MARIANO LUIZ MÁRSELO HEYDEN

Essays on Upper Echelons & Strategic Renewal

A Multilevel Contingency Approach

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A Multilevel Contingency Approach

Studies over opper echelons & strategische vernieuwing:
Een contingentie benadering op meerdere niveau's

Thesis

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To Victoria.

Preface

In this dissertation I report four of the studies I have been conducting during the last few years at the Rotterdam School of Management, Erasmus University. The studies reported here are the fruits of intensive efforts in trying to figure out how, and under what conditions, the most prominent actors in organizations influence the choice of adaptive strategic renewal responses. Before proceeding to the content of the work conducted, I would like to acknowledge some of those who contributed in a particular way in helping me survive the PhD trajectory and bringing this dissertation to fruition. I split my acknowledgments (in some instances overlapping) into acknowledgements per study conducted and acknowledgments more generally.

Study 1, titled "Environmental Dynamism, Relative Competitive Performance, and Top Management Team Diversity: Examining Cross-Level Correlates of CEO Advice-Seeking" benefitted greatly from rich discussions and collaborations with my friend and former officemate Sebastiaan van Doorn as well as a research visit at the WHU in Vallendar (Germany) in late 2011, where I worked in close cooperation with my friend dr. Marko Reimer on revising the chapter for Organization Studies. *Previous versions of this study were presented at the Strategic Management Society (SMS) Annual Meeting 2010 in Rome (Italy) and the Academy of Management Annual Meeting 2010 in Montreal (Canada). Dr. Shahzad Ansari (Cambridge Judge Business School, UK), Prof. Dr. Dodo zu Knyphausen-Aufseß (TU Berlin, Germany), and Dr. Mathias Mahlendorf (WHU, Germany) provided valuable comments on previous drafts of this study. I am grateful to the Erasmus Innovation Monitor team for providing me access to their rich database.*

The ideas put forward in study 2, titled "Top Management Team Diversity, Environmental Volatility, & Strategic Renewal: How Managerial Attention to Local and Non-Local Search Drives Adaptive Change," were sharpened through intense collaboration and discussions with my friend and daily supervisor Dr. Jatinder Sidhu (Rotterdam School of Management, Netherlands). Previous versions of this study were presented at EIASM's 1st Workshop on TMTs & Business Strategy 2010 in Valencia (Spain), the European Academy of Management Annual (EURAM) Conference in 2010 in

Rome (Italy), the Academy of Management (AOM) Annual Meeting 2010 in Montreal (Canada), and the SMS Annual Meeting 2010 in Rome (Italy). A version of this chapter is currently under review at the Academy of Management Journal. *This chapter benefitted from invaluable data-collection assistance from Kim Cramer & Wiebke Foerstmann and I would also like to thank Bernardo Lima and Aybars Tuncdogan for providing me with critical insights in the development of the search dictionary. I would like to thank Heidi Wechtler (Sorbonne Business School, France) for stimulating discussions regarding content analysis methodology (and the debate between statistical significance versus effect size), and Dr. Sabina Nielsen (Copenhagen Business School, Denmark) for providing insightful comments on a previous draft of this essay.*

Study 3, titled "Driving Management Innovation from Within: Additive and Interactive Effects of Top Management, Middle Management, and Shared Organizational Vision," builds on a unique database and I am particularly grateful to Prof. Henk W. Volberda for brokering access to this data through a globally renowned human-resource consulting firm. This chapter is currently under review at Organization Studies *and previous versions have been presented at the SMS Annual Meeting in 2011 in Miami (USA) and accepted for presentation for the EURAM 2012 (Rotterdam). The study builds on a conceptual framework presented at the SMS Annual Meeting in 2009 in Washington, DC (USA). I would like to thank Danielle Keijzer, Erik-Bart Rosman, and Robert Vergeer for invaluable assistance in data collection, and Dr. Orlando Richard (UT Dallas, USA) and Dr. Anneloes Raes (University of St. Gallen, Switzerland) for stimulating comments on rough versions of some of the ideas presented in this chapter.*

The final study, titled "Top Management Team (TMT) Search and New Knowledge Creation: How TMT Experience Diversity and Shared Vision Influence Innovation," is scheduled for publication in 2013 in International Studies of Management & Organizations. *The development of the chapter benefitted greatly from the suggestions of our action-editor dr. Alessandro Minichilli from Boconni (Milan, Italy) and two anonymous reviewers. A previous version of this study was presented at the AOM Annual Meeting 2009 in Chicago (USA), the European Group for Organization Studies Colloquium in 2009 in Barcelona (Spain), and appeared in the proceedings of the*

PREBEM Conference in 2008 (Amersfoort). Dr. Peter Bryant (IE Business School, Spain) provided me with valuable comments on a previous draft. I am grateful to the Erasmus Innovation Monitor team for providing me access to their rich database.

I am indebted to my doctoral advisors Prof. Dr. Henk W. Volberda for always believing in me and encouraging me to take on challenges above my pay grade and Prof. Dr. Frans F.A.J. Van Den Bosch for his continued wisdom, guidance, and inspiration. I would like to particularly thank Dr. Jatinder S. Sidhu for constantly challenging me to push harder against established views and to think critically about everything I write. Doc, working with you has been a pleasure (especially on our epic trip to Riga). I hope you enjoyed it too despite your initial reluctance to accept me as your student (and running away from me in the park)! I would also like to thank the leadership of the Erasmus Research Institute of Management for providing me with the resources necessary to put together a dissertation which I can be proud of. Thanks for supporting the data collection efforts, the research visit at WHU, and my participation in the aforementioned conferences. I will always keep the umbrella with me as a kind reminder of your generosity.

I would like to thank the members of my doctoral committee; it is truly an honor to have such accomplished scholars evaluating my efforts. To the ladies who make things happen in the department (Patricia Wilde-Mes, Miriam Stikkelorum, and the true boss of the department -Carolien Heintjes), thanks for your help and patience. A special thanks to Marisa van Iperen for ensuring the dissertation made it to the publisher on time (I hope). To my department head, Prof. Pursey Heugens, who has always believed in me, thank you for your confidence, I hope to share a nice bowl of iguana soup with you someday. Dr. Nikos Kavadis, with whom I have several ongoing projects (not reported in this dissertation), it has been a pleasure collaborating and hanging out with you. To the other great people I have ongoing projects with (not reported in this dissertation) –Dr. Shaz Ansari (Cambridge, UK), Prof. Patrick Reinmoeller (Cranfield, UK), Dr. Jana Oehmichen (Göttingen, Germany), Dr. Stelios Zyglidopoulos (Cambridge, UK), Heidi Wechtler (Sorbonne, Paris), Sven Nichting (former student), Bas Bosboom (former student), thanks for giving me the opportunity to learn from you. And we WILL finish these projects – someday. As I sit in my room in Tallinn and write these acknowledgments (appropriately

accompanied by a Saku Hele), I would like to thank Maarja Murumägi (Estonian Business School) for making this research visit possible and being a wonderful hostess. I am glad to have succeeded in putting a few smiles on that poker face. To Prof. Dr. Han van Dissel (University of Amsterdam; former dean of RSM), who believed that bringing a 22-year old island boy to Rotterdam just might turn out to be worthwhile, I hope I did not miss the gorilla in the room.

Dr. Sebastiaan van Doorn (yes, I said it!) and Dr. Yuri Peers, it was an honor to serve with you in the PhD Council. Seb, my officemate and friend, this PhD trajectory would not have been the same without you as my wingman. From our international adventures (Berlin and Barcelona come to mind immediately), to our local trips to De Smitse, to our many mishaps while biking in Rotterdam, it has been a good ride, thanks for riding with me. Keep taking good care of the girls, I'm very proud of you! My fellow PhD colleagues in the department, Lima, Naumovska, Müm, Shiko, Oli, MariaRita (crazy gurl), Prof. Fourne, Andreas, Nacho, and Alex, thanks for the good times. By blurring the line between collegiality and true friendship, you have made the social component of my PhD experience a very special one. The ones whom I have shared an office with (Seb, Ivana Naumovska, Bernardo Lima, Mumtaz Arici) and have had to put up with the influx of my daily visitors (professional and social) and my messy desk, thanks for your tolerance. Shiko Ben-Menahem it was a pleasure working with you in writing the book chapter on Strategic Renewal and organizing the Strategic Management interest group for EURAM 2011. I hope you will not miss my Caribbean love songs too much. The usual suspects with whom I shared many liters down in De Smitse, you know who you are, thanks for the company!

If you have read to this part, you are probably looking for your name, or just gossip. No point in stopping now, might as well keep on reading. To my family who has always been there for me, the family is too large to mention everyone, but, Dr. Justine Heyden, Tinchi, I am blessed to have you as my sister and I am honored to be your favorite brother. Oh, and I also like you because thanks to you (and Ivan of course) we have little Princess Victoria in our lives! Reyna Joe (mom) and Mariano Luis Heyden (dad), well, thanks for making me into who I am today (biologically, socially, and professionally). If you are reading this, then you must have done something right. Wela, I hope you will

attend my defense, but even if you don't take the long flight over, I know that you are always with me in spirit! Bryan Joe a.k.a. L-Joe The Boss, remember that I nag because I love you and only want the best for you. I will spit some sixteens on a trap beat with you soon! Ruth Joe (Uti), my second mom, thanks for taking such good care of me during my stay in The Netherlands. The last few months in Blaricum have been filled with love, laughter, lots of food, and a few speeding tickets. I don't know how to repay you for everything you've done for me, so while I think about it I will say thanks once again and that I will miss you a lot. And oh, I will clean my room before I leave –promise.

Finally, Ginny Hu-a-ng, who stuck with me through the larger portion of this trajectory, thanks for your love, care, and (almost) endless patience. Good luck with the next phase, I am rooting for you! Duane Arnell, kampion, thanks for the many hours we spent discussing intellectual and quasi-philosophical subjects, but more importantly for providing the necessary distractions through our many adventures (C.O.B. for life!). I think it is wise if I abstain from going into any more detail at this point. Albert Engelhardt, Punky, a constant in my life for the last 16 years, thanks for being there bro. Harry Kempler and Evangelos Kaldelis, the Rotterdam experience would have been incomplete without you guys, and I have a feeling I will be seeing you both very soon. Francis Sling, thanks for designing my cover and keep up the good work. Can't forget the boys and girls behind the bar at De Smitse (my second office), thanks for the many fuzzy memories! If you have read to this point and did not see your name, the next sentence is for you. To all my other colleagues, friends, and family who have supported me in any way or form during the writing of this book –I am forever grateful.

May this dissertation adorn your bookshelves for a long time.

One luv,

P.

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Chapter 1. General Introduction

1.1 Strategic Renewal

Modern day incumbent firms operate in challenging task environments. The pursuit of competitive advantage and survival under these conditions is increasingly characterized by temporary advantages punctuated by frequent disruptions (Agarwal & Helfat, 2009; Baden-Fuller & Stopford, 1994; Stopford & Baden-Fuller, 1994; Volberda, Baden-Fuller & Van Den Bosch, 2001). At the core of strategic management thinking rests the premise that, over time, a fit should exist between organizational structure, processes, competencies and resources on the one hand, and opportunities and threats arising in the organization's external environment on the other hand (Miles & Snow, 1978; Snow & Miles, 1983; Venkatraman & Camillus, 1984). However, continuous changes in the organization's task environment –driven by increasing rates of technological innovations, changing customer preferences, rise of more efficient organizational forms, lower entry barriers, and shorter product life cycles, have become the reality confronting even the largest and historically successful organizations (Baden-Fuller & Volberda, 1997). To survive and prosper, firms have to continuously renew their strategies to maintain a dynamic strategic fit with their changing environments (Zajac, Kraatz & Bresser 2000).

Strategic renewal encompasses the process, content, and outcome of refreshment or replacement of attributes of an organization that have the potential to substantially affect its long-term prospects (Agarwal & Helfat, 2009). Strategic renewal increases the likelihood of long-term survival by alleviating the stress that arises from a mismatch between changing environmental conditions and the firm's ability to combat inertia and adapt accordingly (Huff, Huff & Thomas, 1992). Zahra (1996) suggested that strategic renewal entails revitalizing the

company's operations by changing the scope of its business, its competitive approach, or both. Floyd & Lane (2000: 155) expanded this notion by viewing it as "an evolutionary process associated with promoting, accommodating, and utilizing new knowledge and innovative behavior in order to bring about change in an organization's core competencies and/or change in its product market domain." Taken together, strategic renewal can be understood as the *adaptive choices and actions a firm undertakes to alter its path dependence and maintain a dynamic strategic fit with changing environments over time* (Ben-Menahem *et al.*, 2012; Kwee *et al.*, 2010; Volberda *et al.*, 2001: 160).

Remarkable heterogeneity in the modes of renewal responses can be observed across firms and over time (Baden-Fuller & Volberda, 1997). Whereas some firms adopt a course of renewal that sees business contraction, others renew in the opposite direction by expanding the scope of operations and, still others, by restructuring and streamlining operations (Agarwal and Helfat, 2009; Barr, Stimpert, and Huff 1992; Dutton and Jackson, 1987; Eggers and Kaplan, 2009). However, "firms" do not adapt, rather adaptation reflects the choices of key decision-makers regarding the mode through which firms are to alter their path dependencies. The behaviors, preferences, and choices of key decision makers serve to define resource allocations, expected relationships, prescribed behaviors, and actions for organizational members (Hambrick & Mason, 1984; Lyles & Schwenk, 1992). The influence of the most influential strategic decision-makers in organizations –the organizations top management, has been captured in the Upper Echelons framework originally articulated by Hambrick & Mason (1984).

1.2 Upper Echelons Theory

Upper Echelons models assert that organizations and their corresponding strategic behaviors reflect the cognitive and observable characteristics of their top managers (Hambrick & Mason, 1984). The core proposition put forward by

Hambrick & Mason (1984) is that the organization's top management determines the developmental trajectory of firms through the preferences, behaviors, and abilities encased in their strategic choices (Carpenter, Geletkanycz & Sanders, 2004; Cyert & March, 1963; Hambrick, 2007; Nielsen, 2010). This research tradition stems from conceptualizing strategy and firm behavior as being driven by the organization's dominant coalition (Cyert & March, 1963), typically situated at the strategic apex of the organization. Where the top management team (TMT) typically is defined as the upper two-layers of corporate decision-makers (Wiersema & Bantel, 1992).

The Upper Echelons perspective is principally a theory of information processing, with managers acting on the basis of their filtered construals of the situations they face (Cho & Hambrick, 2006; Hambrick, Cho & Chen, 1996). Top managers bring a set of values and beliefs ('cognitive base') to their formal roles that represent the means through which understanding and action are embedded within established social worlds (Dill, 1958; Hargadon, 2006). Wiersema & Bantel (1994: 94) defined this cognitive base as "assumptions about future events, knowledge of alternatives, and the consequences attached to alternatives." In effect, this cognitive base serves to "filter and distort the decision maker's perception of what is going on and what should be done about it" (Hambrick & Mason, 1984: 195). This cognitive base is itself a path-dependent function of a fluid mix of factors such as socio-demographic background, experience, training & education, professional socialization, personality traits, and contextual (organizational) conditioning that are more or less unique to individual actors and largely exogenous to discrete tasks carried out in the organization.

Diversity in this cognitive base is probably the most studied aspect in Upper Echelons research (Carpenter *et al.*, 2004; Nielsen, 2010). A long tradition of research has argued convincingly that more diverse groups have more innovative potential (see Van Knippenberg & Schippers, 2007 and Williams & O'Reilly, 1998 for insightful reviews) because diversity leads to greater variance in ideas,

creativity, and innovation, and thus generates superior group performance (Knight et al, 1999). The degree of diversity in teams is largely accepted as a good indicator of the extent to which group members converge or diverge in their beliefs about task issues, including key decision areas, procedures, and the appropriate choice for action (Amason, 1996; Pelled, Eisenhardt & Xin, 1999; Simons & Peterson, 2000). Variance in perspectives further offers the potential for constructive controversy, as diversity contributes to the magnitude of the team's total pool of task-related skills, information, and perspectives via informational conflict (Eisenhardt, Kahwajy & Bourgeois, 1997; West et al, 2006, Jehn, Northcraft & Neale, 1999). Thus, team decisions and actions are more likely to encompass the full range of perspectives and issues that might affect the ensuing outcomes of a collective endeavor (Van den Ven et al, 2008; Van der Vegt & Bunderson, 2005).

Different renewal trajectories are more or less suited to increase likelihood of survival given contingencies at different levels, such environmental, organizational, and team, confronting top management at any given point in time. Given these contingencies, the organization's top management is entrusted to make suitable choices regarding whether to renew by focusing on levers within familiar domains of organizational activity, such as adapting organizational structure, recombining existing knowledge elements, refining market approaches geared at maintaining existing customers, and creating and implementing new structures, procedures, and systems that change managerial work (Burgelman, 1991; Stopford & Baden-Fuller, 1994); or alternatively decide on courses of action that entail exploring novel opportunities, such as entering new product markets, and acquiring new technologies or capabilities. However, differentially diverse TMTs may reach different conclusions on the courses of action to be pursued. Therefore, taking Upper Echelons Theory as a starting point, we elaborate on several essays in which we develop and test contingency models of how Upper Echelons influence the mode of renewal.

1.3 Research Gaps & Problem Definition

The view taken in this dissertation is consistent with top management actively scrutinize the internal and external environment in their *searching* role in an attempt to identify and define what is needed to ensure alignment between the competences and the environment, for instance, whether exploitative choices are necessary or more diverging explorative ones. At its core we seek to uncover *contingent search patterns of managers in driving strategic renewal*. Search, defined in the Behavioral Theory of the Firm (Cyert & March, 1963) as adaptive problem solving, is driven by the behaviors, preferences, and biases of the organization's dominant coalition –its Upper Echelons (Hambrick & Mason, 1984). Though the Behavioral Theory of the Firm is much broader in its articulation, we focus on the concept of search as a key intervening mechanism that can help bridge Upper Echelons and heterogeneity in mode of renewal in a population of firms.

Further asserting that search is an adaptive problem-solving behavior activated in relation to a stimulus, we probe how different search behaviors and patterns ensue from Upper Echelons being subjected to different contingencies. Attesting to the unique structural position of the organization's Upper Echelons at the interface with the environment, the firm, and key organizational members (Mintzberg, 1983), we look at contingency factors reflecting multiple levels of analysis. In sum, we seek to *bridge* Upper Echelons Theory with strategic renewal research by proposing that different trajectories and manifestations of renewal can be understood by zooming in on the search patterns engendered by the organization's managers. We propose that Upper Echelons matter in different stages and under different team, organizational, and environmental level conditions. In understanding search patterns as a crucial intermediate, and contingent, linkage between the organization's Upper Echelons and different manifestations of renewal, we can inch closer to *understanding why "firms" differ in their modes of renewal*. We do so by evaluating several challenges in four essays

connected through different forms of search, which we consider as offspring of this overarching framework in Figure 1.1 and summarized in Table 1.1.

Figure 1.1: Overarching Conceptual Framework: Multilevel Contingency Model of Upper Echelons & Strategic Renewal

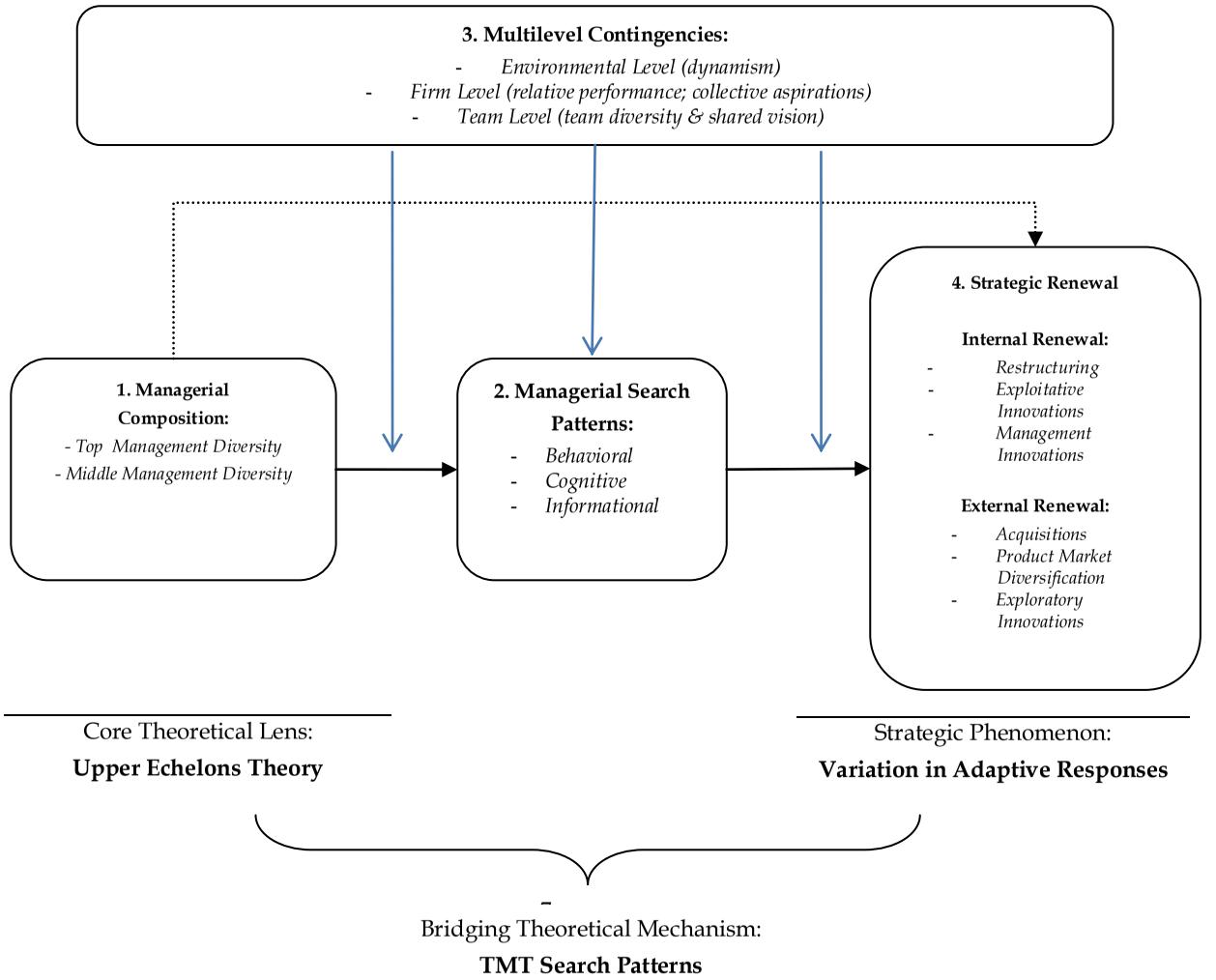

Table 1.1: Overview of Dissertation Studies

	Overarching Research Question	Theoretical Lens(es)	Method	Main Contribution(s)
Study 1	Where do CEOs search for knowledge inputs in relation to different contingencies? (Conceptual boxes 2 & 3 in Fig. 1.1)	• Upper Echelons Theory • Strategic decision making	• Mixed panel of Dutch executives 2006-2009 • Large-scale survey • Structural Equation Model	Focusing on the antecedents of Upper Echelon behaviors as opposed to their outcomes by uncovering patterns of CEO search behaviors in relation to cross-level contingencies.
Study 2	How does managerial cognition influence internal and external renewal in dynamic environments? (Conceptual boxes 1-4 in Fig. 1.1)	• Upper Echelons Theory • Adaptive learning • Managerial cognition	• Balanced panel of 181 US manufacturing firms for 1998-2007 • Archival sources & letters to shareholders • Computer-aided content analysis and 2-level GEE	Advancing notions of managerial cognition by proposing attention to local vs. non-local search as a TMT cognitive processes that links TMT attributes to variation in firm-level adaptive responses.

Table 1.1: Overview of Dissertation Chapters (continued)

	Overarching Research Question	Theoretical Lens(es)	Method	Main Contribution(s)
Study 3	How do managers at different hierarchical levels, additively and interactively, influence internal renewal? (Conceptual boxes 1, 3, & 4 in Fig. 1.1)	• Upper Echelons Theory • Middle Management Perspective • Management Innovation	• Balanced panel of 33 Dutch firms for 2000-2008 comprising 8000+ top- and middle manager observations • Secondary sources, archival sources, and multi-respondent survey • Computer-aided content analysis and 2-level GEE	Adding to the intraorganizational determinants of management innovation by proposing a managerial contingency model of how top *and* middle management composition relates to firm-level introduction of new structures, processes, and practices.
Study 4	How does TMT knowledge search influence different types of innovation? (Conceptual boxes 2,3, & 4 in Fig. 1.1)	• Upper Echelons Theory • Behavioral Theory of Firm • Organizational learning	• Random sample of Dutch firms in 2007 • Large-scale survey • Nested Multigroup Structural Equation Model	Incorporate TMTs into search-innovation models by highlighting the influence of TMTs in the conversion of knowledge assembled through local and non-local search into exploitative and exploratory innovations.

1.4 Research Design

The dissertation is inherently based on a mixed-method research approach and combines quantitative and qualitative data from multiple primary and secondary sources, representing various time periods (from 1998-2008), and reflects multiple levels of analyses (environmental, firm, team, and individual), that allow for triangulation of the predictive validity of the proposed framework. The mixed-method design across chapters is partially a result of intentional pursuit of methodological rigor, but also partially based on devising creative ways to tackle measurement challenges that emerged along the way. Combining data from multiple respondents, from different time periods, from different populations, and at different levels of analysis is not without its challenges, and the particular challenges, tradeoffs, and solutions, are discussed in the methods and discussion section of each of the studies reported.

Each study in this dissertation drew on a different dataset, and three out of four were longitudinal in nature. Study 1 and 4 are based on perceptual measures obtained through a large-scale survey. The datasets for Study 2 and Study 3 combined quantitative (archival) data and qualitative (textual) inputs to operationalize the core concepts and test the respective hypotheses. Study 3 further draws on multi-respondent survey data from non-focal actors in the study (i.e. subordinates of middle managers). Computer-aided content-analysis further proved to be a valuable technique for tapping into otherwise hard-to-measure constructs, and was used in Study 2 and Study 3.

1.5 Study 1: Cross-level Drivers of CEO Knowledge Search Behaviors

In the first study titled *Environmental Dynamism, Relative Competitive Performance, and Top Management Team Diversity: Examining Cross-Level Correlates of CEO Advice-Seeking*, we conceptualize Chief Executive Officer (CEO) advice-seeking as a form of search behavior aimed at improving judgment accuracy in relation to different contingencies. We elucidate patterns of advice-seeking by hypothesizing how correlates reflecting the environment, the firm, and the top management team (TMT), as perceived by the CEO, prompt advice-seeking behavior from internal and/or external sources. We empirically test our hypotheses on a large survey panel (N=3,518) collected from Dutch CEOs from 2006-2009 using a structural equation model (SEM) and uncover asymmetric patterns of CEO advice-seeking in relation to different contingencies.

Our main findings suggest that higher perceived environmental dynamism is related to a CEO's tendency to seek advice from external sources, whereas firm underperformance relative to competitors relates to CEO advice-seeking from internal sources. Additionally, CEOs of less heterogeneous teams show a tendency to seek advice from internal sources, whereas CEOs of more heterogeneous TMTs show a tendency to seek advice from external sources. The relations examined in this study reflect the link between conceptual boxes 2 and 3 in Figure 1.1.

1.6 Study 2: Top Management Team Cognitive Search Focus & Mode of Renewal

In the second study titled *Top Management Team Diversity, Environmental Volatility, & Strategic Renewal: How Managerial Attention to Local and Non-Local Search Drives Adaptive Change,* we look at the latent TMT cognitive factor underlying adaptive renewal choices –attention to local versus non-local search. In

chapter 3 we therefore draw on a cognitive search perspective, by looking at the local versus non local search orientation of TMTs. Research into the cognitive underpinnings of strategic renewal has emphasized how TMT attention focus (e.g., a new emerging technology) can anticipate the domain of organizational action (e.g., investment in this emerging technology). This study carries the discussion forward by exploring the issue of why then firms' adaptive renewal responses differ when their TMTs' attend to the same stimulus. Drawing on the learning literature, we conceptualize TMT cognition as a selective information processing faculty in terms of whether the TMT is more inclined towards local or nonlocal search. We postulate that TMT demographic attributes can predict TMT attention to search on a local-nonlocal continuum in dynamic environments, which in turn explains variation in firms' renewal responses.

We adopt a computer-aided content analysis approach to measure TMT attention to local-nonlocal search. Ten-year panel data (1998-2007) from 181 industrial machinery and computer equipment companies in the US provides strong empirical support for our model. Our results suggest that higher levels of TMT education as well as TMT newness to the industry are associated with greater attention to nonlocal search when the industry becomes more volatile. However, we counter-intuitively find that the positive association between TMT functional diversity and attention to nonlocal search becomes weaker when industry volatility increases. Further, our analysis of the impact of TMT attention to search on strategic-renewal decisions reveals that, while greater TMT attention to local search engenders renewal through restructuring and entry into related product-markets, greater TMT attention to nonlocal search stimulates renewal through unrelated acquisitions and diversification. The relations examined in the first part of this study (hypotheses 1-3) primarily reflect the relation between conceptual boxes 1, 2, and 3 in Figure 1.1. The second part of this study focuses (hypotheses 4-6) on the link between conceptual boxes 2 and 4 in Figure 1.1.

1.7 Study 3: Top and Middle Management Influences on Internal Renewal

In the third study reported, *Driving Management Innovation from Within: Additive and Interactive Effects of Top Management, Middle Management, and Shared Organizational Vision*, we set out to add to the intra-organizational determinants of renewal by emphasizing how both top and middle management influence firm-wide introduction of changes in structures, processes, and practices that alter managerial work (i.e. management innovation). We argue that the compositional attributes of top and middle management matters for management innovation in both additive as well as interactive ways. We further contend that a shared organizational vision can serve as a compass for sensemaking and navigating uncertainty in the face of irreversible changes in managerial work.

We empirically test our hypotheses on a unique longitudinal dataset (2000-2008) of 33 medium-to-large Dutch firms representing different industries and comprising data reflecting the firm, TMT, and middle management (MM) level. The dataset is based on over 8,000 top and middle manager-year observations and multi-respondent survey data obtained from subordinates of MMs on shared organizational vision. We further adopt a novel computer-aided content analysis approach for measuring the span of management innovation in their firm-specific context. Our findings suggest that whereas both TMT and MM diversity exert a positive influence on changes in structures, process, and practices, the interaction between TMT and MM diversity exerts a negative impact. However, we find that the commonality of aspirations, as embodied in a strong shared organizational vision can help counterbalance some of these tensions. The relations examined in this study primarily reflect the link between conceptual boxes 1, 3, and 4 in Figure 1.1.

1.8 Study 4: Incremental & Radical Innovation Outcomes of Top Management Team Knowledge Search

In the fourth and final study, *Top Management Team (TMT) Search and New Knowledge Creation: How TMT Experience Diversity and Shared Vision Influence Innovation,* we probe into the vital role a top management team (TMT) plays in the coupling of knowledge elements assembled through local and nonlocal search into radically new, exploratory innovations and incrementally new, exploitative innovations. We theorize that the materialization of exploratory and exploitative innovations from a firm's recombinatory stock of knowledge elements is contingent on the interplay between a TMT's experience diversity and TMT shared vision. Multigroup structural-equation modeling (MSEM) of data from a large cross-section of firms (N=1,089) in the Netherlands in 2007 supports the theoretical model. We find that while greater variation in TMT experiences fosters exploratory innovations, lesser variation promotes exploitative innovations. A shared TMT vision moderates these relationships. The relations examined in this study mainly reflect the link between conceptual boxes 2, 3, and 4 in Figure 1.1.

1.9 Outline of dissertation

Following this general introductory chapter, we proceed to elaborate on each study conducted as part of the dissertation research. Each essay (Chapters 2-5) represents its own core set of assertions and recommendations and should be viewed as an autonomous study with linkages to the broader conceptual framework. Though there are several recurring themes, which we elaborate upon in the concluding chapter, each chapter is self-contained with its own specific research questions, theoretical review and development, its own data used and method of analysis adopted, and ends with its own conclusions and recommendations. The dissertation concludes with a short summary in Chapter 6.

Chapter 2. Study 1: Environmental Dynamism, Relative Competitive Performance, and Top Management Team Diversity: Examining Cross-Level Correlates Of CEO Advice-Seeking[1]

2.1 Introduction

Scholarly and managerial interest in the role of advice in the executive suite has been gaining significant momentum (Alexiev, Jansen, Van den Bosch & Volberda 2010; McDonald, Khanna & Westphal 2008; Vissa & Chacar 2009). Studies have shown that decision-makers turn to advisers to help improve the accuracy of their judgments and commonly do so when stakes are high (Bonaccio & Dalal 2010; Post, Van Den Assem, Baltussen & Thaler 2004; Schotter, 2003). Advice, as a form of knowledge input for strategic decision-making, embodies prescriptive insights in the form of formulated judgments and opinions about current strategic directions or recommended alternatives for future courses of action (Alexiev *et al.* 2010; Sniezek & Buckley 1995). Chief Executive Officers (CEOs) are held ultimately accountable for strategic decisions and before committing to a possibly irreversible course of action with consequences for the firm, its stakeholders, and the CEO, they may seek strategic advice to aid their judgment of changing environmental conditions, acquire insights on how to improve the competitive position of the firm, or help in selecting between multiple viable alternatives (Eisenhardt & Bourgeois 1988; Miller, Burke & Glick 1998).

The inclusion of advisers in models of strategic decision making implies that decision-making involvement encompasses actors who may or may not be members of the top management team (TMT) or even of the firm (Arendt *et al*, 2005). The source from which advice is sought has therefore been at the center of

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the conversation on CEO advice seeking and studies have shown that CEOs solicit counsel from other managers (Auster & Choo 1993; Roberto 2003), experts (Bergh 2011; Onkal *et al.* 2009; Sniezek, Schrah & Dalal 2004), and friends (McDonald & Westphal 2003; McDonald *et al.* 2008). Using advice sought from different sources has in turn been linked to outcomes such as innovation (Alexiev *et al.* 2010), strategic inertia (McDonald & Westphal 2003), and firm performance (McDonald *et al.* 2008). However, whereas the consequences of advice-seeking are becoming better understood, the question remains: *what prompts CEOs to seek advice from different sources in the first place?*

In this study we aim to elucidate patterns of CEO advice-seeking from internal and external sources. We conceptualize CEO advice-seeking as a problem-solving behavior to improve judgment accuracy in relation to different cross-level contingencies. Attesting to the unique role of CEOs at the interface with the environment, the firm, and key organizational members (Mintzberg, 1983), we provide some answers by examining how perceived environmental dynamism, firm performance in relation to close competitors, and TMT heterogeneity, relate to CEO advice-seeking from sources within or outside their organizations – following Alexiev *et al.*'s (2010) analytical distinction between internal and external sources of advice respectively.

We contribute to Upper Echelons theory by providing evidence of CEO advice-seeking tendencies in relation to different contingencies. Though the literature is growing, models of executive advice-seeking have mainly informed Upper Echelons scholarship by emphasizing the ensuing implications of using advice. However, we emphasize the drivers of executive behaviors instead of the outcomes of these. If the behaviors of top managers are reflected in firm-level actions, then understanding the triggers for behaviors such as advice-seeking offers a rich basis for a more comprehensive picture of how top managers' behaviors are ultimately reflected in firm processes and outcomes. Within this framework our model also has implications for strategic decision-making research

more specifically, by articulating a conceptualization of advice-seeking as an important problem solving behavior as compared to other forms through which CEOs gather descriptive decision inputs such as scanning (Garg *et al*. 2003). We highlight that advice-seeking is (1) an induced problem-solving behavior aimed at improving judgment accuracy in relation to different contingencies, (2) facilitates the transfer of complex and less codifiable normative insights to a CEO, and (3) carries a distinct weight on strategic choice as it embodies prescriptions based on perceived trustworthiness. In interpreting CEO advice-seeking like this, our model tackles one important way through which CEOs and their advice-seeking tendencies can weigh in on decision-making dynamics and ensuing strategic choice.

We further contribute empirically by testing hypotheses on a pooled cross-sectional panel comprising 3,518 observations acquired from surveys of Dutch executives from 2006-2009. Our findings suggest that perceived environmental dynamism is positively related to a CEO's tendency to seek advice from external sources, but is not significantly related to advice-seeking from internal sources. Competitive underperformance in turn prompts advice-seeking from internal sources, but does not have a significant effect on external advice-seeking by the CEO. Finally, high TMT heterogeneity related to a tendency to seek advice from external sources, whereas low TMT heterogeneity is related to a tendency to seek advice from internal sources. Our empirical analysis extends the conceptual work on advice-seeking (e.g., Arendt *et al*. 2005; Jones & Cannella 2011) as well as research conducted in experimental settings (e.g., Bonaccio & Dalal 2006; Gino 2008; Sniezek *et al*. 2004; Van Swol & Sniezek 2005; Yaniv & Kleinberger 2000), by bringing research on advice-seeking closer to the complex set of empirical contingencies confronting CEOs.

