TOP MANAGEMENT ATTENTION TO INNOVATION: THE ROLE OF SEARCH SELECTION AND INTENSITY IN NEW PRODUCT INTRODUCTIONS

QIANG LI
The Hong Kong University of Science and Technology

PATRICK G. MAGGITTI
Villanova University

KEN G. SMITH
University of Rhode Island

PAUL E. TESLUK
University at Buffalo, State University of New York

RIITTA KATILA
Stanford University

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 search independently and jointly influence new product introductions. We have three important findings. First, in contrast to the portrait of local managerial search, we find teams that select locations that contain novel, vivid, and salient information introduce more new products. Next, unlike information-gathering approaches that merely "satisfice," persistent search intensity may lead to increases in new product introductions. Finally, level of search intensity must fit the selected location of search to maximize new product introductions.

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 (Katila & Ahuja, 2002; Maggitti, Smith, & Katila, 2013; March, 1991). Top management teams (TMTs) serve a critical role in that search process. Indeed, a team that more effectively searches and acquires new knowledge and informa-

tion is able to make better strategic decisions, to innovate, and to grow its firm (Cyert & March, 1963; Katila, Chen, & Piezunka, 2012; Mintzberg, 1973; Simon, 1955).

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) and offers 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 distinct 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 (Ahuja & Katila, 2004; Cyert & March, 1963). Only when local and simple search efforts fail will search be expanded and made more complex. Al-

though 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 search that explores and identifies new knowledge (Gupta, Smith, & Shalley, 2006; March, 1991).

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 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 a manager and not an 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 to 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 their 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 as including two underlying components: attention selection and attention intensity. He noted,

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. (Kahneman, 1973: 3)

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 (Hitt, Nixon, Hoskisson, & Kochhar, 1999; Smith et al., 2005) and innovation (Bantel & Jackson, 1989; Sethi, Smith, & Park, 2001; Taylor & Greve, 2006). In particular, one meta-analysis showed 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 study 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 attention intensity (Fiske & Taylor, 2008; Kahneman, 1973). Attention intensity captures the extent to which individuals allocate 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).[1] According to Kahneman (1973), the intensiveness aspect of attention must be included in any analysis of attention. In concert with Kahneman (1973), to understand how individuals cognitively process information, we suggest studying the effect of TMT search intensity. This investigation is important, since it sheds light on the valuable role of managerial 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 & Rothbart, 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 study 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 TMTs influence new product introductions, including the detection of new information and knowledge, the development of actual products and services, and the deployment of new products and services in customer markets (Katila et al., 2012; Yadav, Prabhu, & Chandy, 2007). 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 their search behavior increases their capacity to process and make sense of information to which they are exposed. We tested our theory with data gathered in an intensive field study of TMT search behaviors in 61 public US 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 a search takes place, the greater the likelihood of finding new information and knowledge that 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 &

---

[1] There 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. To overcome these hurdles, upper echelons theory research, like much of the existing research on search, typically uses distal demographic characteristics as proxies 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 finer-grained, more detailed theories (Pettigrew, 1992; Priem, Lyon, & Dess, 1999; West & Schwenk, 1996) and found that the direct measurement of TMT processes offers more explanatory power than 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).

Nerkar, 2001), international expansion decisions (Vermeulen & Barkema, 2001), and 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 to 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 an 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 & Bower, 1996). Although process studies of the impact of TMTs on firm innovation are rare, Yadav et al. (2007) developed theory and empirically tested a model highlighting an important role of TMTs 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 & 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 (Fiske & Taylor, 2008; Koput, 1997; Sullivan, 2010). Managers' limited attentional capacity necessitates that they select parts of their terrain to attend to (Cyert & March, 1963; Dearborn & Simon, 1958; March & Simon, 1958). Prior research characterizes search focus as either local or distant (Helfat, 1994; Martin & Mitchell, 1998; Stuart & Podolny, 1996), narrow or broad (Katila & Ahuja, 2002), and familiar or 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 searchers' focus primarily because such information stands out relative to its 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 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 *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 to be, 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.

