search over time: 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.
- Katila, R., & Chen, E. L. 2008. Effects of search timing on innovation: The value of not being in sync with rivals. *Administrative Science Quarterly*, 53(4): 593-625.
- Katila, R., Chen, E., & Piezunka, H. 2012. All the right moves: How entrepreneurial firms compete effectively. *Strategic Entrepreneurship Journal*, 6(2): 116-132.
- Katila, R. and Thatchenkery S. 2014. "Distant Search" in D. Teece, M. Augier, C. Helfat (Eds.), *Palgrave Encyclopedia of Strategic Management*.
- 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.

- Knight, D., Pearce, C. L., Smith, K. G., Olian, J. D., Sims, H. P., Smith, K. A., & Flood, P. 1999. Top management team diversity, group process, and strategic consensus. *Strategic Management Journal*, 20(5): 445-465.
- Knudsen, T., & Levinthal, D. A. 2007. Two faces of search: Alternative generation and alternative evaluation. *Organization Science*, 18(1): 39-54.
- Kotter, J. 1982. *The General Manager*. New York: Free Press.
- Lavie, N. 1995. Perceptual load as a necessary condition for selective attention. *Journal of Experimental Psychology: Human Perception and Performance*, 21: 451-468.
- Lavie, D., Stettner, U., & Tushman, M.L. 2010. Exploration and exploitation within and across organizations. *Academy of Management Annals*, 4: 109-155.
- Levinthal, D. A., & March, J. G. 1993. The myopia of learning. *Strategic Management Journal*, 14: 95-112.
- Levitt, B., & March, J. G. 1988. Organizational learning. *Annual Review of Sociology*, 14: 319-340.
- Luthans, F., Hodgetts, R.M., & Rosenkrantz, S.A. 1988. *Real managers*. Cambridge, MA: Ballinger.
- Maggitti, P.G., Smith, K.G., & Katila, R. 2013. The complex search process of invention. *Research Policy*, 42(1): 90-100.
- March, J. G., & Simon, H. A. 1958. *Organizations*. New York: Wiley.
- March, J. G. 1991. Exploration and exploitation in organizational learning. *Organization Science*, 2(1): 71-87.
- Martin, X., & Mitchell, W. 1998. The influence of local search and performance heuristics on new design introduction in a new product market. *Research Policy*, 26(7-8): 753-771.
- McArthur, L. Z., & Post, D. L. 1977. Figural emphasis and person perception. *Journal of Experimental Social Psychology*, 13(6): 520-535.
- Milkovich, G. T. 1987. Compensation systems in high technology companies. In D.B.Balkin & L.R.Gomez-Mejia (Ed.), *New Perspectives on Compensation*. Engelwood Cliffs, NJ: Prentice-Hall.
- Miller, D., & Chen, M.-J. 1994. Sources and consequences of competitive inertia: A study of the U.S. airline industry. *Administrative Science Quarterly*, 39(1): 1-23.
- Mintzberg, H. 1973. *The nature of managerial work*. New York: Harper & Row.
- Mintzberg, H., Raisinghani, D., & Theoret, A. 1976. The structure of "unstructured" decision processes. *Administrative Science Quarterly*, 21(2): 246-275.