2.2 Theoretical Background & Hypotheses

The role of advice in models of judgment and choice has been of central concern to organizational scholars and has been tackled from different complementary traditions. Organizational researchers adopting a more micro perspective have elucidated cognitive and social-psychological processes underlying *when* advice is used for discrete decision problems with limited or no consequence for the user of the advice beyond the experimental setting (e.g. Gino & Moore 2007; Harvey & Fischer 1997; Yaniv & Kleinberger 2000). Organizational design theorists in turn have sought to understand the interplay between formal decision support systems (e.g. ERP-systems) and more informal ones such as advice, and have tried to optimize the design of information systems by identifying contingencies that favor different systems (De Alwis, Majid & Chaundhry 2006; Ko, Kirsch & King 2005; Onkal *et al* 2009; Saunder & Jones 1990; Yasai-Ardekani & Nystrom 1996). One observation that emerges from these traditions is that as more information becomes available through formal systems, and as stakes become higher, the more decision-makers will rely on advice.

More recently strategy scholars have also started theorizing about the role of advice and advisers in contemporary models of strategic decision-making (e.g. Arendt *et al.* 2005; Jones & Cannella 2011). The recurring theme in these studies is that the source from which advice is sought matters. Empirical studies in turn have corroborated the implications of seeking advice for outcomes of strategic interest such as strategic inertia (McDonald & Westphal 2003), radical innovations (Alexiev *et al*. 2010), and performance (McDonald *et al.* 2008; Vissa & Chacar 2009). McDonald & Westphal (2003) for instance drew on social categorization theory and looked at how advice sought by CEOs from one specific category of advisors –friends, was related to strategic inertia and subsequent decline in performance. McDonald *et al.* (2008) further found that CEOs with larger risk-sensitive compensation packages tended to seek more advice from their circle of external advisors, with implications for firm performance. Vissa & Chacar (2009) in turn

theorized on the structure of entrepreneurial teams' external advice networks and its implications for new venture performance. Alexiev *et al*. (2010) most recently drew on Upper Echelons theory and organizational learning to show how advice acquired from *both* internal and external sources were significant antecedents of exploratory innovations. Though the aforementioned studies all highlight the strategic consequences of CEO advice-seeking in relation to defined sources, the drivers of CEO advice-seeking from different sources still remain elusive.

2.2.1 The rationale for advice-seeking

Strategic decision-making is a judgment task with long-term outcomes subjected to uncertainties and ambiguities not completely known at the point when the strategic decisions are made (Arendt *et al.* 2005). CEOs are entrusted to make sensible strategic choices in the face of different contingencies and can be considered information processing agents at the intersection between the firm, its key actors, and the environment (Haleblian & Finkelstein 1993; Huber 1991; Mintzberg 1983). As comprehensive decisions are more likely to lead to favorable outcomes (Forbes 2008; Heavey, Simsek, Roche & Kelly 2009), CEOs have been shown to be sophisticated information-seekers, scanning their internal and external organizational domains for inputs to update and inform comprehensiveness of decisions (Forbes 2008; Garg *et al.* 2003; Boyd & Fulk, 1996). Upper Echelons scholarship has traditionally emphasized the knowledge encased in background experiences of top managers to understand decision-making processes and subsequent strategic choice (Carpenter, Geletkanycz & Sanders 2004). However, the complex and ambiguous nature of strategic decision-making implies that experientially-acquired insights often become redundant in the face of new scenarios (Gino & Moore 2007; Sachi & Burigo 2008). Moreover, the data inputs CEOs seek through scanning are often unavailable, incomplete, or obsolete (Eisenhardt & Bourgeois 1998; Huber 1991; Mintzberg, Raisinghani & Theoret

1976). Ironically, modern information systems can provide CEOs with an overflow of factual and descriptive inputs (Chenhall 2003), making it inherently difficult to process all available bits of data in a timely and sensible fashion. Therefore, reliance on experiential knowledge acquired from 'doing,' such as experimentation or experience (Regnér 2001), or descriptive information such as fact reports, newspapers or web-based sources (Auster & Choo 1993; Bonaccio & Dalal 2006), provides an incomplete basis on which to justify commitment to a course of action that may have irreversible consequences for the firm, its stakeholders, and the CEO (Bonaccio & Dalal 2010; Isenberg 1986). The distinct value of advisers becomes that they can aid in filling in missing information, serving as a "sounding board," or helping to assess the values of alternative options (Yaniv 2004). Seeking advice can thus help CEOs improve the confidence and likelihood that ensuing decisions are comprehensive through the inclusion of additional task-related prescriptions, opinions, and suggestions.

The nature of advice. Sniezek & Buckley (1995) conceptualized advice as formulated judgments or recommended alternatives which are communicated to the decision maker. CEOs seek advice to discover 'what works' or 'what works better' (Demarest 1997). Some have observed that CEOs may rely more on advice gained from personal relations than from formal advisory systems (Arendt *et al.* 2005). CEOs seek advice from sources with some form of expertise, authority, or goodwill by engaging in interpersonal interactions, such as informal discourse. These interactions facilitate the articulation and transfer of hard to codify beliefs about proper strategic action (McDonald & Westphal 2003; Onkal *et al.* 2009; Schrah *et al.* 2006) and advice serves as an efficient informational vessel for transferring this type of normative input (Ko, Kirsch & King 2005). Thus, whereas acquired information from, for instance, scanning is descriptive and non-interpretative in nature, advice is prescriptive or evaluative and is weighted to some degree by its perceived trustworthiness (Schrah *et al.* 2006; Szulanski, Cappetta & Jensen 2004). If advice-seeking is intended as an aid to improve

judgment accuracy in the face of different contingencies, understanding how different factors induce CEOs to seek advice from different sources becomes important.

2.2.2 Sources of Advice

The boundary of the firm serves as an important demarcation line for the nature of knowledge in the population and CEOs can draw on external sources through their contacts with agents at other companies, or focus on seeking more insights from managers within their own organization (Alexiev *et al.* 2010; De Alwis *et al*. 2006; Menon & Pfeffer 2003; Menon *et al.* 2006). In taking this view, we underwrite a conceptualization of advice from internal and external sources as orthogonal knowledge streams that can provide the CEO with judgments and recommendations regarding current and future strategies.

Internal sources. Internal advice is typically sought from other agents (e.g. middle managers, senior managers) and acts mainly as a conduit for firm-specific prescriptions that are generated within functional and organizational boundaries (Spender 1996). Its prescriptions are usually conditioned by organizational memory, and thus more likely to be characterized by informational elements in relation to the dominant logic (Agyris 1976; Bettis & Prahalad 1995). Advice sought from internal sources conveys opinions that can provide the CEO with prescriptions from users of concepts in the firm-specific context (Carlile 2002; Katila & Ahuja 2002). Internal advisers can highlight key issues that need to be addressed, and how to address these, based on the interpretations of those with rich firm-specific knowledge and contextually sensitive causal understandings. However, path-dependent courses of action can become so taken-for-granted that members of the focal organization who adhere to them rarely scrutinize them (Green, Li & Nohria 2009). As the embeddedness of internal advisers makes it difficult for them to identify new problems and solutions beyond their functional

domains, and as a result they are more likely to prioritize issues related to their own firm-specific activities. Internal advisers might also be more reluctant to confront the CEO with suggestions that challenge current logics because of individual career concerns, and may therefore ignore their own opinions and instead attempt to validate the CEO's beliefs (Boot *et al.* 2005).

External sources. Advice from external sources (e.g. managers at other firms, consultants, outside experts) is typically sought from advisers with knowledge not proprietary to the focal firm, its members, or its internal relations (Menon & Pfeffer 2003). External advisers tend to be considered more objective because their prescriptions are less colored by previous successes and failures of a single organization which are often stored in organizational memory, myths, and symbols that outlive individual actors and events (Crossan & Bedrow 2003). Menon & Pfeffer (2003) note that these insights tend to be less-rich in detail, farther removed from existing path dependent conditioning, and more valuable because they tend to be a scarcer resource and more difficult to access (cf. Gino 2008; Mcdonald *et al.* 2008). Knowledge from external advisers serves to help decision makers stay in touch with reality by providing them with strategic interpretations of best practices, market knowledge, and expert analysis that internal agents might not have (Glückler & Armbrüster 2003; Larsson, Hedelin, & Garlin 2003; Kets de Vries 1989). Advice from external sources offers more variety of interpretations as it tends to embody beliefs interpreted through different terms of cognitive schemas by outsiders. This can help the basic questioning of underlying operating assumptions or governing principles of the dominant managerial logic that can potentially become, or have become, harmful to the functioning of the firm (Akbar 2003; McDonald *et al*. 2008; Robson & Bennet 2000). As a result of fewer vested interests in ongoing configurations, external advisers can also be more candid in their evaluations and prescriptions. The prescriptions from external advisors are further considered more legitimate because external advisors are typically more impartial and emotionally unattached to prior courses

of action. However, advice from outsiders also tends to be of lesser depth as it is more difficult to incorporate considerations regarding covert nuances and firm-specific idiosyncrasies in its prescriptions.

If CEOs seek advice to improve their judgment accuracy, and internal and external advisers are likely to possess different knowledge and insights, then there could be a contingent tendency for the CEO to seek advice from different sources. In the following section we develop hypotheses corresponding to three complementary vantage points, the environment, the firm, and the TMT, that reflect correlates that may prompt CEOs to seek advice from internal and/or external sources.

2.2.3 Environmental level: perceived environmental dynamism & CEO advice-seeking

A firm's ability to devise correct adaptive responses to maintain a fit with their environment stems partly from the ability of its CEO to assess and anticipate market dynamics accurately and comprehensively. Dynamic environments are characterized by "rapid, discontinuous change in demand, competitors, technology, and/or regulations such that information is often inaccurate, unavailable, or obsolete" (Eisenhardt & Bourgeois, 1988, p. 816). This results in high uncertainty and increased complexity (Lawrence & Lorsch, 1967), while simultaneously commanding enhanced responsiveness from the CEO, both in decision making processes as well as subsequent implementation of strategic alternatives (Baum & Wally, 2003). Milliken (1987: 136) suggested that in general terms uncertainty can be understood as a "perceived inability to predict something accurately." In particular, she suggested that decision-makers experience uncertainty "when they perceive the organizational environment or a particular component of that environment, to be unpredictable" (p. 136). This unpredictability is manifested in dynamism in the rate of market and industry

change and the extent of irregularity in forces that are beyond the control of individual businesses (Aldrich 1979; Baum & Wally, 2004; Dess & Beard 1984). Such sources of dynamism in the organization's task environment may arise from, for instance, discontinuous customer preferences, rapidly changing market and technological conditions, and unpredictable supply and demand cycles (Eisenhardt & Bourgeois 1988; Jansen *et al.* 2006; Tripsas 2008).

The relation between the extent of uncertainty in the environment perceived by the CEO and the subsequent adaptive responses has been shown to be crucial for understanding differential adaptive responses of firms (Auster & Choo 1993; Yasai-Ardekani & Nystrom 1996; May, Stewart & Sweo 2000). From the social systems level, under conditions of uncertainty organizational decision makers will tend to mimic the behavior of other organizations in their environment by adopting similar best-practices, market positions, and technologies of other organizations in the system (DiMaggio & Powell 1983; Galaskiewicz & Wasserman, 1989; Greve 1998b). Lee & Miller (1996) noted from a strategic management angle, that CEOs of firms facing high environmental uncertainty will focus on external sources of competitive advantage (e.g. new market entry), as opposed to pursuing internal cost-saving strategies based on operational efficiency. Consistent with this, from a cognitive perspective, Eggers & Kaplan (2009) found that CEOs who focus their attention externally on a disruptive new technology, were quicker to react and venture into new markets based on these emerging technologies. Chenhall (2003) proposed from an information systems perspective that CEOs adjust their management control systems to be more open and externally focused as environments becomes more uncertain. Echoing this from a strategic decision-making perspective, Arendt *et al.* (2005) proposed in their conceptual paper that under conditions of environmental uncertainty CEOs are more likely to seek advice from external sources.

Extending the aforementioned logic to inform CEO advice-seeking as a problem-solving behavior to improve judgment accuracy, we can expect that

when CEOs perceive their environment to be predictable, they will focus their efforts on improving judgment through accumulation of firm-specific insights regarding operational concerns and potential efficiency gains. However, when CEOs perceive the environment to be dynamic, they will most likely gear their efforts towards external advice-seeking by acquiring insights from outside sources to keep a close watch on the environment in order to be able to adapt swiftly by imputing probabilities as events unfold. Gathering advice from external sources provides interpretations from sources that may have identified blind spots that could remain potentially unidentified by the CEO and, as environments become more dynamic, CEOs can be expected to seek advice from outsiders to improve their comprehension of changing opportunities and threats confronting the firm. Thus, whereas higher perceived environmental uncertainty primes CEOs to engage in problem-solving efforts geared at obtaining inputs to make sense of, and cope with, forces that are beyond their direct control, when uncertainty is perceived to be low and the environment regarded as predictable, CEOs will focus on seeking insights to improve discretionary levers within the firm (Lee & Miller, 1996). Formally we can expect that all else being equal:

HYPOTHESIS 1a: *Lower perceived environmental dynamism will be positively related to CEO internal advice-seeking.*

HYPOTHESIS 1b: *Higher perceived environmental dynamism will positively be related to CEO external advice-seeking.*

2.2.4 Firm level: performance relative to competitors & CEO advice-seeking

CEOs not only seek advice from different sources in relation to perceived environmental dynamism, but also in relation to their firm's performance as they evaluate their past choices to the needs of the future. The CEO is held responsible

for the performance outcomes of the firm, and performance in relation to close competitors is a key issue that needs to be addressed by the CEO. CEOs evaluate, and are evaluated by, their firm's performance relative to competitors, where a par-level performance can be considered "the smallest outcome that would be deemed satisfactory by the decision maker" (Cyert & March 1963; Schneider 1992: 1053). This relative competitive performance functions as a feedback indicator in evaluating past decisions and constitutes a benchmark for perceived success or failure (Greve 1998b). Whereas decision-makers have been shown to repeat and expand the courses of actions that led to satisfactory performance outcomes, lower organizational performance relative to competitors triggers motivated efforts towards finding a solution close to the source of the problem (Cyert & March 1963; Vissa, Greve & Chen 2010; Argote & Greve 2007). To the extent that the CEO regards the firm's performance as being worse in comparison to close competitors, then the CEO cannot credibly attribute underperformance to exogenous (e.g. environmental) sources, as these would be expected to affect the competitors as well (Clapham & Schwenk 1991). Thus the search for a solution has to at least start close to the core problem –the previous strategic choices of the firm.

Seeking advice from external sources in light of underperformance can be interpreted as an acknowledgment of the CEO's incompetence or inability to solve her own strategic problems. Thus, the CEO may be reluctant to discuss problems "outside the family" and tend seek advice from those who can be held jointly accountable (Harvey & Fischer 1997). Resonating with this, the propositions drawn from threat rigidity theory (Staw, Sandelands & Dutton 1981; Bourgeois & Eisenhardt 1988), generally state that low performance leads to restricted information processing and centralized decision making. At the individual level (e.g. CEO) this implies that decision makers experience stress and anxiety caused by a threat and face increased career concerns (e.g. lower compensation, job insecurity). These threats lower the CEO's ability to distinguish and process information, which in turn produces greater reliance on well-learned responses

consistent with the dominant logic of the firm (Greve 2010). This behavior may indicate CEO's tendency for internal advice-seeking in cases of performance below aspiration levels. On the other hand, if CEO advice-seeking can be considered as induced problem-solving behavior, then when performance relative to competitors is high, we can expect that no clear patterns of advice-seeking will emerge as the CEO will tend to repeat validated courses of action. Therefore, a clear pattern for either internal or external advice will not be observed for CEOs of firms with higher relative competitive performance. Therefore, we argue:

HYPOTHESIS 2a: *Lower relative competitive performance will be positively related to CEO internal advice-seeking.*

HYPOTHESIS 2b: *Higher relative competitive performance will exert no discernible effect on CEO internal or external advice-seeking.*

2.2.5 Team level: TMT heterogeneity & CEO advice-seeking

CEOs operate at the interface with a team of senior managers and are held principally accountable for the final decisions made in conjunction with the team (Buyl, Boone, Hendriks & Matthyssens 2010; Cao, Simsek & Zhang 2010; Simsek 2007). The composition of the organization's TMT has long been shown to matter for strategic decision making dynamics (Carpenter *et al.* 2004). Conceptualizing composition in terms of heterogeneity has been at the core of Upper Echelons research. Heterogeneity refers to the variety in the categories of attributes such as education, functional experience, and tenure present in groups (Harrison & Klein, 2007). The composition of TMTs in terms of heterogeneity presupposes that variation in professional experiences encases the collective information processing capacity underlying the generation of alternatives related to strategic issues such

as responses to competitive threats (Hambrick *et al.* 1996), expansion strategies (Barkema & Chyrkov 2007), and strategic change (Boeker 1997).

Low heterogeneity in professional experiences implies that executives are more likely to have overlapping frames of reference, shared cause-effect understandings, and common arsenal of problem-solving heuristics (Bantel & Jackson 1989; Hambrick *et al.* 1996). This experiential commonality facilitates complex knowledge exchange leading to a deeper, more profound analysis to discover new opportunities within the framework of mutual knowledge boundaries (McCauley 1989). These low heterogeneity TMTs are likely to foster analogous interpretations of threats and opportunities and devise a narrower, but simultaneously more specialized, set of solutions (Van Knippenberg, de Dreu and Homan, 2004). When a CEO observes a singularity of opinion based on depth of understanding, as likely to emerge from less heterogeneous TMTs, the CEO may perceive a high degree of group efficacy in the TMT's perspective (Janis 1982; Peterson *et al.* 1998; Park 1990; Choi & Kim 1999). Pressures to maintain cohesiveness may in turn cause the CEO to censor any misgivings they may have, ignore insights that may challenge collective beliefs, and in turn overestimate the group's chances of success (Peterson *et al*. 1998: 273; see also Hambrick 1995). In this sense, concurrence-seeking behavior includes avoiding insights that might disrupt established consensus and favors advice seeking within the realm of the established in order to further legitimize current courses of action. Internal advice extends legitimacy for chosen strategic directions and serves to underline and fine-tune the converging interpretations of low heterogeneity TMTs without the risk of challenging the dominant perspective (Scholten, Van Knippenberg, Nijstad & De Dreu 2007).

More heterogeneous TMTs in turn can draw on a more varied repertoire of knowledge and problem-solving approaches. These TMTs are likely to generate a higher volume and broader set of novel interpretations and ideas as a result of informational debate (Paulus 2000; Simons, Pelled and Smith 1999).

Heterogeneous teams combining knowledge from different domains through enriching informational debate, can result in multiple interesting alternatives for singular decision issues. However, when heterogeneity is high, the lack of detailed comprehension of the specialized domains of expertise of other team members as well as variation in executive experiences is likely to impede in-depth analysis within a shared arena of understanding and from the vantage point of a common perspective (Tsai and Ghoshal 1998). Hence, the multitude of strategic options emerging from the different perspective and beliefs of team members can confound the CEO's judgments for gauging the appropriateness of alternative strategic directions . In the face of multiple alternatives, decision makers become more sensitive to the payoffs of others (Schwartz 2004). Studies in laboratory settings have shown that when multiple competing alternatives are generated, actors turn to help from outsiders to help challenge or validate their own intuition or to help justify the selection of one alternative over another (Harvey, Harries & Fischer 2000; Gino, Shang, Loser 2009). The higher volume and broader spectrum of quality alternatives, makes it harder to reach consensus on the most appropriate course of action, and the CEO may turn to outsiders for additional insights on key issues that might help legitimize the selection of one course of action over another. Hence, CEOs who carry the main accountability and responsibility for the ensuing strategic choice may resort to more objective outside advisers for judgments and opinions that may help legitimize beliefs, settle disputes, or justify the choice for a particular alternative (Hambrick 1995). Therefore,

HYPOTHESIS 3a: *Lower TMT heterogeneity will be positively related to CEO internal advice-seeking.*

HYPOTHESIS 3b: *Higher TMT heterogeneity will be positively related to CEO external advice-seeking.*

2.3 Data & Methods

2.3.1 Research design & sample properties

We set out to test our hypotheses on a random sample from the population of Dutch firms (≥ 20 employees) based on pooled cross-sectional panel for a four year period (2006-2009). Multiple indicators based on existing scales were collected through a large-scale mixed mode survey (mail & web-based) as part of a larger project into the innovation level of the respective population. CEOs and general managers from firms in 12 industries were targeted as respondents and were identified from the REACH database, which compiles data on organizations registered at The Netherlands Chamber of Commerce. These executives were sent a paper-version of the questionnaire with a return envelope. The cover letter addressed the purpose of the study and a brief profile of the research team, along with a link to a web-based version of the questionnaire. Confidentiality was guaranteed and as an added incentive to participate respondents were offered an analysis of their firm's competitive position vis-à-vis national and industry averages with recommendations on their strengths and weaknesses.

Two weeks after questionnaires were sent we followed up with telephone calls to encourage participation and increase response rate, whilst highlighting the benefits of participating. When target respondents could not be reached by phone we asked for their e-mail addresses and sent them a reminder with a link to the web-based version of the questionnaire. The average response rate was almost 13%, sample-wide, which is in line with average response rates from large scale sampling of corporate elites (Cycyota & Harrison 2006; Hambrick, Geletkanycz & Fredrickson 1993). We restricted our analysis to respondent who indicated that they were CEO, General Manager, or President. The largest sub-clusters of the firms in the sample belonged to Manufacturing & Mining (26.55%), Business Services (22.80%), Construction (13.39%), and Transport & Trade (12.39%).

Responses from the remaining eight industries each accounted for between 1.0-6.05% of the sample. This all corresponded to 3,518 observations included in the panel for our observation window of four years.

To further increase the reliability of measures, we sent out the questionnaire to another executive in the firm after two weeks. On average we managed to get a second respondent for close to 10% of the observations in the sample. We calculated an inter-rater agreement score (rwg) for each item used for the analyses (James *et al*. 1993). The average inter-rater agreement ranged from 0.85 to 0.91, which suggests high agreement between raters. The examination of intra-class correlations also revealed a strong level of inter-rater reliability: correlations were consistently significant at the 0.001 level (Jones *et al*. 1983). To check for potential biases stemming from the method of data collection we first checked whether there were differences between web-based and paper-based respondents, and then for respondent age using the sample average as a cutoff. T-test results did not indicate significant differences for the items used in this study. Finally, to check for common method bias we conducted a Harman single-factor test on items included in our multivariate model to examine whether common method bias was augmenting relationships. We found multiple factors, and a first general factor did not account for the majority of variance extracted, thus providing us with the confidence to conclude that common method bias was not misleading our interpretations (Podsakoff *et al*. 2003).

2.3.2 Measures & operationalizations

Our core constructs were measured using established multi-item scales previously validated in the literature. Table 1 provides an overview of the variables, the corresponding set of items measured on seven-point Likert-type scales, their means and standard deviations, standardized factor loadings, Cronbach's alpha, and average extracted variance. For our first hypothesis we

operationalized *perceived environmental dynamism* as a latent factor reflecting multiple items, corresponding to the variable ξ_1 in Figure 1. For our second hypothesis we modeled *competitive underperformance* as a latent factor reflecting multiple items measuring perceived financial performance in relation to the firm's closest competitors, as indicated by ξ_2 in Figure 1. We reverse-coded the perceived relative performance items to capture perceived *under*performance in order to facilitate interpretation in line with our theoretical premises. For our third and final hypothesis we operationalized TMT heterogeneity as a latent function of multiple items measuring variety in functional background experiences present in the TMT, as indicated by ξ_3 in Figure 1.

The dependent variables related to the source from which CEOs sought advice were operationalized using items asking about the respondent's extent of advice-seeking about current strategy and extent of advice-seeking about future strategy, based on Alexiev *et al.*'s (2010) 7-point scale, as adapted from McDonald & Westphal's (2003). Further following Alexiev *et al*. (2010) we focused on advice acquired from other managers and these questions were repeated in relation to managers from within the focal organization ("CEO internal advice-seeking") and managers from other organizations ("CEO external advice-seeking"). These two items were then modeled onto two corresponding latent variables, η_1 and η_2 respectively, as shown in Figure 1.

Control Variables. We controlled for potential influences that might drive our dependent variables from different levels. From the CEO level we included *CEO tenure* and *CEO age* as more experienced and older CEOs could be more inclined to rely on their own experiences or intuition to inform judgment (Arendt *et al.* 2005), and *CEO advanced degree* if the CEO had a masters, multiple masters, or PhD as a proxy for their ability to process information (Hambrick & Mason, 1984). We also controlled for the intensity of advice seeking to control for the general propensity of a CEO to seek advice. The *propensity to seek advice* was operationalized as a summated index of two 7-point items asking about the extent

to which the CEO had sought advice from internal or external sources in general ("*How often did you seek advice from the managers of other organizations*" and "*How often did you seek advice from the managers of your own organizations*"). At the TMT level we controlled for *TMT size* by taking the log of the number of team members, as this has been shown to be influential for decision making dynamics (Certo *et al*. 2006).

At the firm level we controlled for *firm size* as log of employees (Autio, Sapienza & Almeida 2000; Bourgeois 1981) (raw average of 397.59 employees; std. of 4,768), as larger firms tend to have more slack resources and more internal variety, thus potentially influencing advice-seeking (McGrath, 2001), and log of *firm age*, as older firm may have more established and sophisticated information systems that can influence the CEO advice-seeking due to the amount of accessible bits of raw information (Chenhall, 2003). At the environmental level we included a dummy to capture advice-seeking that could have been driven by the environmental jolt colloquially labeled the global financial crisis, and thus observations from 2008 and 2009 were categorized into the *Financial Crisis Dummy*. Finally we included industry effects by classifying firms into relatively high or low discretion industries, as the behaviors of CEO are contingent on the latitude of action endowed by the specific industry context (Hambrick & Finkelstein, 1987; Finkelstein & Hambrick, 1989; Hambrick, 2007). As no prior research with criteria for ranking the 12 industry categories in our sample could be found, we sought advice from a regulatory expert to validate our list based on the expert's knowledge of the Dutch market. We settled on the final classification for the purposes of this study by coding relatively high discretion industries as: media & publishing, food and agriculture, business services, other services, information and communication technology, transport and trade; and relatively low discretion industries as: construction, manufacturing & mining, pulp-paper-forest, chemicals, financial services, and energy and utilities.

Validity & reliability. Statistically, Fornell & Larcker (1981) argued that constructs demonstrate *discriminant validity* if the variance extracted for each is higher than the squared correlation between the constructs. Hair *et al*. (1998) extended this condition by proposing that the composite reliability should be above the 0.70 threshold and an extracted variance above the.50 threshold. All our measures were consistent with these using a Principal Component extraction. Reliability scores were further computed and were all in line with generally accepted standards of good reliability of >.70, as shown in Table 2.1.

Table 2.1: Factor Table & Descriptives

Model Variable	Item Descriptions	Mean (s.d.)	Factor Loadings[a]	Cronbach's Alpha	Average Variance Extracted[b]
Latent Factor					
Environmental Dynamism ($\xi_{1)}$ (Jansen et al., 2006)	Changes in our market environment are very intense	4.60 (1.61)	.83	.82	65.45
	Clients in our markets regularly demand completely new products and/or services	4.11 (1.62	.81		
	The markets in which we operate are constantly experiencing changes	4.74 (1.57)	.88		
	Demand fluctuates rapidly and frequently in our markets	4.50 (1.16)	.72		
Competitive Underperformance (ξ_2) [b] (Jansen et al., 2006)	Your return on assets compared to your closest competitors	4.81 (1.15)	.84	.82	65.35
	Your revenue growth compared to your closest competitors	4.81 (1.21)	.78		
	Your profit compared to your closest competitors	4.74 (1.10)	.80		
	Your acquisition of new customers compared to your closest competitors	4.68 (1.04)	.82		

Table 2.1: Factor Table & Descriptives (continued)

TMT Heterogeneity (ξ_{3}) (Alexiev et al., 2010; Campion et al., 1993)	The members of the management team have divergent areas of expertise	5.73 (1.20	.79	.81	65.94
	The management team members have a great variety of backgrounds	5.45 (1.31)	.85		
	The management team is comprised of members with diverse experiences	5.47 (1.22)	.86		
	The members of the management team have skills that complement each other strongly	5.54 (1.11)	.75		
Internal Advice-Seeking (η_{1}) (Alexiev et al., 2010; McDonald & Westphal, 2003)	To what extent did you acquire knowledge from the managers within your organization	5.03 (1.41)	.97	.94	94.48
	To what extent did you acquire knowledge from the managers within your organization about the current strategy	5.02 (1.42)	.97		
External Advice-Seeking (η_{2}) (Alexiev et al., 2010; McDonald & Westphal, 2003)	To what extent did you acquire knowledge from the managers of other organizations about your future strategy	3.60 (1.56)	.95	.89	90.34
	To what extent did you acquire knowledge from the managers of other organizations about your current strategy	3.82 (1.61)	.95		

Table 2.1: Factor Table & Descriptives (continued)

Observed variables	*Propensity to Seek Advice*	8.88 (2.21)
	High Discretion Industry	.44 (.50)
	Financial Crisis Dummy	.51 (.50)
	Firm Size (log)	4.16 (1.18)
	Firm Age (log)	1.25 (.52)
	TMT Size (log)	1.53 (.51)
	CEO Tenure	13.12 (10.41)
	CEO Advanced Degree	.34 (.47)
	CEO Age	47.23 (9.08)

[a] Principal component extraction; [b] reverse coded for interpretation purposes.

2.3.3 Multivariate approach: structural equation modeling

Structural equation models (SEM) with latent variables can be used when one aims to test specific hypotheses about the dependence relationship among certain constructs where a well-defined structure is imposed a priori (MacDonald & Ho 2002). This technique has the advantage of explicitly considering the measurement error in the indicators and simultaneously estimating a system of structural equations (Jöreskog & Sörbom 1984). We use a Maximum Likelihood estimation and run 1,000 bootstraps to mitigate issues of non-normality in the distribution of the data, whilst preserving the advantages of sample size. We further adhered to Zaheer *et al*.'s (1998) recommendations in adopting Bagozzi & Heatherton's (1994) *partial disaggregation* approach to test the structural models. This is because as the number of items and parameters increases, the model "can be unwieldly because of the likely high levels of random error in typical items and the many parameters that must be estimated" (Bagozzi & Heatherton 1994: 43). The partial disaggregation model represents a compromise between the most aggregative approach (i.e., the standard practice of summing responses to all items into single scales) and the most disaggregative approach (i.e., treating each item as an individual indicator of its respective factor) (Bagozzi & Foxall 1996). Our hypotheses were tested on this model.

2.4 Analysis & Results

Bivariate correlations are presented in Table 2.2 and Figure 2.1: SEM Output Model displays the output model for our SEM. Table 2.3 summarizes the coefficients obtained for testing of our hypotheses. Looking at the coefficients corresponding to our first set of hypotheses 1a and 1b, we expected that higher perceived environmental dynamism would be positively related to CEO external advice-seeking, whereas lower perceived environmental dynamism would be expected to lead to internal advice-seeking. For hypothesis 1a, we did not find

support for the notion that lower perceived environmental dynamism would be related to CEO internal advice-seeking (b=.03; ns). For hypothesis 1b, we find a positive and significant coefficient at the .001 level (b=.11) in the hypothesized direction, thus corroborating our expectation that higher perceived environmental dynamism is related to CEO external advice-seeking.

For our second set of hypotheses, 2a and 2b, we find that performance lower than closest competitors is related to CEO internal advice-seeking (b=.07; p<.01), thus corroborating hypothesis 2a. We further find no discernible patterns of CEO advice-seeking for CEOs experiencing higher relative competitive performance, which is in line with hypothesis 2b. As for the third hypothesis, we expected that TMT heterogeneity would be negatively related to CEO internal advice-seeking (hypothesis 3a) but positively related to CEO external advice-seeking (hypothesis 3b). Our results are significant at the .001 level and in the hypothesized directions. We observe a statistically significant negative effect on CEO internal advice-seeking (b= -.14; p<.001). Hence, hypothesis 3a implying that CEOs of less heterogeneous teams tend to look more for sources of advice inside the firm is confirmed. CEOs of more heterogeneous TMTs in turn display a tendency for seeking external advice (b=.10; p<.001) providing evidence for hypothesis 3b. Our results are largely consistent with our predictions and we believe they have important implications.

Table 2.2: Bivariate Correlations

		(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
(1)	**Propensity for Advice-Seeking**																
(2)	**CEO Internal Advice Seeking**	.65	***														
(3)	**CEO External Advice Seeking**	.64	***	.28	***												
(4)	**Environmental Dynamism**	.17	***	.17	***	.18	***										
(5)	**Competitive Underperformance**	.11	***	.13	***	.05	**	.08	***								
(6)	**TMT Heterogeneity**	-.23	***	-.23	***	-.10	***	-.13	***	-.16	***						
(7)	**CEO Tenure**	-.09	***	-.05	*	-.04	*	.01		.04	*	.04	†				
(8)	**CEO Advanced Degree**	.12	***	.12	***	.09	***	.01		.03		-.02		-.20	***		
(9)	**CEO Age**	-.01		.00		.00		.00		-.01		.00		.08	***	-.03	†
(10)	**TMT Size (log)**	.13	***	.19	***	.06	**	.06	***	.08	***	-.09	***	.02		.13	***
(11)	**Firm Size (log)**	.10	***	.09	***	.04	*	.03	†	-.01		-.05	**	-.02		.19	***
(12)	**Firm Age (log)**	.01		.03		-.04	*	-.04	*	-.04	*	-.01		.09	***	.01	
(13)	**High Discretion Industry**	.01		.04		-.01		.08	***	.05	**	.01		-.06	**	.08	***
(14)	**Financial Crisis Dummy**	.03		.02		.03	†	.04	*	.05	**	-.06	**	.02		.00	

† p<.10; * p<.05; **p<.01; *** p<.001

Table 2.3 (continued): Bivariate correlations

		(9)		(10)		(11)		(12)		(13)	
(10)	**TMT Size (log)**	.01									
(11)	**Firm Size (log)**	.00		.31	***						
(12)	**Firm Age (log)**	.00		.11	***	.18	***				
(13)	**High Discretion Industry**	.01		-.02		-.10	***	-.18	***		
(14)	**Financial Crisis Dummy**	.03	†	-.01		-.12	***	-.25	***	.20	***

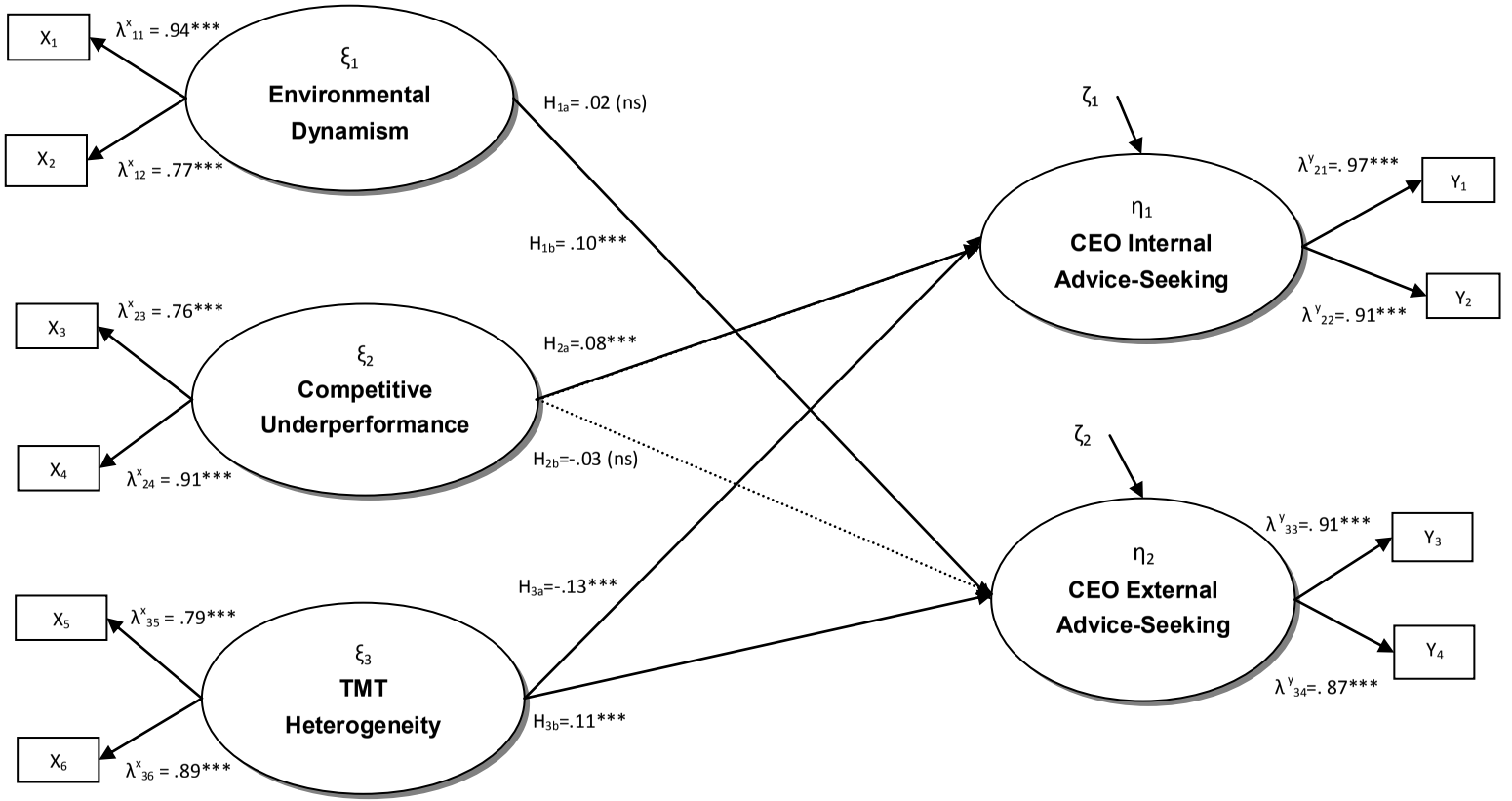
† p<.10; * p<.05; **p<.01; *** p<.001

Table 2.3: SEM Model Coefficients

	A. CEO Internal Advice-Seeking (η_1)			B. CEO External Advice-Seeking (η_2)		
	b.	**(s.e.)**	**p.**	**b.**	**(s.e.)**	**p.**
H1: Environmental Dynamism (ξ_1)	.03	(.02)		.11	(.02)	***
H2: Relative Competitive Underperformance (ξ_2)	.07	(.03)	**	-.04	(.03)	
H3: TMT Heterogeneity (ξ_3)	-.14	(.03)	***	.10	(.03)	***
CEO Tenure (X_7)	.00	(.00)		.00	(.00)	†
CEO Advanced Degree (X_8)	.07	(.04)		.05	(.05)	
CEO Age (X_9)	.00	(.00)		.00	(.00)	
Propensity to Seek Advice (X_{10})	.35	(.01)	***	.40	(.01)	***
TMT Size (X_{11})	.27	(.04)	***	-.09	(.04)	*
Firm Size (X_{12})	-.02	(.02)		-.04	(.02)	†
Firm Age (X_{13})	.04	(.04)		-.11	(.04)	*
High Discretion Industry (X_{14})	.10	(.04)	*	-.10	(.04)	*
Financial Crisis Dummy (X_{15})	-.03	(.04)		.01	(.04)	

[a] Unstandardized Maximum Likelihood estimates: † p<.10; *p<.05; **p<.01; ***p<.001. N: 3,518. Model fit statistics: CFI .98; NFI .97; RMSEA .04. Standardized factor loadings & coefficients omitted for expositional ease but displayed in Figure 1. Squared Multiple Correlations η_1 =.42 and η_2 = .43.