In keeping with selective attention theory, and drawing on 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 are thus

more likely to capture 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 in behavior based on competencies they developed and used in the past—falling into 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. (1a) Unfamiliar TMT search selection, (1b) distant TMT search selection, and (1c) diverse TMT search selection are positively related to number of new product introductions.

Search Intensity

In Hypothesis 1 we proposed that TMT search selection influences the number of new products introduced by a 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 people allocate 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 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, fail to be persistent), they may remain ignorant of better alternatives and miss the chance to compare alternatives in a more rigorous manner. Less persistent top-level searchers will overinvest in a suboptimal outcome, thus falling into 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 extent of 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 their terrain along with their own knowledge, thereby allowing them to categorize and recategorize new information and knowledge and infer 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, Ward, and Smith (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 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 compre-

hend 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 an 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. (2a) Effortful TMT search intensity and (2b) persistent TMT search intensity are positively related to number of 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).

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 indi-

FIGURE 1
Conceptual Model
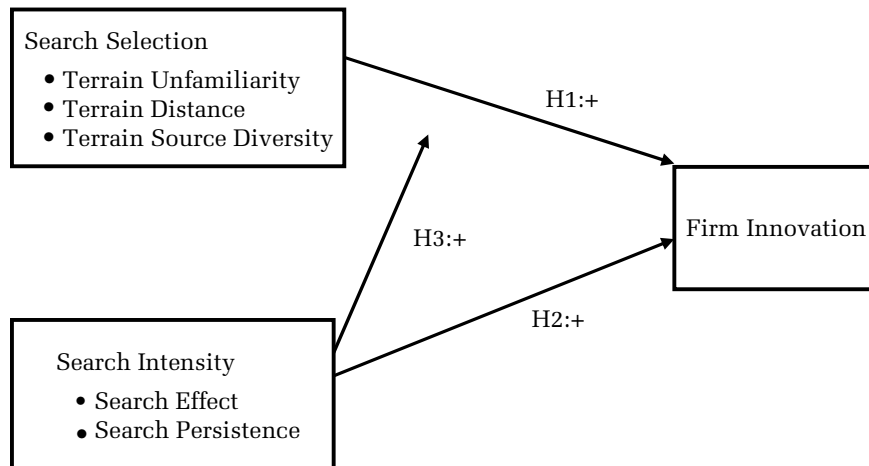
vidual's attentional capacity, especially when top managers need to interpret novel information generated in unfamiliar, distant, and diverse terrains.

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 that 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, *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 et al. (1992) suggested that the process of generating new knowledge and information from selection is interrelated with 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 per-

sistence. 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. Given the above arguments, we predict:

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

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

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

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

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

Hypothesis 3f. Persistent TMT search intensity enhances the positive relationship between diverse TMT search selection and 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 United States. 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, to have a focused sample of companies facing 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 in which to study managerial search and innovation.

An initial set of 358 public companies was identified using Hoover's online service and three-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), we sent a letter to the CEOs of 327 companies to explain the purpose of the study and request an interview. Ninety-two CEOs agreed to be interviewed, for a participation rate of 28.1 percent.

During the interview, a CEO was asked to identify members of his/her firm's 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 microdimensions 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 informa-

tion 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 11 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, and boundary spanning. 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 interfirm and interpersonal differences in the search stimuli, organizational routines, and contexts. The scenario (see the Appendix) 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 time frame. 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 having 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 us 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 participants 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, we included questions (see the Appendix) to assess if respondents found the scenario to be realistic ($\alpha = .84$). The mean response per respondent was 4.03 out of 5 (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 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 the years 2005–08.

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 from 2005 through 2008.

Dependent Variable: New Products

As have prior researchers (Katila, 2002; Smith et al., 2005), 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 2006–08, 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") and the name of the firms in our sample using Lexis-Nexis to identify the relevant new product activities for each firm. We carefully read each article to eliminate duplicates. Per Derfus, Maggitti, Grimm, and Smith (2008), a second author of this article independently coded data for 10 percent of the firms in the sample and had 97.21 percent interrater 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 ($r = .38$, $p < .01$), 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 in which 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. Respon-

dents 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 used in the past) as opposed to familiar information (information used in the past, or information that was once known) by assigning 100 points to both 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 the following: "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 ($r = -.32$, $p < .05$), providing evidence of convergent validity.