- Nelson, D. L. 1979. Remembering pictures and words: Appearance, significance and name. In L. S. Cermak & F. I. M. Craik (Eds.), *Levels of processing in human memory*: 45-76. Hillsdale, NJ: Erlbau.
- Nelson, R. R., & Winter, S. G. 1982. *An evolutionary theory of economic change*. Boston: The Belknap Press of Harvard University Press.
- Noda, T., & Bower, J. L. 1996. Strategy making as iterated processes of resource allocation. *Strategic Management Journal*, 17(S1): 159-192.
- Nutt, P. C. 1986. Tactics of implementation. *Academy of Management Journal*, 29(2): 230-261.
- Nutt, P. C. 1993. The identification of solution ideas during organizational decision making. *Management Science*, 39(9): 1071-1085.
- Ocasio, W. 1997. Towards an attention-based view of the firm. *Strategic Management Journal*, 18: 187-206.
- Ocasio, W. 2011. Attention to attention. *Organization Science*, 22 (5):1286-1296.
- Pettigrew, A. M. 1992. On studying managerial elites. *Strategic Management Journal*, 13: 163-182.
- Pfeffer, J. 1983. Organizational demography. In L. L. Cummings & B. M. Staw (Ed.), *Research in organizational behavior*, Vol. 5: 299-357. Greenwich, Conn: JAI Press.
- Pitcher, P., & Smith, A. D. 2001. Top management team heterogeneity: Personality, power, and proxies. *Organization Science*, 12(1): 1-18.
- Posner, M. I., & Rothbart, M.K. 2007. Research on attention networks as a model for the integration of psychological science. *Annual Review of Psychology*, 58: 1-23.
- Priem, R. L., Lyon, D. W., & Dess, G. G. 1999. Inherent limitations of demographic proxies in top management team heterogeneity research. *Journal of Management*, 25(6): 935-953.
- Rerup, C. 2009. Attentional triangulation: Learning from unexpected rare crises. *Organization Science*, 20(5): 876-893.
- Rosenkopf, L., & Nerkar, A. 2001. Beyond local search: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, 22(4): 287-306.
- Rosenkopf, L., & Almeida, P. 2003. Overcoming local search through alliances and mobility. *Management Science*, 49(6): 751-766.
- Rousseau, D. 1985. Issues of level in organizational research: Multilevel and cross level perspectives. In C. B.M.Staw (Ed.), *Research in Organizational Behavior*, Vol. 7: 1-37. Greenwich, CT.: JAI Press.

- Schneider, W., & Shiffrin, R. M. 1977. Controlled and automatic human information processing: Detection, search, and attention. *Psychological Review*, 84(1): 1-66.
- Schwenk, C. R. 1984. Cognitive simplification processes in strategic decision-making. *Strategic Management Journal*, 5(2): 111-128.
- Sethi, R., Smith, D.C., & Park, C.W. 2001. Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research*, 38(1): 73-85.
- Shalley, C.E., & Zhou, J. 2008. Organizational creativity research: A historical overview. In J. Zhou and C. Shalley (Eds.) *Handbook of Organizational Creativity*, 3-31. New York: Lawrence Erlbaum and Associates.
- Shrout, P. E., & Fleiss, J. L. 1979. Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, 86(2): 420-428.
- Simon, H. A. 1955. A behavioral model of rational choice. *The Quarterly Journal of Economics*, 69(1): 99-118.
- Simsek, Z., Veiga, J. F., Lubatkin, M. H., & Dino, R. N. 2005. Modeling the multilevel determinants of top management team behavioral integration. *Academy of Management Journal*, 48(1): 69-84.
- Smith, K. G., Grimm, C. M., Gannon, M. J., & Chen, M.-J. 1991. Organizational information processing, competitive responses, and performance in the U.S. domestic airline industry. *Academy of Management Journal*, 34(1): 60-85.
- 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., Smith, K. A., Olian, J. D., Sims, H. P., Jr., O'Bannon, D. P., & Scully, J. A. 1994. Top management team demography and process: The role of social integration and communication. *Administrative Science Quarterly*, 39(3): 412-438.
- Smith, K. G., Collins, C. J., & Clark, K. D. 2005. Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal*, 48(2): 346-357.
- Srivastava, A., & Lee, H. 2005. Predicting order and timing of new product moves: The role of top management in corporate entrepreneurship. *Journal of Business Venturing*, 20(4): 459-481.
- Starbuck, W. H., & Milliken, F. J. 1988. Challenger: Fine-tuning the odds until something breaks. *Journal of Management Studies*, 25(4): 319-340.