Figure 2.1: SEM Output Model



Controls

X7	X8	X9	X10	X11	X12	X13	X14	X15
CEO Tenure	CEO Advanced Degree	CEO Age	Propensity for Advice-Seeking	TMT size	Firm size	Firm Age	High Discretion	Financial Crisis Dummy

2.5 Discussion & Conclusion

The study of CEO advice-seeking has emerged as crucial for understanding the outcomes of strategic decision-making. Contributing to this young and growing literature, we set out to examine CEO advice-seeking from internal and external sources in relation to correlates reflecting environmental-, firm-, and TMT-level contingencies. We build from the premise that CEOs seek advice to improve judgment accuracy and turn to internal and/or external sources given different contingencies. Attesting to the complex role of CEOs at the intersection between the firm, its environment, and key organizational members, we have provided some important preliminary answers by uncovering asymmetric patterns of CEO advice-seeking in relation to perceived environmental dynamism, relative competitive underperformance, and TMT heterogeneity.

We first focused on the environmental level and hypothesized that higher perceived environmental dynamism would be related to a CEO's tendency to seek advice from external sources, whereas lower perceived environmental dynamism would be related to a tendency to seek advice from internal sources. Our results indeed indicate a tendency to seek advice from outside sources as environments are perceived to become more dynamic. These findings are consistent with the propositions of Arendt *et al.* (2005) and congruent with observation in the literature on environmental scanning (Auster & Choo 1993; Boyd & Fulk 1996; Garg *et al.* 2003). The mounting uncertainty in dynamic environments persuades CEOs to externally validate strategy formation as the viability of strategic alternatives is heavily dependent on environmental dynamics beyond the discretion of the firm. However, we did not observe a tendency to seek advice from internal sources in relation to lower environmental dynamism. One reason for this could be that if advice is indeed an induced problem-solving behavior to improve judgment accuracy, CEOs operating in stable environments can rely on

established processes and routines and can exert confidence in their judgments based on experience.

From the firm level we looked at firm performance relative to competitors. We hypothesized that performance lower than closest competitors would be related to a tendency for CEO advice-seeking from internal sources, whereas performance higher than that of competitors would have no discernible influence on the tendency to seek advice from either internal or external sources. Our results are consistent with our hypotheses, as CEOs facing below-aspiration level performance seem to engage in advice-seeking from internal advisers in order to make sense of the origins of the problem from those who are familiar with the underlying logic and rationale for previous decisions. A complementary explanation is grounded in the sociological reasons for advice seeking –namely sharing responsibility for decisions. Firm performance is typically attributed to the CEO, and CEOs of underperforming firms are held personally accountable and singled out and stigmatized as 'bad CEOs' (Morck, Shleifer & Vishny 1990; Wiesenfeld, Wurthmann & Hambrick 2008). CEOs of relatively underperformaing firms are subsequently confronted with increased career concerns as they experience reduced pay and a decrease in career opportunities (Fee & Hadlock 2004), increased monitoring by the board (Mergenthaler, Rajgopal & Srinivasan 2008), and/or dismissal (Denis & Serrano 1996; Wulf & Singh 2007). CEOs may thus seek internal advice from others not for informational, but for political purposes (Harvey & Fischer 1997). By asking other organization members for their council CEOs can create perceptions of commitment and shared responsibility through (the guise of) participative leadership and integrative decision making (Brousseau, Driver, Hourihan & Larsson 2006), even if they do not, or never intended to, actually use the actual prescriptions encased in the advice (Pogrebna 2008). In seeking advice from other internal sources, CEOs may choose the symbolic use of advice to reduce the exposure to board pressures over the informational use of external advice to enhance judgment accuracy.

From the TMT level we observe that CEOs of more heterogeneous TMTs are prompted to seek advice from external sources, whereas lower heterogeneity is related to a tendency to seek advice from internal sources. Our findings related to hypothesis three are consistent with Upper Echelons scholars who have been considering CEOs and TMTs concurrently as distinct actors operating at the interface with one another (e.g. Buyl *et al.* 2010; Cao *et al.* 2010, Simsek 2007). We further highlight an overlooked challenge in models of TMT heterogeneity and strategic outcomes. Whereas most models assume that the value-added of heterogeneous teams is naturally translated into creative solutions, we propose that an overlooked challenge is that the CEO has to judge multiple alternatives and select the "best" one. From this sense, whereas executive work is generally collective, the CEO is typically held accountable for the decision and its consequences (Arendt *et al.* 2005), and can seek external advice to help validate a selected course of action. The findings related to internal advice-seeking when leading less heterogeneous TMTs resonates with models of "groupthink" (Janis 1982). Peterson *et al*. (1998: 273) for instance note that "[t]hese pressures cause decision makers to censor any misgivings they may have, ignore outside information, and overestimate the group's chances of success" (see also Hambrick 1995). In this sense, concurrence-seeking behavior includes ignoring insights that may challenge collective beliefs –hence focusing on internal advice.

2.5.1 Boundary conditions & future research

Our study is subject to some boundary conditions that open doors for new research opportunities. First, we have looked at pooled cross-sectional correlates, which is not the same as causality. However, they provide the basis for future multilevel research to tap deeper into the causal direction of these relationships. We have further only considered additive effects within the scope of the current study, though these factors might coexist and interact in more complex and

intuitive ways. Future research could benefit from examining how the different cross-level mechanisms interact to influence CEO advice-seeking and consider broadening to set of predictor variables. A key question to be answered is how challenges stemming from different factors are prioritized within the bounded attention span of CEOs. In a similar vein, researchers could try to integrate behavioral and network views of advice-seeking, by considering for instance how membership interlocking directorates influences advice-seeking behavior (e.g., Pettigrew 1992). Though data restrictions inhibited us from testing these relations, it seems plausible that executives who served several years in leading positions in global investment banks or strategy consulting firms before becoming CEOs, would have built networks linking them to top managers in many different companies or industries. Therefore, these CEOs are able to seek external advice more often, but from different sub-clusters within their network of external advisors. Also, the role of boards of directors could also complement these findings (McDonald *et al.* 2008). Board mandates frequently outline the strategic profile of the firm, which in turn may influence the scope of CEO advice-seeking, especially for new executives (Shen & Cannella 2002). Future research should also address several contingent factors, which could potentially influence CEOs' advice-seeking behavior (e.g., type of decision problem, time pressure, advice accessibility), but also try to assess the actual quality of the advice itself (Schotter 2003).

2.5.2 Conclusion

What drives CEOs to seek advice from different sources? Our study suggests that correlates at the environmental, firm, and TMT level exert asymmetrical influences on the tendencies for CEO internal and external advice-seeking. We conclude that CEO advice-seeking from different sources, as problem solving behavior to improve judgment accuracy in relation to different

contingencies, could be important for Upper Echelons research aimed at understanding subsequent strategic decisions.

Chapter 3. Study 2: Top Management Team Diversity, Environmental Dynamism, & Strategic Renewal: How Managerial Attention to Local and Non-Local Search Drives Adaptive Change[2]

3.1 Introduction to Study 2

Drawing on the ideas of bounded rationality and the limited ability of decision-makers to acquire and process all relevant information (Cyert and March, 1963; Simon, 1947), an august literature has emerged which suggests that firm strategy is determined by managerial cognition in the form of heightened attention to some event, domain or category (see e.g., Cho and Hambrick, 2006; Gavetti, 2005; Gioia and Manz, 1985; Kaplan, 2008; Marcel, Barr, and Duhaime, 2010; Tripsas and Gavetti, 2000). Further, at any point in time, what event or issue captures the attention of decision-makers is argued to be determined by the filter of their formative experiences (Cyert and March, 1963; Finkelstein and Hambrick, 1990; Walsh, 1995). Thus, an apparently plausible central narrative of this literature is that decision-makers confronted with more data than can be comprehended, deal with inflowing information through a selective-attention and action sequence (cf. Fiske and Taylor, 1991; Ocasio, 1997). In attention-outcome models, the specific attention focus of decision-makers predicts whether strategic actions related to the focus of attention will be prescribed and legitimized (Cho and Hambrick, 2006; Eggers and Kaplan, 2009). By stressing the funneling effect of cognitive filters linked to decision-makers' experiences, such models neatly express how the domain of managerial attention determines the domain of organizational action. While insightful in explaining say, firm's speed of new

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market entry or adoption of an emerging technology by virtue of a new market or technology having registered itself on the decision-makers' attention screen (Eggers and Kaplan, 2009; Nadkarni and Barr, 2008), the models do however fall short of explaining why strategic responses diverge when managerial attention is focused on the same event or issue. For example, when faced with the same pressing environmental concerns, decision-making teams have been noted to vary in their responses (Russo and Fouts, 1997; Sharma, 2000).

This paper addresses the void in understanding identified above by bridging the cognitive psychology (Neisser, 1967; Sternberg, 2008) and adaptive learning (Kaufmann, 1989; Levinthal, 1997) literatures to introduce the concept of attention to search. We argue attention to search as a critical cognitive mechanism that can predict variation in firms' actions when decision-making teams note and respond to the same stimulus. The concept we propose emphasizes cognition as decision-makers' inclination towards problem-solving. Akin to organizational-system models of adaptive learning (Levinthal, 1997; Levinthal and March, 1981), the concept distinguishes between two basic and opposing problem-solving preferences based on local or nonlocal information processing. The first identifies a heuristic adopted by decision-makers preferring low risk and high certainty of returns, who seek incrementally better solutions near the domain of their extant expertise. The latter describes an algorithm favored by more risk-tolerant actors, who seek radically better solutions with potentially high albeit uncertain returns in realms distant to extant expertise (cf. Fleming, 2001; Levinthal, 1997). Because the two imply a difference in the opportunity landscape with reference to which data is gathered and analyzed and alternative feasible solutions are found, attention to search allows room for theorizing about variation in firms' responses. The concept assumes that, given a stimulus, decision-makers with bounded rationality avoid cognitive overload by turning to a local or a nonlocal search algorithm, which simplifies decision-making by delineating the search perimeters and information analysis. However, contrary to the assumption of focused

attention on a domain (e.g., the task or general environment) or a specific issue or event (e.g., the emergence of a new technology) as a means of reducing cognitive burden, attention to search assumes that decision-makers can simultaneously attend to multiple domains and factors including, organizational competences, resource availability and competitor actions (cf. Kraatz and Zajac, 2001; Tripsas and Gavetti, 2000).

Inasmuch as managerial cognition is a function of past formative experiences (Finkelstein and Hambrick, 1990; Miller, Burke, and Glick, 1998), this paper further investigates whether the collective educational, functional and industry experiences of a firm's top management team (TMT), the decision-making group with arguably the most impact on firm strategy (Cannella, Park, and Lee, 2008; Hambrick and Mason, 1984), influence TMT attention to search. Empirical evidence of a relationship between TMT experiences and attention to search should promote confidence in the nomological validity of the concept. In addition, we also investigate whether attention to search as the product of combined TMT experiences explains the observed variance in adaptive paths when firms confront industry volatility. Instability of the environment and allied uncertainty typically educe an adaptive reaction from firms (Elenkov, 1997; Lant, Milliken, and Batra, 1992). In examining the effect of TMT attention to search, we particularly engage with the research on strategic renewal. This literature has a rich tradition of inquiring into the micro-foundations of strategy to develop a better understanding of what role executive cognition plays in determining why some firms adopt a course of renewal that sees business contraction, while others renew in the opposite direction by expanding the scope of operations and, still others, by restructuring and streamlining operations (Agarwal and Helfat, 2009; Barr, Stimpert, and Huff 1992; Dutton and Jackson, 1987; Eggers and Kaplan, 2009). By specifically studying the effect of TMT attention to search on internal and external strategic renewal (Capron and Mitchell, 2009) in the form of restructuring and entry into related and unrelated product-markets respectively,

this paper seeks to demonstrate the potential of the attention to search concept as a predictor of variation in firm behavior and, more generally, it aims to present a model of the antecedents and consequences of attention to search as the cognitive mechanism that connects decision-makers attributes to firm-level adaptive change.

We test our theory using Generalized Estimating Equations (GEE) to analyze ten-year panel data from industrial and commercial machinery and computer equipment firms in cluster 35 of the Standard Industrial Classification scheme. Following earlier studies of managerial cognition (Kaplan, 2008; Osborne, Stubbart, and Ramprasad, 2001), we employ textual analysis of letters to shareholders to assess TMT attention to search. We find that when industry volatility increases, higher levels of TMT education are associated with more attention to nonlocal search and greater TMT length of industry tenure is related to more attention to local search. Counter-intuitively, we find that following industry volatility, a positive relation between TMT functional diversity and attention to nonlocal search becomes weaker. Our analysis also shows that while more TMT attention to local search is linked to renewal through restructuring and entry into related product-markets, more TMT attention to nonlocal search leads to renewal through unrelated diversification and acquisitions. This paper makes several contributions. Perhaps most prominently, it enriches the literature on managerial cognition and strategic decision-making through a new conceptualization of cognition as attention to search. Foreshadowing our detailed discussion below, by emphasizing cognition in terms of information processing, risk and return preferences, attention to search fosters prediction of variation in organization behavior in a way that extant notions of attention focus and cognitive-schemas cannot. Further to this, by advancing a model in which cognitive processes act as the link between TMT attributes and firm outcomes, the paper adds to the upper-echelon literature by casting more light on the black-box of TMT demography (Lawrence, 1997). The article also adds to understanding of the micro-foundations of strategic renewal by revealing how decision-making

depends on executives' problem-solving routines. Last but not the least, while scholars building on the evolutionary (Nelson and Winter, 1982) and learning (March, 1991) frameworks have put a great deal of stock in environment and organization-level drivers of adaptive change (see Lavie, Stettner, and Tushman, 2010), this article draws attention to the role of managerial agency. In doing so, it points to the value of a closer integration between the cognitive, learning and evolutionary literatures.

3.2 Theorical Background & Hypotheses

3.2.1 Cognition, decision making and firm strategy

In the organizational literature two distinct approaches regarding how decision-makers solve problems dominate research on the cognitive underpinnings of decision making. These approaches reflect different perspectives on how decision-makers with bounded rationality reduce informational complexity. Drawing on the notion of attention in cognitive psychology (LaBerge, 1995; Shiffrin and Schneider, 1977), an attention-focus approach highlights how decision-makers manage over-abundance of information by selectively attending to events, domains or categories that they perceive to be particularly relevant (Dutton and Jackson, 1987; Hambrick, 1991; Ocasio, 1997). In this tradition, empirical studies report that strategic choices depend on the specific attention focus of decision-makers, because enhanced noting presumably fosters action in the direction of the object of attention and away from other domains (Eggers and Kaplan, 2009; Nadkarni and Barr, 2008). Given the key role of perceptions in directing attention, much effort has been devoted to understanding how decision-makers' experiential backgrounds affect perceptual filtering (Cho and Hambrick, 2006; Hambrick and Mason, 1984).

In contrast to the attention-focus approach, building on cognitive psychology's idea of analogy as a means to comprehend new contexts (Gick and

Holyoak, 1983; Thagard 1996), a schema-based approach emphasizes cognitive templates as drivers of decision making. These templates or mental models constitute simplified knowledge structures, which identify the focal elements and their interrelationships in the decision-makers' minds (Daft and Weick, 1984; Kiesler and Sproull, 1982; Walsh, 1995). Research in this tradition holds that these templates are relatively stable and tend to be shared within and across firms in an industry. Further, these schemas are argued to affect strategic choices by influencing how decision-makers frame and make sense of their competitive context (Elsbach, Barr, and Hargadon, 2005; Greve, 1998; Porac et al., 1995; Reger and Huff, 1993). In particular, research indicates that managers create industry schemas by classifying organizations into reference groups that are similar to the focal organization on important attributes (Fiegenbaum and Thomas, 1995; Porac and Thomas, 1994). Reference groups are important because their mean strategy supposedly offers a focal point towards which organizations' strategic choices converge (Greve, 1998; Porac et al., 1995).

The attention-focus and schema-based approaches in fact underscore separate facets of human cognition. While very revealing, neither delves into another vital aspect of cognition namely, how decision-makers with particular attention foci and cognitive schemas arrive at a solution when a problem arises. Cognitive psychologists have long observed that problem solving and learning are based on dynamic information-processing, which is reflected in how decision-makers search for information and analyze it (Neisser, 1967; Sternberg, 2008). We focus on this crucial aspect of cognition in proposing the concept of attention to search to understand variation in decision outcomes and firm-level adaptive change. In the next section, we first delineate the theoretical domain of the concept by briefly reviewing the idea of local versus nonlocal search in the literature on adaptive learning. Our discussion is set against the backdrop of environmental change, which compels decision-makers to deal with the problem of a potential organization-environment misfit that accompanies such change. The discussion

highlights that decision-makers' cognitive inclination towards local or nonlocal search not only identifies the solution set from which a response to the issue at hand will be selected, it also identifies decision-makers' risk-return preferences.

It is perhaps best underlined here that the attention to search concept responds to the lament that extant models inaccurately represent cognitive processes in organizations and may hence lead to erroneous predictions (e.g., Elsbach et al., 2005; Lant, 2002). We submit that the concept should foster the prediction of real-life outcomes. By recognizing that both the range of potential solutions as well as risk orientations and payoffs are relevant in organizational decision making (March, 1991; March and Shapira, 1992), attention to search provides a more robust basis for predicting adaptive change. In addition, the concept incorporates dynamism into the decision-making process. It assumes that decision-making teams idiosyncratically learn and update their beliefs and solution preferences based on the information they assemble and assess, which contrasts sharply with models based on stable cognitive schemas shared within and across firms (e.g., Elsbach et al., 2005; Greve, 1998). As a result, attention to search can move beyond an explanation of why strategies of industry incumbents converge (Fiegenbaum and Thomas, 1995; Porac and Thomas, 1994) to explain why firms' strategies vary.

In addition, with respect to explaining strategy variation, attention to search would seem to have more promise than the notion of attention focus. For one, the premise that focus on one domain means the neglect of others is perhaps not very tenable in the context of organizational decision-making. Because of industry participation by means of, say, buyer-supplier networks, trade-association links, attendance of fairs and newsletter subscriptions, it is unlikely that a decision-making group such as the TMT would continue to exclusively focus attention on one domain while overlooking other domains of import. If this is acknowledged, it becomes hard to explain a firm's adaptive response in terms of a singular focus. On the other hand, if significant events or developments are

likely to come to any TMT's attention due to industry participation, cause-effect attribution is difficult due to lack of variation in attention focus. For instance, in the case of a new technology or industry decline (e.g., Barnett and Carroll, 1995; Lavie, 2006), incidents likely to get attention of all TMTs, variance in firms' responses cannot be attributed to differences in TMT attention focus. Lastly, even in cases in which decision-makers are recorded to be more attentive to a particular domain, the locus of adaptive action might be different from the locus of attention depending on what else decision makers note, the information they seek and assess, the response options they conceive and their risk-return preferences.

3.2.2 Environment change and attention to local-nonlocal search for adaptive solutions

The imperatives of an organization-environment fit (Lawrence and Lorsch, 1969; Naman and Slevin, 2006; Porter, 1981) imply that environmental change exerts pressure on organizations to adapt. Thus, decision-makers are more likely to engage in search for adaptive solutions in volatile rather than stable environments. Consistent with this, empirical work indicates increased information processing and a more frequent change of strategy given industry flux (Dutton, Fahey, and Narayanan, 1983; Garg, Walters, and Priem, 2003; Lant et al., 1992). Assuming increase in industry volatility, we submit that decision-makers can be cognitively more or less attentive to two forms of search: local and nonlocal. The general idea of local-nonlocal search has roots in discussions of adaptation in biological as well as artificial systems (Holland, 1975; Smith, 1989). Given an *n*-dimensional landscape of attribute combinations, which circumscribes the entire gamut of the best to the worst adaptive possibilities for a system, at any point in time, the system occupies a specific spot on the landscape topography. Assuming omnipresent change, the logic of fit obliges the system to search for

better positions on the landscape to enhance its odds of prosperity and survival relative to rivals (Kaufman, 1989; Wright, 1931).

In seeking a superior position through attribute modification, one option for an organizational system is to experiment locally in the vicinity of the current landscape position, by drawing on and analyzing familiar information. This amounts to adaptive learning through neighborhood search (Levinthal, 1997; March and Simon, 1958). Due to the small adjustments or refinements it entails, local search is associated with path-deepening incremental change. The alternative is experimentation based on unfamiliar information from domains that are distant from the current landscape position, which amounts to adaptive learning through nonlocal search (Katila and Ahuja, 2002; Nerkar and Roberts, 2004). Since nonlocal search implies major shifts in the repertoire of knowledge and competences to allow radically new attribute combinations, it is associated with path-breaking change (Ahuja and Lampert, 2001; March, 1991). Whereas the benefit of local search is the relative ease and low cost of transition to an adjoining attribute combination, the downside is that it neither allows much improvement if the initial position was average or poor, nor does it allow the attainment of a possibly far-superior, distant position (Kauffman, Lobo, and Macready, 2000). Contrastingly, nonlocal search allows for a radical shift to a much better position on the landscape, but represents a more complex and costly attribute-modification alternative (Fleming, 2001; March, 1991). Due to the higher costs and the *a priori* ambiguity of successful transformation, the returns from nonlocal search are systematically less certain and more remote in time (Levinthal and March, 1993; March, 1991).

Employing the language of adaptive learning in the context of decision-making teams, one possibility is that in a decision situation the team would display a cognitive preference for identifying solutions based on the information that it possesses or is not too far removed from the domain of current

understanding. That is, the decision-making team may be more attentive to local landscape search to find a solution. The contrasting possibility is that the team would be cognitively inclined to find a solution based on acquiring and analyzing novel information quite afar from its knowledge repertoire, that is, the team may be more attentive to nonlocal search. Because local and nonlocal search by definition imply disparity in expected returns and their certainty, greater attention to one or the other reflects divergence in teams' risk preferences. A non-trivial implication of the above is that even though an environmental stimulus may lead decision-making teams to focus attention on the same category, the teams' approaches to find a remedy for the problem can vary in terms of more or less attention to local or nonlocal search. The differences in approaches connote difference in the range of solution opportunities because of variation in the information that is evaluated. We assume that a team's attention to local versus nonlocal search constitutes a tendency towards an adaptive learning algorithm that is enduring and is determined by the collection of experiences of those forming the team. Further, we regard attention to local versus nonlocal search as the two endpoints of a continuum, such that, the allocation of a team's cognitive resources to one precludes their assignment to the other. This one-dimensional conceptualization is analogous to how models of search as a behavioral property of an organization portray firms' exploitation-exploration choices (March, 1991; Lavie et al., 2010; Sidhu, Volberda, and Commandeur, 2004).

With a view to establish nomological validity of the attention to search concept, we next draw on the upper-echelon literature (Hambrick and Mason, 1984) to predict how aggregate experiences of TMT members are likely to have an effect on the team's attention to search given an environmental contingency that obliges the team to fashion an adaptive response. Particularly, because the formative educational, functional and industry experiences of senior executives have featured prominently in past research (e.g. Cannella et al., 2008; Haleblian and Finkelstein, 1993; Wiersema and Bantel, 1992), we theorize how these three

particular attributes will influence a TMT's cognition in terms of the learning algorithm that is followed. After that, we focus on the ability of TMT attention to search to predict variation in adaptive change across firms. Specifically, we hypothesize the effect of TMT attention to search on firms' strategic renewal actions pertaining to organizational restructuring and new product-market entry (Agarwal and Helfat, 2009; Capron and Mitchell, 2009).

3.2.3 TMT education, industry volatility, and attention to search

The education level attained is an indicator of a specific as well as a general proficiency. While the former relates to the grasp of the specialized content of a field, its concepts and cause-effect models, the latter refers to cognitive ability by way of aptitude for information processing and analysis, integrative complexity and ambiguity tolerance. From a general proficiency angle, all else being the same, while a lower education level implies that an executive has the skill to tackle concrete problems using familiar problem-solving routines, progressively higher education levels translate into a greater wherewithal for analysis and resolution of complex problems in creative new ways (cf. Bantel and Jackson, 1989; Bower and Hilgard, 1981). In light of this, in the event of industry volatility we would expect TMTs with higher average education levels to be more attentive to nonlocal search and TMTs with lower average education levels to be more attentive to local search as a basis of finding an adequate response. Our rationale is as follows.

The more elementary the education level, the more likely that decision makers would lean towards an adaptive learning paradigm that does not mentally tax them by necessitating that they cross the perimeters defined by current proficiency. Rather than nonlocal search, which obliges the development of understanding of a distant, unfamiliar landscape, cognitively arduous experimentation based on informational inputs new to the decision makers and

increased tolerance of solution uncertainty and risk, TMTs with lower education can be expected to favor local search (see also Wiersema and Bantel, 1992). This may divulge opportunities for incremental change or first-order transformation (e.g., Denis, Lamothe, and Langley, 2001). On the other hand, the higher the TMT's educational level, the more likely that the team would be inclined to scour for solutions in distant domains beyond the realm of extant expertise. Because of a stronger cognitive ability, a more educated team should be more comfortable with acquiring and assessing novel information. In addition, such a team should be more willing to take risk in the pursuit of higher returns through, say, re-considering the very nature and boundaries of the organization. This expectation is consistent with the observation that the more educated TMTs tend to look more for innovative options (e.g., Bantel and Jackson, 1989). Formally:

HYPOTHESIS 1: *Whereas a higher average educational level of the TMT will be associated with greater TMT attention to nonlocal search as the industry becomes more volatile, lower average educational level will be associated with greater attention to local search.*

3.2.4 TMT functional background, industry volatility, and attention to search

Besides education, executives' functional experiences influence their cognitive and attitudinal makeup (Bantel and Jackson, 1989). Indeed, regardless of educational level, whether managerial career has evolved within the accounting, marketing, operations, strategy or some other function determines such crucial things as the professional association the person will be a member of, person's approach to problem framing, information seeking, analysis and inferences, propensity for risk-taking, norms and values (Barker and Mueller, 2002; Chattopadhyay et al., 1999). In view of this, we expect the collective TMT repertoire of functional experiences to influence the team's attention to search in

the wake of environmental volatility. Specifically, we anticipate that the less varied the repertoire, which would be the case when more team members have the same functional background, the more likely that the team's attention will tend towards local search. On the contrary, the more varied the repertoire, when team members have different functional history, the more the team's attention will move towards nonlocal search.

When executives' functional experiences overlap, they cannot tap into varied sets of knowledge and different networks of information available to a team with diverse functional backgrounds (cf. Bunderson and Sutcliffe, 2002). Also, as the environment fluctuates, lacking experience beyond the common functional domain, a functionally homogenous team is likely to be cognitively more comfortable with and display preference for local search in the neighborhood of what team members know best (cf. Tuggle, Schnatterly, and Johnson, 2010; Waller, Huber, and Glick, 1995). A functionally diverse team is however more likely to be drawn to nonlocal search because it is better placed to absorb, make sense of and integrate information from varied domains. It can draw on the more assorted functional know-how, perspectives and opinions of team members to explore nonlocal possibilities that have potential, but are fundamentally new to the team (see also Bunderson and Sutcliffe, 2002; Lant et al., 1992). Additionally, when TMT members represent an array of business functions, the team should have greater self-efficacy by way of confidence in the ability to find successful solutions through boundary-spanning search. Consequently and given the potentially larger returns from nonlocal search, the team should be more attentive to nonlocal search despite the attendant risk. Our overall argument finds indirect support in the literature on new product development, which indicates that cross-functional teams are more adept than mono-functional ones at finding solutions that break new ground (e.g., Lovelace, Shapiro, and Weingart, 2001):

HYPOTHESIS 2: *Whereas greater variety in TMT functional backgrounds will be associated with greater TMT attention to nonlocal search as the industry becomes more volatile, less variety in functional backgrounds will be associated with greater attention to local search.*

3.2.5 TMT industry tenure, industry volatility, and attention to search

Although the impact of TMT tenure longevity on attention to search has not been investigated, prior work does observe that differences in tenure length stimulate team members to voice and consider alternative views (Wiersema and Bantel, 1992). We carry this reasoning forward to suggest that the more the average length of time clocked by a TMT in an industry, the more the team's attention will be directed to local search in response to industry flux. Longer tenures imply a deeper understanding of the industry through close relationships with customers, suppliers and other stakeholders (cf. Hambrick et al., 1993; Kor, 2003). Given such intricate knowledge, but concomitantly lacking first-hand familiarity with the institutional, technical and market aspects of other industries, long tenure is likely to lead a TMT to turn to its repertoire of intra-industry knowledge and experiences when faced with volatility (also Hambrick and Mason, 1984). Attention to nonlocal search is doubtful, because the returns from it are quite uncertain when a TMT lacks extra-industry experience.

On the other hand, if a TMT has low average industry tenure because team members have had fragmented careers in different industries, it implies that the group has access to the core supply and demand-side fundamentals of business domains other than the focal one. Some of this information might be usefully leveraged to conceive path-breaking solutions to deal with volatility in the decision-makers' current industry. Such information leveraging or brokering is viewed as a key element underlying successful innovation in several traditions including the dynamic capabilities (e.g., Eisenhardt and Martin, 2000), invention

as knowledge recombination (e.g. Yayavaram and Ahuja, 2008) and technology management (e.g., Dosi, 1982) research. Further, executives who have worked in different industries typically have varied networks of contacts (cf. Cannella et al., 2008), which can act as a conduit of valuable information from other industries. Given access to and understanding of boundary-spanning data, teams with shorter industry tenure are thus more likely to be attentive to nonlocal search to find adaptive solutions. Therefore:

HYPOTHESIS 3: *Whereas higher average industry tenure of the TMT will be associated with greater TMT attention to local search as the industry becomes more volatile, lower average industry tenure will be associated with greater attention to nonlocal search.*

3.2.6 TMT attention to search and strategic renewal

Strategic renewal refers to adaptive change that involves the transformation or replacement of one or more core organizational attributes, such as, products offered, market served, technologies employed and organization design for input-output conversion (Agarwal and Helfat, 2009; Huff, Huff, and Thomas, 1992). Accordingly, strategic renewal may take the form of reconfiguration of the organization, shift in the main business through acquisition or diversification-based entry into new domains and even industry exit (Agarwal and Helfat, 2009; Burgelman, 1994; Volberda, Baden-Fuller, and Van den Bosch, 2001). Regardless of the specific manifestation, since strategic renewal entails the alteration or outright replacement of core attributes, it depends on the unlearning of old ways and the development of new understanding (Floyd and Lane, 2000; Kim and Pennings, 2009; Lant and Mezias, 1990). Further, while firms might engage in ongoing, proactive renewal in pursuit of their goals, often renewal is set off by the need to prevent misfit with a changing environment and the attendant

risk of firm failure (Agarwal and Helfat, 2009; Henderson and Clark, 1990; Tushman and Anderson, 1986).

In examining whether TMT attention to local versus nonlocal search can predict variation in firms' strategic-renewal decisions, we consider the impact of TMT attention to search on both internal and external strategic renewal (Capron and Mitchell, 2009; Gulati and Puranam, 2009). Whereas the former refers to adaptive change that is essentially organization centered, the latter pertains to change whose locus is outside the firm. In particular, we focus on internal renewal by way of a realignment or restructuring of organizational systems and processes. Further, we consider external renewal in the form of entry into new product-markets, which could either take place with or without the acquisition of independent companies. Internal and external renewal are not mutually exclusive and firms may indeed simultaneously engage in both (cf. Capron and Mitchell, 2009; Rothaermel and Alexandre, 2009). Because we expect that TMT attention to search should help predict firms' actions vis-à-vis both categories, we formulate hypotheses pertaining to organizational restructuring as well as new product-market entry.

We have argued above that attention to local search can identify refinement opportunities in the neighborhood of current operations, which enables path-deepening incremental change. Accordingly, we anticipate that greater TMT attention to local search would result in strategic renewal that retains the firm's principal business and competencies but modifies or leverages these to strengthen the organization's long-term prospects. In contrast, because attention to nonlocal search can promote path-breaking radical change by disclosing opportunities in new-to-the-firm domains, greater TMT attention to it should be connected to strategic renewal that de-emphasizes the firm's extant business and competencies (cf. March, 1991; Ahuja and Lampert, 2001). The foregoing leads us to surmise that while the organizational restructuring form of renewal is likely to be positively related to greater attention to local search, it should be negatively

related to nonlocal search. Restructuring or reorganization reflects an effort to revise organization design, systems and processes for a better internal alignment to respond to a changed context (e.g., Gulati and Puranam, 2009). It represents an adaptive response through improvement of extant operations but not a fundamental departure from the core business and competencies. Hence:

Hypothesis 4 (H4): Whereas greater TMT attention to local search will be positively related to organizational restructuring, greater attention to nonlocal search will be negatively related to it.

Entry into new product-markets offers a strategic-renewal avenue that can lessen exposure to risk associated with a single business. A firm can diversify into domains with technological or market connectedness to the firm's focal industry or into those unrelated to extant operations (Rumelt, 1982; Tanriverdi and Lee, 2008). Separate arguments have been put forth as to why firms pursue related or unrelated diversification. The foremost explanation for the former combines insights from transaction-cost economics and the resource-based view to suggest that it is motivated by economies of scope through leveraging unutilized stocks of extant resources in related businesses (Chatterjee and Wernerfelt, 1991; Miller, 2004). Inasmuch as related diversifiers outperform unrelated diversifiers (Palich, Cardinal, and Miller, 2000), an agency theory lens is often used to suggest that unrelated diversification is spurred by managerial self-interest to gain more power and prestige (Chatterjee and Wernerfelt, 1991; Lim, Das, and Das, 2009). We suggest another dynamic as to why some firms renew through related and others unrelated diversification. We submit that the choice between the two can be explained by the effect of TMT attention to search on the detection of profitable opportunities.