Terrain distance. Terrain distance refers to the extent to which search by TMT members focus on information outside their organization when searching. Respondents allocated a total of 100 points to three different types of information sources: inside (within organization), intraindustry, and outside industry. We then calculated terrain distance as the average number of points allocated by the members of a TMT to intraindustry 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 ($r = .31$, $p < .01$) with a scaled questionnaire item (not used in the analysis) asking each team member to rate this statement: "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 a TMT to acquire information. This measure is adopted from prior research (e.g., Beal, 2000; Daft, Sormunen, & Parks, 1988) and is broken down into 12 categories: TMT members, managers not part of TMT, nonmanagers, consultants, suppliers, customers, alliance partners, competitors, government, university, investors, and other sources outside industry. Terrain source diversity is calculated using the following formula: $1 - \Sigma_b (\Sigma_n S_{bn}/n)^2$, where S_{bn} is the share or proportion of search conducted in the bth information source category by the nth member and n is the number of TMT members. A

higher value indicates greater diversity in the information sources different TMT members use. We validated this variable by finding it significantly correlated ($r = .21$, $p < .05$) with a measure of TMT functional diversity, measured as the range of functional areas in which TMT members have experience and information, such as marketing, finance, R&D. 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 on a scale ranging from 1, "strongly disagree," to 5, "strongly agree." Search effort, the extent to which the members of a TMT devote time and energy to search rather than to other activities, was assessed with four items ($\alpha = .81$), including "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 optimal outcome. A four-item scale ($\alpha = .75$) 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 informa-

tion," "persist until I found all the information pertaining to this problem," "take as much time as needed to identify all available information," and "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 fit 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 and Larcker (1981) and bigger than the squared correlation (.21), indicating good discriminant validity. Search effort ($\alpha = .81$) and search persistence ($\alpha = .75$) have high reliability, indicating a high internal consistency. The composite reliability of search ef-

TABLE 1
Means, Standard Deviations, and Correlations[a]

	Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11
1.	New product introductions	1.67	2.42											
2.	New product introductions	3.84	5.47	.76										
3.	Terrain unfamiliarity	61.89	11.45	.00	.04									
4.	Terrain distance	65.14	10.65	−.01	−.01	.41								
5.	Terrain source diversity	0.87	0.03	.21	.12	−.16	.18							
6.	Search effort	3.73	0.36	−.25	−.14	.16	.39	.02						
7.	Search persistence	3.17	0.47	−.05	.06	.08	.15	−.06	.46					
8.	Team size	3.43	1.16	.10	.07	−.11	.04	.29	.25	−.04				
9.	Team heterogeneity	0.64	0.13	−.06	.05	−.02	.03	−.07	.29	−.02	.34			
10.	Firm size[b]	1.94	4.45	.13	.28	.06	−.14	.09	.07	−.10	.03	−.13		
11.	R&D intensity[b]	−2.15	2.44	.03	.01	−.14	−.15	.05	−.20	.08	−.22	−.14	−.29	
12.	Slack[b]	0.28	0.57	.19	.08	−.08	−.11	−.04	−.01	.22	−.21	−.33	−.19	.09

[a] $n = 61$.
[b] Logged value.

fort (.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}), which is used 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 the following: r_{wg} values above .70, indicating agreement; ICC1 values above the threshold value of .12 often cited as sufficient for testing hypotheses based on team-aggregated measures (Bliese & Halverson, 1998); and ICC2 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 and therefore to promote innovation, but also to have more problems with conflict and information exchange. We measured team size as the number of executives on a team, as provided by a firm's CEO during her/his 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 a team. We measured functional heterogeneity using Blau's (1977) heterogeneity index: $1 - \Sigma_t f_t^2$, where f is the proportion of top managers in the fth functional category and t is the number of functions. Functional data were collected from CEOs 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 have often utilized 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 controlled 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 ($r = .84$, $p < .001$).