- Stuart, T. E., & Podolny, J. M. 1996. Local search and the evolution of technological capabilities. *Strategic Management Journal*, 17(S1): 21-38.
- Sullivan, B. N. 2010. Competition and beyond: Problems and attention allocation in the organizational rulemaking process. *Organization Science*, 21(2): 432-450.
- Szymanski, D. M., & Henard, D. H. 2001. Customer satisfaction: A meta-analysis of the empirical evidence. *Journal of the Academy of Marketing Science*, 29(1): 16-35.
- Taylor, A., & Greve, H. R. 2006. Superman or the fantastic four? Knowledge combination and experience in innovative teams. *Academy of Management Journal*, 49(4): 723-740.
- Taylor, S. E., & Fiske, S. T. 1978. Saliency, attention and attribution: Top of the head phenomena. In L. Berkowitz (Ed.), *Advances in experimental social psychology*, Vol. 11: 249-288. New York: Academic Press.
- Thompson, J. 1967. *Organizations in Action*. New York: McGraw-Hill.
- Tidd, J., & Bodley, K. 2002. The influence of project novelty on the new product development process. *R&D Management*, 32 (2): 127-138.
- Vermeulen, F., & Barkema, H. 2001. Learning through acquisitions. *Academy of Management Journal*, 44(3): 457-476.
- Weick, K. E. 1995. *Sensemaking in Organizations*. Sage, Thousand Oaks, CA.
- Weick, K. E., & Sutcliffe, K. M. 2006. Mindfulness and the quality of organizational attention. *Organization Science*, 17: 514-524.
- Weiss, A. M., & Heide, J. B. 1993. The nature of organizational search in high technology markets. *Journal of Marketing Research*, 30(2): 220-233.
- West, C. T. Jr., & Schwenk, C. R. 1996. Top management team strategic consensus, demographic homogeneity and firm performance: A report of resounding nonfindings. *Strategic Management Journal*, 17(7): 571-576.
- Witt, U. 2009. Propositions about novelty. *Journal of Economic Behavior and Organization*, 70: 311-320.
- Yadav, M. S., Prabhu, J. C., & Chandy, R. K. 2007. Managing the future: CEO attention and innovation outcomes. *Journal of Marketing*, 71(4): 84-101.

TABLE 1
Means, Standard Deviations, and Correlations

	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11
1 New product introductions (2006)	1.67	2.42											
2 New product introductions (2006-2008 ave.)	3.84	5.47	0.76										
3 Terrain unfamiliarity (selection)	61.89	11.45	0.00	0.04									
4 Terrain distance (selection)	65.14	10.65	-0.01	-0.01	0.41								
5 Terrain source diversity (selection)	0.87	0.03	0.21	0.12	-0.16	0.18							
6 Search effort (intensity)	3.73	0.36	-0.25	-0.14	0.16	0.39	0.02						
7 Search persistence (intensity)	3.17	0.47	-0.05	0.06	0.08	0.15	-0.06	0.46					
8 Team size	3.43	1.16	0.10	0.07	-0.11	0.04	0.29	0.25	-0.04				
9 Team heterogeneity	0.64	0.13	-0.06	0.05	-0.02	0.03	-0.07	0.29	-0.02	0.34			
10 Firm size*	1.94	4.45	0.13	0.28	0.06	-0.14	0.09	0.07	-0.10	0.03	-0.13		
11 R&D intensity*	-2.15	2.44	0.03	0.01	-0.14	-0.15	0.05	-0.20	0.08	-0.22	-0.14	-0.29	
12 Slack*	0.28	0.57	0.19	0.08	-0.08	-0.11	-0.04	-0.01	0.22	-0.21	-0.33	-0.19	0.09