A feature of attention to local search is quest for performance improvement through small product-market modifications that are not far

removed from existing competences. As such, it is more likely to unearth business opportunities associated with current operations through the application and extension of surplus financial, technological and knowledge resources. Given the higher probability of discovering lucrative opportunities in allied fields, the more the TMT attention to local search, the greater the odds of related rather than unrelated diversification. Conversely, a hallmark of attention to nonlocal search is attainment of superior performance through radical changes in product-market attributes, which are liable to lead the firm away from extant operations and prompt the building of new knowledge and competences. By virtue of revealing opportunities in hitherto alien and untried domains for the firm, greater TMT attention to nonlocal search is more likely to be associated with unrelated rather than related diversification. An implication of our argument is a different trigger for unrelated diversification than that suggested by agency theory. Rather than being driven by managerial self-interest, such diversification might ensue due to the *ex-post* wealth potential of an opportunity discovered through attention to nonlocal search. The preceding points lead us to the following hypothesis:

HYPOTHESIS 5: *Whereas greater TMT attention to local search is more likely to lead to related diversification, greater attention to nonlocal search is more likely to lead to unrelated diversification.*

The above discussion has implicitly assumed new product-market entry through internal development. Firms can of course also enter new businesses via acquisitions in related or unrelated fields (Lee and Lieberman, 2010), which enable access to competences that do not exist in-house (see also, Capron and Mitchell, 2004). In line with our earlier arguments, we anticipate that greater TMT attention to local search would predict related acquisitions. Specifically, because new opportunities exposed by TMT attention to local search are likely to be in the vicinity of ongoing operations, we can expect the drive to pursue these

opportunities to spawn the takeover of firms that can provide technological resources and know-how that are complementary to present ones. Such related acquisitions denote an extension of operations into adjacent domains, which permits the pursuit of fresh possibilities through the leverage of extant competencies (cf. Anand and Singh, 1997). In contrast to this, because TMT attention to nonlocal search is likely to reveal opportunities that cannot be exploited with the present configuration of know-how and skills, it should predict unrelated acquisitions that bring new-to-the-firm resources into the organizational fold (cf. Vermeulen and Barkema, 2001). Hence:

HYPOTHESIS 6: *Whereas greater TMT attention to local search is more likely to lead to related acquisitions, greater attention to nonlocal search is more likely to lead to unrelated acquisitions.*

3.3 Data & Methods

3.3.1 Sample construction

To test hypotheses we collected data from industrial and commercial machinery and computer equipment firms in sector 35 of the Standard Industrial Classification (SIC) scheme. As Table 1 indicates, the sector includes nine three-digit level sub-sectors, which makes for ample variation in terms of diversity of lines of business. We used Compustat to identify firms for the sample, with the only restriction for sample inclusion being that a firm be publicly traded in the US. This ensured a sample of firms with comparable financial information, because of the standardized data that the Securities and Exchange Commission (SEC) requires US firms to maintain. Further, because TMT attention to search can be expected to influence strategic renewal with a time lag, we collected longitudinal data in the form of annual repeated measures covering a ten-year (1997-2008)

period. To create a balanced panel, we only included those firms that were in active operation for all the observation years (Verbeek, 2008). Our final sample included 181 firms distributed across the nine three-digit SIC sub-sectors as shown in the table below.

Table 3.1: Frequency distribution of three-digit sub-sectors in SIC sector 35

Description	Valid %
351 – Steam, Gas & Hydraulic Turbines	0.0
352 - Farm & Garden Machinery	4.4
353 - Construction, Mining, Materials Handling	12.5
354 - Metalworking Machinery & Equipment	4.4
355 - Special Industry Machinery	17.3
356 - General Industry Machinery & Equipment	13.9
357 - Computer & Office Equipment (reference group)	42.3
358 - Refrigeration & Service Industry Machinery	4.0
359 - Miscellaneous Industrial & Commercial	1.0

3.3.2 Data collection and measures

Following others (Carpenter, 2002; Geletkanycz and Hambrick, 1997), for all firm-years in our sample we identified firms' TMTs as the upper two tiers of corporate management as listed in the SEC filings. Empirically this implies that TMTs comprised corporate managers holding one or more titles of vice president or higher. We collected three types of data from different sources. First, to operationalize TMT education, functional background and industry tenure, we gathered individual data for each TMT member by using 10-K SEC forms, Dun and Bradstreet reference book of corporate management, and Hoover's database. Any missing biographical data was obtained via popular business-press sources, such as Forbes and Business Week. Second, to assess TMT attention to search we used letters to shareholders in company annual reports. This approach has become popular given the widespread acceptance of semantic analysis as a valid

proxy of socio-psychological constructs (Pennebaker, Mehl and Niederhoffer, 2003; Sonpar and Golden-Biddle, 2008). Moreover, shareholder letters have the advantage that they can reveal the time-varying cognitive mindset of the TMT (see also Kaplan, 2008; Osborne et al., 2001). Third, Compustat and Thompson Worldscope were used to compile industry volatility data and firm-level data on restructuring expenses, diversification, acquisitions, financial, and control variables.

3.3.3 TMT attributes

TMT educational level average was calculated as follows. First, the highest educational level attained by each team member was established on a seven-point scale ranging from: 1 = high school, 2 = some college or associate degree, 3 = undergraduate degree, 4 = some graduate school, 5 = master's degree, 6 = attended doctoral program, 7 = doctorate degree (Datta and Rajagoplan, 1998; Zhang and Rajagopalan, 2010). A weighted average of the proportion of team members in each category was used as the measure of a team's educational level. *TMT functional background* variety was calculated using Blau's index, $(1-\Sigma p_k^2)$, where p is the proportion of team members in the kth functional category (Harrison and Klein, 2007). Six functional categories were used to record executives' predominant experience: administrative, engineering/R&D, finance/accounting, legal, marketing/sales and production/operations (Barker and Mueller, 2003). *TMT industry tenure* average was calculated as the mean number of years each team member had worked in the focal 3-digit SIC sub-sector. The variables were lagged by one year in the multivariate analysis.

3.3.4 TMT attention to search

To capture our core concept of theoretical interest we adopt a computer-aided text analysis (CATA) of letters to shareholders. Methodologically, this approach is based on the premise that theoretically meaningful cognitive associations can be derived from the analysis of language and patterns in its usage reflects deep-level concepts by the user (Duriau, Reger & Pferrer, 2007; Pennebaker, Mehl & Niederhoffer, 2003). In using CATA to capture complex latent concepts, letters to shareholders have recently been established as a valuable data source for scholars interested in cognitive concepts such as attentional orientation (Cho & Hambrick, 2006), strategic schemas (Nadkarni & Barr, 2008), and cognitive frameworks (Marcel et al., 2011), though it has been applied in mainstream management and strategy research for some time (e.g. D'Aveni & MacMillan, 1990). In more practical terms, the CATA helps in assisting human coders in filtering, categorizing, and processing a large corpus of textual sources, capitalizing on the reliability of computer filtering and accuracy of human judgment, while decreasing the likelihood of systematic error due to exclusive reliance on either (Krippendorff, 2004).

We used QSR NVivo 8 package to identify the frequency of references to local and non-local search in letters to shareholders. We conducted a thorough review of the literature to develop a comprehensive search dictionary with indicators that might be taken to connote local or non-local search. To ensure that our list was not limited by scholarly terminology, but also included terms likely to be used in everyday business communications, we extended our initial list by identifying synonyms of our markers in the Merriam-Webster thesaurus. We asked several experts to validate our dictionary in sequential rounds to ascertain the face validity of our instrument. After thorough cleansing and validation of the list in iterative steps we ended up with a dictionary with 25 markers for each form of search. The detailed protocol for building the dictionary and the markers used can be found in Appendix A.

The variable score was based on the total references to indicators of each form of search (see Table 2. Because frequency could be affected by the length of a letter, we took care to normalize the counts by the length of letters. The normalized counts were used to determine TMT attention to search score, with the correlation between local and non-local being -.19 (p. <.05) sample-wide. For each firm-year, we divided the normalized count of references to non-local search by the sum of normalized count of references to local plus nonlocal search to obtain the search score. By construction, whereas higher scores reflect relatively more TMT attention to nonlocal search, lower scores reflect greater attention to local search, though no normative connotation is implied. This operationalization is in line with the view that local and nonlocal search reflect endpoints of a continuum and that more of one implies less of the other (March, 1991; Sidhu et al., 2007; Lavie et al., 2010). Appendix 3A summarizes the protocol for measuring attention to search including the construction of the search dictionary, sample excerpts, and validity and reliability considerations.

3.3.5 Industry volatility

We used fluctuation in sales as a metric of industry volatility (Castrogiovanni, 2002; Dess and Beard, 1984). Annual 3-digit sub-sector sales figures were obtained from Compustat for the period 1993-2007. We used five-year observation windows to calculate volatility. To illustrate, the volatility in 2000 was obtained with data from 1996 through 2000 using the standard linear equation $y_t = a + b_1 x_t + e_t$ where y_t is sales in the year t, x_t is a time dummy and e is the residual. We first regressed the time dummy variables on total sub-sector sales and then the standard error of the regression slope coefficient was divided by the average sales over the five-year period to obtain the volatility score for a particular 3-digit sub-sector (Nadkarni & Barr, 2008). Larger values indicate greater industry volatility.

3.3.6 Strategic renewal

Data on o*rganizational restructuring* was extracted from Compustat, which defines restructuring expenses as costs associated with realignment, reorganization, repositioning, industry exit and closing costs. Count data on *acquisitions* was obtained from Thompson One Banker. Consistent with prior research (Krishnan, Miller, and Judge, 1997), while a firm's acquisitions within the two-digit SIC sector were counted as *related acquisitions*, others were regarded as *unrelated acquisitions*. *Related and unrelated diversification.* Following prior work (Jacquemin & Berry, 1979; Palepu, 1985) we used an entropy measure to operationalize *related* and *unrelated* product market diversification. We treated sales from operations in different 4-digit segments within a 3-digit SIC sub-sector as sales from related businesses and accordingly computed the level of *related diversification* as $\Sigma[p_k \cdot ln(1/p_k)]$, where p represents the fraction of sales in the *kth* segment contributing to total firm sales and with $\ln(1/p_k)$ depicting the weight per segment. Further, we treated sales from operations in different 3-digit and 2-digit sub-sectors as sales from unrelated businesses and using the same entropy formula computed the level of *unrelated diversification,* with p representing the fraction of sales in the *kth* sub-sector and with $\ln(1/p_k)$ depicting the weight per sub-sector.

3.3.7 Control variables

Several relevant controls were included in our analytical models. With respect to the relationship between TMT experiences and attention to search, first, because slack resources might influence TMT cognition, we controlled for absorbed slack (*selling, general, and administrative expenses to sales*), unabsorbed slack (*cash and marketable securities to liabilities*) and potential slack (*debt to equity ratio*) based on Greve (2003). Second, we sought to control for the effect of

organizational aspiration by including past performance in the form of ROA relative to three-digit industry average for the previous year (Greve, 2003). It is generally held that the closer a firm's performance to the aspiration level, the less likely that the TMT would engage in uncertain experimentation of the kind associated with nonlocal search. The reverse is the case when performance falls below aspiration (cf. March and Shapira, 1987; Kahneman and Tversky, 1979). Third, as larger teams might be more attentive to nonlocal search because they have more capacity to collect and process information, we included log of TMT size as a control. Finally, to control for unobserved time effects and heterogeneity between the three-digit level industries, we included year and industry dummies respectively in our models. In addition to these controls, for H4-H6 we also controlled for firm size as the log of employees (in ten thousands), as it might influence organizational restructuring, diversification and acquisitions (Amburgey, Kelly, and Barnett, 1993; Davis and Duhaime, 1992). All control variables were lagged by one year (except the survival coefficient, which corrects for potential sample bias in the focal year, as explained later in the post-hoc analyses section). Moreover, to the extent that some variance in a dependent variable might be due to momentum from the preceding year, in each model we included the previous year's value of the dependent variable.

3.4 Analysis & Results

We analyzed data using Generalized Estimating Equations (GEE), which is an extension of the generalized linear model. The technique is suitable in the event of non-independent observations, such as those in our data set (Liang and Zeger, 1986). We specified our observations as a two-level nested model, with the firm identifier being treated as the subject variable and individual firm-year observations as nested within-subject effects. Further, our model assessment was

based on the significance level of the Wald X^2 statistic and the corrected quasi-likelihood information criterion (QICC), which accounts for model complexity and provides a statistic that can be compared independently across models (Pan, 2001). We additionally report the R^2 statistic based on the formula by Zheng (2000). This reflects the amount of variance in the response variable that is explained by the fitted model (Ballinger, 2004). Model specification followed a stepwise approach. We first estimated models that explained variance in the dependent variables solely in terms of the control variables, then introduced the explanatory variables and finally the interaction terms based on the explanatory variables. To avoid problems due to multicollinearity, all variables were mean-centered before creating the interaction terms. We should also note that models were estimated by lagging control and explanatory variables by one year as well as two years. The two sets of results differed only trivially. Because a shorter rather than a longer lag is more probable between a team's experiences, its cognition as influenced by these and specific actions that ensue due to the team's mindset and learning, below we present and discuss results obtained with one-year lags.

Table 3.2: Descriptive statistics and correlations†

		Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	TMT Attention to Local vs.											
(1)	Non-Local Search	0.21	0.24									
(2)	Unrelated Diversification	0.47	0.46	0.08								
(3)	Restructuring	0.01	0.03	-0.01	0.13							
(4)	Related Acquisitions	0.47	1.62	-0.02	0.06	0.08						
(5)	Unrelated Acquisitions	0.17	0.52	0.03	0.16	0.03	0.22					
(6)	Industry Volatility	4.76	3.49	0.01	-0.03	-0.06	0.06	-0.06				
(7)	Industry Tenure	14.55	6.28	0.02	0.09	-0.07	-0.02	0.04	-0.20			
(8)	Education Level	3.30	1.22	-0.01	-0.12	-0.04	0.00	-0.04	0.12	-0.09		
(9)	Functional Background Het.	0.37	0.66	0.09	0.03	-0.02	-0.03	-0.02	-0.02	-0.03	0.01	
(10)	Survival coefficient	0.94	0.04	0.00	0.31	0.06	0.14	0.22	0.35	0.01	-0.22	0.01
(11)	Firm Size (log)	0.07	2.00	-0.04	0.11	0.13	0.32	0.25	-0.19	0.09	-0.11	-0.02
(12)	TMT Size	6.78	3.11	-0.07	0.08	0.09	0.21	0.16	-0.07	0.04	-0.20	-0.14
(13)	Firm Profitability (log)	3.56	2.19	-0.05	-0.01	0.07	0.32	0.21	-0.14	-0.02	0.03	-0.03
(14)	Absorbed Slack	0.50	2.69	0.01	-0.06	-0.02	-0.02	-0.03	0.12	-0.06	0.04	0.00
(15)	Unabsorbed Slack	2.20	2.36	0.02	-0.07	-0.06	-0.04	-0.08	0.23	-0.07	0.17	-0.03
(16)	Potential Slack	0.17	0.19	0.02	0.08	0.05	0.00	0.11	-0.11	-0.01	-0.08	-0.01
(17)	Organizational Aspiration	0.00	0.51	-0.02	0.12	0.03	0.06	0.07	-0.12	0.09	-0.13	-0.01

† Sample-wide correlations. Coefficients larger than |.05| are significant at the p<.05 level; correlations above |.07| at p<.01

Table 3.1 (continued): Bivariate Correlations

		Mean	S.D.	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(11)	Firm Size (log)	0.07	2.00	0.35						
(12)	TMT Size	6.78	3.11	0.23	0.58					
(13)	Firm Profitability (log)	3.56	2.19	0.22	0.77	0.49				
(14)	Absorbed Slack	0.50	2.69	0.00	-0.14	-0.05	-0.01			
(15)	Unabsorbed Slack	2.20	2.36	-0.04	-0.30	-0.12	-0.20	0.03		
(16)	Potential Slack	0.17	0.19	0.14	0.20	0.09	0.15	-0.01	-0.27	
(17)	Organizational Aspiration	0.00	0.51	0.18	0.30	0.17	0.05	-0.35	0.08	0.03

† Sample-wide correlations. Coefficients larger than |.05| are significant at the $p<.05$ level; correlations above |.07| at $p<.01$

Table 3.3: Results of GEE analysis for attention to local – non-local search [a]

		Attention to local – non-local search		
Controls	Survival coefficient	0.18**	0.21**	0.24***
	TMT size $_{t-1}$	-0.16***	-0.15***	-0.16***
	Firm profitability $_{t-1}$	-0.28***	-0.25***	-0.23***
	Absorbed slack $_{t-1}$	0.02	0.00	-0.01
	Unabsorbed slack $_{t-1}$	0.02	0.02	0.02
	Potential slack $_{t-1}$	-0.03	-0.02	-0.02
	Social aspirations $_{t-1}$	-0.13***	-0.16***	-0.16***
Main Effects	Industry volatility $_{t-1}$		-0.02	-0.02
	TMT educational level $_{t-1}$		-0.04	-0.05
	TMT functional background $_{t-1}$		0.19***	0.18**
	TMT tenure $_{t-1}$		0.11*	0.12***
Hypothesized:				
H1 (+):	Volatility * TMT educational level $_{t-1}$			0.28***
H2 (-):	Volatility * TMT functional background $_{t-1}$			-0.10*
H3 (-):	Volatility * TMT tenure $_{t-1}$			-0.14**
	R^2_{marg}	0.25	0.28	0.38
	Wald X^2	243.34***	258.57***	418.45***
	QICC	661.32	655.99	561.21

[a] Model specified as linear with an identity link. The table does not display the intercept, nine year dummies and seven 3-digit SIC dummies for expositional ease. †p < 0.10; *p < 0.05; **p < 0.01; ***p < 0.01; n= 1,606.

Table 3.4: Results of GEE analysis for effect of TMT attention to search on strategic renewal

		H4: Organizational restructuring	H5(i): Related diversification	H5(ii): Unrelated diversification	H6(i) [a]: Related acquisitions	H6(ii) [a]: Unrelated acquisitions
Controls	Dependent variable $_{t-1}$	-0.16***	0.79***	0.79***	0.19†	0.19***
	Survival coefficient	-0.05	-0.03	-0.03	0.15***	-0.01
	Firm size $_{t-1}$	0.09***	-0.03	-0.03	-0.27*	0.06
	Firm profitability $_{t-1}$	-0.04†	-0.02	-0.02	0.26**	0.10**
	Absorbed slack $_{t-1}$	-0.01	-0.06	-0.06	0.25	-0.17
	Unabsorbed slack $_{t-1}$	0.01	-0.03***	-0.03***	-0.16	0.18***
	Potential slack $_{t-1}$	0.02	0.01	0.01	0.05	0.05
	Organizational aspiration $_{t-1}$	-0.06	0.04*	0.04*	0.13†	0.06
	Industry volatility $_{t-1}$	-0.01	-0.12***	-0.10***	-0.37†	0.22†
Hypothesized	TMT Attention to local – non-local search $_{t-1}$	-0.17*	-0.12*	0.13*	-0.23***	0.14***
	R^2 $_{marg}$	0.19	0.81	0.76	0.59	0.32
	Wald X^2	146.40***	4505.13***	1928.99***	128.32***	144.77***
	QICC	712.30	209.03	369.17	409.17	804.69

[a] Model specified as Poisson with a log link. The table does not display the intercept, nine year dummies and seven 3-digit SIC dummies for expositional ease. †p < 0.10; *p < 0.05; **p < 0.01; ***p < 0.01; n= 1,521

Table 3.2 displays the descriptive statistics and variable correlations. While GEE models to test H1, H2 and H3 are shown in Table 3.3, those to test H4, H5 and H6 are shown in Table 3.4. With respect to Table 3.3 first, the marginal R^2_{marg} improves from 0.25 in Model 1 (which includes only the control variables), to 0.28 in Model 2 (which shows the main effects of controls and explanatory variables), to 0.38 in Model 3 (which also includes interaction effects). With the Wald X^2 being highly significant for all three models, model improvement is also indicated by the declining values of QICC as we move from Model 1 to Model 3. All in all, the model assessment criteria provide ample confidence regarding hypotheses-related inferences based on the parameter estimates. Since this study's theoretical interest is in the relationship between TMT attributes and attention to search when a team is confronted with industry volatility, our chief focus here is on the direction and significance of the interaction terms based on the corresponding variable measures. Figure 3.1-3.3 provide a visual indication of each interaction effect. In support of H1, which predicts that higher TMT education levels will be associated with attention to nonlocal search as industry volatility increases, the pertinent interaction coefficient is positive and significant (b = 0.28, p < 0.01). With regard to H2, the interaction coefficient is negative and significant (b = -0.10, p < 0.05), though we had awaited a significant positive effect. However, the main effect of greater variety in TMT functional experiences is positive and significant (b = 0.18, p < 0.01). As Figure 3.2 reveals, these two effects imply that an overall positive association between functional variety and nonlocal search becomes weaker following more volatility. Further, corroborating H3, which predicts that more TMT tenure length should be associated with greater attention to local search, there is a significant negative interaction coefficient (b = -0.12, p < 0.01).

To facilitate comparison of the impact TMT attention to search has on restructuring, related versus unrelated diversification and related versus unrelated acquisitions, the full models corresponding to the relevant dependent

variables are presented side by side in Table 3.4. Noting that all models have acceptable fit levels, in support of H4, we observe a significant negative coefficient (b = -0.17, p < 0.05). The negative coefficient implies that while more attention to local search is related to more expenditure on organizational restructuring, more attention to nonlocal search is related to less restructuring expenses. With reference to H5, the coefficients of TMT attention to search variable are respectively negative (b = -0.12, p < 0.01) and positive (b = 0.17, p < 0.10) in Models 5a and 5b. Thus, while greater attention to local search leads more to related diversification, greater attention to nonlocal search is connected to unrelated diversification. The coefficient in Model 5b is only marginally significant. There is more unequivocal support for H6. The coefficients of TMT attention to search are very significant and in the hypothesized directions in Models 6a and 6b. While greater attention to local search is associated with related acquisitions (b = -0.23, p < 0.01), greater attention to local search is associated with unrelated acquisitions.

Figure 3.1: Interaction Plot Hypothesis 1

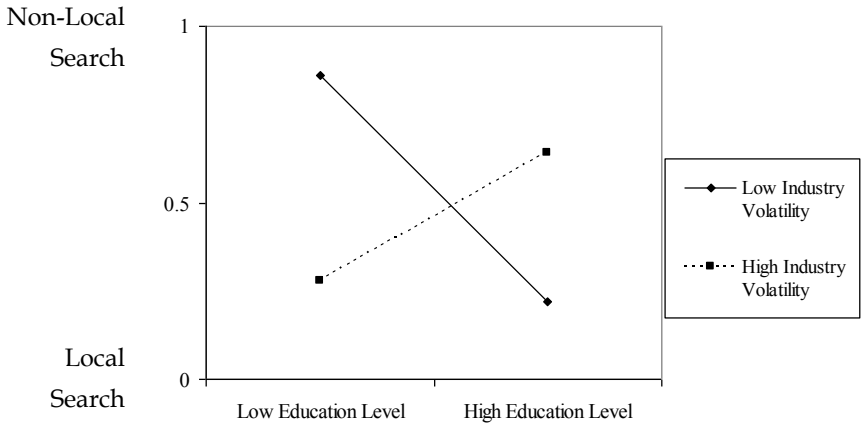


Figure 3.2: Interaction Plot Hypothesis 2

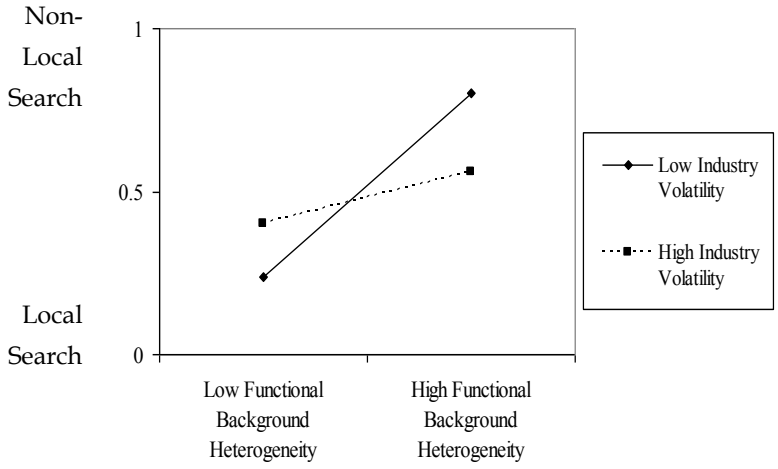
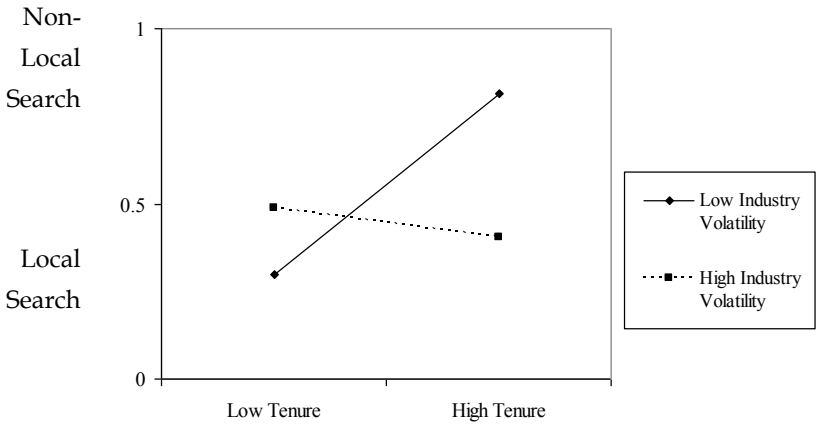


Figure 3.3: Interaction Plot Hypothesis 3



3.4.1 Additional analyses

We took steps to ensure that our results were not marred by endogeneity and survival bias, which is a possibility in data such as ours. We estimated simple GEE models (correcting for fixed subject effects and within-subject correlations) with single focal predictors of the response variables of interest to see whether

bivariate correlations between saved predicted values and raw residuals were significantly correlated. Inspection revealed that this was the case with only the predicted values of TMT tenure being significantly correlated with the error terms (r = -0.14, $p < 0.05$). To correct for this, we adopted a two-stage least squares (2SLS) logic, where a variable that can be considered an exogenous correlate of the tainted variable, but not of the residuals, is used to predict this effect. The saved predicted scores are used for subsequent analysis, with the endogenous effects captured by the residuals of this model (which are omitted from further analyses). Specifically, we examined the data we had collected to see if we could identify an instrumental variable that would be correlated with the predicted values but *not* with the error terms. The variable TMT average age revealed itself to be one such strong instrument (R^2 = 0.68, p < 0.01). The instrumentally corrected variable, with endogenous effects removed, was accordingly used for model estimation. No relationship warranting instrumental variable corrections was diagnosed for the model corresponding to H4-H6, which specified TMT attention to search as the predictor of our strategic-renewal variables. Further to this, because of the time lag between our predictor and criterion variables, and inclusion of the previous values for the criterion variables, we concluded that endogeneity on account of simultaneity was not an issue in our case (Granger, 1969).

We constructed a balanced sample by including only those firms that had been active during the entire period of observation. Although sample selection bias is not a concern in the sense that firms were selected without regard to the outcome variables (Winship and Mare, 1992), survival bias remains a possibility with such a sample construction approach. To control for this, we computed a hazard rate coefficient and included this in our models. The coefficient was calculated over the period 1990-2008 based on a Cox regression model of all firms in the 35-digit SIC code, as listed in Compustat. Because prior research indicates that older and larger firms are more likely to survive and that some sub-sectors are more hostile than others (Amburgey *et al.*, 1993), based on firm age, size and

the three-digit SIC classification, we estimated the likelihood of firm *i* being active after a discrete, identifiable event affecting the whole population of firms. Specifically, for the universe of firms given by the two-digit SIC classification 35, we estimated the probability of survival since a firm's initial public offering, a strategically important event that can be compared across firms and over time. The survival coefficient was included as a control variable in all our models in Tables 3 and 4. Taken together, the procedures we followed to mitigate worries about endogeneity and survival bias enhance confidence in the robustness of the reported results.

3.5 Discussion & Conclusion

In advancing the concept of attention to search, our central purpose in this article has been to take forward inquiry and discourse regarding the effect of managerial cognition on firms' strategic decisions. Founded on the ideas of problem-solving as dynamic information-processing (e.g., Neisser, 1967) and adaptive learning as a function of local-nonlocal information analysis (e.g., Holland, 1975), attention to search emphasizes managers' cognitive heuristics. The concept not only accounts for how cognitive burden is reduced through a particular delineation of the search landscape to guide information gathering and analysis, it also pays heed to managerial risk-return preferences that underlie decision outcomes. An upshot of this is a conceptualization of organizational decision-making that neither discounts TMT ability to simultaneously attend to and weigh multiple variables, nor disregards TMT's risk propensity. As compared to the attention-focus and schema-based research into managerial cognition, attention to search allows room for dynamic models of how managers with varying cognitive resources process information and learn given ongoing inflow of stimuli. Since the attention-focus framework is a model of situated attention at any one time, with cognition being conceived in terms of discrete issue categories

that get noticed (Ocasio, 1997), it offers limited scope for a longitudinal cause-effect analysis. That is, the effect of cognitive processes in an unfolding environment that creates multiple stimuli cannot be modeled. Attention to search avoids this conceptual constraint because it stresses search algorithms that decision-makers prefer given stimuli, rather than focus on any specific stimulus at a point in time as a predictor of firm actions. By underscoring variation in the cognitive abilities and preferences given issue categories that all decision-making teams note, unlike schema-based studies which stress the stability of shared knowledge structures across firms (e.g., Porac et al., 1995), attention to search allows for idiosyncratic information processing and differences in learning that lead firms on to different technology, product and market paths over time.

To examine the potential of the attention to search concept, this paper drew on the upper-echelon framework to establish whether the filters constituted by TMT educational, functional and industry experiences would predict variation in attention to search. Furthermore, engaging with the strategic renewal literature, this study investigated whether variation in TMT attention to search explains the differences in firms' adaptive responses in the wake of industry volatility. Our ten-year analysis of the industrial machinery and computer equipment industry vindicates our individual hypotheses and overall model of antecedents and consequences. The findings are consistent with the view that decision-makers' experiences influence their cognitive responses (Finkelstein and Hambrick, 1990; Walsh, 1995). Further, empirical affirmation of the hypothesis that higher TMT educational levels are related to greater attention to nonlocal search deepens previous understanding by detailing the learning mechanism that connects TMT education to strategic change (Bantel and Jackson, 1989; Wiersema and Bantel, 1992). Interestingly, the testing of our second hypothesis yielded an unexpected result. We saw that greater variety in TMT functional backgrounds was less strongly associated with nonlocal search following volatility. This is reminiscent of Carpenter and Fredrickson's (2001) finding that greater TMT functional

heterogeneity led to a decline in firms' global strategic posture with increase in industry uncertainty. A reason for our finding could be that, although functional-experience diversity theoretically lays the ground for nonlocal search due to executives' varied functional knowledge and information networks, the practical difficulty of fast translation, transference and transformation of such knowledge (see Carlisle, 2002) reduces preference for the more risky and time-entailing nonlocal search when a TMT must quickly find a feasible solution to manage volatility. In any event, the relation we discovered, along with the earlier inconsistent findings (cf. Cannella et al., 2008; Carpenter et al., 2004; Keck, 1997), suggests a caveat when postulating direct effects of TMT functional diversity. Where reasonable, upper-echelon scholars may want to consider the inclusion of TMT attention to search as an intermediate cognitive mechanism that links TMT attributes to outcomes. This would resonate well with the calls for more consideration of process dynamics resulting from TMT characteristics (Denis et al., 2001; Lawrence, 1997).

The empirical support for the hypothesis that the length of TMT industry tenure influences attention to search has an interesting implication for upper-echelon scholars. Namely, it compels one to critically revisit the view that long industry tenures disincline TMTs towards organizational change (cf. Finkelstein and Hambrick, 1990; Miller, 1991). Our work indicates that, given the difference in intra-industry versus extra-industry experience due to differences in tenure length, TMTs with longer industry tenures tend to pay greater attention to local search, whereas those with shorter tenures tend to pay greater attention to nonlocal search. Importantly, even though greater attention to local search fosters incremental rather than path-breaking change, tenure longevity cannot be concluded to imply that the TMT is inclined to the status quo. A more appropriate inference would appear to be that long tenured TMTs have a tendency to look for adaptive solutions in the vicinity of current operations and expertise. What effect this has on firm growth and survival is of course likely to depend on the industry

context, because fruitful opportunities for incremental versus radical adaptation vary over the technology cycle (Sidhu et al., 2007; Tushman and Anderson, 1986). Hence, the metaphor "stale in the saddle" is probably best set aside for situations of technological discontinuity, in which long-tenured TMTs are unable to initiate the radical change that is necessary for an organization-environment re-alignment (cf. Miller, 1991; Wu, Levitas, and Priem, 2005). More generally, our work hints that the ascription of change or inertia to variance in TMT educational levels, functional and industry experience might constitute a simplified misconception. Rather than focusing on the presence or absence of change, future work should be heedful of these variables' impact on the nature of change.

We found that variation in TMT attention to search explains differences in firms' restructuring and new product-market entry decisions. Firms whose TMTs paid greater attention to local search tended more towards organizational restructuring and entry into related product-markets given industry volatility. In contrast, unrelated diversification and acquisitions were more likely in the case of TMTs with greater attention to nonlocal search. These results contribute to the strategic-renewal literature by providing insight into how firms' adaptive direction and hence long term growth and survival depend on TMT cognition (see e.g., Agarwal and Helfat, 2009; Tripsas and Gavetti, 2000). The ability to predict differences in organization behavior through attention to search as a salient aspect of TMT cognition makes a strong case in favor of inclusion of the variable in future research into the micro-foundations of strategic renewal. Whereas bounded rationality, managerial schemas and selective attention focus have assumed a prominent position in discussions of TMT cognition and strategic renewal (Barr et al., 1992; Nadkarni and Barr, 2008), managerial preferences regarding problem-solving, risk and return that typically underpin decision-making (March, 1991; March and Shapira, 1992) have unfortunately received less attention. By attaching importance to the latter, attention to search proffers a mean to move beyond the mere prediction of the domain of action (e.g., investment in

an emerging technology) because of some stimulus (e.g., advent of a new technology), to also the prediction of firm-level behavioral differences given the same stimulus.

The results of this study also have an implication for research based on evolutionary (Nelson and Winter, 1982) and organizational learning models (March, 1991), which has focused on search as a behavioral property of firms in terms of the choice between exploitation and exploration routines (McGrath, 2001; Nerkar, 2003). While much work in this area has focused on the environmental and organizational determinants of exploitation and exploration (e.g., Rosenkopf and Nerkar, 2001; Sidhu et al., 2007), the effect of firms' TMT has received little consideration. However, if as we have argued and found, the genesis of path-deepening exploitation decisions and path-breaking explorative decisions lies in TMT attention to search, future exploitation-exploration models would do well to incorporate the influence of TMT variables and agency. In this context, our findings resonate with the results of a recent study by Cao, Simsek and Zhang (2009), which indicates that executives matter in exploitation-exploration decisions. The TMT's pivotal role is similarly evident in Cho and Hambrick's (2006) investigation of deregulation in the airline industry. These scholars found that a change in the composition of a TMT and, hence the team's aggregate attributes such as functional background and industry tenure, could incline the team towards either more of exploitative engineering (centering on delivering products to customers efficiently and effectively) or explorative entrepreneurship (by way of determining the product-market domains to concentrate on). These and our results taken together underscore the fruitfulness of combining insights from the cognitive, learning and evolutionary literatures to develop fuller explanations of adaptive organizational change.

An important managerial contribution of our research is in the identification of TMT attention to search as an intervening cognitive variable that connects TMT demography to firm behavior. This insight into the black box of

TMT demography (Carpenter et al., 2004; Lawrence, 1997) gives practitioners a mean to influence firm outcomes by altering attention to search. Because TMT demography is not easily changeable without altering the TMT composition and because demography's effect on outcomes is not direct and straightforward, influencing attention to search may be a more feasible option with a view to engender either more path-deepening or more path-breaking change as warranted by circumstances. The liability of their education and experience notwithstanding, executives could still learn to frame the search landscape differently, look for and examine information from more proximate or distant domains, take more or less risk and adjust their preferences vis-à-vis expected returns (see also Barr et al., 1992). One way to encourage such cognitive change would be through motivational compensation plans that reward more or less risk taking by manipulating incentive pay (see e.g., Balkin and Gomez-Bejia, 1987; Miller, Wiseman, and Gomez-Bejia, 2002). If a change in TMT compensation does not deliver, a revision in TMT demography could of course be weighed to herald a new cognitive approach to search. In this regard, there is prior work which shows that a change in TMT composition can influence strategic reorientation (Tushman and Rosenkopf, 1996).

3.5.1 Limitations and future research

The shortcomings of our work create enticing opportunities for future scholarship. This study did not inquire into TMT perceptions about stimulus salience. Thus, whereas earlier studies may have ignored differences in TMT cognition in terms of preferred search algorithms, we sidestepped the matter of subjective perceptions about the import of a particular stimulus and its triggering effect on a search algorithm. Inasmuch as successful organizational change depends on both TMT's timely recognition of developments that are salient and TMT's specific problem-solving routines, future studies that consider variation in

TMT's salience perception as well as attention to search could contribute to a fuller understanding of the dynamics of TMT cognition and organizational adaptation. It should also be fruitful to explore in future whether there are additional facets of TMT cognition that could be relevant to understanding strategic renewal. Markoczy (1997) found that managerial characteristics such as age and nationality were related to managerial cognition, operationalized in terms of cause-effect beliefs about organizational success. Do TMT cause-effect beliefs perhaps also play a part in guiding renewal decisions? These suggestions collectively point to the opportunity for developing more holistic or comprehensive models of managerial cognition to predict organizational behavior and outcomes.

An additional shortcoming of our study is the focus on only the industrial machinery and computer equipment companies. While our sample spans multiple lines of business, it remains the case that confidence in our findings would be bolstered if the results could be replicated in other settings. It is useful to note here that different contexts confront firms with different constraints and possibilities. To illustrate, the opportunities for related-entry based change would be fewer when a business is already characterized by a high degree of vertical integration as in the case of oil extraction, refining and distribution. As another illustration, renewal by way of restructuring may not be a viable option in the event of discontinuous technological change that renders a firm's core capability obsolete, as in the case of Remington Rand with the advent of computers. These examples underscore the need for systematic inquiry into the effect of TMT attention to search on strategic-renewal decisions in varied technology-product-market contexts.