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 1,000 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 overdispersed, meaning the variance of the counts exceeds their means (Derfus et al., 2008). A likelihood-ratio test of overdispersion also indicated that negative binomial regression was an appropriate choice. Negative binomial regression overcomes distribution problems and estimates an additional parameter that corrects for overdispersion (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.

Table 2 shows the regression results used of our tests of 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 (2006−08).

TABLE 2
Negative Binomial Regression Predicting Number of New Products[a]

Variables	New Product Introductions, 2006			New Product Introductions, 2006–08 Average		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Search selection						
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)
Search intensity						
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)
Search selection × search intensity						
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)
Control variables						
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 log-likelihood	−102.34	−93.2	−82.56	−92.23	−84.97	−80.41
Wald χ^2	4.42	43.15	83.79	6.18	34.7	74.67
df	5	10	16	5	10	16

[a] $n = 61$. Robust standard errors are in parentheses. One-tailed test for main effects; two-tailed test for interaction effects.
[†] $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

In Hypothesis 1, we argue that unfamiliar (1a), distant (1b), and diverse (1c) search selection result in more new product introductions. To test Hypothesis 1, we examined the coefficients of search selection in model 2. We find all three coefficients of search selection are positive, and terrain unfamiliarity (1a) is significant ($\beta = 0.03$, $p < .05$); terrain distance (1b) is moderately significant ($\beta = 0.04$, $p < .10$); and terrain source diversity (1c) 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 Hypothesis 2 by examining the coefficients of search intensity in model 2 and find that search persistence (2b) is positive and significant ($\beta = 0.64$, $p < .05$), but search effort (2a) is negative and significant ($\beta = -2.82$, $p < .001$). These results show that search persistence can result in more new product introduction, yet 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. To test Hypotheses 3a through 3f, 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 ($\beta = -0.23$, $p < .01$); 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 stated in Hypotheses 3b, 3c, and 3f, and we did not have significant findings for

Hypotheses 3a, 3d, and 3e. We return to these interesting results in the discussion section.

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 presample approach (Blundell, Griffith, & Van Reenen, 1995). In the presample 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 presample 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 represent 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 number of patents in 2005. Again, these results were broadly similar to those that we originally reported. Third,

FIGURE 2
Interaction of Terrain Source Diversity and Search Effort
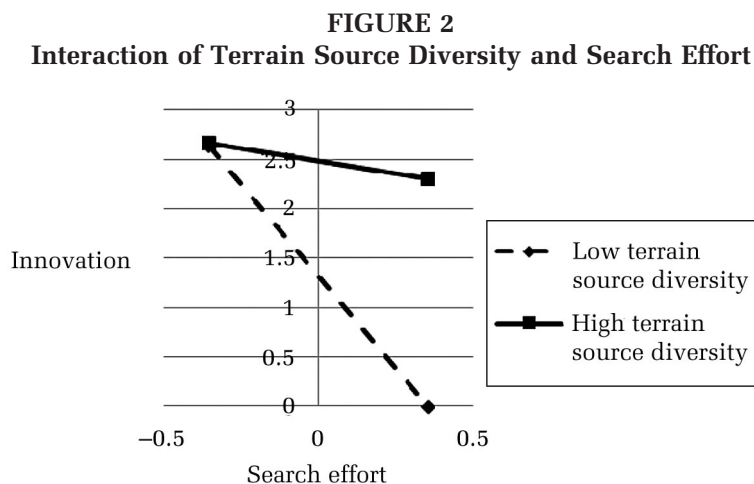
FIGURE 3
Interaction of Terrain Distance and Search Effort
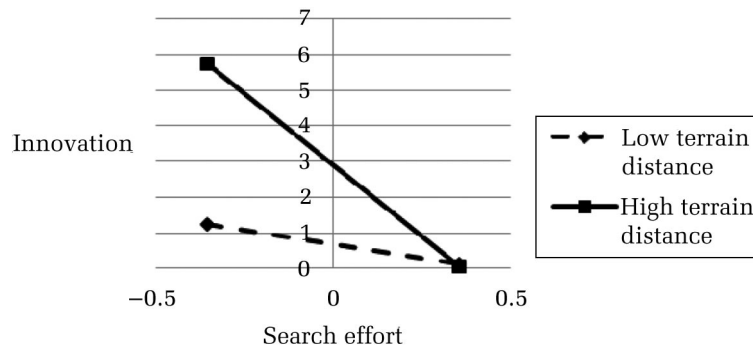
we ran all original regressions using Poisson models and found virtually identical results. We also ran Poisson regression with presample, lagged dependent variables, and patent data separately finding significant main effects (except search persistence) and three interaction effects graphed remain significant.