N = 61; *: Logged value

TABLE 2
Negative Binomial Regression Predicting Number of New Products

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	New Product Introductions in 2006			New Product Introductions (2006-2008 average)		
<i>Search selection</i>						
Terrain unfamiliarity		0.03*	-0.003		0.02+	0.02
		(0.02)	(0.02)		(0.02)	(0.03)
Terrain distance		0.04+	0.002		0.04*	0.02
		(0.03)	(0.03)		(0.02)	(0.03)
Terrain source diversity		23.46**	50.08***		9.13+	13.18
		(9.44)	(12.66)		(6.91)	(11.54)
<i>Search intensity</i>						
Search effort		-2.82***	-4.66***		-2.05***	-2.31***
		(0.68)	(0.82)		(0.56)	(0.65)
Search persistence		0.64*	1.67***		0.76*	1.04*
		(0.36)	(0.51)		(0.38)	(0.51)
<i>Search selection × search intensity</i>						
Unfamiliarity × search effort			-0.10+			0.02
			(0.06)			(0.07)
Distance × search effort			-0.23**			-0.19**
			(0.09)			(0.06)
Source diversity × search effort			144.34***			59.99*
			(32.62)			(23.70)
Unfamiliarity × search persistence			0.01			0.003
			(0.03)			(0.05)
Distance × search persistence			0.12+			0.07
			(0.07)			(0.06)
Source diversity × search persistence			-76.78**			-26.69
			(24.69)			(17.53)
<i>Control variables</i>						
Team size	0.84	1.29	0.47	0.34	0.85	0.60
	(0.69)	(0.88)	(0.70)	(0.60)	(0.59)	(0.55)
Team heterogeneity	-0.35	1.53	1.68*	0.72	1.78*	1.78*
	(1.29)	(1.04)	(0.76)	(0.89)	(0.81)	(0.72)
Firm size	0.05	0.11**	0.11**	0.07*	0.12**	0.11**
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
R&D intensity	0.08	0.09	0.09	0.08	0.08	0.08
	(0.08)	(0.07)	(0.08)	(0.07)	(0.06)	(0.07)
Slack	0.59+	1.05**	0.95**	0.48	0.76**	0.56*
	(0.35)	(0.27)	(0.25)	(0.32)	(0.23)	(0.23)
Constant	-0.83	-1.10	-0.48	0.001	-0.46	-0.12
	(1.30)	(1.34)	(0.93)	(0.97)	(0.83)	(0.79)
Pseudo Loglikelihood	-102.34	-93.2	-82.56	-92.23	-84.97	-80.41
Wald chi2	4.42	43.15	83.79	6.18	34.7	74.67
df	5	10	16	5	10	16

N = 61. Robust standard errors in parentheses

One-tailed test for main effects; Two-tailed test for interaction effects.

+ significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%

FIGURE 1
Conceptual model

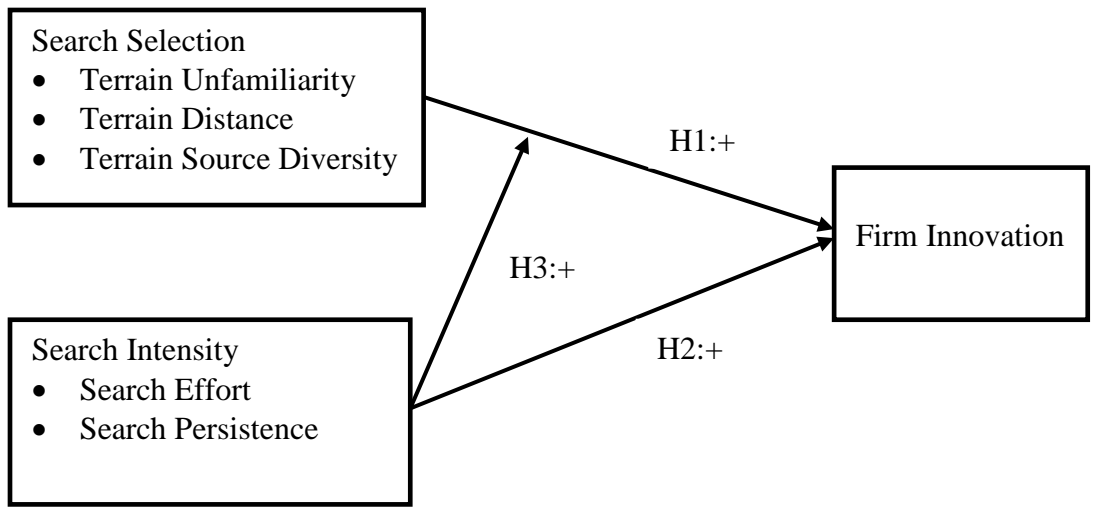


FIGURE 2
Interaction of terrain source diversity and search effort

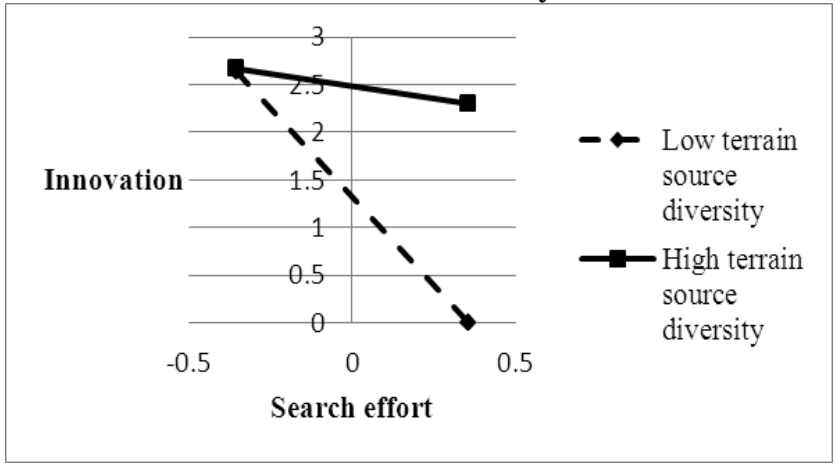


FIGURE 3
Interaction of terrain distance and search effort

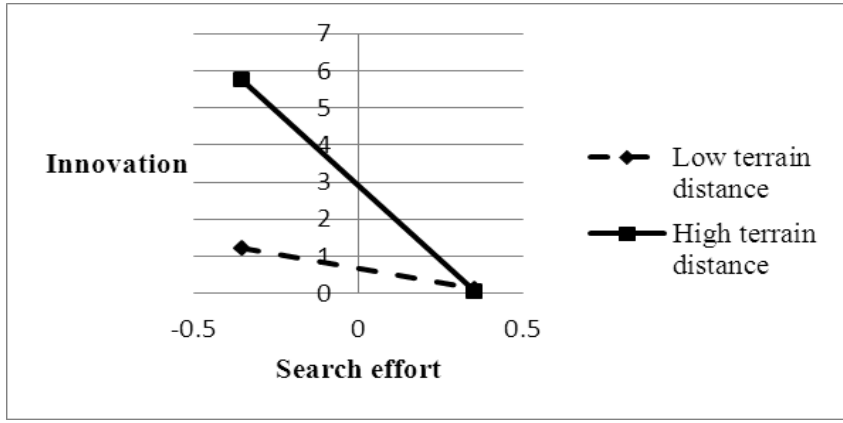
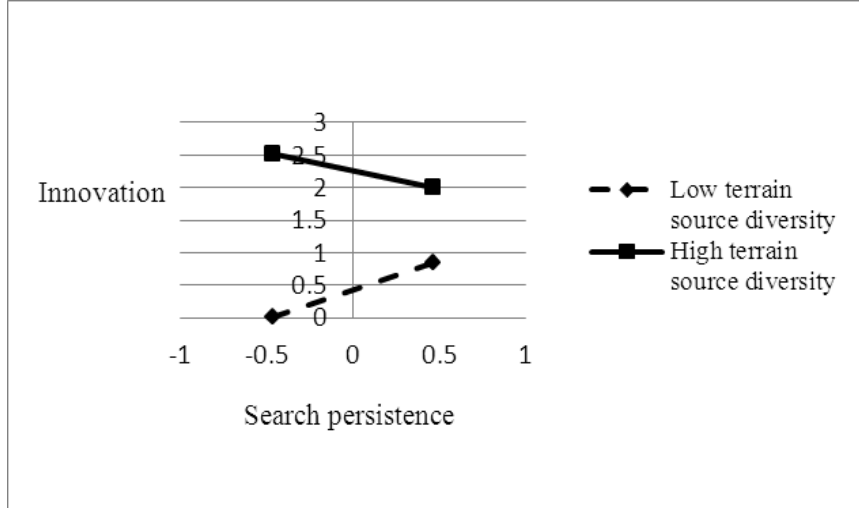


FIGURE 4
Interaction of terrain source diversity and search persistence



APPENDIX A

Scenario

“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 your 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.

The CEO has given you the responsibility of actively searching and identifying strategic alternatives or opportunities so that your organization can effectively respond to this new challenge. Because this responsibility is so important, you have decided that this is not something that you can delegate (i.e., you are going to take this on personally). Your CEO anxiously awaits your suggested alternatives.”

Items used to validate and assess the realism of the scenario

The above scenario...

1. ...reflects an actual problem our organization has faced (or is facing)
2. ...is directly relevant to my role within the organization.
3. ...reflects a situation which I would normally be called upon to deal with as part of my role in this organization.
4. ...presents a situation in which I would typically search for information.
5. ...reflects a situation that would demand my personal attention.