A potential weakness of our study relates to the measurement of attention to search through analysis of shareholder letters. While the method has gained extensive acceptance because it enables acquisition of researcher-independent otherwise difficult-to-obtain data (e.g. Kaplan, 2008), the measure is removed from the richness of actual cognitive dynamics. A challenging opening for scholars

would be to verify our conclusions using an alternative method of gauging TMT attention to search. One possibility is a longitudinal case-study design, which should allow the mapping of attention to search through a mix of data including company archives, interviews and participant observations. Such work can shed more light on the dynamics underpinning TMT cognition. For instance, if attention to search is observed to vary from one period to another, such work might inform us why and how this cognitive shift happens and the consequences thereof.

That TMT attention to search determines restructuring, acquisition and diversification decisions raises curiosity about its impact on other variables, such as, R&D, alliances and bottom-line financial performance. Besides entry decisions, does TMT attention to search also explain exit decisions? Interested researchers thus have an opportunity to advance understanding of how managerial cognition affects the ebb and flow of a firm's scope of operations, thereby influencing the firm's fortunes. Another issue that we could not explore but warrants inquiry is how attention to search is impacted by team-members' length of experience with one another. A longer history means more time for socialization and the emergence of mutual knowledge and effective interaction routines (Cramton, 2001; Chatman and Flynn, 2001). This should aid cooperation and the materialization of a collective cognition by overcoming any initial schisms on account of lack of common vocabulary and paradigms (see also Hambrick, Cho, and Chen, 1996). Hence, inclusion of the time aspect in future work might additionally explain some of the variance in the TMT attention to search variable.

While this study sought to generate better understanding about the relationship between TMTs and strategic renewal, future work could center on more complex models that consider interactions between TMT attention to search and organization level predictors of adaptive change (cf. Kaplan, 2008; Kraatz and Zajac, 2001). Future work could also examine whether in addition it makes sense to incorporate separate CEO effects in renewal models. While in the upper-

echelon tradition our focus was on TMTs, CEO-centered research indicates that variables such as CEO charisma (Agle, Nagarajan, Sonnefeld, and Srinivasan, 2006), emotions (Delgado-Garcia and Fuente-Sabate, 2010) and hubris (Li and Tang, 2010) influence decision making. As such, it would be worthwhile to establish whether CEO characteristics condition TMT attention to search or moderate its effect on strategic renewal. A valuable extension of the CEO-TMT dynamics line of inquiry would be research that considers the effect of broader TMT dynamics on attention to search. The idea of faultlines offers a particularly interesting path to such investigation. Faultlines emerge when TMT subgroups form because of social categorization along demographic categories (Lau and Murnighan, 2005). A complementary approach to incorporate the process aspect in future models would be by analyzing TMT behavioral integration in terms of resource and information sharing by team members (Hambrick, 2007). Insights from process-oriented research will be much appreciated as they can improve our understanding of the drivers of TMT attention to search. Yet another exciting research avenue that comes to mind is the effect of boards on TMT attention to search. To the extent that boards monitor and control executive decision making (Finkelstein, Hambrick, and Cannella, 2009), it is fitting to ask whether they also influence TMT attention to search or moderate its effect on strategic-renewal? While an answer must await future inquiry, recent work does indicate that board composition and processes matter with regard to issue discussion (Tuggle at al., 2010).

3.5.2 Conclusion

This article advances the literature on managerial cognition and strategic decision-making by introducing the concept of attention to search. By emphasizing cognition in terms of information processing, risk and return preferences, attention to search fosters the prediction of variation in strategic

behavior. The article provides evidence for the nomological validity of the concept by showing that TMT educational, functional and industry background influence TMT attention to search, which in turn influences organizational renewal. The paper hence presents a model of the antecedents and consequences of attention to search as the cognitive mechanism that connects decision-makers attributes to firm-level adaptive change.

3.6 Appendix: Measuring TMT Attention to Local & Non-Local Search

3.6.1 Computer-aided text analysis of letters to shareholders

In using CATA to capture complex latent concepts, documented managerial communications, such as letters to shareholders, have recently been established as a valuable data source for scholars interested in cognitive concepts (e.g. Cho & Hambrick, 2006; Nadkarni & Barr, 2008; Eggers & Kaplan, 2009). In analyzing patterns of language use to tap into cognitive dimensions it is "assumed that groups of words reveal underlying themes, and that, for instance, co-occurrences of keywords can be interpreted as reflecting association between the underlying concepts" (Duriau *et al*., 2007: 6; see also Pennebaker *et al*., 2003 for an insightful overview). Letters to shareholder represent underlying thought-patterns that, overtly or covertly, drive the strategic logic for firm processes and outcomes. Fanelli *et al.* (2009: 1017) further note that letters to shareholders are free from legal restrictions about content (Abrahamson & Park 1994), communicate both facts and beliefs in a form that is directly approved by the CEO (D'Aveni and MacMillan, 1990), and reflect managerial attributions, locus of attention, and framing strategies (D'aveni & MacMillan, 1990; Porac, Wade & Pollock, 1999; Staw, McKechnie & Puffer, 1983).

Though letters to shareholders are sometimes criticized because they are written by professional writers and executives could mislead stakeholders through them (Crawford, 2003), more recent findings suggest that despite the qualitative and subjective nature of voluntary strategy-related disclosure by executives, stock price reactions are sensitive to the disclosures (Gu & Li, 2007) because framing strategies (positive or negative tones) cause investors to think about the results in terms of increases or decreases relative to communicated reference points (Henry, 2008; Kahneman & Tversky, 1979). Therefore, like Eggers & Kaplan (2009: 468) observe, an "excessive amount of misdirection by the CEO is

unlikely because the letter to shareholders goes out under the CEO's signature, and therefore, for fiduciary reasons, it is unlikely that the CEO would suppress important discussions." Moreover, even if the criticisms hold to some extent, then if there is variance between scores, this should lead towards more conservative interpretations (Eggers & Kaplan, 2009: 468). We add that other benefits are that it allows for non-obtrusive measurement and a reliable way to capture contextually meaningful cognitive associations across TMTs and over time. We were able to obtain letters to shareholders for 89% of the original sample (204 firms) and used QSR NVivo 8 to assist us in the analysis of the textual input.

3.6.2 Development of search dictionary

We start by developing a list of terms that can be argued, in general, to be indicators of local and non-local search activities in managerial communications. The purpose of this list is to specify a system of queries in which instances of words are identified in the corpus of text, which we subsequently validate by human coders. Though some researchers rely on existing dictionaries for other purposes (e.g. Fanelli et al., 2009), Krippendorff (2004: 287) notes that most content analyses can benefit from the construction of special-purpose dictionaries –though he acknowledges that this can be a formidable task. We took and this task and in staying true to March's (1991) conceptualization, we stayed close to the terms he denoted as indicative of different forms of search. In particular, he defined exploration as including 'things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation' (March, 1991: 71). Exploitation in turn includes terms such as "refinement, choice, production, efficiency, selection, implementation, execution" (March, 1991: 71).

As attention to search is inherently an active cognitive exercise reflected in behaviors, we identified verbs that are believed to be manifestations of a higher order conceptual category by looking at the Merriam-Webster thesaurus, as a

respected lexicographic source, to identify words that are related in meaning (e.g. synonyms, associates, and members of word families) (Krippendorff, 2004: 281). We asked two colleague researchers, with established track records of expertise in the subject matter, to evaluate the face-validity of our dictionary to ensure we did not omit obvious markers or whether markers were properly classified (Krippendorff, 2004: chapter 13.1). After incorporating their suggestions we asked an additional two colleagues to assess the face validity of the new list.

3.6.3 Validation of dictionary

Though the CATA query will identify each marker identified in the dictionary, we conducted a refinement and contextual validation of the instances extracted from the texts by coders deeply familiar with the research framework and the pertinent literature ("expert" coders). As the computer is intended as an aid, we specified a query in which the markers would be extracted from the textual input with their preceding 25 words, and subsequent 25 words ("broad context" extraction). Note that asking each coder to actually find and assign each word in the dictionary would be an inefficient exercise, and would remove the added-value of the CATA. The reason we let the computer aid us in identifying the words is that we cannot realistically expect singular individuals to scan a vast corpus of text with a list of markers and realistically expect them to capture every instance reliably.

We ran a preliminary query and two members of the research team inspected a random sample of 25 instances of *each* empirical marker. The purpose of this exercise was to evaluate whether the empirical usage of the terms corresponded to the same meaning as that intended in the search dictionary. Words such as "risk" for instance showed to be used in sentences such as "*..[a]nd of course, weather is a constant risk factor in the markets that we serve*" or "*[the] technology also improves safety and well-being by reducing the risk of slip-and-fall*

accidents and mold formation." We specified "NOT" and "near" conditions in the query based on these trivial instances, though they occurred in less than 10% of the instances sampled for the whole search dictionary. We re-ran the query a few more times and repeated the procedure based on a randomly sampled ten instances of each marker till the inclusion of "NOT"-conditions did not reveal any trivial or ambiguous instances in three consecutive rounds. Markers that could not be disambiguated through an agreement principle were excluded altogether. Table 3.5 shows our final search dictionary in its nested form and Table 3.6 provides sample excerpts from the CATA.

Table 3.5: CATA Nested Search Dictionary[a]

Local search		Non-Local Search	
Conceptual Node	Textual Markers	***Conceptual Node***	Textual Markers
Choice/Selection	Emphasiz* Focus Select Specializ*	***Discovery***	Detect*~! Discover*~! Identif*~! Uncover*~!
Efficiency	Downsiz* Economiz* Low*~$ Reduc~$	***Experimentation/ Play***	Attempt Test Try
Implementation/ Execution	Apply* Align* Control* Implement* Operat* Organiz*	***Flexibility***	Chang* Modif* Transform* Versatil*
Production	Boost~# Enlarg*~# Expand~# Increas*~# Produce*	***Innovation***	Conceiv* Creat* Invent* Pioneer*
		Risk	Start_up Tak*~chance/risk Ventur*

[a] *: indicates that any conjugation following the root of the marker is to be extracted. | ~: indicates near-term to capture non-verbs (+/- 2 words) in the vicinity of the marker. | !: indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: new; novel; idea; techn*; market*; product*; process*; partner*; service; opportunit*; solution. | #: indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: capacity; capability; production; productivity; margin; output; efficienc*. | $: indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: cost; expense.

Table 3.5: CATA Nested Search Dictionary[a] (continued)

Local search		Non-Local Search	
Refinement	Continu*	*Search*	Explore~!
	Elaborat*		Scan~!
	Enhanc*		Search~!
	Improve*		Seek~!
	Refin*		
	Updat*		
		Variation	Differentiat*
			Diversif*
			Vary*

[a] *: indicates that any conjugation following the root of the marker is to be extracted. | ~: indicates near-term to capture non-verbs (+/- 2 words) in the vicinity of the marker. | !: indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: new; novel; idea; techn*; market*; product*; process*; partner*; service; opportunit*; solution. | #: indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: capacity; capability; production; productivity; margin; output; efficienc*. | $: indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: cost; expense.

Table 3.6: Sample Excerpts from Computer-Aided Content Analysis

Local Search	*Non-Local Search*
"Our technology leadership strategy continues to focus on internal product development." (Cisco, 1998)	*These financial accomplishments validate the purposeful transformation of Ingersoll-Rand from a cyclical machinery company to a global diversified industrial enterprise. (Ingersoll-Rand, 2004)*
Several major projects are underway to enhance the performance of our products and expand the applications for our equipment within our existing markets. (BTU, 2002)	*The Company has targeted and is aggressively exploring various opportunities so that it is positioned to fully capitalize on the next industry upturn. (Amtech, 1998)*
We worked in partnership with these early customers to refine our product and implementation procedures to prepare for full-scale deployment. (Xata, 2003)	*Transformation best expresses what we have been undergoing across all our businesses in the last few years. At first, we pursued subtle, "evolutionary" change, but as our employees worked harder and harder to maintain the some business, we realized that we needed more "revolutionary" change in order to grow. Many of the businesses we operate in have fundamentally changed in the last few years with the rise of China and the creation of chronic overcapacity. (Tecumseh, 2003)*
"We strengthened our balance sheet and sharpened our focus on our three core business segments." (Lennox, 2003).	

3.6.4 Inter-coder reliability

Ascertaining reliability in content analysis is about whether two or more equally competent coders, subjected to the same coding instructions, are consistent in using the instrument in assigning scores to the theoretically relevant categories (Krippendorff, 2004). The key instruction here was whether the word, once extracted by the query, and interpreted in its broader empirical context, and subjected to human judgment, corresponded to the node defined in the search dictionary, as intended by the construct of interest. Thus, here the dictionary is the measurement instrument and the reliability concerns if whether human and

computer coders use the instrument consistently within an acceptable confidence interval.

We calculated several inter-coder reliability scores. As the query will always spot the marker, the agreement between human coders and the computer-aided coding captures whether different coders categorize tally a similar number of extracted instances in accordance with the query. To the extent that the coders and computer both indicate their tallies of instances to a specific node, we can calculate a reliability coefficient alpha, which corrects for chance assignment of scores and corresponds to Krippendorffs' (2004) formula for multiple observers and multiple metric variables (Chapter 11.3.1.). To obtain the reliability data necessary to calculate the inter-coder reliability score, we split the 250 randomly assigned letters to make sure each letter had a chance of being selected to see the extent of (1) inter-rater agreement between two naive coders working independently and the computer, (2) the extent of inter-rater agreement the computer-returned results and two expert coders working independently, and (3) the extent of agreement between the two expert coders and two naïve coders.
For the first condition we recruited two Master of Science-level assistants ("naïve" coders) to assist with the coding. The assistants received two basic 90-minute face-to-face training sessions from the lead author in content analysis methodology from selected chapters of Krippendorff (2004), tutorials on how to work with the QSR NVivo 8 software, and instructions on how to tally their counts in the spreadsheet to use for reliability scores.

In a third session the assistants received a one hour seminar in which the theoretical framework and research design of the particular study was discussed. In return for their services the students received a small compensation for services rendered and a reference letter ascertaining that they had received basic training in content analysis methodology (not explicitly covered in the methodology course). For the second inter-coder condition we used two expert coders (two lead authors), and coded 250 letters with 150 randomly selected from the population

not coded by the naïve coders, and 100 commonly coded with the naïve coders (randomly selected from those coded by the naïve coders). For the final inter-coder condition we copied the tallies for each overlapping score and calculated alphas based on the 100 letters commonly coded by the two naïve coders and the two expert coders. The corresponding Alpha's can be found in Table 3.7. Based on these findings, we assess the confidence to be high enough to proceed with the calculation of the variable score, as described in the methods section.

Table 3.7: Inter-Coder Reliability Scores

	Inter-coder Condition 1[a]	**Inter-coder Condition 2[b]**	**Inter-coder Condition 3[c]**
Local Search	.85	.93	.86
Non-Local Search	.79	.89	.82

[a] 250 random letters; alpha corresponds to reliability between computer and 2 naïve coders.

[b] 250 letters (150 random letters and 100 common letters with condition 1); alpha corresponds to reliability between computer and 2 expert coders.

[c] 100 letters from conditions 1 and 2; alpha corresponds to reliability between 2 naïve coders and 2 expert coders.

Chapter 4. Study 3: Driving Management Innovation from Within: Additive and Interactive Effects of Top Management, Middle Management, and Shared Organizational Vision[3]

4.1 Introduction

Management innovation has recently emerged as a vantage point for understanding renewal and competitive advantage by bringing the focus to the most fundamental inception point of how organization's function –how managers do their work. Birkinshaw, Hamel & Mol (2008: 825) defined management innovation as the "invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals." From the intra-organization's perspective, a management innovation alters the genetic design by introducing structures, processes, and practices that are new-to-the-firm. Scholars adhering to this vantage point have examined the tradeoff between internally developed ideas and externally sourced knowledge (Mol & Birkinshaw, 2009), how external stakeholders expectations and demands influence the adoption of new management concepts (e.g. Nicolai, Schulz & Thomas, 2010), and how externally sourced management ideas are adapted as they become new-to-the-firm (e.g. Ansari, Fiss & Zajac, 2010). Although the field is gaining significant momentum, studies on the role of internal agents as antecedents of management innovation are notably rare.

Birkinshaw *et al*. (2008: 827) posted the question: "what is the role of managers in inventing and implementing new management practices?" In a commendable first step, Vaccaro *et al*. (2012) adopted an Upper Echelons perspective and provided some answers by showing that the leadership style of

[3] This study is under review at *Organization Studies.*

the top management team (TMT) mattered for management innovation, depending on the organizational size. However, their model omits a key internal agent that has been shown to be imperative for understanding change –middle managers (MM) (Wooldridge, Floyd & Schmidt, 2008). Whereas studies focusing on TMTs have contributed importantly to our understanding of intra-organizational innovation and change more generally over the last decades (Bantel & Jackson, 1989; Carpenter, Geletkanycz & Sanders, 2004; Wiersema & Bantel, 1992), MMs have also been shown to be important internal agents with substantial decision-making authority that might influence organizational processes underlying change and innovation (Wooldridge *et al.*, 2008). However, TMTs and MMs have markedly different information, interests, and roles in the face of imminent changes (Balogun & Johsnon, 2005; Floyd & Lane, 2000; Taylor & Helfat, 2009; Raes *et al*., 2011). Novel changes in managerial work can challenge the professional and functional identities of MMs –or even make them redundant, and MMs can be expected to enable or constrain the creation and introduction of new innovative ways of doing managerial work. It follows that the conjoint consideration of TMT and MM is crucial for a comprehensive understanding of how key internal agents influence management innovation.

Our aim in this study is to add to the intra-organizational determinants of management innovation by focusing on how both TMT and MM influence firm-level management innovation. Whereas TMTs are commonly considered the upper two layers of corporate management and includes managers with titles such as CEO, CFO, COO and SVP (Carpenter *et al*., 2004), MM's inhabit the organizational layer with decision-making authority below the TMTs but above supervisory levels and typically carry titles such as functional managers, department heads, and line managers (Wooldridge *et al*., 2008). Conceptually we articulate our framework along three pillars. First, we propose that management innovation is strategic in intent and typically takes the form of planned episodic change in pursuit of strategic objectives. This implies that to a reasonable extent it

is driven by the preferences, behaviors, and knowledge of the TMT (Hambrick & Mason, 1984). Second, management innovation transcends multiple domains of managerial activity, thus involving actors across multiple decision-making levels and representing different organizational knowledge domains –with middle management playing a particularly key role (Raes *et al.*, 2011; Wooldridge *et al.*, 2008). Finally, management innovation is inherently uncertain because the imminent changes are irreversible once introduced, thus requiring organization-wide cooperation, coordination, and sensemaking (Kouzes & Posner, 1995; Wu, Tsui & Knicki, 2010).

Building on the properties of our proposed framework, we contribute to the management innovation literature by arguing how heterogeneity in the attributes of TMTs serves as a key determinant of management innovation. We enrich this notion by considering how MMs, as key sensemakers for change (Balogun & Johnson, 2005), influence the relation between TMTs and management innovation by looking at the compositional attributes of middle management (Raes *et al.*, 2011). We further propose that firm-wide commonality of purpose, through a shared organizational vision, can help collective sensemaking necessary to accommodate the introduction of changes in structures, processes, and practices. We argue that a shared organizational vision is important in a multilevel managerial model of management innovation, as it serves as a compass for sensemaking and navigating uncertainty in the face of irreversible changes in managerial work. We contribute empirically by testing hypotheses on a unique panel (2000-2008) longitudinal dataset of Dutch firms comprising multilevel data at firm, TMT, and MM level (comprising over 8,000 managers-year observations), and multi-respondent survey data obtained from subordinates on shared organizational vision. Viewing management innovation as those changes that are new-to-the-firm (Vaccaro *et al.*, 2012), and operationally focusing on the span of the changes (Mol & Birkinshaw, 2009), we adopt a novel computer-aided content analysis approach to capture management innovation in its firm-specific context.

Our main findings suggest that whereas both TMT and MM diversity exert a positive influence on the introduction of changes in structures, process, and practices, the interaction between TMT and MM diversity exerts a negative impact. However, we find that the commonality of aspirations, as embodied in a strong shared organizational vision can help counterbalance some of these tensions.

4.2 Theoretical Background & Hypotheses

Management innovation is a distinct form of change that fundamentally alters the way managers do their work in pursuit of collective goals. Management innovation was seminally defined as "a difference in the form, quality, or state overtime of the management activities in an organization, where the change is a novel or unprecedented departure from the past" (Birkinshaw *et al*, 2008: 826). Variations on the theme, but which have essentially stayed true to the aforementioned definition, have been largely concerned with the drivers of adoption of new management concepts. Scholars have looked at how external stakeholders expectations and demands influence the adoption of new management concepts (e.g. Nicolai *et al*, 2010), how the leadership style of senior executives influence the adoption of new structures, processes, and practices (Vaccaro *et al*., 2012), and how externally sourced management ideas are adopted and adapted as they become new-to-the-firm (e.g. Ansari *et al*., 2010). However, radical new-to-the-world inventions aside (e.g. Burgelman, 1991), generalizable studies on the role of managers as internal change agents as an endogenous source of new management ideas are harder to find.

The role of managers as internal agents of change has been studied widely over the last decades (Carpenter *et al*., 2004; Wooldridge *et al*., 2008). Research on organizational change more generally has traditionally focused on the role and characteristics of TMTs in shaping innovation, change, and performance

(Carpenter *et al.*, 2004; Hambrick & Mason, 1984). Due to their privileged access to organizational resources, top executives' decisions are seen as critical to organizational change and its outcomes. The preferences, behaviors, and knowledge are reflected in their patterns of resource and attention allocation that translate into tangible organizational outcomes (Hambrick & Mason, 1984). However, this Upper Echelons perspective gives lesser attention to managers lower in the hierarchy who also influence the dynamics and outcomes of change processes (Wooldridge *et al.*, 2008).

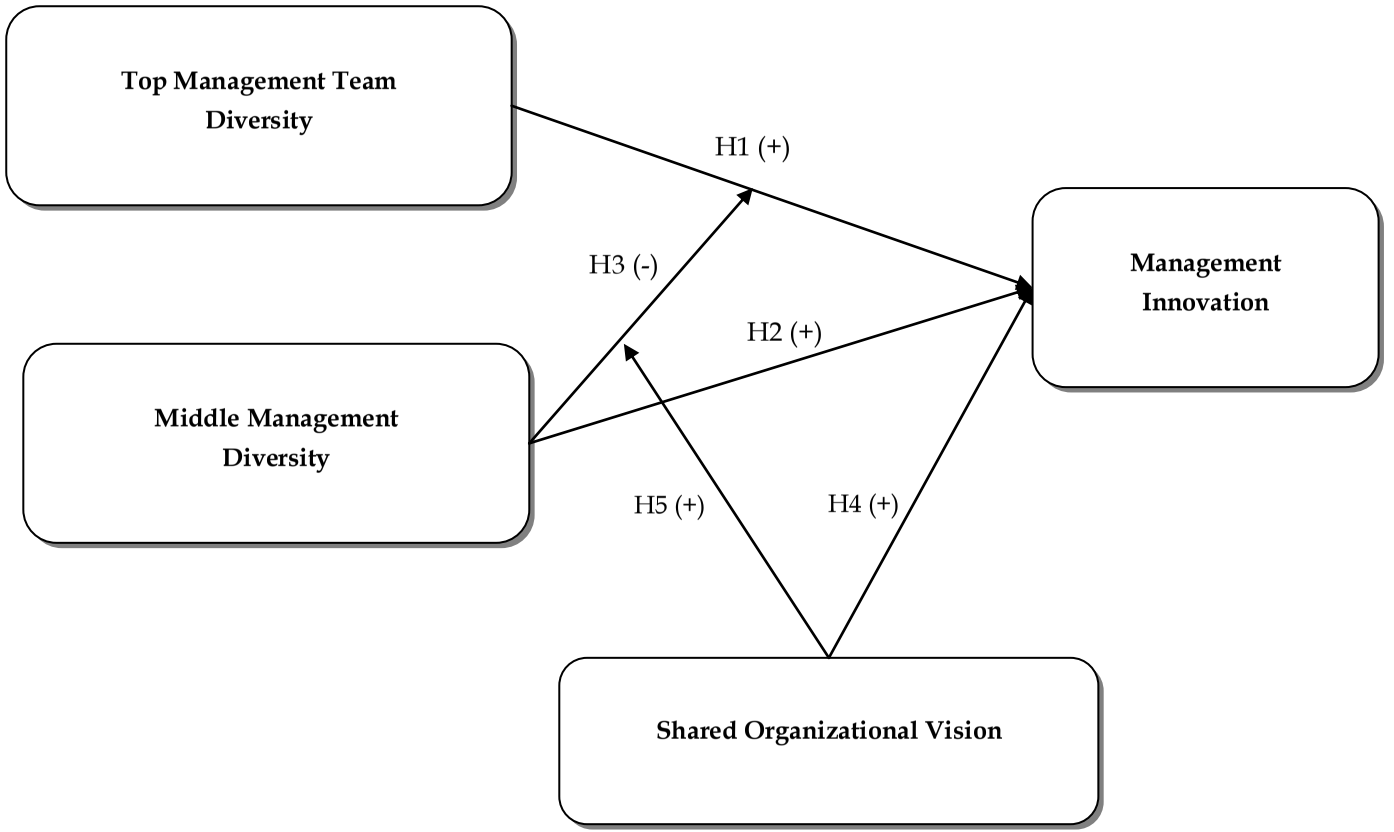
Recent years have seen the responsibilities and span of control of MM broaden considerably. As a result of among other things rising executive job demands (Hambrick, Finkelstein & Mooney, 2005), more complex and decentralized organizational structures (Burgers *et al.*, 2009), and globally dispersed teams in uncertain environments (Cannella, Park & Lee, 2008), managerial discretion and autonomy is increasingly situated at lower levels of the organization (Takeuchi, Shay & Li, 2008; Burgers *et al.*, 2009). Increasingly, the role of middle managers –those decision-makers located below top managers and above supervisors in the hierarchy (Dutton & Ashford, 1993) –has been included in a parallel model labeled the Middle Management Perspective (Floyd & Wooldridge, 1992; Wooldridge *et al.*, 2008; Wooldridge & Floyd, 1990). Due to their intermediate position between top executives and frontline managers, MMs serve as important interfaces between otherwise disconnected actors and domains (Floyd & Wooldridge, 1997).

Middle managers have been described as "linking pins" connecting the strategic goals of top managers with the day-to-day realities of lower level managers (Floyd & Wooldridge, 1992; Shi, Markoczy & Dess, 2009), this role being especially prominent in periods of change (Taylor & Helfat, 2009). They play a role both as a critical "vertical link" within the hierarchy of an organization, as well as a horizontal integrator in the creation and distribution of organizational knowledge (Bartlett & Ghoshal, 1993; Huy, 2002; Nonaka, 1994). In doing so they

"knit together" organizational activities and coordinate between top and lower levels, being both the accomplice of top management and representatives of front-line managers (Sims, 2003). However, compared to top managers, middle managers are also more prone to experiencing strategic role conflict and uncertainty, especially in the face of change (Floyd & Lane, 2000).

Despite middle managers' roles as internal change agents have increased in importance (Balogun and Johnson, 2004), limited empirical research addresses the influence of different hierarchically-organized groups on change (Huy, 2002; Rajagopalan & Spreitzer, 1997). The influences of top *and* middle management have rarely been researched together (see e.g. Raes and colleagues 2007 & 2011 for notable exceptions). Management innovation is particularly interesting for studying how managers at these two crucial decision making levels influence firm functioning because it affects how managers actually do their day-to-day jobs. Following from this, we proceed to decompose some conceptual properties of management innovation that opens the door for the linking TMTs and MM to management innovation. Our conceptual logic for subsequent hypotheses is premised on the decomposition of management innovation in terms of: strategic intentionality, domain-spanning nature, and sensemaking requirements. We summarize our model graphically in Figure 4.1.

Figure 4.1: Conceptual Model



4.2.1 Top management teams & management innovation

Management innovations comprise changes introduced by individuals with the goal of making their organizations work more effectively (Birkinshaw *et al.*, 2008: 828). Organizational change efforts of this nature tend to be episodic and planned, where a change agent intentionally acts and intervenes for achieving a different state of behavior, structure, and/or conditions (Ford & Ford, 1995; Balogun & Johnson, 2005; Lewin, 1951). For incumbent firm these changes often take the form of purposeful episodic change that are "discontinuous, infrequent, and intentional" (Weick & Quinn, 1999: 365). Though the spark for change may find its inception anywhere in the organization (Day, 1994), changes of this nature need to be sanctioned by the TMT before introduced organization-wide. Top managers perceive change from an *organizational level* perspective and focus on what change means for the organization as a whole and its strategy, survival, and competitiveness (Hambrick, 1983). If management innovations are strategic in intent, to some extent they should be driven by the preferences, knowledge, and abilities of the decision-makers who determine, and are held accountable for, the strategic direction of the firm.

Evidence suggests that top managers matter for organizational processes and outcomes such as innovation and change more generally (Bantel & Jackson, 1989; Wiersema & Bantel, 1992), and some have hinted to how they influence management innovation more specifically as well (Vaccaro *et al.*, 2012). The core premise of Upper Echelons models is that a TMT's knowledge, preferences, behaviors, and biases influences the conclusions it draws as a result of information processing (Carpenter *et al.*, 2004; Hambrick & Mason, 1984). The Upper Echelons tradition for studying change has long been concerned with the composition of TMTs. Diversity in TMTs in terms of variety in attributes presupposes that when TMT experiences are similar, executives have overlapping frames of reference,

shared cause-effect understandings, and common arsenal of problem-solving heuristics (Bantel and Jackson 1989; Hambrick *et al*. 1996; Harrison & Klein, 2007). As TMTs become more heterogeneous however, the team can draw on a more mixed repertoire of knowledge and problem-solving approaches, which is likely to be more conducive to generating higher volume and a broader set of novel interpretations and fresh ideas as a result of informational debate (Paulus 2000; Simons, Pelled and Smith 1999).

If management innovation is to be internally driven, TMTs can be expected to play a role as fusing knowledge from different domains is necessary for a novel ideas and frameworks for comprehensive overhaul of structures, processes, and procedures through the introduction of new managerial ways of working. When variety in background experiences is high, due to lack of detailed comprehension of each other's specialized domain of expertise, variation in executive experiences is likely to impede in-depth analysis within a shared arena of understanding and from the vantage point of a common perspective (Hambrick *et al.*, 1996). Diverse TMTs can be expected to have more insights that transcend multiple domains of knowledge. TMTs influence management innovation because they are responsible for the strategic choice underlying subsequent time, effort, attention, and resource allocations for introducing changes in managerial work. In discussing interpretations on how to improve competitive advantage by looking at ways of doing managerial work, the more overlap in causal understandings, the more difficult to unlearn and deviate from previously accepted norms, whereas heterogeneous teams have the potential to be more creative and have been shown to be more receptive in embracing novelty (Bantel & Jackson, 1989; Nielsen, 2010; West & Anderson, 1996). Thus,

HYPOTHESIS 1**:** *Top management team background diversity will be positively related to management innovation.*

4.2.2 Middle management & management innovation

Management innovation requires fundamental changes in the genetic makeup of the organization (Birkinshaw *et al*., 2008). If organizations comprise the whole of diverse consciously coordinated activities at different levels (Barnard, 1938; Selznick, 1948), then to some extent the compositional makeup of the firm's managerial workforce at *multiple managerial levels* and reflecting *multiple managerial knowledge domains* (e.g. functional areas of expertise) must be considered. Heterogeneity in the knowledge of managers representing different domains of managerial activity has been shown to be important for innovative performance (Cummings, 2004; Majchrzak, More & Faraj, *forthcoming*). MMs have markedly different knowledge from the TMT, and consideration of MMs can help to accurately capture the sources of potential ideas for devising new ways of working. Middle managers perceive change from an operational or *group level* perspective and since they are often responsible for keeping business going during change, they are likely to be more concerned about how change affects daily activities (Balogun 2003; Caldwell *et al*., 2004; Strebel 1996). Middle managers, arguably, have a greater understanding of lower managers' and employees' perspectives and are better placed to gain their support for change and its integration into their work processes (King & Zeithaml, 2001).

MMs are often closer to new market developments, day-to-day operations, employees and customers and often more aware of potential problems and opportunities for the organization as compared to top executives (Burgelman, 1991; Huy, 2001; Floyd & Wooldridge, 1997) and therefore, better placed to perceive bottlenecks in previous ways of working and devise alternative ways of working. They are more effective in effectuating organizational change from within -at the operational or group or unit level (Whelan-Berry *et al.*, 2003). MMs can diagnose the specific cause of an organization's problems as MMs have more intimate knowledge of the causal linkages between managerial activities and outcomes (King & Zeithaml, 2001). Heterogeneity in the backgrounds of MMs can

help diagnose a broader range of potential bottlenecks and help in devising new ways of working, by coming up with unconventional and innovative solutions on how to alter the nature of work based on a refined understanding of causal linkages.

HYPOTHESIS 2: *Middle management background diversity will be positively related to management innovation.*

However, whereas diversity at each level separately might serve as a valuable source of new ideas and perspectives, greater diversity conjointly at these two levels might very well impede management innovation by standing in the way of cooperative synergy. Because of mismatching conceptual understandings, interests, and information, collective sensemaking necessary to accommodate new management structures, practices, and processes, might be difficult between those who formulated, and those who implement, especially when members' expertise domains and professional identifications differ (cf. Bunderson & Sutcliffe, 2002; Hambrick *et al*., 1996; Harrison & Klein, 2007). Top managers often engage themselves with organizational-level strategic considerations and the alignment and realignment of an organization with its environment. Middle managers, in contrast are more likely to focus on change diffusion activities such as communication, helping others make sense of changes, and cultivating support among employees in order to generate positive change outcomes. Because the role of MMs is more clearly defined and specialized in general, role conflict is likely to be activated in the face of imminent uncertainty due to changes in managerial work. Middle managers, typically representing different throughput and output functions, can have their professional and functional identities can be challenged, making knowledge sharing less desirable in situations where the introduction of new structures, practices, and processes might make them redundant.

Although both top management and middle management depend on each other to manage change, they interpret change from different perspectives. TMT and MM are not equally powerful, having different knowledge and different concerns (e.g., Edmondson *et al*., 2003; Raes *et al*., 2011). Coordinating and synchronizing activities with a diverse MM group also adds complexities to coordination as knowledge exchange between different frames of reference is inherently difficult. The ideas generated by those at the top, and those at the middle who are closer to the core technologies and functional realities of current managerial work are likely to differ. When MM s are heterogeneous, they are also more likely to have multiple interpretations of the desired course of action, thus leading to conflict regarding proper course of implementation for changes that span multiple domains of managerial activity. When both TMTs and MM are heterogeneous, the complexity of integrating different knowledge within and across levels can be expected to make it hard to implement ideas as they were intended. Thus,

> HYPOTHESIS 3: *Middle management background diversity will negatively moderate the influence of top management team background diversity on management innovation, so that this effect is dampened or becomes negative.*

4.2.3 The role of shared organizational vision

As management innovation deals with changes in managerial work that have no known precedent to organizational state-of-the-art (i.e. incumbent structures, processes, and practices in the firm), they carry inherent uncertainty. These types of changes are competency destroying and require unlearning of redundant ways of working (Floyd & Lane, 2000), otherwise the introduction of a new structure, process, or practice could be bound by path-dependent thinking. Changes of this nature require commonality of purpose throughout the

organization in order to navigate the uncertainty and resistance to changes en route to long term organizational effectiveness. However, as the previous hypothesis implies, the complexity of management innovation partially stems from knowledge exchange and coordination efforts and challenges necessary to instill cooperation and leverage knowledge from actors across multiple levels, and representing multiple knowledge domains in achieving a collective purpose. Therefore, we propose that a shared organizational vision can serve as a compass for sensemaking and navigating uncertainty inherent in the introduction of new ways of doing managerial work.

Shared vision has been shown to matter for the overall effectiveness of organizations as it embodies the collective goals and aspirations of the TMT that expresses the developmental path for an organization (Jansen *et al.,* 2008; Pearce, & Ensley, 2004). Shared vision is particularly important for knowledge integration, which occurs when various interpretations converge to form unified understandings towards mutually valued objectives (Flores, Zheng, Rau & Thomas, 2012). Commonality of purpose, through a strong shared vision, can foster identification and infuse a cooperative spirit in teams which stimulates willingness to expend more effort on the exchange of domain knowledge and ideas between team members (Kouzes & Posner, 1995; Wu, Tsui & Knicki, 2010). Thus, a collective vision that ties in diverging viewpoints within a coherent, understandable, and commonly valued framework of higher order purpose can help infuse a collaborative spirit necessary to cope with the uncertainty of management innovations.

HYPOTHESIS 4: *Shared organizational vision will be positively related to management innovation.*

When shared organizational vision is high, organizational members tend to engage in more intense exchange of the distributed knowledge they possess,

and expend more effort aimed at coordinating, adjusting, and integrating knowledge elements from different domains of managerial activity. Commonality of interest encapsulated in a shared vision facilitates coordination, because it fosters communication and information sharing between team members (Pearce and Ensley 2004). The beneficial effects of a shared vision are attributed to the trust it induces by underscoring team-members' common goal. By fostering trust and preventing disruptive conflict, a shared vision instills a cooperative spirit (Kouzes and Posner 1995; Wu *et al.* 2010). Absent a shared vision, important knowledge elements may remain under-exploited and synergy potential between different insights may fail to be sufficiently realized because of the lack of parameters to informational debate (Wang & Rafiq, 2009).