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 their firm's capability to detect, develop, and deploy new products in markets. 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 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 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 (Yadav et al., 2007). Further, by investigating search as an individual process functioning at the TMT level, we

FIGURE 4
Interaction of Terrain Source Diversity and Search Persistence
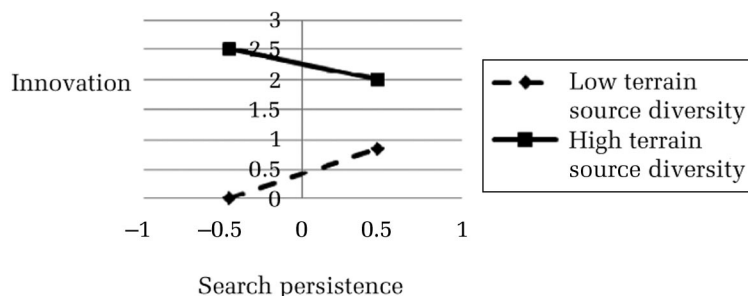
provide a micro foundation for other more outcome-based or end-state indicators of search such as patent citations (Katila & Chen, 2008; Rosenkopf & Nerkar, 2001), international expansion decisions (Vermeulen & Barkema, 2001), and types of acquisitions (Baum et al., 2000).

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, increase 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 showed no support for the presence of mediation 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 allo-

cates 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 overinvestment of TMT members' limited cognitive and time resources in information gathering 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 TMT 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 overcommitted 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, 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 TMT delegation of search to others in their 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 per-

spective, low effort is not what is causing innovation; it is that the responsibility for effort may be delegated away from a TMT and to another group in its 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.

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 import to understand how search selection and search intensity are linked to one another. Even though, contrary to our expectations, Figures 2–4 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. In keeping 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 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 are 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 TMT 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. Overallocation 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 echelons literature has suggested that TMT demographic background predicts 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 attri-

butes and characteristics may also prove impactful in search and could represent rich future research potential.

Furthermore, Ocasio (1997) theorized that organizational variables such as culture, context, and economic resources will predict organizational attentional focus. 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, Raisinghani, & Theoret, 1976). Interestingly, our research on search suggests that search intensity is a characteristic of TMTs and is linear. 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 would be found to vary if one were to study search selection and intensity among scientists or other R&D personnel in firms' technical cores. 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 their firms, 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: 1069–1085.

Ahuja, G., & Katila, R. 2004. Where do resources come from? The role of idiosyncratic situations. *Strategic Management Journal,* 25: 887–907.

Ahuja, G., Lampert, C. M., & Tandon, V. 2008. Moving beyond Schumpeter: Management research on the determinants of technological innovation. In A. P. Brief & J. P. Walsh (Eds.), *Academy of Management annals,* vol. 2: 1–98. Essex, UK: Routledge.

Alexander, E. R. 1979. The design of alternatives in organizational contexts: A pilot study. *Administrative Science Quarterly,* 24: 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: 495–516.

Ancona, D. G., & Caldwell, D. F. 1992. Demography and design: Predictors of new product team performance. *Organization Science,* 3: 321–341.

Anderson, J. C. 1987. An approach for confirmatory measurement and structural equation modeling of organizational properties. *Management Science,* 33: 525–541.

Argote, L. 1999. *Organizational learning: Creating, retaining, and transferring knowledge.* Boston: Kluwer Academic.