Sidhu *et al*. (2004) argued and found support for the notion that shared vision was beneficial for the pursuit of uncertain organizational paths. Looking at exploration orientation, they argued that exploratory paths require strong shared sense of direction to guide the divergence from natural incremental path-dependent trajectories. In a similar vein, Heyden *et al.* (*forthcoming*) argued that shared vision at the TMT level could help heterogeneous TMTs in exchanging domain-specific knowledge underlying the creation of radical new knowledge. For organizations to capitalize on its internal potential for inventing and implementing new ways of working, high levels of cooperation are vital, because unfettered sharing of data, knowledge, and ideas can promote creative recombination of knowledge elements into new ways of working that span multiple domains. A higher degree of shared vision is particularly helpful as it channels efforts towards the pursuit of a collectively-valued objective when diverging interpretations are being generated, and can help reduce role conflict arising from imminent changes. Thus,

HYPOTHESIS 5: *Shared organizational vision will dampen the negative impact of MM diversity on the relation between TMT diversity and management innovation.*

4.3 Data & Methods

4.3.1 Sample properties & data collection

We test our proposed relations on a subset of firms from The Netherlands for the period 2000-2008. The main justification for this sample was the unique opportunity to acquire longitudinal data on MM characteristics that could be matched to TMT and firm-level data. Though data on TMTs of these firms can be obtained reliably by drawing on archival sources, data on MMs is particularly difficult to acquire reliably across firms and over time, as firms have no obligation or incentive to publicly disclose the identity of their lower level managers. We further focused on medium-sized firms because though the roles of TMTs are clearer across firm sizes, the roles of MMs are not, and MMs of very large corporations (e.g. general managers of business units) might resemble more TMT members than actual MMs[4]. The data on middle managers were obtained in cooperation with a large globally-recognized human resource consulting firm that conducts annual performance evaluations of middle managers. Though the identities of individuals remained strictly confidential, we were able to obtain multi-respondent survey items from subordinates of the respective middle managers and raw demographic data on >7,000 manager-year observations from 2000-2007.

We then identified top managers following Wiersema & Bantel (1992) as the upper two-layers of corporate management, for the same firm-year observations as listed in their annual reports and the Dutch equivalent of SEC-filings. In practical terms this translated into corporate executives with one or more titles of vice president or higher. We then collected data on the same

[4] Though it is oftentimes clear who the TMT members are, MMs have to be identified within the confines of the specific population of types of organizations, where organizational size is at least a basic necessary condition. For instance, MMs can be narrowly defined as department or unit head in a functionally organized medium-sized firm (e.g. marketing & communication manager), or more broadly as strategic business unit managers (divisional GMs) in large conglomerates. Our focus here is on MMs defined in their narrow form.

demographic characteristics as the middle managers from publicly available sources such as annual reports, Dutch exchange commission filings, print and web-based (auto)biographical sources, and business press profiles of executives. Variables corresponding to top and middle managers were operationalized in the same way. As we lag our empirical predictors by one year, we gathered firm-level data through 2008. To homogenize the sample we further restricted to the sample to firms headquartered and with >50% of operations (as per headcount) stemming from the Netherlands leaving us with a balanced panel of 33 firms for which close to full data could be obtained for the eight-year observation window and comprising over 8,000 top and middle manager-year observations. This eight-year period was further chosen as it provided us with the most balanced sample of the observed firms and maximized our sample size. We aggregated the individual scores into organizational level variables for the empirical analysis. The final sample comprised 224 firm-year observations. Though this sample is not completely random and representative only of the aforementioned population of Dutch firms, it provides us with a unique opportunity to contribute to the literature by conducting a large-scale longitudinal quantitative analysis on both MM and TMT.

4.3.2 Measuring management innovation: a content analysis approach

The measurement of management innovation is one of the crucial challenges for this young field. The firm-specific nature of a management innovation makes it a challenging task to find an objective measurement instrument to evaluate across firms and over time. Whereas some have conducted archival analysis of singular companies (Birkinshaw & Mol, 2006), others have turned to cross-sectional self-report by senior managers (Vaccaro *et al.*, 2012), and still others have relied on surveys from the state statistical bureaus about innovation in particular time intervals (Mol & Birkinshaw, 2009). As an alternative, we propose here that computer-aided content analysis (CATA) offers a

viable alternative which allows us to conduct longitudinal analysis on our unique dataset (Krippendorff, 2004). If new managerial processes, practices, or structures that change the nature of managerial work are strategic in intent, span multiple domains, and inherently irreversible once put into action, to a reasonable extent they must appear in the formal communications of executives accountable to stakeholders of the firm.

The analysis of documented sources, such as those captured in annual reports, has been gaining notoriety as valid measurement strategy in related streams facing similar challenges (e.g. Uotila *et al.*, 2009). CATA builds on the premise that "groups of words reveal underlying themes, and that, for instance, co-occurrences of keywords can be interpreted as reflecting association between the underlying concepts" (Duriau *et al.*, 2007: 6; see also Pennebaker *et al.*, 2003 for an insightful overview). CATA assists the researcher to filter, categorize, and process information, and combines the strengths of computer reliability and expert human judgment (Krippendorff, 2004). Though one could cast doubt on the validity of the content of corporate communications such as annual reports, Eggers & Kaplan (2009) note that an excessive amount of misdirection is unlikely because the document goes out under the TMT's signature, and therefore, for fiduciary reasons, it is unlikely that they would suppress important discussions. Moreover, even if the criticisms hold, then if there is variance between scores, this should lead towards more conservative interpretations (Eggers & Kaplan, 2009: 468).

We followed several steps in conducting the CATA. First, we carefully scanned the literature and developed a search dictionary comprising textual indicators of change more generally. We then consulted with two colleagues with established track records on strategic and organizational change to help validate our list of indicators, and settled on the list of words in the first column of Table 4.1. Then, we drew an initial query in which we instructed the software to highlight instances of words (including the preceding 25 words and the following

25 words). Two members of the research team identified distinctive strategic change initiatives, based on an agreement principle, from the results obtained per textual source. Distinct change initiatives were coded along numbered nodes and we then scrutinized sections with these indicators, as to find clues to the introduction of new-to-the-firm structures, processes, and practices more specifically. In this step, three coders (1 expert and 2 research assistants) scanned the nodes and identified and coded each marker into one of three nodes: new structure, new process, new practice[5].

Each node was then scanned and we counted the number of actions per node we could identify as distinct manifestation of that node. The research assistants received instructional training on working with the QSR NVivo software and detailed coding protocols. The coders each coded 101 annual reports, with 40 reports commonly coded in order to calculate Krippendorffs's coefficient of reliability alpha (Krippendorff, 2004). Alphas obtained at this stage were .86, .79, and .68 for structures, processes, and practices respectively, which we deemed to provide us with enough confidence to proceed. The span of management innovation initiatives across the three nodes (Mol & Birkinshaw, 2009), as a percentage of all change activities identified, was used as the final score for our dependent variable. We maintain that it is imperative to inspect the actual textual material in order to judge whether some other combinations of words might also indicate management innovation given idiosyncratic vocabulary in a particular population context. However, in Table 4.1 we offer a list of commonly used terms identified in our sample that might denote initiatives related to new structures, processes, and practices for future research. In Table 4.2 we offer some sample excerpts from our analysis.

[5] At the operational level we can identify new-to-the-firm *management practices, management processes, management techniques,* and *organizational structures* as key manifestations of management innovation (Birkinshaw *et al*., 2008: 828). Following Birkinshaw *et al*. (2008; footnote 2), we attest that the distinctions among practice, process, structure, and techniques are not clean, either conceptually or empirically, so it would be difficult to define management innovation in a way that excluded one or other of them. The dimensions of practices and techniques proved particularly hard to distinguish and were grouped together into one node.

Table 4.1: Search Dictionary Computer-Aided Content Analysis

General Change Indicators	*Theoretical Node 1: Structures (.86)[a]*	*Theoretical Node 2: Processes (.79)[b]*	*Theoretical Node 3: Practices (.68)[c]*
New~	!struct!	Process!	Practice!
Novel!	!design!	Routin!	Best_practic!
Implement!!	Architect*	Rule*	Technique*
First~	Network*	Proced!	Model
Adopt!~	Layer	Standardi*e!	Framework
Improv!~	Hierarchy	Standard!	Tool
Unprecedent*~	Flex!	Communicat*	Accountab!
Chang!~	Diversif!	IT	Style
Re!~	Portfolio*	Activit!	Concept*
Strateg!~		Efficien!	Method*
Transform!~		Distribut!	!_based/ !-based
Simplif*			
Unpreceden*			

[a,b,c] Inter-coder reliability alpha variation: multiple coders, multiple categories, metric scores, and corrected for chance. (Krippendorff, 2004). * indicates that any conjugation following the root of the marker is to be extracted. ~ indicates near-term to capture words (+/- 2 words) in the vicinity of the main marker. ! indicates command to extract any of the following terms in conjunction ("OR"-command) with the particular marker: new; novel; idea; techn*; market*; product*; process*; partner*; service; opportunit*; solution.

Table 4.2: Sample Excerpts from Content Analysis

Company[a]	*Sample Excerpt*	*Sample Coding*
Alpha (2006)	Page 9: *We now have a strong focus on execution, all through the organization. We have implemented the unit steering model and standardized selected key work processes."*	Practices
Bravo (2003)	Page 5: *"We have replaced the existing structure with four core divisions, each headed by a member of the Executive committee. In a change from the past, the new structure ensures greater accountability for performance and customer service while making better use of our internal supply chains and facilitating the sharing of resources and best practice."*	Structures
Charlie (2004)	Page 16: *"In 2004, the first steps were taken within the Fixed division to structure its activities around the following customer groups and operations: Consumer, Business and Wholesale & Operations."*	Processes

a Pseudonyms

4.3.3 Independent variables

Following Upper Echelons practice, we operationalized diversity as variety in *background heterogeneity*. We obtained scores using Blau's index (Blau, 1977) based on six functional categories: administrative, engineering/R&D, finance/accounting, legal, marketing/sales, and production/operations (Barker and Mueller, 2003), where higher scores denote more variety in compositional attributes. This index is a widely used measure of heterogeneity when one is concerned with diversity in terms of variety of nominally coded categories, and higher scores correspond to more heterogeneity (Harrison & Klein, 2007; Nielsen,

2010). The distribution within and across levels is displayed in Table 4.3. As composition at these two levels can be expected to be correlated, we adopt and endogeneity correction to mitigate potential biases stemming from simultaneity and similarity attraction dynamics (Boone *et al.,* 2004). For both TMT and MM functional background heterogeneity we regressed the Blau's scores with a one-year lagged model and for the TMT score we additionally corrected for MM_{t-1} and for the MM score we corrected for TMT_{t-1}. Both these models included the control variables described later at t_{-1}. The residuals were saved for these variables and used as predictor variables for Hypotheses 1 and 2. An interaction term was created for testing hypothesis 3, and this variable was residual-centered to remove multicollinearity concerns.

Table 4.3: Cross-tabs for managerial levels and functional background categories

		Managerial Level	
		TMT	**MM**
Finance & Accounting	*Count*	123	698
	% within Level	16.47%	9.55%
	% of Total	1.53%	8.66%
Legal	*Count*	19	510
	% within Level	2.54%	6.97%
	% of Total	0.24%	6.33%
Production/Operations	*Count*	20	218
	% within Level	2.68%	2.98%
	% of Total	0.25%	2.71%
Marketing/Sales	*Count*	30	1556
	% within Level	4.02%	21.28%
	% of Total	0.37%	19.31%
Engineering/R&D	*Count*	22	155
	% within Level	2.95%	2.12%
	% of Total	0.27%	1.92%
Administration	*Count*	402	1342
	% within Level	53.82%	18.35%
	% of Total	4.99%	16.65%

Shared organizational vision. Next to this we also obtained survey items as filled in by multiple subordinates of each middle manager, evaluation several organizational climate dimensions at the unit and firm level (Bock *et al.*, 2005; Kuenzi & Schminke, 2009; Luthans *et al.*, 2008). Of these, we were particularly

interested in organizational vision. As organizational vision is a latent variable, we used the predicted factor score using a Principal Components Extraction to obtain an aggregated score for organizational vision at the firm level. The items were filled on average by 5.3 subordinates, and item descriptives, factor loadings, and inter-rater reliability scores are summarized in Table 4.4. As shared organizational vision may itself stem from the composition of managers in the firm, we corrected for potential endogeneity in this variable by regressing it with TMT and MM functional background heterogeneity at t_{-1}, and the control variables explained later. The residuals were saved and used as the predictor for testing hypothesis 4. A 3-way (residual-centered) interaction term comprising TMT heterogeneity, MM heterogeneity, and Shared Organizational Vision was created for testing hypothesis 5.

Table 4.4: Descriptives & Psychometrics for Shared Organizational Vision Scale

Item	Factor Loading	Mean (s.d.)	Inter-rater reliability (Rwg)
The mission and goals for the organization are clear	. 79	4.77 (1.18)	.88
People understand how the work group´s goals are related to the organization´s goals.	. 72	4.61 (1.23)	.87
Policies and procedures are clear.	.77	4.58 (1.19)	.88
People have a clear idea of what is expected of them.	. 81	4.73 (1.08)	.91
I have a clear idea of what my supervisor/colleague expects of me on projects.	. 73	4.94 (1.07)	.92
People in are encouraged to do things that will help meet the organization´s goals.	. 72	4.97 (.96)	.95

N=7,293; 6-point Likert scales. Average 5.3 respondents/item; Cronbach's Alpha; .85; Average variance extracted: 57.32%

4.3.4 Control variables

We also controlled for variables at different levels in our multivariate analysis. We included seven *year dummies* to capture unobserved time effects and six *industry dummies* based on primary business line as listed in the Dutch industry classification code to capture time and environmental effects. We used fluctuation in sales as a metric of industry dynamism in the main industry code (Castrogiovanni, 2002; Dess and Beard, 1984), and used five-year observation windows to calculate volatility. To illustrate, the volatility in 2000 was obtained with data from 1996 through 2000 using the standard linear equation $y_t = a + b_1 x_t + e_t$ where y_t is sales in the year t, x_t is a time dummy and e is the residual. We first regressed the time dummy variables on total sub-sector sales and then the standard error of the regression slope coefficient was divided by the average sales over the five-year period to obtain the volatility score for a particular 3-digit sub-sector (Nadkarni & Barr, 2008). Larger values indicate greater industry dynamism.

At the firm level we controlled for *performance* by taking ROA and *firm size* was taken into account as the log of total employees. At the intra-organizational level we controlled for *TMT size* and *MM size* by taking the log of the number of top managers and middle managers respectively. We further included the *average age* at the different management levels to capture learning effects that can be attributed to skills and experiences otherwise gained and differential learning abilities of individuals related to age. We also included sex distribution at each level and also education level heterogeneity along four categories (no degree, high school graduate, undergraduate, advanced degree) to capture managerial human capital of the firm.

4.3.5 Multivariate approach

A Generalized Estimating Equations (GEE) was deployed to analyze the data. This approach extends the Generalized Linear Model and permits the analysis of non-independent events, which can result from repeated, longitudinal or nested measures, such as those in our sample (Ballinger, 2004; Liang & Zeger, 1986; see e.g. Katila & Ahuja, 2002; Chatterjee & Hambrick 2007). We model our analysis as a two-level model to account for non-independent observations, using a firm identifier as the subject variable and annual observations for each firm-year as nested within-subject effects. We ran the models in a hierarchical logic by including respective predictor variables in each sequential stage. Our interpretations are based on the final full model by assessing significance levels of the Wald X^2 and the marginal R-squared (R^2_{marg}) for GEE (Ballinger, 2004).

4.4 Analysis & Results

The univariate and bivariate statistics for this study are summarized in Table 4.5.

Table 4.5: Descriptives & Bivariate Correlations [a]

		Mean	s.d.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	Management Innovation (CATA)	.43	.16											
(2)	TMT Funct. BG. Heterogeneity (blau)	.26	.26	.37										
(3)	MM Funct. BG. Heterogeneity (blau)	.62	.19	.17	.04									
(4)	Shared Organizational Vision (scale)	4.47	.22	-.02	.01	.10								
(5)	TMT Education Heterogeneity (blau)	.13	.20	.17	.37	.08	-.03							
(6)	MM Education Heterogeneity (blau)	.53	.12	-.11	.02	.21	.144	.05						
(7)	TMT Age (cov)	.09	.04	.07	.12	-.04	.02	-.04	.04					
(8)	MM Age (cov)	.14	.02	-.04	-.06	.13	.29	-.02	.08	.05				
(9)	TMT Gender Heterogeneity (blau)	.07	.14	-.06	-.18	-.07	-.08	-.16	-.07	.05	-.03			
(10)	MM Gender Heterogeneity (blau)	.27	.14	.01	.01	.00	.32	-.13	-.30	.08	.06	.06		
(11)	TMT Size (log)	.61	.16	-.04	.15	-.07	-.09	.16	.05	.30	-.16	-.11	.12	
(12)	MM Size (log)	1.50	.50	-.05	-.05	.14	.32	-.02	.48	.06	.38	-.13	-.22	.08
(13)	Firm Size (log employees)	3.87	.95	-.14	.39	-.02	.14	.31	.34	.12	-.04	-.10	-.04	.53
(14)	Firm Performance (ROA)	.05	.10	.09	.09	-.08	-.01	.09	-.16	.02	-.07	-.06	-.17	.14
(15)	Environmental Dynamism	.08	.16	-.16	-.10	-.16	.18	-.04	.03	-.19	.03	.28	.05	-.10

[a] p<.10 for r= | .11 | ; p<.05 for r= | .14 | ; p<.01 for r= | .18 | ; p<.001 for r= | .21 |

Table 5.5 (continued): Descriptives & Bivariate Correlations

		(12)	(13)	(14)
(13)	Firm Size (log employees)	.24		
(14)	Firm Performance (ROA)	.01	-.03	
(15)	Environmental Dynamism	-.01	.05	.03

[a] p<.10 for r=|.11|; p<.05 for r=|.14|; p<.01 for r=|.18|; p<.001 for r=|.21|

Table 4.6: GEE Regression Results for Management Innovation[a]

	(1)			(2)			(3)			(4)		
	b	*(s.e.)*		*b*	*(s.e.)*		*b*	*(s.e.)*		*b*	*(s.e.)*	
Intercept	.64	(.26)	*	.52	(.31)	+	.54	(.27)	*	.51	(.29)	+
Environmental Dynamism	-.09	(.06)		-.05	(.05)		-.04	(.05)		-.02	(.05)	
Firm Performance	.05	(.05)		.05	(.05)		.07	(.05)		.06	(.05)	
Firm Size	-.06	(.02)	***	-.09	(.02)	***	-.08	(.02)	***	-.07	(.02)	***
TMT Size	-.17	(.13)		-.05	(.12)		-.08	(.12)		-.07	(.11)	
MM Size	-.02	(.04)		.00	(.04)		-.01	(.04)		-.01	(.04)	
TMT Gender Heterogeneity	.09	(.10)		.12	(.10)		.14	(.11)		.13	(.11)	
MM Gender Heterogeneity	.10	(.11)		.03	(.10)		.02	(.11)		-.01	(.11)	
TMT Age	.12	(.46)		-.22	(.42)		-.16	(.39)		.04	(.37)	
MM Age	-.94	(.47)	*	-.69	(.51)		-.59	(.51)		-.45	(.50)	
TMT Education Heterogeneity	.17	(.08)	*	.11	(.08)		.08	(.08)		.07	(.08)	
MM Education Heterogeneity	.10	(.24)		.06	(.20)		.04	(.21)		-.07	(.20)	
Shared Organizational Vision	.08	(.05)	+	.09	(.05)	+	.07	(.04)	+	.07	(.04)	+
TMT Background Heterogeneity (blau)				.24	(.06)	***	.23	(.06)	***	.19	(.05)	***
MM Background Heterogeneity (blau)							.16	(.09)	+	.22	(.08)	**
TMT Background Heterogeneity x MM Background Heterogeneity										-.03	(.01)	**
Wald's X²	72.15	***		82.35	***		86.57	***		97.37	***	
R^2_{marg}	.33			.42			.44			.48		

[a]Dependent variable at t+1; N: 215; + = p<.10; * = p<.05; ** = p<.01; *** = p<.001

Table 5.6 (continued): GEE Regression Results for Management Innovation[a]

	(5)			(6)			(7)		
	b	*(s.e.)*		*b*	*(s.e.)*		*b*	*(s.e.)*	
Intercept	.50	(.28)	+	.72	(.23)	***	.74	(.22)	***
Environmental Dynamism	-.03	(.05)		-.01	(.05)		.00	(.05)	
Firm Performance (ROA)	.06	(.04)		.05	(.05)		.06	(.05)	
Firm Size (log employees)	-.07	(.02)	***	-.08	(.02)	***	-.07	(.02)	***
TMT Size (log)	-.08	(.11)		-.09	(.11)		-.09	(.11)	
MM Size (log)	-.01	(.04)		-.01	(.04)		-.02	(.04)	
TMT Gender Heterogeneity (blau)	.13	(.11)		.11	(.11)		.10	(.11)	
MM Gender Heterogeneity (blau)	-.01	(.11)		-.05	(.10)		-.06	(.10)	
TMT Age (cov)	.02	(.37)		.06	(.37)		-.02	(.38)	
MM Age (cov)	-.48	(.48)		-.69	(.48)		-.52	(.46)	
TMT Education Heterogeneity (blau)	.07	(.07)		.08	(.07)		.09	(.07)	
MM Education Heterogeneity (blau)	-.06	(.19)		-.21	(.19)		-.22	(.19)	
Shared Organizational Vision	.08	(.04)	+	.06	(.04)		.06	(.04)	
TMT Background Heterogeneity (blau)	.19	(.06)	***	.19	(.06)	***	.19	(.05)	***
MM Background Heterogeneity (blau)	.22	(.08)	**	.21	(.08)	**	.18	(.08)	*
TMT Background Heterogeneity x MM Background Heterogeneity	-.03	(.01)	**	-.04	(.01)	***	-.03	(.01)	***
TMT Background Heterogeneity x Shared Organizational Vision	.00	(.01)		.00	(.01)		-.01	(.01)	
MM Background Heterogeneity x Shared Organizational Vision				-.02	(.01)	**	-.01	(.01)	
TMT Background Heterogeneity x MM Background Heterogeneity x Shared Organizational Vision							-.03	(.01)	***
Wald's X²	97.13	***		119.00	***		134.24	***	
R^2_{marg}	.48			.50			.52		

[a]Dependent variable at t+1; N: 215; + = p<.10; * = p<.05; ** = p<.01; *** = p<.001

Table 4.6 displays the unstandardized multivariate results we interpret to evaluate our proposed hypotheses. For our first hypothesis we expected that TMT functional background heterogeneity would be positively related to management innovation. Looking at model 7 in Table 6, the results obtained from the GEE models indicate a positive and significant (b=.19; p<.001), providing support for this hypothesis. Hypothesis two, where we elaborated on the main effect of MM functional background heterogeneity and expected a positive main effect, consistent with our findings (b=.18; p<.05). For the third hypothesis we argued that the interaction between TMT and MM diversity would be negatively related to management innovation. Consistent with this we obtained a negative and significant coefficient for the interaction term (b=-.03; p<.001). Interpreting the corresponding interaction plot (Figure 2) uncovers that the slope for TMT diversity when MM is high is not significant from zero (p>.15), indicating that the effect of high TMT diversity obtained in hypothesis 1, is dampened when MM diversity is also high, corroborating our hypothesis.

For the fourth hypothesis we expected the main effect of shared organizational vision to be positively related to management innovation. However, though the coefficient was in the right direction, the main effect of shared organizational vision was not significant on management innovation (b=.06; ns), thus rejecting this hypothesis. However, for the fifth hypothesis we expected a positive three-way interaction between TMT diversity, MM diversity, and shared organizational vision. The coefficient for this hypothesis showed to be significant (b=.03; p<.001), warranting an interpretation of the respective slopes as indicated in Figure 3. The pattern of results shows that the slopes for the high shared vision conditions have a stronger influence on management innovation. In particular, when both TMT and MM diversity are high in the high shared organizational vision condition, the slope is significantly different from zero (p<.05). Thus corroborating our final hypothesis. In the next session we discuss the implications of our findings for theory and practice.

Figure 4.2: Two-Way Interaction Plots for Hypothesis 3

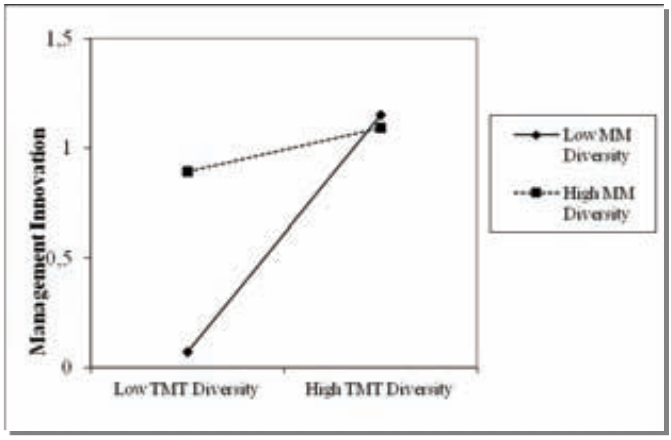
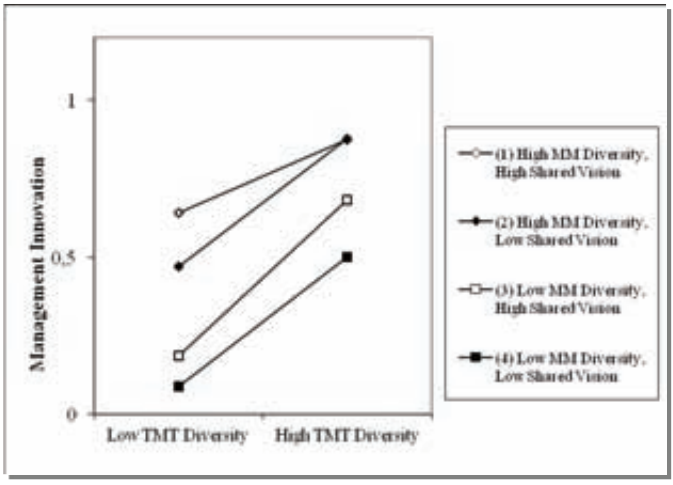


Figure 4.3: Three-Way Interaction Plots for Hypothesis 5



4.5 Discussion & Conclusion

In this study we set out to add to the intra-organizational determinants of management innovation by focusing on how both TMT and MM influence firm-level management innovation. We have articulated our framework along three pillars. First, we propose that management innovation is strategic in intent and

typically takes the form of planned episodic change in pursuit of strategic objectives. This implies that to a reasonable extent it is driven by the preferences, behaviors, and knowledge of the TMT (Hambrick & Mason, 1984). Second, management innovation transcends multiple domains of managerial activity, thus involving actors across multiple decision-making levels and representing different organizational knowledge domains –with middle managers playing a particularly key role (Raes *et al.*, 2011; Wooldridge *et al.*, 2008). Finally, management innovation is inherently uncertain because the imminent changes are irreversible once introduced, thus requiring organization-wide cooperation and sensemaking efforts (Kouzes & Posner, 1995; Wu *et al.*, 2010). We have drawn on a unique longitudinal dataset and tested hypotheses related to the additive and interaction effects of TMTs, MMs, and shared organizational vision on the introduction of new structures, processes, and practices. For our first and second hypotheses we reasoned that diversity in the compositional attributes of both top and middle management would be positively related to the introduction of changes in structures, processes, or practices. Both of these expectations were corroborated and provide support for Upper Echelons (Carpenter *et al.*, 2004; Hambrick & Mason, 1984) and Middle Management Perspective (Wooldridge *et al.*, 2008) assertions on the influences of internal agents on organizational outcomes and processes.

Recent developments have argued that these two perspectives merit a certain degree of integration as to achieve a more comprehensive view of how internal agents influence organizational processes and outcomes (Raes *et al*, 2011). Building on this notion we provided a first test of the interaction effects between top and middle management composition. We find that indeed the influence of internal agents at multiple hierarchical levels is quite informative, though in the case of management innovation diversity at these two levels does not seem to reinforce each other –consistent with our hypothesis. This implies that some of the inconsistent results from Upper Echelons scholarship (Carpenter *et al.*, 2004;

Nielsen, 2010), could be attributed to a lack of explicit inclusion of middle management. From a Middle Management Perspective, it contributes by preaching caution in romanticizing the role of middle management. Though this decision-making level is imperative for management innovation, novel changes in managerial work can challenge the professional and functional identities of middle managers –or even make them redundant. For the TMT-MM interface model, this implies that the conjoint analysis is indeed informative and that the influences of these actors should be understood in a multilevel contingency framework (Raes *et al.*, 2011).

Given the uncertainty of management innovation, we have further argued that a shared organizational vision can serve as a compass for sensemaking and navigating uncertainty inherent in the introduction of innovative ways of doing managerial work. It appears that for management innovation, a shared organizational vision is a contingency condition with little impact in and of its own. Our findings indeed provide support for the notion that a strong organizational vision can help counterbalance some of the challenges of having diverse top and middle management in the face of introducing changes in structures, processes, and practices. Notably, we did not find support for a main effect of shared organizational vision, in comparison to for instance Sidhu *et al*. (2004) and Heyden *et al*. (2012). One explanation could be that these studies have looked at innovation and change that is outward-looking in terms of product-market mix. However, internally-driven management innovation seems to be a distinct form of innovative change in which shared vision serves as a contingency factor.

4.5.1 Boundary conditions & future research

Our study is prone to several limitations that provide opportunities for future research. First, we have looked at only one dimension of diversity, though

the construct is a richer one and a distinction between task-related and social-category aspects of diversity could be considered. Next, we looked at the span of changes in structures, processes, and practices introduced, as a percentage of all changes identified. However, we have not distinguished between radical and incremental changes. The concept of management innovation is clearly multidimensional, and antecedents of specific dimensions could be studied separately, also considering the magnitude of changes. Finally, our sample has been restricted to firms in the Netherlands, however, management innovations could be driven differentially across contexts. The role of background institutions and national culture could be incorporated to refine our model.

4.5.2 Conclusion

What is the role of managers in inventing and implementing new management practices? Our study suggests that both TMT and MM background diversity matter for the introduction of changes in structures, process, and practices. In the pursuit of organizational effectiveness, internally-driven management innovation involves actors at multiple managerial levels and embodying knowledge from different managerial domains that need to make collective sense of uncertain changes in the way they perform their daily tasks. Harnessing the value of managerial diversity for driving management innovation from within, is contingent on a strong shared organizational vision in order to guide collective sensemaking in the face of irreversible changes in the most fundamental way organizations function –the way managers do their work.

Chapter 5. Study 4: Top Management Team (TMT) Search and New Knowledge Creation: How TMT Experience Diversity and Shared Vision Influence Innovation[6]

5.1 Introduction

There is a long intellectual tradition in the management and strategy literature that those at the organizational helm and the choices they make matter (Barnard 1938; Child 1972; Hambrick and Mason 1984). Building on this tradition, upper echelon scholars have found considerable evidence that a firm's top management team (TMT) is a critical variable that influences organizational strategy and outcomes (Cannella, Park, and Lee 2008; Carpenter and Fredrickson 2001; Hambrick, Cho, and Chen 1996; Marcel, Barr, and Duhaime 2011; Wiersema and Bantel 1992). In this blossoming TMT literature there is one particularly important topic that has not yet received sufficient scrutiny, namely, the effect of a firm's TMT on the creation of new knowledge that underpins commercially successful innovations.

Scholars studying innovation suggest that new products and services that are valued in the market frequently originate by mixing and matching existing knowledge elements in fresh ways (Fleming 2001; Kogut and Zander 1992; Nerkar 2003; Schumpeter 1934). Depending on how novel the knowledge-recombination outcome is in terms of the underlying scientific and technological principles or by way of the customer need served, it may either represent a radical or exploratory innovation, or it may amount to an incremental or exploitative innovation (cf. Ahuja and Lampert 2001; Gatignon, Tushman, Smith, and Anderson 2002; Jansen, Van den Bosch, and Volberda 2006). Against this backdrop, the present study investigates whether a firm's TMT influences its output of exploitative and

[6] A version of this paper is scheduled for publication in 2013 in *International Studies of Management & Organizations*.

exploratory innovations by affecting the firm's knowledge stock and the recombination of elements included in it.

This article builds the argument that the influence of TMTs on innovation depends in fact on the interplay between the diversity of TMT experiences and the commonality of their interest and purpose as reflected in a shared vision. Cross-sectional data from a large sample of firms in The Netherlands supports our theoretical model. We find that while lesser TMT experience diversity fosters exploitative innovations, more of it spawns exploratory innovations. We also find that a shared vision augments the positive effect of lesser and greater TMT experience diversity on exploitative and explorative innovations respectively. This moderating effect plausibly arises because unity of purpose fosters identification and infuses a cooperative spirit in teams (Kouzes and Posner 1995; Wu, Tsui and Knicki 2010), which stimulates willingness to expend more effort on the exchange of ideas and domain knowledge among team members.

We add to the upper-echelon literature by untangling some of the dynamics of TMT experience diversity and vision consensus that determine innovation outcomes. In this context the article highlights the value of bridging the TMT (Hambrick and Mason 1984) and organizational learning (March 1991) fields to build a finer understanding of how senior executives matter for firm renewal and wellbeing. In relation to the last, this article also speaks to scholars studying the firm search-innovation link (Katila 2002; Nerkar and Roberts 2004; Phelps 2010). Work in this area has traditionally laid more emphasis on firm, industry, and inter-firm variables, while paying less attention to the part played by the TMT in the conversion of information assembled through local and nonlocal search into exploitative and explorative innovations. By showing that TMTs count, this article underscores the value of including TMT variables in search-innovation models.

The article also helps reconcile the somewhat contradictory theory and results of earlier work. Whereas some researchers have emphasized that a shared

TMT vision has a positive effect on both exploitative and exploratory innovations (Jansen, George, Van den Bosch, and Volberda 2008; O'Reilly and Tushman 2008), other work suggests a positive effect on the former but not the latter (Sidhu, Volberda, and Commandeur, 2004). By revealing that the effect of TMT shared vision is not in isolation but in conjunction with TMT diversity of experiences, the present study points to a more complex picture as to the contingent manner in which a TMT shared vision influences exploitative and exploratory innovations.

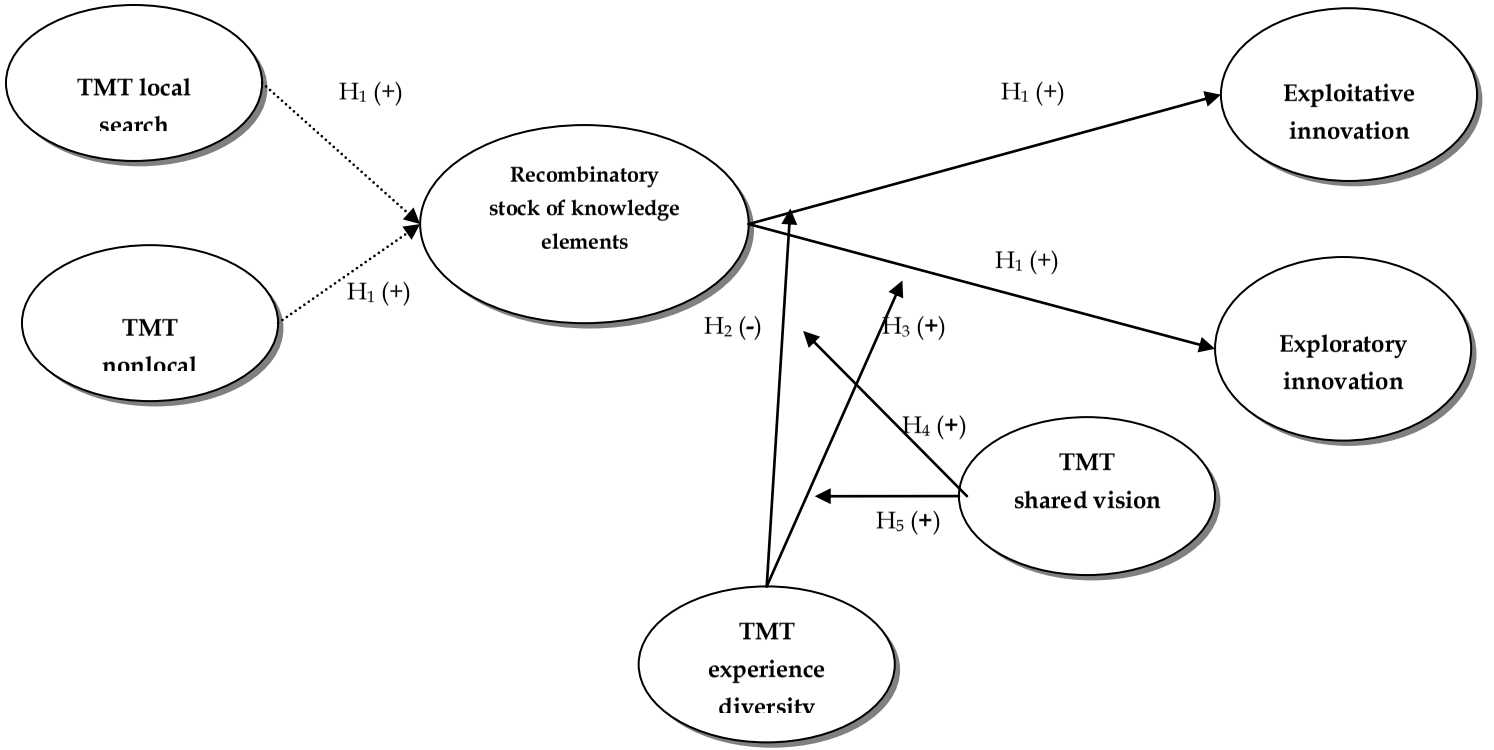
5.2 Theoretical Background & Hypotheses

Corresponding to a wider scholarly interest in how TMT diversity drives firm outcomes (e.g., Carpenter, Geletkanycz, and Sanders 2004; Nielsen 2010), research into the effect of TMTs specifically on innovation outcomes has typically considered the issue from a TMT homogeneity-heterogeneity perspective (Ahuja, Lampert, and Tandon 2008; Bantel and Jackson 1989). A core thesis put forth in this context is that greater TMT experiential diversity on account of functional, organizational, industrial, and educational differences of team members promotes innovativeness. The thesis rests on the argument that TMT experience diversity, rather than experience similarity, is likely to ensure a more exhaustive analysis of data from different angles, which should lead to the identification of a larger number of novel ideas (Hambrick et al. 1996). The few published studies that have tested this argument report broad empirical support for it (Bantel and Jackson 1989; Hambrick et al. 1996; Smith, Collins, and Clark 2005).

We carry forward inquiry into the impact of TMT experience diversity on innovation by employing two key ideas that have not featured in earlier work. Specifically, we propose new theory below by drawing on the idea of search from the behavioral approach to organizational learning and adaptive change (Cyert and March 1963; March 1991) and synthesizing it with the view that innovations arise from recombining knowledge elements in new ways (Schumpeter 1934;

Fleming 2001). To foreshadow our detailed discussion, the concepts of search and knowledge recombination allow us to shift the scholarly discourse beyond a mere analysis of the effect of TMT on innovation amount, to an examination of the effect of TMT on patterns of knowledge acquisition and recombination that lead to different types of innovations. Figure 5.1 outlines our theoretical discussion and related hypotheses.

Figure 5.1: Conceptual Model



5.2.1 TMT local search, nonlocal search, and innovation

In models of firm adaptation building on the behavioral (Cyert and March 1963) and evolutionary literatures (Nelson and Winter 1982), the notion of search often takes center-stage in explaining innovation (Katila and Ahuja 2002; Siggelkow and Rivkin 2006). Firm search processes can take many forms, for example, R&D and experimentation, analysis of competitors' products and strategies, industry surveys, advice seeking, and discussions with informed specialists (Huber 1991). Further, a distinction can be drawn between local and nonlocal search, both of which contribute fresh knowledge elements to a firm's accumulated stock of knowledge (Katila 2002; Sidhu, Commandeur, and Volberda 2007). However, whereas local search increases the depth of firm's knowledge stock by adding new knowledge that is in the neighborhood of past experiences and learning, nonlocal search increases the breadth of knowledge stock by adding knowledge obtained through boundary-spanning learning (Levinthal and March 1993; Rosenkopf and Nerkar 2001). By enriching and expanding the firm's knowledge stock, local and nonlocal search increase the odds of innovation. The larger the firm's knowledge stock, the more the knowledge elements that can be potentially accessed and recombined or synthesized to create new knowledge in the form of superior products and services (Fleming and Sorenson 2004; Kogut and Zander 1992).

While past studies have often analyzed the results of knowledge search and recombination at the firm (Ahuja and Lampert 2001; Galunic and Rodan 1998) and inter-firm level (Ahuja and Katila 2001; Puranam, Singh, and Zollo 2006), the contribution of a firm's TMT to the search process, knowledge accumulation, and recombination has not yet received similar attention (for a notable exception see Alexiev, Jansen, Van den Bosch & Volberda 2010). We maintain that local and nonlocal search conducted by the TMT will enrich and expand the recombinatory

set of knowledge elements, which should increase the firm's overall innovative output. Search by senior executives can contribute important bits of technical and market information of value for both exploitative and exploratory innovations. The two types of innovation differ in terms of the extent of divergence from the firm's extant product-market paradigm (cf. Abernathy and Clark 1985). While exploitative innovations reflect small changes ensuing from the recombination of knowledge elements in ways that improve the current product-market offering, exploratory innovations result from fundamentally novel ways of recombining knowledge, which shift the firm's product-market trajectory (Benner and Tushman 2003; Jansen et al. 2006). With respect to both innovation types, we predict a positive effect of TMT local and nonlocal search as formulated below:

HYPOTHESIS 1: *TMT local and nonlocal search is positively related to firm's innovation output, such that, the larger the the recombinatory stock of knowledge elements that search engenders, the higher the likelihood of exploitative and exploratory innovations.*

5.2.2 TMT experience diversity and exploitative versus exploratory innovations

We have argued above that TMT local and nonlocal search should enhance a firm's overall innovation output by increasing the depth and breadth of the recombinatory knowledge set. We however also expect an additional effect of a firm's TMT on innovation. Specifically, we anticipate that by influencing the recombination of elements in the knowledge stock, the degree of convergence or divergence in team members' experiential backgrounds will determine the firm's propensity to produce more exploitative versus more exploratory innovations. Our overarching prediction is that while greater TMT homogeneity of experiences will foster exploitative innovations, more heterogeneity will engender exploratory innovations. Our rationale is as follows.

When TMT diversity of experiences is low and executives are experts in the same or closely related knowledge domains, they are more likely to think alike in terms of product-market advancements. Less diversity means that executives have shared frames of reference, cause-effect understandings, and arsenal of problem-solving heuristics (Bantel and Jackson 1989; Hambrick et al. 1996). More experiential commonality should facilitate information exchange leading to a deeper, more profound analysis to discover new opportunities within the framework of mutual knowledge boundaries. Given this dynamic and the probably identical beliefs about supply and demand-side constraints and possibilities, less experience diversity should foster analogous interpretations of technical and market data obtained through local and nonlocal search. The related dynamic of thoughts and conjectures on how best to strengthen the firm's competitive position is therefore likely to lead to exploitative innovations, which improve current product-market offerings without any radical departure from the TMT's prior collective experience and learning.

Greater TMT experience diversity should have a contrasting effect on innovation. Because of lack of detailed comprehension of each other's specialized domain of expertise, variation in executive experiences is likely to impede in-depth analysis within a shared arena of understanding and from the vantage point of a common perspective. On the plus side though, because experience diversity implies that executives can draw on a more mixed repertoire of knowledge and problem-solving approaches, it is likely to be more conducive to generating a broader set of data interpretations and fresh product-market ideas (Paulus 2000; Simons, Pelled and Smith 1999). In the absence of dynamics that channel discussion and discovery along the path of common experiences and limit them to the confines of a single realm of knowledge, greater experience diversity increases the likelihood of finding a more wide-ranging set of ways to synthesize elements in the knowledge stock. By broadening the spectrum of alternatives that are conceived and deliberated upon, diversity raises the odds of finding feasible

exploratory innovations that are based on technological principles and market understanding quite removed from the firm's existing product-market configuration. We formalize the preceding theoretical reasoning as follows:

HYPOTHESIS 2: *The lower the level of the TMT diversity of experiences, the stronger the relationship between the recombinatory stock of knowledge elements and exploitative innovation.*

HYPOTHESIS 3: *The higher the level of the TMT diversity of experiences, the stronger the relationship between the recombinatory stock of knowledge elements and exploratory innovation.*

5.2.3 TMT shared vision and exploitative & explorative innovations

Besides TMT diversity of experiences, we submit that a firm's innovation output will also depend on TMT unity of interest and purpose. In particular, we expect the relationship between TMT experience diversity and exploitative-explorative innovations to be moderated by the extent to which the team has a shared vision, which embodies the team-members' collective aspiration. Scholars studying group dynamics have long suggested that the commonality of interest encapsulated in a shared vision facilitates task coordination, because it fosters communication and information sharing between team members (Jehn, Northcraft, and Neale 1999; Pearce and Ensley 2004). In a similar vein, research into knowledge-sharing in the context of multinational firms has emphasized the salience of a shared vision in the process (Fey and Furu 2008; Tsai and Ghoshal 1998). The beneficial effects of a shared vision are attributed to the trust it induces by underscoring team-members' common goal. By fostering trust and preventing disruptive conflict, a shared vision instills a cooperative spirit (Kouzes and Posner 1995; Wu et al. 2010). For TMTs engaged in the pursuit of innovation, high levels

of cooperation are vital, because unfettered sharing of data, knowledge, and ideas can promote creative recombination of knowledge elements into improved products and processes. Also, the trust spawned by a shared vision should facilitate the timely allocation of resources to potentially innovative projects. In the absence of trust, the TMT might face roadblocks in pursuing innovative ideas further, because agreement cannot be reached on funding of initiatives (Hambrick et al. 1996). In light of the foregoing points, we formally hypothesize:

HYPOTHESIS 4*: A shared TMT vision will strengthen the positive impact of lesser TMT experience diversity on exploitative innovation.*

HYPOTHESIS 5: *A shared TMT vision will strengthen the positive impact of greater TMT experience diversity on exploratory innovation.*

5.3 Data & Methods

5.3.1 Sample and data collection

Hypotheses were tested using a sample of 1089 firms (each with more than twenty full-time employees) operating in the following sectors: food and agriculture, business services, chemicals, construction, energy and utilities, financial services, ICT, manufacturing and mining, media and publishing, paper and pulp, and transport and trade. Data were collected in 2007 through a mixed-mode (post and web-based) survey as part of a larger project into firm innovativeness. Targeted respondents were senior executives, who were identified using the REACH database that compiles data on companies registered with the Dutch Chamber of Commerce. The executives were sent a paper-version of the questionnaire with a return envelope. The cover letter explained the purpose of the study, provided a profile of the research team, and a link to the web-based version of the questionnaire. As an incentive to participate, respondents were

offered a personalized analysis of their firm's competitive position vis-à-vis national and industry averages and a tailored report on their firm's strengths and weaknesses.

Two weeks after the questionnaire mailing, follow-up telephone calls were made to encourage participation and increase response rate. Those executives who could not be reached on the telephone were approached via e-mail. The final response rate of almost 13% is consistent with U.S. response rates in the context of large-scale surveys of corporate elites (Hambrick, Geletkanycz and Fredrickson 1993). Listwise deletion of cases with missing variable values resulted in a final sample of 1089 valid observations. The average age of respondents was 46.9 years, the average tenure was 12.8 years and the median formal education was the Bachelor's level. Further, the distribution of responses by sector was as follows: business services 25%, manufacturing and mining 22.8%, construction 16.7%, transport and trade 10.1%. The remaining 25.4% of the responses were from the other eight sectors, with each accounting for 1.0% to 5.4% of the sample.

5.3.2 Variables

Variables were operationalized using multi-item scales that have been validated in prior studies (Alexiev et al. 2010; Jansen et al. 2006). Table 5.1 provides an overview of the variables, the corresponding set of items measured on seven-point Likert-type scales, standardized factor loadings, Z-statistics, composite reliability, and average extracted variance figures. Variable descriptive statistics and correlations are presented in Table 5.2. Our main exogenous variables are *TMT local search* and *TMT nonlocal search* (ξ_1 and ξ_2 respectively in Figure 5.2). As we theorize these search variables to increase the firm's knowledge stock, we include a second-order latent construct, recombinatory stock of knowledge elements (η_1 in Figure 3) as an endogenous formative variable in our model (Jarvis, Mackenzie, and Podsakoff 2003). Our remaining two endogenous

variables are *exploitative innovation* and *exploratory innovation* (η_2 and η_3 in Figure 5.2 respectively). Further to this, we included several control variables in our analysis that would seem relevant based on previous research. Thus, we controlled for the effects of environmental dynamism (Jansen et al. 2006), firm size (Bourgeois 1981), and TMT size (Amason and Sapienza 1997). We also controlled for the main effects of TMT experience diversity (Smith et al. 2005), and TMT shared vision.

Table 5.1: Factor Table & Descriptives

Factor Label	Items	Factor Loadings[a]	Z-statistic	Cronbach's Alpha	Composite Reliability	Average Variance Extracted[b]
Exploratory innovation (Jansen et al., 2006)	Our company accepts demands that go beyond existing products and services	.83	Fixed	.87	.89	56.60
	We invent new products and services	.86	16.62			
	We commercialize products and services that are completely new to our company	.83	16.29			
	We frequently utilize new opportunities in new markets	.82	16.44			
	We regularly search for and approach new clients in new markets.[c]	.69	14.21			
Exploitative Innovation (Jansen et al., 2006)	We introduce improved, but existing products and services for our local market	.66	Fixed	.82	.84	61.99
	We frequently refine the provision of existing products and services	.72	13.95			
	We improve our provision's efficiency of products and services	.76	14.89			
	Our company expands services for existing clients	.84	15.42			
	Lowering costs of internal processes is an important objective [d]	.77	15.33			

Table 5.1: Factor Table & Descriptives (continued)

Factor Label	Items	Factor Loadings[a]	Z-statistic	Cronbach's Alpha	Composite Reliability	Average Variance Extracted[b]
Non-local Information search (Alexiev et al., 2010; McDonald & Westphal, 2003)	To what extent did you acquire advice from the managers of other organizations about your future strategy	.87	Fixed	.88	.89	81.24
	How frequently did you acquire advice from the managers of other organizations	.92	35.96			
	To what extent did you acquire advice from the managers of other organizations about your current strategy	.92	29.55			
Local information search (Alexiev et al., 2010; McDonald & Westphal, 2003)	To what extent did you acquire advice from the managers within your organization about the future strategy	.92	Fixed	.93	.94	88.28
	How frequently did you acquire advice from the managers within your organization	.96	54.86			
	To what extent did you acquire advice from the managers within your organization about the current strategy	.94	41.34			

Table 5.1: Factor Table & Descriptives (continued)

Factor Label	Items	Factor Loadings[a]	Z-statistic	Cronbach's Alpha	Composite Reliability	Average Variance Extracted[b]
TMT Functional Expertise Diversity (Alexiev et al., 2010; Campion et al., 1993)	The members of the management team have divergent areas of expertise	.76	Fixed	.80	.80	62.56
	The management team members have a great variety of backgrounds	.84	19.47			
	The management team is comprised of members with diverse experiences	.86	20.18			
	The members of the management team have skills that complement each other strongly	.72	16.43			
Shared Vision (Jansen et al., 2008; Sinkula et al., 1997)	There is a common goal within our management team	.79	Fixed	.87	.87	66.30
	Our management team agrees on the vision	.84	25.60			
	Our top managers are committed to the collective goals of the organization	.84	24.98			
	Top managers are enthusiastic about the collective ambition of our organization	.82	24.24			
	The top managers within our organization share common objectives	.78	22.18			

Table 5.1: Factor Table & Descriptives (continued)

Factor Label	Items	Factor Loadings[a]	Z-statistic	Cronbach's Alpha	Composite Reliability	Average Variance Extracted[b]
Environmental Dynamism (Jansen et al., 2006)	Changes in our market environment are very intense	.82	Fixed	.81	.82	63.98
	Clients in our markets regularly demand completely new products and/or services	.80	22.58			
	The markets in which we operate are constantly experiencing changes	.87	25.50			
	Demand fluctuates rapidly and frequently in our markets	.69	17.09			

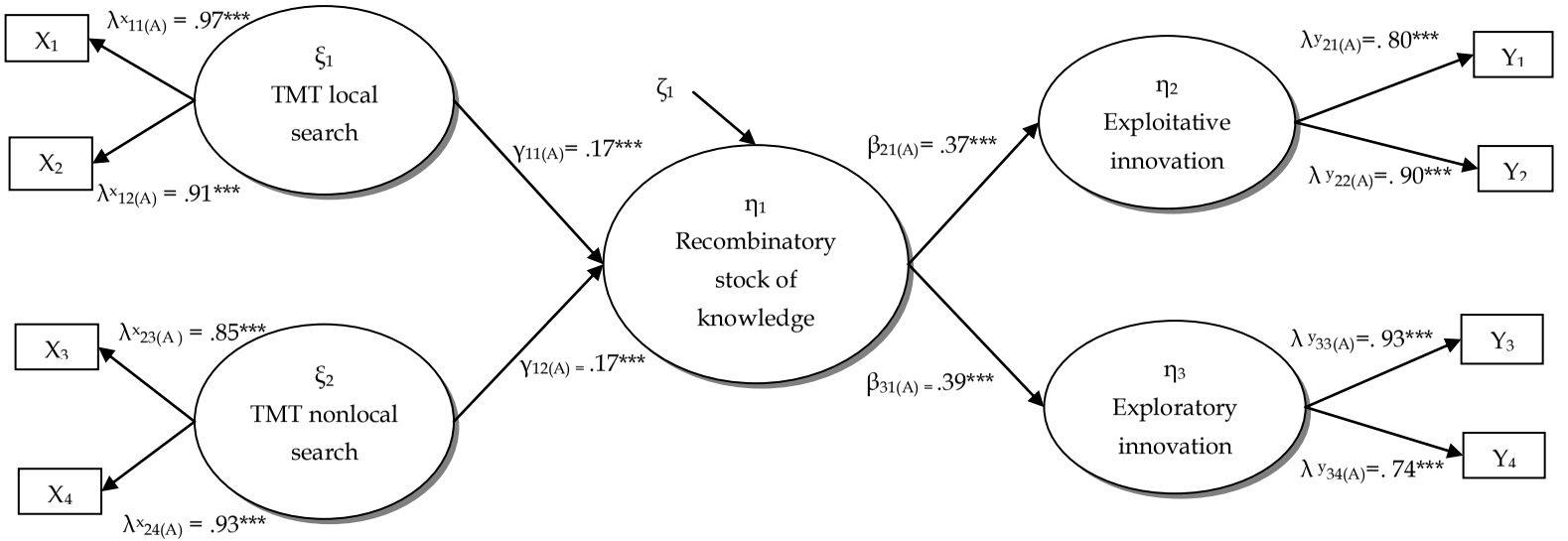
[a] Standardized; [b] Principal component extraction; [c] [d] reverse coded from original questionnaire item. Measurement model descriptives: GFI = .981; AGFI=.960; RMSEA=.034; X^2/df=2.27

Table 5.2: Means, standard deviations and correlations for variables in the model

	(1)	(2)		(3)		(4)		(5)		(6)		(7)		(8)	(9)	
1	TMT nonlocal search															
2	TMT local search	.25	***													
3	TMT experience diversity	.15	***	.26	***											
4	TMT shared vision	.11	***	.30	***	.34	***									
5	Exploratory innovation	.24	***	.25	***	.20	***	.26	***							
6	Exploitative innovation	.19	***	.27	***	.25	***	.27	***	.59	***					
7	Environmental dynamism	.22	***	.15	***	.10	**	.11	**	.53	***	.39	***			
8	TMT size (log)	.05		.19	***	.08	*	.05		.13	***	.14	***	.04		
9	Firm size (log)	.10	**	.17	***	.04		.03		.07	*	.09	**	.00	.38	***
	Mean	.00		.00		.00		.00		.00		.00		.00	4.18	1.63
	St. Dev.	1.46		1.25		.91		.87		1.28		1.10		1.34	1.085	.46

N=1089. †p<.1*p<.05; **p<.01; *** p<.001

Figure 5.2: Output Model SEM



5.3.3 Validity and reliability

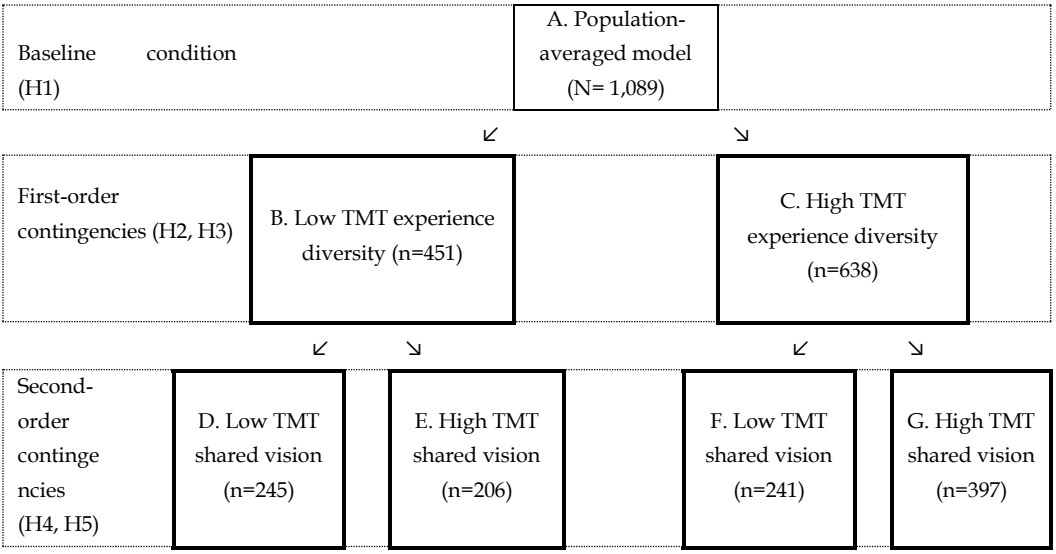
Fornell and Larcker (1981) note that constructs demonstrate discriminant validity if the variance extracted for each is higher than the squared correlation between the constructs. Hair, Anderson, Tatham, and Black (1998) propose that, for discriminant validity, the composite reliability should be above the 0.70 threshold and extracted variance above the 50% threshold. All our constructs met these criteria. To further control for potential biases stemming from the method of data collection, we ensured that there were no differences between web-based (69%) and paper-based respondents (31%). We also controlled for potential biases on account of age and gender. T-tests indicated no significant differences.

As Table 1 indicates, all reliability scores were above the generally accepted norm of 0.70. Further, a second wave of questionnaires, targeted at two other members of sampled firms, was sent out after the initial responses had been obtained (15% and 5% second and third respondents respectively). We calculated an inter-rater agreement score (r_{wg}) for each variable (James, Demaree, and Wolf 1993), which ranged from 0.67 to 0.85, which reflects "substantial" to "almost perfect" agreement on Landis and Koch's (1977) scale. The examination of intra-class correlations also revealed a strong level of inter-rater reliability: correlations were consistently significant at the 0.001 level (Jones, Johnson, Butler, and Main 1983). Finally, to check for common method bias, we conducted a Harman single-factor test, which did not suggest any cause for concern. Further, our confirmatory factor analysis (CFA) model performed well in terms of fit (GFI: 0.981; RMSEA: 0.034; $p \leq .0.00$; cf. null model GFI: 0.519; RMSEA: 0.22; $p \leq 0.00$). All factor loadings were well above the 0.40 level recommended by Ford, MacCallum and Tait (1986). The CFA solution thus replicated our proposed operationalizations, attesting to the reliability and dimensionality of the items and operationalizations.

5.3.4 Modeling approach

Using AMOS graphics (Byrne 2001), structural equations modeling (SEM) with maximum likelihood estimation was employed to test all hypothesized relations simultaneously. To test contingency effects, we adopted a variation of the SEM approach namely, latent multi-group SEM (MSEM) (Byrne 2004). This allows one to specify contingency effects for theoretically defined groups within the broader sample. The models are considered nested because multiple groups can be defined for the same theoretical model and differences across groups can be evaluated for the parameters of theoretical interest (Figure 5.3). This approach follows a quasi-experimental logic for testing of contingency effects and allows the researcher to test whether defined groups are invariant vis-à-vis each other and/or a higher-order group within the sample (Byrne 2004). The added value of this approach is that the nested structure of theorized multiple groups is reflected in the overall fit measures and that effect sizes can be compared across conditions (Bagozzi and Yi 1988). A poor selection of the nested groups to be compared results in a poorly fitting model, attesting to the (in)adequacy of the theorized contingency effects. As our model is estimated without intercept using a maximum likelihood, we mitigate industry-specific effects by categorically mean-centering the items used based on the 12 industry groups. Further, to improve the efficiency of model estimation, we adopted Bagozzi and Heatherton's (1994) partial disaggregation approach to test the structural models. In this approach multiple items are aggregated into fewer items using the average of a subset of items and these aggregated new items are then employed as latent variable indicators (Zaheer, McEvily, and Perrone 1998).

Figure 5.4: Nested data structure for theoretically defined groups



5.4 Analysis & Results

To test our contingency effects in the MSEM we test for lack of invariance across multiple nested groups corresponding to theorized conditions (Byrne 2004). We conduct our MSEM based on a specification of relatively high versus relatively low TMT diversity and relatively low versus high shared vision conditions adopting a weighted mean-cutoff to get comparable sub-group sizes[7]. For hypotheses two and three, we specify equality constraints between the high diversity and low diversity groups (see Figure 2) for all parameters estimated in a "fully constrained model." Paths corresponding to the hypothesized relations (β_{21} and β_{31} in Figure 3) are allowed to be freely estimated in a "partially constrained" model. Following the same logic we apply equality constraints between the second order contingency conditions in Figure 2, where the p-value for the X^2

[7] Though strictly speaking it would be possible to make 3-way interaction terms between all observed items, the complexity added to the model would make the estimation extremely inefficient and the model would be penalized by the fit statistics for lack of parsimony, making it difficult to evaluate (e.g. 60 additional items would have to be created and loaded onto a latent variable for a latent 3-way interaction construct to test H4 or H5). Moreover, the specific ranges of scores for which the contingency effects would be present would be masked by the crude interaction term and the value-added of the SEM would become trivial.

difference test denotes the probability of the fully constrained model fitting the data better than the partially constrained model. For the conditions corresponding to H2 and H3 we obtained a ΔX^2 of 6.44 for the change in two degrees of freedom ($p < .04$). For the conditions corresponding to H4 and H5 the ΔX^2 was 15.17 given a change in six degrees of freedom, meaning that the probability of the hypothesized paths not being significantly different across subgroups is <.02. The results from the aforementioned multi-group invariance tests provide us with the necessary confidence to proceed to interpret the magnitude, direction, and statistical significance of the path coefficients corresponding to our defined groups.

Whereas Figure 3 provides a graphical representation of our structural model with the path coefficients for the baseline population-averaged model (see Figure 2), Table 3 shows path coefficients for all the nested groups. With regard to Hypothesis 1, we see in Table 3 that the *recombinatory stock of knowledge elements* is positively related to both *exploitative innovation* and *exploratory innovation* ($\beta_{21(A)}$ = 0.37; $p < 0.001$ & $\beta_{31(A)}$ = 0.39; $p < 0.001$ respectively), which corroborates the hypothesis. For Hypothesis 2, we test our first-order contingency for the path between *recombinatory stock of knowledge elements* and *exploitative innovation*. We had argued that the relationship between *recombinatory stock of knowledge elements* and *exploitative innovation* would be stronger for TMTs with less experience diversity (group B in Figure 2). Looking at the corresponding model in Table 3, we find support for this hypothesis ($\beta_{21(B)}$ = 0.46; $p < 0.001$). Similarly for Hypothesis 3, we see that the coefficient for the hypothesized relationship between *recombinatory stock of knowledge elements* and *exploratory innovation* ($\beta_{31(C)}$ = 0.51; $p < 0.001$) is stronger for high experience diversity TMTs (group C in Figure 2).

For Hypotheses 4 and 5, we predicted second-order contingency effects of *TMT shared vision* on the relationship between *recombinatory stock of knowledge elements* and low and high *TMT experience diversity*. Specifically with regard to Hypothesis 4, we argued that the relationship expressed in Hypothesis 2 would be

stronger for TMTs who also exhibited higher degrees of shared vision. As Table 3 indicates, the hypothesized relationship ($\beta_{21(E)} = 0.49$; $p < 0.05$) is positive and significant, but the coefficient for Group E (low TMT diversity – high shared vision) is somewhat lower than the coefficient ($\beta_{21(D)} = 0.54$; $p < 0.01$) of Group D (low TMT diversity - low shared vision). This is intriguing, because it implies that less vision consensus is somewhat better than more consensus. With respect to Hypothesis 5, we expected the relationship expressed in Hypothesis 3 would be stronger for TMTs with a higher degree of shared vision. Table 3 indicates this to be indeed the case. The relevant coefficient is positive and significant and the effect size ($\beta_{31(G)} = 0.57$; $p < 0.001$) is stronger for Group G (high TMT diversity - high shared vision) as compared to the coefficient ($\beta_{31(F)} = 0.34$; $p < 0.05$) for Group F (high TMT diversity - low shared vision). Hypothesis 5 is hence supported.

Table 5.3: Multigroup Structural Equation Results[a]

	Path description			A. Baseline model	B. Low TMT diversity	C. High TMT diversity	D. Low TMT diversity - low shared vision	E. Low TMT diversity - high shared vision	F. High TMT diversity - low shared vision	G. High TMT diversity - high shared vision
β_{21}	Recombinatory stock of knowledge elements	→	Exploitative innovation	.37***	.46**	.34**	.54**	.49*	.39†	.39*
β_{31}	Recombinatory stock of knowledge elements	→	Exploratory innovation	.39***	.35**	.51***	.24†	.27†	.34*	.57***
γ_{11}	TMT local search	→	Recombinatory stock of knowledge	.17***	.17***	.17***	.20**	.14***	.07*	.22***
γ_{12}	TMT nonlocal search	→	Recombinatory stock of knowledge elements	.17***	.17***	.17***	.19**	.16***	.06*	.25***
γ_{24}	TMT shared vision	→	Exploitative innovation	.15***	.15***	.15***	.09**	.10***	.06***	.08***
γ_{34}	TMT shared vision	→	Exploratory innovation	.14***	.13***	.14***	.08**	.07***	.07***	.06***
γ_{33}	TMT experience diversity	→	Exploitative innovation	.15***	.05***	.05***	.07**	.09***	.04***	.07***
γ_{23}	TMT experience diversity	→	Exploratory innovation	.08**	.02**	.03**	.04**	.04**	.02**	.03**
γ_{35}	Environmental dynamism	→	Exploitative innovation	.32***	.39***	.30***	.34**	.48***	.36***	.28***

Table 5.3: Multigroup Structural Equation Results (continued)[a]

	Path description			A. Baseline model	B. Low TMT diversity	C. High TMT diversity	D. Low TMT diversity - low shared vision	E. Low TMT diversity - high shared vision	F. High TMT diversity - low shared vision	G. High TMT diversity - high shared vision
γ_{25}	Environmental dynamism	→	Exploratory innovation	.48***	.48***	.50***	.46***	.54***	.49***	.51***
β_{31}	TMT size (X_{11})	→	Exploitative innovation	.09**	.12**	.08*	.07	.12†	.15**	.04
β_{21}	TMT size (X_{11})	→	Exploratory innovation	.09**	.10*	.08*	.06	.15*	.08	.07
β_{21}	Firm size (X_{12})	→	Exploratory innovation	.01	.01	.00	-.01	.06	.09	-.02
β_{31}	Firm size (X_{12})	→	Exploitative innovation	.03	.00	.05	.01	.05	.06	.04
λy_{21}	Exploratory innovation	→	Y_1	.80***	.82**	.78**	.81**	.82***	.69**	.82**
λy_{22}	Exploratory innovation	→	X_2	.90***	.91***	.88***	.93***	.89***	1.00***	.84***
λy_{33}	Exploitative innovation	→	Y_3	.93***	.88***	.97***	.91***	.86***	.98***	.91***

Table 5.3: Multigroup Structural Equation Results (continued)[a]

	Path description			A. Baseline model	B. Low TMT diversity	C. High TMT diversity	D. Low TMT diversity - low shared vision	E. Low TMT diversity - high shared vision	F. High TMT diversity - low shared vision	G. High TMT diversity - high shared vision
$\lambda_{y_{34}}$	Exploitative innovation	→	Y_4	.74***	.75***	.72***	.69***	.81***	.78***	.73***
λ^{x}_{11}	TMT local search	→	X_1	.97***	.99***	1.02***	1.00***	.95***	1.09***	1.03***
λ^{x}_{12}	TMT local search	→	X_2	.91***	.93***	.87***	.94***	.96***	.79***	.88***
λ^{x}_{23}	TMT nonlocal search	→	X_3	.85***	.90***	.84***	.89***	.96***	.80***	.89***
λ^{x}_{24}	TMT nonlocal search	→	X_4	.93***	.88***	.95***	.89***	.83***	1.01***	.89***
λ^{x}_{35}	TMT experience diversity	→	X_5	.68***	.26	.46**	.39	.45†	.37	.54**
λ^{x}_{36}	TMT experience diversity	→	X_6	.98***	1.16	.94***	.89†	.58†	.89	.85***
λ^{x}_{47}	TMT shared vision	→	X_7	.86***	.78***	.88***	.61†	.97***	.50	.70***
λ^{x}_{48}	TMT shared vision	→	X_8	.97***	1.10***	.91***	1.17**	.60**	1.07*	.79***

Table 5.3: Multigroup Structural Equation Results (continued)[a]

	Path description			A. Baseline model	B. Low TMT diversity	C. High TMT diversity	D. Low TMT diversity - low shared vision	E. Low TMT diversity - high shared vision	F. High TMT diversity - low shared vision	G. High TMT diversity - high shared vision
$\lambda^{x}_{9,5}$	Environmental Dynamism	→	X_9	.78***	.78***	.78***	.77***	.77***	.82***	.77***
$\lambda^{x}_{10,5}$	Environmental Dynamism	→	X_{10}	.93***	.87***	.96***	.88***	.88***	.94***	.96***

[a] Standardized maximum likelihood estimates shown. † p<.10; * p<.05; ** p<.01; *** p<.001

5.5 Discussion & Conclusion

Our main purpose in this article was to examine the link between a firm's TMT and the creation of new knowledge in the form of exploitative and exploratory innovations. We especially sought to engage with the venerable body of TMT research by moving beyond the conventional focus on financial consequences (Cannella et al. 2008; Carpenter et al. 2004; Li and Zhang 2007) to an analysis of how TMTs might affect the nature of new knowledge created. Towards this end we drew on the notion of search in the organizational learning literature (March 1991) and the idea of knowledge recombination in the innovation literature (Fleming and Sorenson 2001) to propose that TMT local and nonlocal search deepens and broadens the firm's stock of knowledge elements, which raises the odds of exploitative and explorative innovations. We moreover theorized that TMT experience diversity is an important variable that influences the direction of innovation. Our empirical study corroborates these arguments to show that whereas less TMT diversity results in exploitative innovations, more diversity fosters exploratory innovations. These findings extend scholarly understanding by revealing how TMT diversity channels the direction of organizational learning and new knowledge creation (Lant, Milliken and Batra 1992; Sidhu et al. 2007).

Interestingly, complementing the view that firms' unique innovation paths originate in idiosyncratic search situations (Ahuja and Katila 2004), our results imply that even firms with comparable knowledge inventories might end up following different knowledge creation and innovation trajectories due to differences in TMT experience diversity. While more variety in TMT knowledge, expertise and problem-solving approaches seems to create the setting for discovery of radically new possibilities through knowledge re-mixing, some of which become commercially-valued exploratory innovations, less variety appears to direct efforts towards recombining knowledge elements in ways that

incrementally improve existing product-service offerings. Importantly, our study demonstrates that besides TMT diversity, TMT unity of purpose too is a critical variable for understanding innovation outcomes. We found a shared vision to positively moderate the effect of TMT experience on innovation. This result not only buttresses the salience of oneness of interest in the context of firm's upper echelons, it also points to a greater relational complexity than usually recognized. Whereas in our data the effect of a shared vision is more pronounced for exploratory rather than exploitative innovation when TMT diversity is considered in the model (Jansen et al. 2008; O'Reilly and Tushman 2008), other work interestingly suggests that a shared vision might benefit exploitative groups more than explorative ones (Lechner, Frankenberger and Floyd 2010).

Clearly, additional research is warranted for a more definitive understanding of the effect of a TMT shared vision. The current investigation does however indicate that TMT concurrence of interest and purpose fuels the discovery of valuable new knowledge combinations, arguably on account of the advantageous impact of a shared vision on information sharing and cooperative teamwork (see also Tsai and Ghoshal 1998; van der Vegt and Bunderson 2005). It is important to underline though that there might be a possible downside to a shared vision. Too much TMT agreement on purpose and firm direction may lead to mental models and blind spots that reduce the number of alternatives considered (Barr, Stimpert, and Huff 1992; Zajac and Bazerman 1991), resulting in a decline in innovation probability. This last dynamic might explain our anomalous observation of a stronger relationship between less TMT experience diversity and exploitative innovation when there was less rather than more of a TMT shared vision. It would appear that to the extent that more TMT experience diversity offers a counterweight to a vision consensus, the interplay of the two promotes innovation. However, when TMT experiences overlap and homogeneity increases, from an innovation perspective, an additional oneness of purpose becomes more of a bane than a boon.