Bagozzi, R. P., & Phillips, L. W. 1982. Representing and testing organizational theories: A holistic construal. *Administrative Science Quarterly,* 27: 459–489.

Bagozzi, R., & Yi, Y. 1988. On the evaluation of structural equation models. *Journal of the Academy of Marketing Science,* 16: 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: 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: 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: 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 (Eds.), *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: 563–580.

Blundell, R., Griffith, R., & Van Reenen, J. 1995. Dynamic count data models of technological innovation. *Economic Journal,* 105: 333–344.

Bromiley, P. 1991. Testing a causal model of corporate risk taking and performance. *Academy of Management Journal,* 34: 37–59.

Brown, S. L., & Eisenhardt, K. M. 1995. Product development: Past research, present findings, and future directions. *Academy of Management Review,* 20: 343–378.

Burgelman, R. A. 1991. Intraorganizational ecology of strategy making and organizational adaptation: The-

ory and field research. *Organization Science,* 2: 239–262.

Chen, W.-R. 2008. Determinants of firms' backward- and forward-looking R&D search behavior. *Organization Science,* 19: 609–622.

Child, J. 1972. Organization structure and strategies of control: A replication of the Aston study. *Administrative Science Quarterly,* 17: 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: 453–469.

Choudhury, V., & Sampler, J. L. 1997. Information specificity and environmental scanning: An economic perspective. *MIS Quarterly,* 21: 25–53.

Cohen, W. 1995. Empirical studies of innovative activity. In P. Stoneman (Ed.), *Handbook of the economics of innovations and technological change:* 182–264. Oxford, UK: 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: 544–560.

Cooper, R. G. 1979. The dimensions of industrial new product success and failure. *Journal of Marketing,* 93–103.

Cooper, R. G., & Kleinschmidt, E. J. 1987. New products: What separates winners from losers? *Journal of Product Innovation Management,* 4(3): 169–184.

Crocker, J., & McGraw, K. M. 1984. What's good for the goose is not good for the gander. *American Behavioral Scientist,* 27: 357–369.

Cyert, R. M., & March, J. G. 1963. *A behavioral theory of the firm.* Englewood Cliffs, NJ: Prentice Hall.

Daft, R. L., Sormunen, J., & Parks, D. 1988. Chief executive scanning, environmental characteristics, and company performance: An empirical study. *Strategic Management Journal,* 9: 123–139.

Daft, R. L., & Weick, K. E. 1984. Toward a model of organizations as interpretation systems. *Academy of Management Review,* 9: 284–295.

Damanpour, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal,* 34: 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: 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: 61–80.

Dollinger, M. J. 1984. Environmental boundary spanning and information processing effects on organizational performance. *Academy of Management Journal,* 27: 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: 716–736.

Dwyer, L., & Mellor, R. 1991. Organizational environment, new product process activities, and project outcomes. *Journal of Product Innovation Management,* 8(1): 39–48.

Finke, R. A., Ward, T. B., & Smith, S. M. 1992. *Creative cognition: Theory, research, and applications.* Cambridge, MA: MIT Press.

Fiske, S. T., & Taylor, S. E. 2008. *Social cognition: From brains to culture.* New York: McGraw Hill.

Fornell, C., & Larcker, D. F. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research,* 18: 39–50.

Forsyth, B. H., & Lessler, J. 1991. Cognitive laboratory methods: A taxonomy. In P. Biemer, R. Groves, L. Lyberg, N. Mathiowetz, & S. Sudman (Eds.), *Measurement errors in surveys:* 393–418. New York: Wiley.

Fredrickson, J. W. 1984. The comprehensiveness of strategic decision processes: Extension, observations, future directions. *Academy of Management Journal,* 27: 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: 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: 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: 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: 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: 413–431.

Greve, H. R. 2003. A behavioral theory of R&D expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal,* 46: 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: 693–706.

Hambrick, D. C. 1982. Environmental scanning and organizational strategy. *Strategic Management Journal,* 3: 159–174.

Hambrick, D. C., & Abrahamson, E. 1995. Assessing managerial discretion across industries: A multimethod approach. *Academy of Management Journal,* 38: 1427–1441.