This article also has managerial implications. Inasmuch as short and long-term firm performance are a function of exploitative and exploratory innovations respectively (Jansen et al. 2006), our work points to a new facet in the difficulty of attaining an exploitation-exploration balance (March 1991; Lavie, Stettner, and Tushman 2010). Senior executives face a challenging assignment, because the extent of experience diversity and vision consensus seem to have a more favorable impact on either exploitative or explorative innovation. An implication is that there is a need to complement the effect of TMT with other variables to simultaneously stimulate both types of innovation. Practitioners hence need to carefully evaluate additional variables and mechanisms to ensure continued firm prosperity. In this regard, it is worth observing that the identification of process, structural, and managerial variables, that can together facilitate the pursuit of both exploitation and exploration, is high on the agenda of ambidexterity research (Cao, Simsek, and Zhang 2010; Jansen, Tempelaar, Van den Bosch, and Volberda 2009; Mom, Van den Bosch, and Volberda 2007).

With a view towards future research, several shortcomings of the present study need to be tackled to push our collective understanding forward. Although our focus here has been exclusively on TMT diversity in terms of the heterogeneity of functional experiences of team members, attention should also be paid to other aspects of TMT diversity that can affect team functioning, such as gender and cultural diversity. This might lead to additional insights into the moderating effect of TMTs on search, knowledge recombination, and innovation. Given the agenda and scope of the present work we did not delve into CEO-TMT and TMT-middle management dynamics, which might also have a bearing on learning and new knowledge creation (Raes, Heijltjes, Glunk, and Roe 2011). Hence, future investigations that expand our conceptual model to include these additional factors should result in a yet better comprehension of firm innovation and performance. Moving from the conceptual to the methodological limitations of the present work, our findings are based on cross-sectional data. While our

research design allowed us to collect information from a large group of diverse firms, observations of firms at one point in time do make it difficult to make indisputable cause-effect claims. As such, longitudinal studies to validate our findings would be very desirable and helpful.

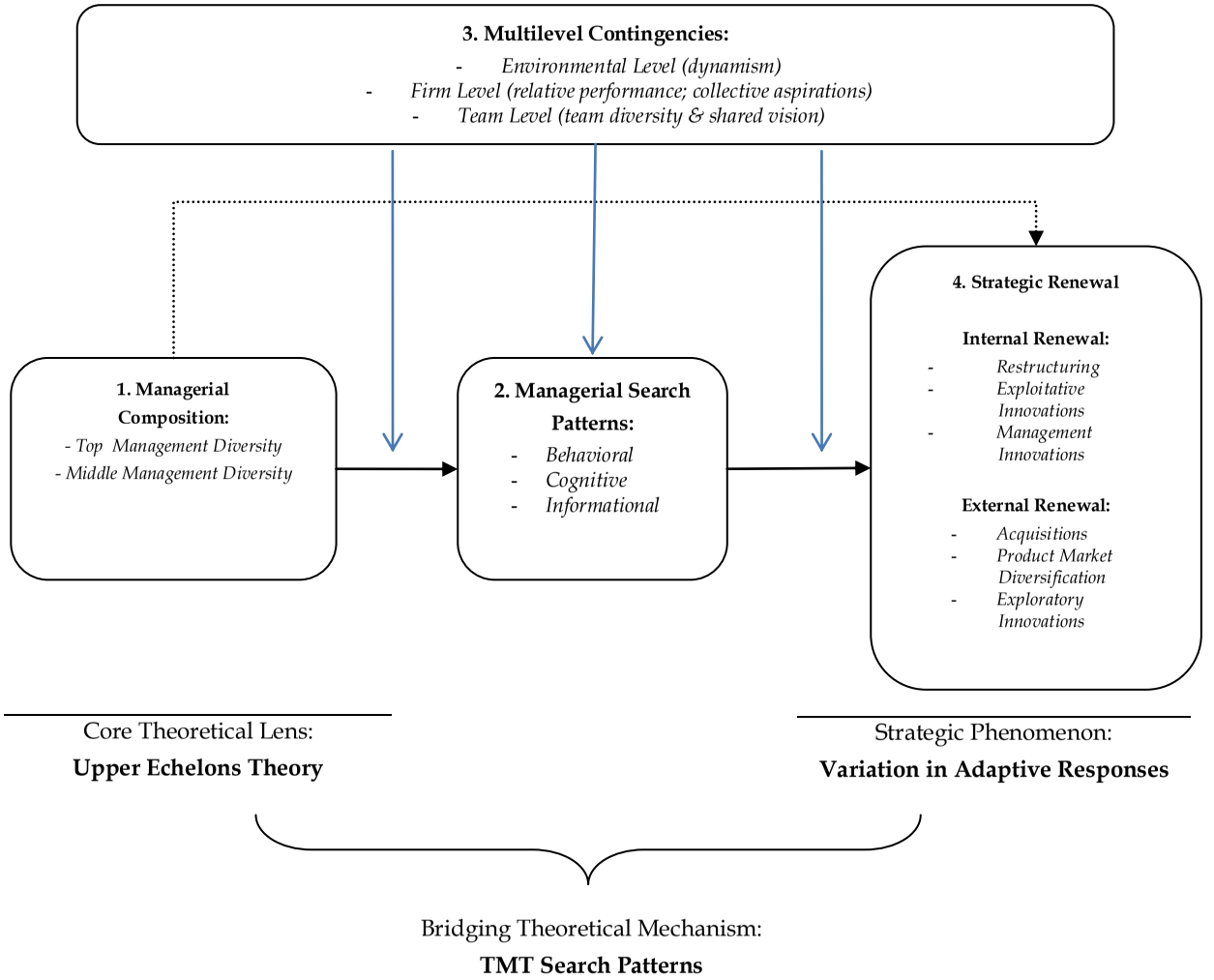
5.5.1 Conclusion

While there is a general scholarly and managerial consensus that TMTs play a decisive role in influencing firm fortunes by setting the strategic course of a firm, this article shows how TMTs may matter in more ways than we presently understand. We found that TMT local and nonlocal search deepens and broadens a firm's stock of knowledge and that TMT experience diversity and vision unity affect the recombination of knowledge-stock elements into exploitative and explorative innovations. We hope that the impact of TMTs that we have identified on new knowledge creation will inspire further research on this crucial topic as we move towards a globalized society, in which, innovation is likely to the prime determinant of firm survival and success.

Chapter 6. Summary of Findings & Contributions

In this dissertation we have sought to uncover contingent search patterns of managers in driving strategic renewal to elucidate why "firms" exhibit different modes of adaptation. In our effort to *bridge* Upper Echelons Theory with strategic renewal research, we have overarching proposed that different modes of renewal can be understood by zooming in on the *search patterns* engendered by the organization's managers in relation to multilevel contingencies (summarized in Figure 6.1). Attesting to the unique structural position of the organization's Upper Echelons at the interface with the environment, the firm, and key organizational members (Hambrick & Mason, 1984; Mintzberg, 1983), we have provided empirical evidence on how *contingent search patterns of managers drive different modes of adaptation.* In taking this approach we can inch closer to *understanding why "firms" differ in their modes of renewal.* In the next sections we summarize the main findings & conclusions of the studies reported here, highlight some noteworthy implications, and provide an overview of the main contributions.

Figure 6.1: Overarching Conceptual Framework: Multilevel Contingency Model of Upper Echelons & Strategic Renewal



6.1 Summary of main findings & conclusions

In the first study we focused on the drivers of executive search behaviors. We CEO advice-seeking as a form of problem solving behavior aimed at improving judgment accuracy in relation to different contingencies. We empirically test our hypotheses on a large panel of survey data collected from Dutch CEOs from 2006-2009 using a structural equation model (SEM). Our main findings suggest that higher perceived environmental dynamism is related to a CEO's tendency to seek advice from external sources, whereas firm underperformance relative to competitors relates to CEO advice-seeking from internal sources. Additionally, CEOs of less heterogeneous teams show a tendency to seek advice from internal sources, whereas CEOs of more heterogeneous TMTs show a tendency to seek advice from external sources.

In the second study we drew on a cognitive search perspective, by looking at the local versus non local search orientation of TMTs. Research into the cognitive underpinnings of strategic renewal has emphasized how top management team (TMT) attention focus (e.g., a new emerging technology) can anticipate the domain of organizational action (e.g., investment in this emerging technology). Ten-year panel data from industrial machinery and computer equipment companies in the US provides strong empirical support for our model. Our results suggest that higher levels of TMT education as well as TMT newness to the industry are associated with greater attention to nonlocal search when the industry becomes more volatile. However, we counter-intuitively find that the positive association between TMT functional diversity and attention to nonlocal search becomes weaker when industry volatility increases. Further, our analysis of the impact of TMT attention to search on strategic-renewal decisions reveals that, while greater TMT attention to local search engenders renewal through restructuring and entry into related product-markets, greater TMT attention to

nonlocal search stimulates renewal through unrelated acquisitions and diversification.

In the third study we set out to add to the intra-organizational determinants of renewal by emphasizing how both top and middle management influence firm-wide introduction of changes in structures, processes, and practices that alter managerial work (i.e. management innovation). We test our hypotheses on a unique panel (2000-2008) longitudinal dataset of large Dutch firms comprising multilevel data at firm, TMT, and MM level (comprising over 8,000 managers-year observations), and multi-respondent survey data obtained from subordinates on shared organizational vision. Our findings suggest that whereas both TMT and MM diversity exert a positive influence on changes in structures, process, and practices, the interaction between TMT and MM diversity exerts a negative impact. However, we find that the commonality of aspirations, as embodied in a strong shared organizational vision can help counterbalance some of these tensions.

In the final study reported we looked at recombinatorial search and probed into the vital role TMTs play in the coupling of knowledge elements assembled through local and nonlocal search into radically new, exploratory innovations and incrementally new, exploitative innovations. Multigroup structural-equation modeling (MSEM) of data from a large cross-section of firms in the Netherlands supports the theoretical model. We find that while greater variation in TMT experiences fosters exploratory innovations, lesser variation promotes exploitative innovations. A shared TMT vision was shown to moderate these relationships.

Table 6.1: Summary of Main Findings & Conclusions

	Research Question	Findings	Conclusion
Study 1	Where do CEOs search for knowledge inputs (e.g. advice) in relation to different contingencies? (Conceptual boxes 2 & 3 in Fig. 6.1)	• Perceived environmental dynamism is related to a CEO's tendency to seek advice from external sources; • Firm underperformance relative to competitors relates to CEO advice-seeking from internal sources; • CEOs of homogenous teams show a tendency to seek advice from internal sources; • CEOs of heterogeneous TMTs show a tendency to seek advice from external sources.	Search patterns of executives, through advice seeking from internal or external sources, are driven by the different contingency problems stemming from correlates reflecting the environment, the firm, and the top management team.
Study 2	How does managerial cognition influence internal and external renewal in dynamic environments? (Conceptual boxes 1-4 in Fig. 6.1)	• Higher levels of TMT education and TMT newness to the industry are associated with greater attention to nonlocal search in dynamic environments; • The positive association between TMT functional diversity and attention to nonlocal search becomes weaker as industry dynamism increases; • TMT attention to local search engenders renewal through restructuring and entry into related product-markets; • TMT attention to nonlocal search stimulates renewal through unrelated acquisitions and diversification.	TMT attributes contingently influence cognitive attention-focus on local versus non-local search patterns to explain divergences in adaptive choices.

Table 6.1: Summary of Main Findings & Conclusions (continued)

	Research Question	Main findings	Conclusion
Study 3	How do managers at different hierarchical levels, additively and interactively, influence internal renewal? (Conceptual boxes 1, 3, & 4 in Fig. 6.1)	• TMT and MM background diversity are positively related to changes in structures, process, and practices; • The interaction between TMT and MM diversity is negatively related to changes in structures, process, and practices; • Shared organizational vision dampens the negative effect of the interaction between TMT and MM background diversity on changes in structures, process, and practices.	TMT and MM diversity can both enable and hamper changes in structures, processes, and practices. Shared organizational vision offers a counterweight to the challenges emanating from having both diverse TMTs and diverse MMs.
Study 4	How does TMT recombinatory knowledge search influence different types of innovation? (Conceptual boxes 2,3, & 4 in Fig. 6.1)	• Higher TMT background diversity fosters exploratory innovations from the stock of knowledge acquired • Lower TMT background diversity fosters exploitative innovations from the stock of knowledge acquired • A shared TMT vision moderates these relationships such that the relation between the stock of knowledge elements and explorative innovations becomes stronger for high diversity TMTs, but not significantly stronger for low diversity TMTs and exploitative innovation.	Diversity and shared TMT vision interact in complex ways to drive exploratory and exploitative innovations from the stock of knowledge acquired through local and non-local search by TMTs.

6.2 Implications for Upper Echelons Theory

Diversity, as one of the core principles for studying Upper Echelons, presents itself as a recurring theme in each study of this dissertation. The concept of diversity is a rich and complex one, however, for the purposes of this dissertation we have consistently adhered to a conceptualization of diversity as *variety* (Harrison & Klein, 2007) and focused on *task-related* (Bezrukova et al., 2009) dimensions of diversity. We highlight a few particularly noteworthy observations emanating from this dissertation that can inform Upper Echelons scholarship.

One notable aspect of diversity we highlight is an underemphasized consequence of leading diverse teams –selecting between competing alternatives (Study 1). Diverse teams combining knowledge from different domains through enriching informational debate can result in multiple interesting alternatives for singular decision issues (Paulus 2000; Simons, Pelled and Smith 1999). However, an overlooked issue in prior studies is that the higher volume and broader spectrum of quality alternatives, makes it harder to reach consensus on the most appropriate course of action. This implies that the CEO may turn to advisers for additional insights on key issues that might help legitimize the selection of one course of action over another. This implies that decision making involvement may come encompass actors who may or may not be members of the top management team or even of the firm. Moreover, in viewing the interaction between the TMT and the CEO in this way, we highlight that this interface conceptualization, providing distinctive weighting to the CEO and other TMT members, can be a fruitful avenue for understanding how decisions are actually made.

Another observation emanating from this dissertation is the contingent influence of managerial diversity at multiple levels. In Study 3 we partially dealt with how middle management diversity would moderate the influence of top management diversity on internal renewal. Recent years have seen the

responsibilities and span of control of middle management broaden considerably. As a result of among other things rising executive job demands (Hambrick, Finkelstein & Mooney, 2005), more complex and decentralized organizational structures (Burgers *et al.*, 2009), and globally dispersed teams in uncertain environments (Cannella, Park & Lee, 2008), managerial discretion and autonomy is increasingly situated at lower levels of the organization (Takeuchi, Shay & Li, 2008; Burgers *et al.*, 2009). However, studies invoking Upper Echelons theory or Middle Management Perspective have developed mostly in parallel. Our findings indicate that the explicit inclusion of this *Middle Echelons* layer is important for a more holistic understanding of how Upper Echelons influence internal renewal. To our knowledge, this is one of the first studies that quantitatively examines how diversity at top and middle management levels interact to influence adaptive change; responding to a call for considering TMT and MM together (Raes *et al.*, 2011).

Many questions remain on the contingent organizational and environmental conditions that influence the interactive impact of top and middle management diversity on different modes of renewal. Adopting different conceptualizations of diversity, such as faultlines (Lau & Murnighan, 1998), and looking at social category dimensions such as gender (Dezso & Ross, forthcoming), and race (Richard, 2000) could elucidate cross-level managerial composition influences on adaptive behaviors of firms.

6.3 Implications for Managerial Search Patterns

In understanding search patterns as a crucial intermediate, and contingent, linkage between the organization's Upper Echelons and different manifestations of renewal, the studies reported in this dissertation help us inch closer to understanding variety in adaptive renewal responses. We have built on the Behavioral Theory premise that search is an adaptive

problem-solving behavior activated in relation to a contingent stimulus. Managers have different search strategies at their disposal and the concept featured most prominently in studies 1, 2, and 4. In Study 1 we conceptualized CEO advice-seeking as a problem-solving behavior aimed at improving judgment accuracy in relation to contingencies reflecting the environmental, firm, and TMT level. Here search manifested itself as a behavioral problem-solving exercise where CEOs sought advice from internal and or external advisers in relation to the aforementioned contingencies (*behavioral search*). Whereas the other studies presented here largely focus on the consequences of search (except for Study 2), this chapter draws attention to the antecedents of senior manager behaviors, responding to a call for more research on the drivers of behaviors in the top ranks of organizations (Hambrick, 2007).

In Study 2 search featured in the form of a cognitive learning process driven by the formative experiences of the TMT, in relation to environmental dynamism (*cognitive search*). Our model importantly accounts for how cognitive burden is reduced through a particular delineation of the search landscape to guide information gathering and analysis. The concept of attention to local-nonlocal search assumes that, given a stimulus (e.g. environmental dynamism), decision-makers with bounded rationality avoid cognitive overload by turning to a local or a nonlocal search algorithm, which simplifies decision-making by delineating the search perimeters and information analysis. However, contrary to the assumption of focused attention on a domain (e.g., the task or general environment) (Cho & Hambrick, 2006; Garg et al., 2003) or a specific issue or event (e.g., the emergence of a new technology) (e.g. Eggers & Kaplan, 2009) as a means of reducing cognitive burden, attention to search assumes that decision-makers can simultaneously attend to multiple domains and factors including, organizational competences, resource availability, and competitor actions (cf. Kraatz and Zajac, 2001; Tripsas and Gavetti, 2000).

In the final study search took the form of knowledge search (*informational search*), with the composition of the TMT and TMT shared vision featuring as crucial contingencies. In this study the concepts of search and knowledge recombination allowed us to shift the scholarly discourse beyond a mere analysis of the effect of TMT on innovation amount, to an examination of the effect of TMT on patterns of knowledge acquisition and recombination that lead to different types of innovations. We argued, and found, that local and nonlocal search conducted by the TMT enriches and expands the recombinatory set of knowledge elements, which should increase the firm's overall innovative output. The contingent ways through which different types of innovations, and other adaptive modes, ensue are discussed in the following sections.

6.4 Implications for Multilevel Contingency Perspectives

Our theorizing has drawn on the idea that search patterns are contingent on multilevel challenges confronting decision-makers. We highlight a few observations stemming from our findings. At the core of strategic management thinking rests the premise that a fit should exist between organizational structure, processes, competencies and resources on the one hand, and opportunities and threats arising in the organization's external environment on the other hand, over time (Miles & Snow, 1978; Snow & Miles, 1983; Venkatraman & Camillus, 1984). *Environmental* dynamism, reflecting a key challenge in the organization's task environment (Dess & Beard, 1984), featured prominently in the first two studies and was controlled for in studies 3 and 4. The findings of the first study imply that the uncertainty presented by dynamic environments focuses the search patterns of CEOs predominantly beyond the boundaries of the organization. In study two our theory and findings suggest that the influence of observable attributes and the latent cognitive component of search, are activated in relation to

this environmental challenge. However, the organization's environment is a broader concept, and the institutional component, and the multiple dimensions within both task and institutional environment, could influence search patterns in different ways.

Although TMT diversity featured as a core explanatory variable in studies 1, 2 & 3, in study 4 its inclusion featured as a moderator. In this study we viewed TMT diversity not as a predictor, rather we juxtaposed the influence of extant knowledge –as encased in the formative experiences of the TMT- against the stock of knowledge elements gleaned through local and nonlocal search efforts by the TMT. Taking this approach we elucidate the search-innovation link by including the moderating role of TMT diversity, whereas work in this area has traditionally laid more emphasis on firm, industry, and inter-firm variables, while paying less attention to the part played by the TMT in the conversion of information assembled through local and nonlocal search into exploitative and explorative innovations. By showing that TMTs count, this study underscores the value of including TMT variables in search-innovation models (Ahuja et al., 2008).

Of the contingencies studied, shared vision featured prominently in two studies. Studies 3 & 4 both draw on the concept of *shared vision* from an *organizational* and *team level* respectively. Though shared vision is not a directional construct, and thus difficult to identify main-effect relationships (see Study 3, Hypothesis 4), it is nevertheless an important moderator of group processes – particularly when considered jointly with diversity. Shared vision is important because it might counterbalance disruptive conflict by imposing parameters on informational debate, as well as serving as a compass for collectively navigating uncertainty. Explicit inclusion of shared vision strikes at one of the core assumptions of the Behavioral Theory of the Firm, from which we have drawn inspiration in our bridging efforts.

Within a broader Behavioral Theory of the Firm framework, shared vision emerges as an important indicator of not only the aspirations of the dominant

coalition per se, but rather on the extent of *agreement on aspirations*. That is, it is not about the absolute social and historical aspiration-levels themselves, rather the extent to which a decision-making collective agrees on the anchor-point towards which is aspired (cf. Shinkle, 2012). This agreement seems particularly important for diverse managerial collectives that may encase diverging viewpoints and interpretations. By revealing that the effect of TMT shared vision is not in isolation but in conjunction with TMT diversity of experiences, the present study points to a more complex picture as to the contingent manner in which a TMT shared vision influences exploitative and exploratory innovations. Although the findings of this dissertation indicate that shared vision can help harness the value of diverse teams facing uncertainty; however, the antecedents of *shared vision* remain relatively under-explored. The relation between TMT shared vision and organizational shared vision, for instance, remains unexplored and we posit this as a crucial avenue for future research.

6.5 Implications for Strategic Renewal

Remarkable heterogeneity in adaptive renewal responses can be observed across firms and over time (Baden-Fuller & Volberda, 1997). Whereas some firms adopt a course of renewal that sees business contraction, others renew in the opposite direction by expanding the scope of operations and, still others, by restructuring and streamlining operations (Agarwal and Helfat, 2009; Barr, Stimpert, and Huff 1992; Dutton and Jackson, 1987; Eggers and Kaplan, 2009). Studies 2-4 provide some answers to this empirical observation.

In study 2 we showed that TMT attributes contingently influence cognitive attention-focus on local versus non-local search patterns to explain divergences in adaptive choices. We looked at different internal and external renewal strategies (e.g. organizational restructuring, product-market diversification, acquisitions). By specifically studying the effect of TMT attention

to local-nonlocal search on internal and external strategic renewal (Capron and Mitchell, 2009), this study seeks to demonstrate the potential of the attention to search concept as a predictor of variation in firm behavior and, more generally, it aims to present a model of the antecedents and consequences of attention to search as the cognitive mechanism that connects decision-makers attributes to firm-level adaptive change. By underscoring variation in the cognitive abilities and preferences given issue categories that all decision-making teams note, unlike schema-based studies which stress the stability of shared knowledge structures across firms (e.g., Porac *et al*., 1995), attention to search allows for idiosyncratic information processing and differences in learning that lead firms on to different technology, product, and market paths over time.

In Study 3 we found that in the context of internal renewal, TMT and MM diversity can both enable and hamper changes in structures, processes, and practices. TMTs and MMs have markedly different information, interests, and roles in the face of imminent changes (Balogun & Johsnon, 2005; Floyd & Lane, 2000; Taylor & Helfat, 2009; Raes *et al*., 2011). Novel changes in managerial work can challenge the professional and functional identities of MMs –or even make them redundant, and MMs can be expected to enable or constrain the creation and introduction of new innovative ways of doing managerial work. Although some conceptual and case-based process studies have looked at the different roles of top- and lower-level managers in different journeys of renewal (Baden-Fuller & Volberda, 1998; Floyd & Lane, 2000; Volberda *et al.,* 2001), our approach here offers a complementary vantage point by bringing middle management composition into the Upper Echelons framework in a multilevel managerial contingency fashion. One reason why firms may exhibit organizational-level inertia then, whereas others manage to adapt, is because the interaction of managerial composition at multiple decision-making levels may be more constraining or more enabling for the introduction of new-to-the-firm changes in structures, processes, and practices.

In Study 4, we looked at different new knowledge creation paths, as evident in the types of innovations created. We found that diversity and shared TMT vision interact in complex ways to drive exploratory and exploitative innovations from the stock of knowledge acquired through local and non-local search by TMTs. Scholars studying innovation suggest that new products and services that are valued in the market frequently originate by mixing and matching knowledge elements in fresh ways (Fleming 2001; Kogut and Zander 1992; Nerkar 2003; Schumpeter 1934). Depending on how novel the knowledge-recombination outcome is in terms of the underlying scientific and technological principles or by way of the customer need served, it may either represent a radical or exploratory innovation, or it may amount to an incremental or exploitative innovation (cf. Ahuja and Lampert 2001; Gatignon, Tushman, Smith, and Anderson 2002; Jansen, Van den Bosch, and Volberda 2006). The findings from this study imply that how TMTs recombine knowledge elements obtained through local and nonlocal search is important for explaining different types of innovations. As different types of innovations pursued lead to different path-dependent constraints and opportunities over time, understanding how differentially composed TMTs use the knowledge available for different types of innovation can help explain whether firms follow more path-deepening versus more path-creating evolutionary trajectories over time.

6.6 Overview of Main Contributions for a Multilevel Contingency Model of Upper Echelons & Strategic Renewal

Table 6.2 provides an overview of the main contributions each study makes to the individual elements of the proposed framework.

Table 6.2: Summary of Main Contributions for a Multilevel Contingency Model of Upper Echelons & Strategic Renewal

	Upper Echelons Theory	Managerial Search Patterns	Multilevel Contingencies	Strategic Renewal
Study 1	• Emphasizing the drivers of behaviors instead of the outcomes of these elucidates an underemphasized element of Upper Echelons Theory. • TMT diversity poses an often overlooked challenge: devising multiple competing alternatives from which the CEO must select.	• Conceptualization of advice-seeking as an induced search behavior to improve judgment accuracy in relation to different contingencies. • Positing internal and external advisors important knowledge streams from which CEOs can acquire inputs for decision making.	• Environmental, firm, and TMT contingencies induce differential, and asymmetric, influences on CEO search behaviors through advice-seeking from internal and/or external sources.	• By extension, understanding the triggers for behaviors such as advice-seeking offers a rich basis for a more comprehensive picture of how top managers' behaviors are ultimately reflected in firm processes and outcomes.

Table 6.2: Summary of Main Contributions for a Multilevel Contingency Model of Upper Echelons & Strategic Renewal (continued)

	Upper Echelons Theory	Managerial Search Patterns	Multilevel Contingencies	Strategic Renewal
Study 2	• How TMT attributes contingently influence cognitive attention-focus to local versus non-local search patterns to explain divergences in adaptive choices. • How cognitive burden is reduced through a particular delineation of the search landscape to guide information gathering and analysis.	• The concept of attention to local-nonlocal search assumes that, given a stimulus (e.g. environmental dynamism), decision-makers with bounded rationality avoid cognitive overload by turning to a local or a nonlocal search algorithm, which simplifies decision-making by delineating the search perimeters and information analysis.	• Decision-makers are more likely to engage in search for adaptive solutions in volatile rather than stable environments; environmental dynamism activates the relation between TMT attributes and generalized patterns of attention to search local versus nonlocal search.	• By specifically studying the effect of TMT attention to local-nonlocal search on internal and external strategic renewal, this study seeks to demonstrate the potential of the attention to search concept as a predictor of variation in firm behavior and, more generally, it aims to present a model of the antecedents and consequences of attention to search as the cognitive mechanism that connects decision-makers attributes to firm-level adaptive change.

Table 6.2: Summary of Main Contributions for a Multilevel Contingency Model of Upper Echelons & Strategic Renewal (continued)

	Upper Echelons Theory	Managerial Search Patterns	Multilevel Contingencies	Strategic Renewal
Study 3	• Novel changes in managerial work can challenge the professional and functional identities of MMs –or even make them redundant, and MMs can be expected to enable or constrain the creation and introduction of new innovative ways of doing managerial work. • Inclusion of MM diversity, additively and interactively, can help explain variation in intraorganizational adaptation.	• By extension, top managers can engage in experiential search be combining insights from different knowledge domains, as encased in the formative experience of both top and middle managers.	• Shared organizational vision is an important contingency that can counterbalance disruptive conflict by imposing parameters on informational debate across hierarchical levels, as well as serving as a compass for collectively navigating uncertainty. • Shared vision emerges as an important indicator of not only the aspirations of the dominant coalition per se, but rather on the extent of *agreement on aspirations* across managerial levels.	• One reason why firms may exhibit organizational-level inertia then, whereas others manage to adapt, is because the interaction of managerial composition at multiple decision-making levels may be more constraining or more enabling for the introduction of new-to-the-firm changes in structures, processes, and practices.

Table 6.2: Summary of Main Contributions for a Multilevel Contingency Model of Upper Echelons & Strategic Renewal (continued)

	Upper Echelons Theory	Managerial Search Patterns	Multilevel Contingencies	Strategic Renewal
Study 4	• Highlighting the vital role TMTs play in the coupling of knowledge elements assembled through local and nonlocal search into radically new, exploratory innovations versus incrementally new, exploitative innovations.	• Knowledge search from internal and external sources add volume and variety to the stock of knowledge elements available for recombination. • Search and knowledge recombination allowed us to shift the scholarly discourse beyond a mere analysis of the effect of TMT on innovation amount, to an examination of the effect of TMT on patterns of knowledge acquisition and recombination that lead to different types of innovations.	• TMT diversity and shared TMT vision interact in complex ways to drive exploratory and exploitative innovations from the stock of knowledge acquired through local and non-local search by TMTs. • TMT shared vision seems particularly important for creating radically new knowledge by diverse managerial collectives, as it may encase diverging viewpoints and interpretations by fostering a cooperative spirit and knowledge exchange & integration efforts.	• Different types of new knowledge creation paths lead to different path-dependent constraints and opportunities over time, understanding how differentially composed TMTs use the knowledge available for different types of innovation can help explain whether firms follow more path-deepening versus more path-creating evolutionary trajectories over time.

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Chapter 7. Summaries

7.1 Summary in English

To survive and prosper firms have to renew their strategies to maintain a dynamic strategic fit with their changing environments. Strategic renewal can be understood as the adaptive choices and actions a firm undertakes to alter its path dependence and maintain a dynamic strategic fit with changing environments over time. In this dissertation we endeavor to develop and test theory on how, and under what environmental, firm, and team conditions, the organization's key decision makers –its Upper Echelons, pursue particular adaptive responses. We focus on some contingencies that prompt Chief Executive Officers (CEOs), Top Management Teams (TMTs), and Middle Managers (MMs) to adapt through internal and/or external modes of renewal. We propose that heterogeneity in adaptive strategic choices ensues from the contingent search patterns (behavioral, cognitive, and informational) adopted by the organization's Upper Echelons. In the first study we find asymmetric behavioral search patterns of CEOs in relation to different cross-level correlates. In study two we find that TMT attributes influence cognitive search-focus in dynamic environments to explain heterogeneous adaptive responses. In the third study we find that TMT and MM attributes can either enable or hamper changes in structures, processes, and practices. Study four exposes how the complex interaction between TMT diversity and shared TMT vision drive new knowledge creation from the stock of knowledge acquired through informational search activities by TMTs. The findings from the four studies, each adopting a unique database, provide evidence on how contingent search patterns of Upper Echelons drive different modes of renewal.

7.2 Summary in Papiamentu

Pa por sobrebibí i prosperá empresanan mester renobá nan strategianan regularmente pa adaptá na kambionan den nan ambiente. Renobo stratégiko ta enserá eskohonan i akshonnan pa rehubenesé konfigurashonnan establesé ku e meta pa adaptá e organisashon na su ambiente. Den e disertashon aki nos ta desaroyá i tèst teoria tokante kon, i bou di kwa sirkumstansha, e aktórnan prinsipálmente responsabel pa desishonnan stratégiko ta skohe diferente forma di renobo. Nos ta enfatisá influensha di gerentenan general, ekipo di gerensha i mènedjer na nivél intermedio riba diferente manera di renobá strategianan interno òf eksterno. Nos ta proponé ku variashon den eskohonan adaptivo ta un funshon di patronchinan di ahustashon (komportashon, kognitivo i uzo di informashon) ku aktornan influenshal ta ekshibí bou di diferente sirkumstansha (na nivel di ambiente, organisashon i ekipo). Nos ta rafiná i tèst e proposishon aki den kuater diferente estudio basá riba analisis kwantitativo di algun banko di dato úniko. Den e promé estudio nos ta observá patronchinan ásimetriko di ahuste di komportashon di gerentenan general relashoná ku sirkumstanshanan den nan ambiente, den e organisashon i den e ekipo di gerensha. Den e di dos investigashon nos ta diskubrí ku atributonan di e ekipo di gerensha ta influenshá e direkshon di nan enfoke kognitivo i unda nan ta buska solushonnan adaptivo den industrianan dinámiko; esaki na su luga ta reflehá den diferente forma di renobo interno i/òf eksterno. Den e di tres estudio nos ta analisá kon e interakshonnan entre ekipo di gerensha i mènedgernan na nivél intermedio ta influenshá renobo interno pa medio di introdukshon di kambionan drástiko den struktura, prosesonan i praktikanan establesé. Den e último investigashon nos ta analisá kon diversidat den e ekipo di gerensha i konsenso riba vishon stratégiko ta influenshá direkshon di inovashon (inkremental òf radikal). E resultadonan di e estudionan raportá ta brinda evidensha pa e validés di e relashonnan propone den e disertashon aki.

7.3 Summary in Dutch

Om te overleven moeten bedrijven hun strategieën vernieuwen zodat zij zich kunnen aanpassen aan veranderingen in hun omgevingen. Strategische vernieuwing omvat de strategische keuzes en acties die bedrijven ondernemen om hun padafhankelijkheden te verbreken en een dynamische fit met hun omgeving te waarborgen over tijd. In dit proefschrift ontwikkelen en testen wij theorie over hoe, en onder welke omstandigheden op omgevings-, bedrijfs- en teamniveau, de meest invloedrijke strategische bevelhebbers van organisaties (de opper echelons), voor verschillende vernieuwingsstrategieën kiezen. Wij richten ons op de invloeden van algemene directeuren, het topmanagementteam en middenkadermanagement op interne en/of externe vormen van vernieuwingen. Wij stellen dat heterogeniteit in de keuze tussen verschillende vernieuwingsstrategieën gerelateerd is aan de aanpassingspatronen (gedrag, cognitie en informatiegebruik) van de organisatie's opper echelons onder verschillende omstandigheden. In de dissertatie rapporteren wij de bevindingen van vier onderzoeksprojecten, elk gebaseerd op een unieke databank. Uit de eerste studie blijkt dat algemene directeuren asymmetrische patronen van aanpassingsgedrag vertonen in relatie tot omstandigheden op omgevings-, bedrijfs- en teamniveau. De bevindingen van de tweede studie wijzen erop dat de compositie van het topmanagementteam invloed heeft op de gehanteerde cognitieve aanpassingspatronen in dynamische industrieomgevingen, en dit verklaart een belangrijk deel van verschillende vormen van interne en externe vernieuwing. In de derde studie ontrafelen wij de individuele en gezamenlijke invloed van topmanagement én middenkadermanagement op interne vernieuwing door middel van veranderingen in structuren, processen en praktijken. In de laatste studie bestuderen wij hoe diversiteit in het topmanagementteam, gepaard met de graad van de collectieve strategische visie, verschillende vormen van innovatie beïnvloedt. Samen leveren de studies bewijs over hoe de aanpassingspatronen van opper echelons variëren onder verschillende omstandigheden en verschillende vernieuwingsstrategieën beïnvloeden.

About the author

Mariano 'Pitòsh' Heyden II (b. Curaçao, 1984) did his PhD candidacy at the department of Strategic Management & Entrepreneurship of the Rotterdam School of Management, Erasmus University. He is a class of 2008 graduate (Cum Laude) of the research master program (MPhil) of the Erasmus Research Institute of Management (ERIM). Prior to joining ERIM, he obtained his BSc in Business Administration (With Honors) in 2006 from the University of the Netherlands Antilles. His research focuses on developing and testing multilevel contingency theory on how, and when, key decision makers matter for firms faced with the challenge of adapting to changing environments. His work has been consistently well-received at the top conferences in the field, including *Academy of Management, Strategic Management Society, European Group for Organization Studies, European Academy of Management*, and the *Academy of International Business*. He has served as chairman of the MPhil Council and the PhD Council at the Rotterdam School of Management, Erasmus University during his tenure in Rotterdam. He has held key leadership roles in the *Strategic Management Interest Group* for the 2010 & 2011 editions of the *European Academy of Management (EURAM),* whilst serving on EURAM's scientific committee in 2011. Pitòsh will continue his career as an Assistant Professor at the University of Newcastle Business School in Australia.

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ESSAYS ON UPPER ECHELONS & STRATEGIC RENEWAL
A MULTILEVEL CONTINGENCY APPROACH

To survive and prosper firms have to renew their strategies to maintain a dynamic strategic fit with their changing environments. Strategic renewal can be understood as the adaptive choices and actions a firm undertakes to alter its path dependence and maintain a dynamic strategic fit with changing environments over time. In this dissertation we endeavor to develop and test theory on how, and under what environmental, firm, and team conditions, the organization's key decision makers –its Upper Echelons, pursue particular adaptive responses. We focus on some contingencies that prompt Chief Executive Officers (CEOs), Top Management Teams (TMTs), and Middle Managers (MMs) to adapt through internal and/or external modes of renewal. We propose that heterogeneity in adaptive strategic choices ensues from the contingent search patterns (behavioral, cognitive, and informational) adopted by the organization's Upper Echelons. In the first study we find asymmetric behavioral search patterns of CEOs in relation to different cross-level correlates. In study two we find that TMT diversity influences cognitive search-focus in dynamic environments to explain heterogeneous adaptive responses. In the third study we find that TMT and MM diversity can either enable or hamper changes in structures, processes, and practices. Study four exposes how the complex interaction between TMT diversity and shared TMT vision drive new knowledge creation from the stock of knowledge acquired through informational search activities by TMTs. The findings from the four studies, each adopting a unique database, provide empirical evidence on how contingent search patterns of Upper Echelons drive different modes of renewal.

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