Hambrick, D. C., & Mason, P. A. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review,* 9: 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: 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: 386–395.

Helfat, C. E. 1994. Evolutionary trajectories in petroleum firm R&D. *Management Science,* 40: 1720–1747.

Hitt, M. A., Nixon, R. D., Hoskisson, R. F., & Kochhar, R. 1999. Corporate entrepreneurship and cross-functional fertilization: Activation, process and disinte-gration of a new product design team. *Entrepreneurship: Theory and Practice,* 23: 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: 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: 1–55.

Huber, G. P. 1991. Organizational learning: The contributing processes and the literatures. *Organization Science,* 2: 88–115.

Iyer, D. N., & Miller, K. D. 2008. Performance feedback, slack, and the timing of acquisitions. *Academy of Management Journal,* 51: 808–822.

James, L. R., Demaree, R. G., & Wolf, G. 1993. r_{wg}: An assessment of within-group interrater agreement. *Journal of Applied Psychology,* 78: 306–309.

James, W. 1890. *Principles of psychology.* New York: Holt.

Jarvenpaa, S. L. 1989. The effect of task demands and graphical format on information processing strategies. *Management Science,* 35: 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: 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: 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: 593–625.

Katila, R., Chen, E., & Piezunka, H. 2012. All the right moves: How entrepreneurial firms compete effectively. *Strategic Entrepreneurship Journal,* 6: 116–132.

Katila, R., & Thatchenkery, S. 2014. Distant search. In D. Teece et al. (Eds.), *Palgrave encyclopedia of strategic management:* In press. New York: Palgrave Macmillan.

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: 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: 445–465.

Knudsen, T., & Levinthal, D. A. 2007. Two faces of search: Alternative generation and alternative evaluation. *Organization Science,* 18: 39–54.

Koput, K. W. 1997. A chaotic model of innovative search: Some answers, many questions. *Organization Science,* 8: 528–542.

Kotter, J. 1982. *The general manager.* New York: Free Press.

Lavie, D., Stettner, U., & Tushman, M. L. 2010. Exploration and exploitation within and across organizations. In A. P. Brief & J. P. Walsh (Eds.), *Academy of Management annals,* vol. 4: 109–155. Essex, UK: Routledge.

Lavie, N. 1995. Perceptual load as a necessary condition for selective attention. *Journal of Experimental Psychology: Human Perception and Performance,* 21: 451–468.

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. In W. R. Scott (Ed.), *Annual review of sociology,* vol. 14: 319–340. Palo Alto, CA: Annual Reviews.

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: 90–100.

March, J. G. 1991. Exploration and exploitation in organizational learning. *Organization Science,* 2: 71–87.

March, J. G., & Simon, H. A. 1958. *Organizations.* New York: Wiley.

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: 753–771.

McArthur, L. Z., & Post, D. L. 1977. Figural emphasis and person perception. *Journal of Experimental Social Psychology,* 13: 520–535.

Milkovich, G. T. 1987. *Compensation systems in high technology companies: New perspectives on compensation.* Englewood 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: 1–23.

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: 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. Hillside, NJ: Erlbaum.

Nelson, R. R., & Winter, S. G. 1982. *An evolutionary theory of economic change.* Cambridge, MA: Belknap.

Noda, T., & Bower, J. L. 1996. Strategy making as iterated processes of resource allocation. *Strategic Management Journal,* 17: 159–192.

Nutt, P. C. 1986. Tactics of implementation. *Academy of Management Journal,* 29: 230–261.

Nutt, P. C. 1993. The identification of solution ideas during organizational decision making. *Management Science,* 39: 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: 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 (Eds.), *Research in organizational behavior,* vol. 5: 299–357. Greenwich, CT: JAI.

Pitcher, P., & Smith, A. D. 2001. Top management team heterogeneity: Personality, power, and proxies. *Organization Science,* 12: 1–18.

Posner, M. I., & Rothbart, M. K. 2007. Research on attention networks as a model for the integration of psychological science. In M. I. Posner & M. K. Rothbart (Eds.), *Annual review of psychology,* vol. 58: 1–23. Palo Alto, CA: Annual Reviews.

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: 935–953.

Rerup, C. 2009. Attentional triangulation: Learning from unexpected rare crises. *Organization Science,* 20: 876–893.

Rosenkopf, L., & Almeida, P. 2003. Overcoming local search through alliances and mobility. *Management Science,* 49: 751–766.

Rosenkopf, L., & Nerkar, A. 2001. Beyond local search: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal,* 22: 287–306.

Schneider, W., & Shiffrin, R. M. 1977. Controlled and automatic human information processing: Detection, search, and attention. *Psychological Review,* 84: 1–66.

Schwenk, C. R. 1984. Cognitive simplification processes in strategic decision-making. *Strategic Management Journal,* 5: 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: 73–85.

Shalley, C. E., & Zhou, J. 2008. Organizational creativity research: A historical overview. In J. Zhou & C. Shalley (Eds.), *Handbook of organizational creativity:* 3–31. New York: Erlbaum.

Shrout, P. E., & Fleiss, J. L. 1979. Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin,* 86: 420–428.

Simon, H. A. 1955. A behavioral model of rational choice. *Quarterly Journal of Economics,* 69: 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: 69–84.

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: 346–357.

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: 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: 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: 412–438.

Smith, W. K., & Tushman, M. L. 2005. Managing strategic contradictions: A top management model for managing innovation streams. *Organization Science,* 16: 522–536.

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: 459–481.

Starbuck, W. H., & Milliken, F. J. 1988. Challenger: Fine-tuning the odds until something breaks. *Journal of Management Studies,* 25: 319–340.

Stuart, T. E., & Podolny, J. M. 1996. Local search and the evolution of technological capabilities. *Strategic Management Journal,* 17: 21–38.

Sullivan, B. N. 2010. Competition and beyond: Problems and attention allocation in the organizational rule-making process. *Organization Science,* 21: 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: 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: 723–740.

Taylor, S. E., & Fiske, S. T. 1978. Salience, attention and attribution: Top of the head phenomena. In L. Berkowitz (Ed.), *Advances in experimental social psychology,* vol. 11: 249–288. New York: Academic.

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: 457–476.

Weick, K. E. 1995. *Sensemaking in organizations.* Thousand Oaks, CA: Sage.

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: 220−233.

West, C. T., Jr., & Schwenk, C. R. 1996. Top management team strategic consensus, demographic homogeneity and firm performance: A report of resounding non-findings. ***Strategic Management Journal,*** 17: 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.

APPENDIX

Scenario

Participants read the following:

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 Scenario Realism

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.

———————ᴧᴧ———————

Qiang Li (qiangli@ust.hk) is an assistant professor of strategic management in the Department of Management of Organizations at the Hong Kong University of Science and Technology. He received his Ph.D. from the University of Maryland. His research interests include top executives, innovation, and entrepreneurship.

Patrick G. Maggitti (patrick.maggitti@villanova.edu) is Helen and William O'Toole Dean of the Villanova School of Business at Villanova University. He received his Ph.D. in strategic management from the University of Maryland, College Park. His research focuses on the dynamics of competition, innovation, top management teams, and decision making.

Ken G. Smith (kgsmith@mail.uri.edu) is professor of strategy and entrepreneurship at the University of Rhode Island, and professor emeritus, the University of Maryland. He earned a Ph.D. in business policy from the University of Washington. His research interests include strategic decision making, competition, and knowledge creation.

Paul E. Tesluk (ptesluk@buffalo.edu) is the Donald S. Carmichael Professor of Organizational Behavior at the University at Buffalo. He received his Ph.D. in industrial/organizational psychology from Penn State University. His research focuses on team effectiveness, management and leadership development, and innovation processes in organizations.

Riitta Katila (rkatila@stanford.edu) is an associate professor of management science and engineering at Stanford University. She received her Ph.D. in strategy from the University of Texas at Austin. Her research interests include technology strategy, technology entrepreneurship, and organizational search and innovation.

———————ᴧᴧ———————